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**Don't Confuse a Tool with a Goal
Making Information Technology Serve Higher Education,
Rather Than the Other Way Around**

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ABSTRACT: This article examines the relationship between information technology (IT) and educational policy and argues that leaders of universities and colleges must do a better job of thinking creatively and strategically about how IT can enrich their institution's basic educational mission. The paper examines five areas of education policy that are deeply affected by IT— library policy, intellectual property, distance education, commercialization, and curricular standards and processes.   The paper suggests that the new technology has unleashed such creative, frequently entrepreneurial activity that is so expensive, pervasive and difficult to manage that it has had a negative impact on some of our fundamental practices in teaching and scholarship. It will continue to do so, and it will drive us if we do not drive it. The paper asks, have we established the mechanisms to review, monitor and evaluate these developments? And, have we given enough thought to how we can employ IT thoughtfully and self-consciously to meet our explicit educational policy goals?

Where am I coming from, you have a right to ask? I am certainly not an expert on information technology, nor is it clear that I am much of an authority on higher education. I am simply a liberal arts humanist, a specialist in history and law, with an additional bit of administrative experience. But I have worked in higher education, one way or another, for almost exactly half a century. I have also just completed 12 years as a trustee of Southern Methodist University, and that experience taught me a lot that I never learned as either professor or administrator. My current perspective on higher education, and on the educational impact of information technology (IT), however, comes mainly from the 11 years I spent as the president of the American Council of Learned Societies (ACLS), this country's national humanities organization.

Almost from the moment I started to work at ACLS in 1986 and began to evaluate the national situation of the humanities fields, I realized that the startling innovations in information constituted the single most important set of influences on humanities teaching and research. This observation surprised me, since I had assumed that the relevance of new computer-based technology would be restricted to the sciences. Humanists, after all, are the people of the book, the manuscript, and the library. But the more I traveled and took note, the more I discovered the remarkable extent to which technology was changing the way humanists did their work.

Let me give just a few examples. In 1986 almost everyone was using word processing and beginning to use e-mail. But perhaps the most obvious evidence of the emergence of IT was in the library, for there, at that time, we were already moving into the era of digital card catalogues and electronic texts. Greek scholars were expanding their capacities by using the CD-ROM Thesaurus Linguae Graecae (which includes complete texts of Greek literature from the earliest known writings well into the Common Era). The classicists were also learning how to teach about fifth century B.C.E. Athens with Gregory Crane's wonderful Perseus project. Linguists were employing computers to create the important new field of computational linguistics. Geographers, historians and other scholars were using G.I.S. software to map human behavior and creating simulation models for teaching purposes. Robert Hollander at Princeton and his colleagues at Dartmouth were building the Dante database. Today, of course, we take all of these things, and more, for granted.

I should admit that over the course of my investigations regarding the impact of IT on the humanities, I became an ardent proponent of the use of IT in teaching and scholarship. Not, I hasten to add, that I am a particularly adept technology practitioner; I am simply an increasingly well-informed fellow traveler. But although I have been a university administrator of one sort or another since the mid-1970's, ACLS forced me for the first time to take a national view of the challenges IT poses to the humanities, and, in particular, to the place of the

humanities in higher education. At that time, I tried to institutionalize my interests in and commitment to the thoughtful use of IT in the arts and humanities by collaborating with the Getty Trust and the Coalition for Networked Information to form the National Initiative for a Networked Cultural Heritage (NINCH), an organization for which I currently serve as president. These experiences are essential to understanding how I have come to have fairly critical views about the impact of information technology on higher education.

When I speak of higher education, I am thinking primarily of research universities, in which I have spent the whole of my forty years as a scholar-teacher. But I am, of course, familiar with a much wider range of institutions. Both of my children are liberal arts college teachers, and I believe that I appreciate the bewildering diversity of higher education, in all its forms. For this reason, I urge readers to consider how some of the generalizations that follow can apply to a variety of particular institutions, even given their disparate sets of needs and priorities.

My subtitle, "Making IT Serve the University, Rather Than the Other Way Around," should make it perfectly clear where I stand in regard to current trends in the utilization of IT in higher education. To state my conclusion at the beginning, I believe that we too often passively react to IT, rather than thinking creatively about how new technology might enrich our basic educational mission. As a few of you will know, my favorite quotation is drawn from Aristotle: "Everything that is

necessary is necessary upon some hypothesis." The purpose of this essay is to challenge institutions to articulate the hypothesis upon which their use of IT is being based. Universities should not simply accept each and every new advance in IT. Instead they should consider how IT best can serve their educational goals.

A similar point has been made by the medievalist-technologist James O'Donnell in his intriguing <u>Avatars of the World: From Papyrus to Cyberspace</u> (Cambridge, 1998). O'Donnell compares the current situation of IT use in higher education to the situation of American railroads in the 1950's, commenting "If the railroads of the 1950's had known they were in the transportation business instead of the railroad business . . . more of them would still be in business" (pp.147-8). He continues, "If we [educational administrators] think we are in the information business, we make the same mistake of confusing a tool with a goal" (p.175). Later, O'Donnell makes the same point in even more straightforward terms: "To use our new technological tools to change education, we must know what it is we are trying to do – what the purpose of education is" (p.183). Bingo! Aristotle could not have put it better. IT is a tool. Information technology, in itself, has nothing to do with higher education. But these days we seem to be confusing subject with object, and drawing conclusions about education from IT, rather than the other way around. This tendency, I believe, is a profound mistake.

But let us do a *tour d'horizon* of the impact of IT on higher education, remembering that IT is not a given, but a socially constructed phenomenon, subject

to numerous potential flaws. Garbage in, garbage out. Bad applications can generate bad results, and inappropriate design, inadequate performance.

First, let us think just a bit about the history of the introduction of IT into higher education. Here I can only give the personal impressions of a university professor. I suppose that the first impact of this technology was in the area of telecommunications – marked by the increasing sophistication of telephone systems, as well as the introduction of facsimile technology and wired networking, especially in conjunction with video and television. At about the same time xerography and other photo reproductive technologies appeared on the scene. We take all of these developments largely for granted today, but even they, simple as they now seem, have had a profound impact on how we teach, research, and administer our universities.

In the present case, however, I am most interested in the introduction of computing into higher education. My discussion is informed by conversations with my Princeton colleague Michael Mahoney, an expert on the history of computing. The story of the relationship between universities and information technology dates back to the mid-1950's and 1960's, when universities first began to rent or purchase computers for scientific research. (Prior to that, their scientists simply had built whatever machines they had needed.) The earliest commercial machines, such as the IBM 650, were not necessarily very expensive and they were paid for by research funders, principally by the federal government. As Mahoney has pointed

out, "The scientists could pay for it, so it was their machine." Indeed, in those early days, university administrations mostly played follow-along, paying scientists for the percentage of computing time they used. The first computer units were housed in engineering schools or science departments, and it was not until the later 1960's that most universities built specialized computer centers for a host of increasingly powerful and costly machines, though these centers were still mostly for the benefit of the sciences. At Princeton in the 1960's, for instance, the administration was still paying scientists for whatever computing time it used and passing the high hourly rates directly onto general users, offering only the most token of institutional subsidies. The university's attitude was that computing costs had to be recovered from users, the sole exception being the small amount of funding contributed by the university to make computing time available for general users (who could not afford the high hourly rates charged for CPU time). The computing environment began to shift, however, when university departments started to buy their own minicomputers in the early 1980's, and, of course, the situation changed radically by the mid-1980's, in the face of what can only be described as the personal computer (PC) revolution.

Mahoney tells me that, already by the early 1960's, discussion had begun about using computers for instructional purposes. Indeed, among 1200 universities as of 1966-67, 40% of computer time was allocated to research, 28% to administration, and a full 30% to instructional use (at least according to Carnegie Foundation for the Advancement of Teaching reports of that era). By the late

1960's, critics such as Anthony Oettinger had already begun to warn of the role of IT in the classroom, and to draw attention to what he believed to be false claims for the utility of computers in teaching. Yet the impact of computer technology, at that time, most likely was confined to a few specific areas of the university, especially science, technology and language instruction. More imaginative and widespread pedagogical applications of IT did not come along, for the most part, until the mid-1980's.

But one of the main parts of the university in which computing drove behavior was the library. From the 1960's onward, libraries began to automate, struggling to buy or develop systems that would facilitate acquisition, cataloguing, and circulation. Later, libraries transformed their basic functions through the searching power of electronic catalogues and other digital tools, and through the access computers could provide to remote databases. Libraries hired technologists and built "systems" to coordinate their new capacities. In the process, they fairly quickly discovered that, far from decreasing costs by replacing librarians with machines, computers drive up costs and require the expansion of library staff. They also found that technology can fracture traditional authority structures. The new computer specialists were soon competing with old-style librarians for control of library administration, and the two groups were often at odds with one another.

Over time, an increasing proportion of the faculty began to use computers, at least for word processing, while the growing range of user-friendly software made

new applications available to teachers and students. Finally, the evolution of Bitnet and, subsequently, the Internet led to a stunning expansion in the proportion of university personnel using computing, and in the range of purposes for which computing could be used. By the early 1990's we had access to the World Wide Web and, later, to Internet II. It was at this time, as I earlier suggested, that interest in instructional computing expanded and deepened. At the turn of the century, then, IT had hit campus. The era of IT had arrived, in all its costly and confusing glory.

Looking back, we can see that by the 1980's, with the general emergence of campus computing centers and the widespread move to employ administrative computing for a broad range of interrelated purposes, universities had begun to deal with computing technology in new ways. The fact that computing was frequently institutionalized in "computing centers" had implications not only for the centralization of campus computing, but also for the ways in which decisions about computing were made. There was, so far as I know, little broad discussion of the larger educational implications of computing during these years, and even less about the influence of the rapidly expanding technological revolution on the fundamental educational purposes of the university as institution. At the same time, of course, administrative computing was becoming both more and more important and more and more costly. Educational institutions also had to expend vast sums of money to network their campuses, and to build new types of computing facilities to provide the distributed access everyone now demanded.

More recently, the pace of change has increased – it may be that something like Moore's Law applies to computing in higher education.[1] Perhaps the most stunning recent development has been the revolution in administrative computing software – the PeopleSoft, Oracle, and SAP revolution. And here, most explicitly, questions must be raised in regard to what extent technological progress and university benefit necessarily coincide. Apart from the issue of how long it will take to make these software systems work properly, and whether they will ever work well, we must also acknowledge their incredible cost. Not just the continuing expenditures, for one of the unpleasant laws of computing turns out to be that it costs more to maintain systems than to build them, but the mindboggling unanticipated expense of installing a system like PeopleSoft. I can still remember the shock created during the SMU Board of Trustees meeting a year ago when the vice president of finances revealed that the university would be facing something along the lines of a $13 million overrun for the installation of its PeopleSoft system. In a relatively small university, even these days, $13 million can buy a lot of books and compensate a lot of professors. But because we are hooked on technology, we have wasted vast sums of money on a fool's quest for efficiency and savings.

Mike Mahoney has argued that in IT:

Things seem out of control now, because something happened in the '90s to provoke a land-rush mentality. Surely the Internet and the Web are part of

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the reason, but so, too, is the hyping of computing by the Administration and Congress, and by the business community from whose ranks the universities draw so many of their trustees. Universities have suspended their traditionally critical faculties (pun intended) and jumped on the bandwagon. And I mean "suspended," because they appear to have been thinking about these issues more critically thirty years ago than they are doing now (e-mail communication, 14 August 2000).

I realize that this summary does not do justice to the history of IT in higher education, but I hope it does provide a tentative context for my discussion. I want to highlight both the tremendous impact IT has already had on our campuses, and the fact that this impact is the consequence of choices we have made (or failed to make) about how, exactly, IT should be applied. We can see the tangible presence of IT all around us and in every aspect of our institutions: administration, library science, scholarship, teaching, and more. But nowadays it is no longer so obvious that the technology did not *have* to be introduced to the campus as it was, that it did not have to be managed in the way it was, and that the same sorts of financial decisions did not have to be taken that were. We need to think about who made (and makes) these decisions, and even harder about who determined (and determines) the standards according to which the decisions are made. What is their hypothesis? What are their educational goals? Above all, we need to put all strategic decisions about IT into the context of thoughtful and purposeful educational policy.

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double approximately every 18 months.

Let me illustrate these comments by one example – the emergence of the campus "computer czar." Whoever decreed that there should be a vice president for computing, or, more recently, one for information services? Were these positions created simply because nobody in the ordinary administrative structure knew enough in the 1980's to help shape decision-making? Or because the PC revolution so decentralized on-campus computing that there was a perceived need for greater coordination of computing activities? How has the creation of such a position affected the administration of libraries, which are the second-largest sites of computing on most campuses? How have both research and instructional computing been effected by the placing of so much executive power in the hands of administrators who know little about either research or teaching? What is the relationship between computing and "information" technology?

My colleague David Dobkin, the chair of our Computer Science Department, thinks that the CIO job (as it is now frequently called), should be thought of primarily as one dealing with academic (meaning research and instructional) computing – leaving administrative computing and infrastructure management either to be outsourced or handled at different (and lower) levels. According to Dobkin, the CIO should therefore be ". . . an academic type. You need someone with the same DNA as the faculty" (e-mail communication, 17 August 2000). Perhaps one should only ask that the CIO have some genuine appreciation for the actual content of the information he or she is expected to manage. The command and control structure (the metaphor is deliberate) we have put in place for

computing and digital information has had unanticipated and largely adverse consequences for the educational goals of the university.

Now I want to survey briefly a number of particular areas of campus policy and practice that seem to me to raise concern about the potentially adverse (or at least sub-optimal) effect of IT on educational policy and practice. This does not pretend to be an exhaustive list, and I will mention each area only briefly, but I hope these examples will illustrate my larger point – that we must not confuse tools with goals.

1. Surely one of the major educational activities most deeply affected by IT is the *library*. It is now hard to imagine how we administered libraries before computers. Almost every step in the library process, from the acquisition of books and journals to their delivery, is now automated. The electronic catalogue, and especially the capacity to search online across library catalogues, provides tremendous new research power. The library now offers online access to databases around the world. But, at the same time, remote access to library databases, to these virtual libraries, means that the library as a place, as a physical facility, is potentially less important than it used to be.

As a technological enthusiast, I do not find the mechanics of the transformation of scholarly communication by IT problematic, although, of course, there is plenty of room for debate about strategies and structures. But I am

convinced that on many campuses far too little thought has been given to how IT is being permitted to change libraries, as well as to how it is (or is not) also transforming the processes of teaching and scholarship. Do we know what we want the virtual library to be and to do? Are sufficient money and personnel being allocated to libraries for these organizations to perform their potentially expanded role in both teaching and scholarship? Do library directors have sufficient independence, resources, and training to lead libraries into the new era? What is the most desirable relationship between the training of faculty and students to use IT and the expanded functional mandate of the library? Does the "teaching and learning center" belong in the library? The above comments are only to suggest that the library of the IT era needs to be broadly reconceptualized as we think our way into the university (or college) of the IT era. What is the goal of the library in this era? How should the library be restructured to attain this goal?

I could of course devote this entire talk to library problems, for I confess that they seem to me the most profound of all educational problems these days, but I will mention only one other aspect of the library situation – the rising cost of serials, mainly in science, technology and medicine. The emergence of e-journals has only intensified the problem, because e-publication is being carried out based on licensing arrangements (rather than principles of purchase and ownership), so that libraries have less and less control over the cost of individual serial titles. Price gouging by commercial STM publishers is not solely the product of IT, though the increased costs of licensing and product packaging are a large part of it. But the

currently suggested university response, the attempt by universities and their libraries to self-publish STM materials in competition with predatory commercial publishers (SPARC), depends upon IT. Everyone wants more information for less money, but do we know what will SPARC-like projects do to the quality of academic publication? Is there no relation between the current system of scientific publication and the quality of scientific research? Do scientific researchers prefer to have their universities own the copyright to their work? I do not know the answers to any of these questions, but I think they deserve to be asked. Thus far the scholars themselves have not had a controlling voice in the discussion. Is this a matter to be left to provosts and librarians, to the Association of American Universities and the Association of Research Librarires?

2. A closely related area that has been dramatically affected by IT is *intellectual property*. I have already mentioned the licensing problem in libraries in relation to the acquisition of electronic publications, but licensing also raises questions of "fair use." It is not so obvious that the traditional exceptions to intellectual property rights on behalf of fair use for scholarship and teaching will be protected under the emerging e-copyright regime. The library is also struggling to determine whether the law will permit the full development of e-reserves or the copying of digital collections for educational purposes. The new licensing regime also creates comparable problems for individual scholars and for everywhere else in the university that software is purchased and used.

At the moment, however, the hot button issue concerning intellectual property has nothing to do with the library, but it has everything to do with the development of educational software. Put too simply, the problem is that universities now want to control potentially profitable electronic publications of faculty members under university patent law, rather than under their longstanding copyright policies. For years administrators have asserted that patents created by scientists and engineers are the intellectual property of universities, since they were created in expensive university laboratories. Faculty members share in the earnings of registered patents according to well-established formulae on each campus. In the past, however, professors have been permitted (indeed encouraged) to copyright their own books and articles, and to retain any profits from royalties. Now comes courseware – software used for teaching (though frequently also for research) and with impressive market potential. It is also, one must say, more closely related to the teaching function for which faculty are primarily employed. The response of university administrations has been to attempt to expand the patent policy to cover courseware, and to claim that this software belongs to the university (with its faculty "inventors" entitled to the same kind of profit-sharing arrangements in place for scientists). Professors, as e-publishing scholars, are thereby being reconceptualized, without their consent, as "workers for hire." The result? One big problem, many articles in the <u>Chronicle of Higher Education</u>. But how much enlightened contemplation has been given to what is educationally or intellectually at stake? How important is courseware to the educational mission of academia? To what extent do we need to provide incentives for faculty production of high-quality

software? Is a controversy over university by-laws the best way to think through

educational policy? I think not. But the courseware copyright policy issue is one of

the many ways the law of intellectual property, as applied to IT, is changing how a

university works and relates to its constituencies. I will not even mention Napster or

the potential liabilities of universities as online service providers.

    3. A third area of concern with respect to the impact of IT is *distance*

education. Who would have thought, only a few years ago, that our great

universities would now be devoting so much apparent effort (and so much money) to

what probably would have been called continuing education a decade ago? Didn't

most of the elite private universities, after all, thumb their noses at adult or

continuing education, unless they thought of it as useful for the cultivation of their

alumni? Suddenly even these ivory towers are hungry to get into what is currently

called "distance education." Would that have happened without the new IT? Not a

chance, so far as I can see. However, too much of what is now being called distance

education in most institutions is not motivated by pedagogy, but by business. I will

come back to the implication of commercialization. The point I should like to make

here is simply that distance education should not be viewed in strictly business

terms. The new technology now gives us the opportunity to deliver education

remotely (virtually), and this enhanced ability should be a cause for educators to

celebrate. But I will only celebrate when I am convinced that our creative energy is

going into using technology to deliver a better quality educational experience rather

than to fatten a university's bottom line. Are we really thinking imaginatively

enough about the pedagogical opportunities (and difficulties) of virtual education? Have we realized that we are engaged in "distance education" within our own campuses, as well as without? How does virtual education on the campus differ from distance education? IT enables us to provide access to information and guidance in every dormitory room on campus, after all, and we now need to think how to use that power in conjunction with the physical presence of faculty and facilities. Is it a problem, by the way, that our libraries are emptier and emptier of students every evening? Is sitting in front of a terminal truly the best way to learn? Or for that matter, how does the use of interactive teleconferencing technology affect the learning process? These are only a few of the unresolved aspects of distance education.

4. My fourth problem is, as I have just hinted, *commercialization*. Distance education is hardly the only evidence of the commercialization of higher education in response to IT. The emergence of a potentially thriving virtual university sector (the University of Phoenix, Sylvan Learning Systems and, most recently, DeVry) gives most of us pause. The change in university attitudes on copyright law given the commercial potential of software is another example of the phenomenon. But, more important, the general impulse to tranform institutions into universities-dot-com, and somehow to make vast sums of money thereby, is quite pervasive these days, however poorly understood and articulated such sentiments may be. Arthur Levine and other cheerleaders for commercialization have been quite clear about

what is at stake –arguing that if the universities do not take immediate action, the moment of business opportunity will be lost. I believe they are dangerously wrong.

At one level, the universities are simply going through what all nonprofit cultural institutions – museums, libraries, or historical societies – are encountering as they seek to reinvent themselves as virtual institutions. The problem in going virtual is not primarily in developing the technology, although that will always be a substantial challenge, but in constructing a viable business plan. How are the trustees and administrators to recover the enormous costs of digitization, equipment purchase and maintenance by a staff of high-priced, high-tech employees? The development of business plans for digital collections in museums and libraries, for instance, is extraordinarily complex – and it is not clear that anyone yet knows how to recover start-up and maintenance costs. It is difficult enough to generate sufficient income simply to break even. But when one attempts to move beyond cost recovery and attempts to produce surpluses, the matter becomes more complex and more troublesome.[2] The problem is that few non-profits have the capital resources to develop ambitious digital programs, and they therefore are turning to for-profit alliances and to capital markets in order to finance their moves into the digital era. This raised the question of whether the nonprofit university is subverting its mission in its quest for IT-related income. Doesn't it matter that some of our finest universities are beginning to behave like proprietary educational institutions?

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[2] The nonprofit world never uses the term "profit." When it acknowledges the fact at all, it speaks of "surpluses."

I have neither the time nor the knowledge to describe fully the multitude of ongoing strategies to build electronic programs designed to enrich the university virtually. I am probably much too cynical, for doubtless some of these efforts are genuinely motivated by the desire to improve education through technology. But judged by their press releases, none of the most highly touted schemes strikes me as being primarily motivated by educational policy. Again, the mood seems to be that if "we" do not do it, then "they" will, taking the money with them. I am thinking about Fathom, e-Cornell, uNext and other for-profit consortia offering Web-based sites. Perhaps we should call this the era of "university as portal," U-Portal.com. Question: "What is the difference between Yahoo or AOL and Columbia University?" Answer: "Less and less." The <u>Chronicle</u> quotes the "organizers" of Fathom.com as saying that their site "will transplant into cyberspace the intellectual milieu of academe – going beyond course offerings to include museum exhibitions, scholarly lectures, artistic performance and the like" (14 April 2000). It sounds as though this site aspires to be a very high-class entertainment portal, at least one or two steps up from NFL.com. I fear that such an endeavor will experience the leveling effects of most media attempts to make money from scholarship – take the History Channel, for example.Such commercial efforts are evidence of how the tool of IT seems to have become the goal.

5. I can think of many more examples, but one final problem I should like to discuss is the impact of IT on *curricular standards and processes*. I was intrigued to read in the <u>Chronicle </u>that a consortium of the higher education accrediting bodies

"are near agreement on guidelines for evaluating distance education that differ from traditional accrediting standards by focusing on how much students learn." One of the accreditors is quoted as saying that the advantage of the new standards is that they really focus on " . . . student learning instead of institutional preferences. . . . We view technology as a tool that can really enable people to learn in their own way" (11 August 2001). Well, I think outcome assessment is an interesting development in higher education, but I also think we should be a little worried if the accreditors take this principle to mean that students should set their own educational goals and be assessed accordingly. But what intrigues me is yet another piece of evidence that IT is both overtly and covertly producing changes in educational standards. If so, the camel's nose is truly under the tent.

Another bit of evidence for this trend is the recent AAU-ARL announcement of a set of principles for "Emerging Systems of Scholarly Publishing" (<u>Chronicle</u>, 16 June 2000). The AAU-ARL project is laudably focused on how to respond to the serials price crisis, but it also calls for reducing emphasis on the quantity of publications in evaluating a professor's work, and for finding new approaches to peer reviews of electronic articles. Now, excessive article publication is not exclusively a product of IT, though it is doubtless related to technological improvements of many kinds; nevertheless, the new policy recommendation emerges from the efforts of librarians and provosts to try to think through one important aspect of the IT era. Perhaps more significant is the extent to which the new e-publication of monographs (and even dissertations) will affect the ways in

which their authors are evaluated for tenure and promotion. And we have barely begun to cope with the question of whether we will give scholarly "credit" for the production of courseware or scholarly databases. Would Harvard today promote to tenure a young Greg Crane, with an online database comparable to <u>Perseus</u> to his credit? Perhaps less importantly, what do we do about online sites like teacherreview.com that mounted student teacher evaluations on the Web? Or with any one of the several Web-based commercial student note-taking services?

I could go on, but my point is simply that the new technology has unleashed such creative, frequently business-oriented, chaotic activity that it has already dramatically altered some of our most fundamental practices in teaching and scholarship. It will continue to do so, and it will drive us if we do not drive it. Have we established the mechanisms to review, monitor and evaluate these developments? Have we given enough thought to how we can employ IT self-consciously to meet our explicit educational policy goals?

What is to be done? I have tried to provide you with a series of examples of what I believe to be a general problem in the way the institutions of higher education are dealing with IT, but I do not pretend to have a program designed to cure all the ills this revolution has called into existence. I would, however, like to make a few specific, short-term proposals.

1. I think that most institutions need to review their governing rules and formal educational policies in the context of this new technology in order to take into account the new relationships and dynamics created by IT. The one area in which action has begun is in intellectual property, for which some excellent university statements have been drafted. But we definitely need specification and clarification of the rights and responsibilities of faculty, students, staff, and administration in this new technological setting. Our governing assumptions are still for the most part premised on an analog environment, and they do not take into account the educational ecology of the IT era. Some of the problems of this era are already quite apparent: ownership of courseware, the legal terms of faculty employment, allocation of faculty time to outside dot-com activities, the copying of research and teaching materials, limits on the use of the Internet (and intranets) for faculty, staff and students, electronic privacy, rules governing the authority of research material taken from the Web, the implications of the use of university IT equipment. The list goes on. I am not here proposing a rule-bound environment, but rather advocating that educational institutions put on the table some general propositions for roles and responsibilities in the IT era. We need to understand better how to relate to one another in this environment. What are our goals, and what are our guiding principles?

2. I think that we have to consider the reorganization of some aspects of the authority/command structure of the university in order to fit IT decision-making into an educational framework. I have already mentioned the emergence of the

upper level administrator for information technology, a CIO, as one of the first university administrative responses to the challenges of IT. I have also mentioned that this office is frequently in conflict with the campus librarian and, for that matter, with the administrators of other educational units. As my friend Barry Sullivan of Washington and Lee University has observed, for the most part, the "IT people keep doing basically what they've been doing and the library keeps doing basically what it's been doing, each wanting to take over the other's empire, but not going to the trouble in either empire to look at the whole picture" (e-mail communication, 14 August 2000). The administrative theory has been that the buck has to stop somewhere, and that is sensible. But the operational result has been that, too often, the information czar focuses primarily on administrative computing since that has usually been the institutional priority. Some institutions are experimenting with combining the CIO and the librarian, and that may be a good solution. Even if it is, however, I fear that technology for instruction (and, to a lesser extent, for research) will tend to be ignored. While I do not know the answer, I think we must create authority structures that evaluate technology needs and opportunities more in terms of intellectual and educational needs rather than administrative imperatives. It might not be a bad idea to find CIO's who have real experience in teaching and research, so that they will be part of the academic culture themselves.

    3. I believe that we need to rethink the institutional ecology of the university in the IT era. As I have indicated, I think that the role of the library is being

steadily transformed, and I think it should probably play a larger role on the instructional side. Librarians are increasingly among those who have the technological capacity to bring faculty into the IT era, and to assist students in locating information far outside the walls of any one building. They are also playing a role in shaping the information placed on library servers. It is possible that the library should take on at least some of the tasks currently undertaken by teaching and learning centers, at least insofar as technology is concerned. We also need to rethink the function of computer centers in relation to both the library and academic classrooms. We no longer live in the mainframe environment that seemed to require such centers, and we have to think how to retrofit them for current hardware and software needs.

4. A related observation is that institutions of higher education are under investing in the human resources necessary to bring the teaching and research functions of the university fully and quickly into the IT era. There are many good examples of how this can be done – the Institute for Advanced Technology in the Humanities at the University of Virginia being my personal favorite among them. But too many campuses are leaving it to students and faculty to educate themselves on how to use the technology to best effect. I am particularly concerned about instructional technology. As I have already suggested, we seem to think of IT instruction primarily in the context of delivering education off-campus, whereas remote access to teacher and information is in fact the reality of today's on-campus educational practices. There are serious questions here of the impact of technology

on the learning process, and we need local experts to help us work them through. Who such experts are, where and how they are trained, and where they should be based on the campus are serious problems that require immediate attention.

5. Finally, we need to continue to pursue the collaborative possibilities that seem both feasible and urgently necessary in the IT environment. Libraries have cooperated together for a very long time, and the new possibilities for digital collaboration are appealing. Distance education is another area in which inter-institutional collaboration is emerging as a possibility, and rightly so. The technology makes teaching, reading and researching all rather easy to do in a multi-media, multi-institutional environment, and the tremendous costs of the technology may force us into the sort of collaboration to which we have in the past paid mostly lip-service. Such collaboration would include inter-institutional sharing of technological resources and partnering to build e-products. And, of course, the entire world is available in an era of virtual communities – we can now begin to make good on our aspirations to internationalize the campus. If we plan such consortial activities with thoughtful attention to the educational values involved, we will serve everyone better.

I am afraid that I have taken rather a long time to make a very simple point. It is that technology is not something that happens to us. It is something we create. We must not confuse a tool with a goal. We must, therefore, be sure that information technology serves the fundamental purposes of our chosen sector,

higher education. In order to do so, we must determine what our fundamental educational goals are, and how technology best can serve them. And this endeavor will be more difficult than it sounds.