Institutional Transformation to a Learning Web

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Abstract: It is recognized that increasing costs and the convergence of computer and communications technologies are creating pressures on universities to transform their modes of operation to be more appropriate to modern society. This article analyzes the transformation of educational institutions from a *learning web* perspective, detailing the critical drivers, obstacles and resources for transformation, and proposing some specific modes of operation for a networked higher educational system. It concludes with a section on how the learning web may be implemented by increasing the flexibility and reducing the cost of university administration through electronic commerce systems.

1 Transforming Educational Institutions

In their influential study on *Transforming Higher Education* for the Society for College and University Planning (SCUP), Dolence and Norris (1995) note that:

> *The Information Age is an epoch where "higher education" could occupy the pivotal role in society. It is a time when demand for learning is anticipated to skyrocket, but resources available under existing models for educational delivery are expected to remain fairly static. Fresh vision is needed to create new delivery systems for learning, new paradigms for financing, and new models for higher education.*

The vision of a *learning web* has been proposed as a model for a future learning society in which individuals, organizations, computational agents and services, and other resources are linked through digital networks to function in a variety of self-organizing, goal-directed systems (Norrie and Gaines, 1995b). Experiments in the application of the learning web to undergraduate collaborative learning have been reported (Shaw and Gaines, 1996), as have the development of special-purpose tools supporting the learning processes in the web (Gaines and Shaw, 1995; Shaw and Gaines, 1995).

An article at EdMedia'96 addressed the rationale for, and systemic foundations of, the learning web, its implications for restructuring the higher education system, and the role of information technology in supporting that restructuring (Gaines, Norrie and Shaw, 1996). This article analyzes the transformation of educational institutions from a learning web perspective, detailing the critical drivers, obstacles and resources for transformation, and proposing some specific modes of operation for a networked higher educational system.

2 The Dynamics of Transformation

In analyzing social change one specifies the initial conditions, the expected outcomes, the critical drivers for change, the expected obstacles to change, and then considers the implementation of change in the light of these factors. Figure 1 diagrams this analysis for the higher educational system.

The initial conditions are that our current universities are a historically well-funded, growing system, taken for granted by society, but their mode of operation is labor-intensive and based on intellectual craft skills. The drivers for change are the inability of society to sustain the present funding model (Clotfelter, Ehrenberg, Getz and Siegfried, 1991; Clotfelter, 1996), and the convergence of computer and communications to a low-cost ubiquitous 'information utility' (Martin, 1978; Gaines, 1996). The obstacles to change are our existing cultures based on 30-200 years of existing concepts of a university, the cost of funding the transition, and the limitations of existing technologies.

An expected outcome is a networked world-wide university system integrated into all aspects of everyday life which will support time- and distance-independent life-long learning (Rossman, 1992; Harasim, Hiltz, Teles and Turoff, 1995). The logic behind this predicted outcome will emerge as we consider the resources required to implement changes that will make universities more cost-effective in fulfilling their roles in society.

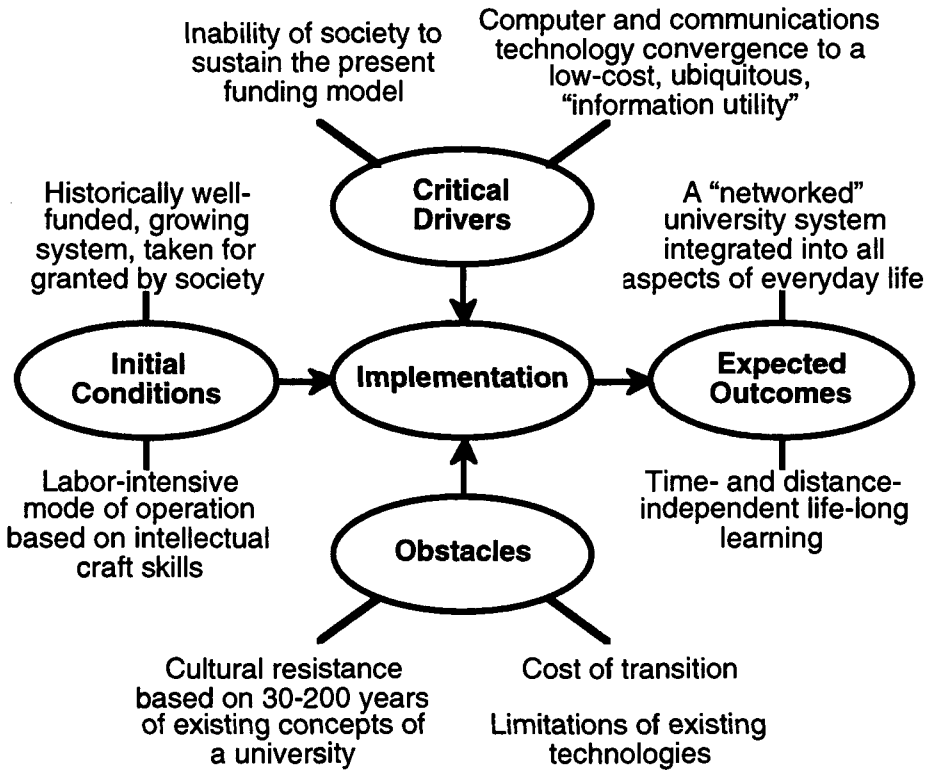

Figure 1 Factors in the transition to a post-modern university system

I have used the much-abused term "post-modern" to describe the networked university because of its connotations of a post-industrial, post-regimented, post-authoritarian age, where people at large recognize that human meaning and human culture are human inventions that are their choice and their responsibility (Aronowitz and Giroux, 1991; Lyotard, 1992). The authority of the academy is being undermined now in the post-modern enlightenment in the same way that the authority of the church was undermined 300 years ago in the modern enlightenment (Schmidt, 1996). Universities cannot stand aside from society as the ultimate conservators, guardians and disseminators of knowledge. They have to become an integral part of a world community where digital communications and media are becoming commonplace, and the students of North America will converse with the people of France or Japan or Russia across the Internet as readily as they chat to their neighbors.

3 The Resources for Transformation

If universities are to transform, both the outcome and the dynamics of transformation are critically dependent on the resource structure that supports them. Figure 2 presents a graphical analysis of the major resources involved. At the center is the definition of the institutional mission. It may seem strange to treat this as a resource, but the existence of a well-defined mission statement, accepted by all the major participants is a key resource in managing change. It is salutary to read Newman's introduction in 1852 to his Dublin lectures on *The Idea of a University*, and recognize that in every age the idea of a university has been brought into question (Turner, 1996). Newman states:

> *The view taken of a University in these Discourses is the following:- That it is a place of* teaching *universal* knowledge. *This implies that its object is, on the one hand, intellectual, not moral; and, on the other, that it is the diffusion and extension of knowledge rather than the advancement. If its objects were scientific and philosophical discovery, I do not see why a University should have students; if religious training, I do not see how it can be the seat of literature and science."*

If one took out the adjective "religious" qualifying training, then this statement of a century and a half ago could be seen as a contribution to the current debates on the roles of the university in research, teaching and training.

Underlying most mission statements is the notion of the university as a *community of scholarship*, where scholarship is some form of open, critical inquiry expressed as overt knowledge. Newman's notion of universal knowledge is suspect in a post-modern world where all knowledge is seen as a human construct subject to a variety of human biases. However, universality does not imply absolutism, and the objective of universality in the sense of being shareable throughout a world-wide community is still at the heart of the notion of scholarship. Landow (1996) in his essay on *Newman and the Idea of an Electronic University* emphasizes the support of collegiality possible through electronic networks, "an idea more honored in the breach than in the observance" in our existing physical institutions.

The mission of the university system as a whole may be defined in terms of a community of scholarship, but the mission statements of particular universities have to go beyond this in defining their particular intended contributions to that community. In the past, a particular physical location could be a major component of the mission—many universities were formed to serve their local communities on the assumption that it was most cost-effective for students to enroll at a university close to their homes. That assumption is now coming into question as digital communications support the possibility of a virtual university, accessed electronically rather than physically. However, the idealized notion of a community of scholars does not address all the reasons why a student might wish to attend a university. University education is only one component of the life experience of individuals and many other factors may determine the attractiveness of a particular university. Those other factors need to be made explicit in a mission statement. In addition, there may be aspects of the scholarly experience in terms of involvement in human society and culture that the technology does not yet support well, and those aspects need to be made explicit in a mission statement if the role of the technology is to be properly evaluable. Overall, in times of change, it becomes very important to be explicit, comprehensive and correct in defining the institutional mission.

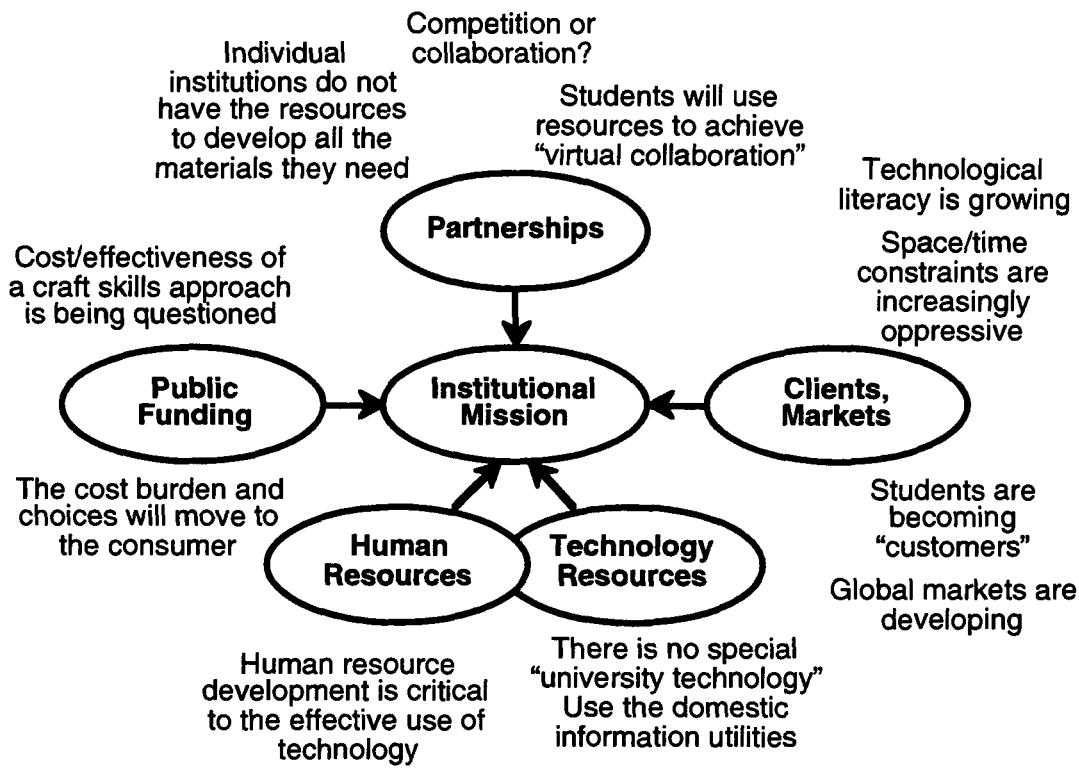

Figure 2 Resources involved in the transition

On the left of Figure 2 are the resources supplied to universities through the general social levies of public funding. These resources are reducing because the cost-effectiveness of universities is seen as suspect, and a free market economy in which resources are allocated according to value received is seen as more appropriate. On the right, resources from this free market are shown where students as customers are increasingly technologically literate and find the space and time constraints of having to attend a particular location at a prescribed time increasingly oppressive. In addition, the true clients who provide the funding may be the

employers of the students, making workplace education significant, and global markets are developing for higher education services world-wide.

The internal resources for change are still in large part people—as much, if not greater, effort needs to be put into developing human resources as into technical ones. The provision of technology resources is becoming increasingly simple as domestic information utilities gain the high speed multimedia and discourse support facilities necessary for effective knowledge dissemination. If universities need to develop a specialist 'technology' of their own it is at the intellectual level of facilitating learning through the effective use of the commonly available information technologies.

The most significant resource issue is that shown at the top of Figure 2, the development of *partnerships* because individual institutions do not have the resources to develop all the materials they need. One response to the availability of distance-independent higher education may be to compete in the physical territories of other universities, and in the short-term this is happening for expensive professional qualifications. However, in the longer term those competing in this way will find their positions eroded as other institutions join the competition and drive prices down so that the distance education market becomes fragmented and financially less attractive. The natural economic model is one of virtual collaboration through market differentiation in which different institutions specialize in the provision of different higher educational services. Students will take course modules from different institutions and be accredited for their qualifications by other institutions that may specialize in accreditation and management of the learning process rather than content provision.

It is these considerations that lead to the expected outcome of a *networked university system integrated into all aspects of everyday life* as shown on the right of Figure 1. They do not lead to a monolithic model in which all higher education is in the cyberspace of a completely virtual university. People have an existence in the physical world also, and different university locations, their amenities and cultures will still be relevant to where students reside. It is an intrinsic feature of the growth of lifelong learning that more students will be concerned about the location of their employment also, but with tele-commuting a growing trend the decision as to whether to tele-commute for ones education or ones employment, or both, will be an increasingly open option. The "network" will not be purely electronic but will involve the heterogeneous integration of learning experiences in the physical classroom, workplace, and virtual campuses of many educational institutions.

4 Learning Web Administration through Electronic Commerce

The pedagogical principles underlying the implementation of the learning web have already been analyzed (Norrie and Gaines, 1995a; Gaines et al., 1996) and exemplars given (Gaines and Shaw, 1996; Shaw and Gaines, 1996; Herlea, Shaw and Gaines, 1997; Shaw and Gaines, 1997). They stem from the basic concept of a learning society as an autopoietic system recursively structured as a network of intelligent learning agents, with the agents ranging from major social complexes and institutions through to roles in individuals (Gaines, 1994). The emphasis on structured social networks leads to pedagogical principles that facilitate the formation of social learning environments where students are resources for one another and where instructors are more facilitators than lecturers.

However, the development of networked higher education resources raises as many administrative issues as it does pedagogical ones. Implementing a distributed social learning environment involves the management of a heterogeneous mixture of resources from many sources. In terms of existing systems it may be seen as requiring the *modularization* of courses to generate a wide range of *virtual courses* tailored to learner needs. The use of modules from various sources to constitute an accreditable virtual course is educationally attractive in providing greater variety for students with different learning styles. It also makes it easier for faculty to specialize in the provision of modules in which they have specialist knowledge both of content and appropriate learning environments and teaching styles.

The administration of virtual courses within a virtual university presents major problems. Universities already have a cumbersome and expensive bureaucracy to deal with the administrative and financial transactions of large numbers of students taking individual mixes of courses on different time scales. Some aspects of administration, such as room allocation and class scheduling will become much simpler for time- and distance-independent learning. However, the current system is complex already in coping with the charging for courses and in the allocation of the resulting resources to the units responsible for courses. Modularization and out-sourcing of course modules will increase the administrative complexity by an order of magnitude and require new systems for charging for comparatively small transactions with a low overhead in transaction costs.

This is precisely the problem being addressed by new developments in electronic commerce where customers shop in electronic malls on the Internet and the entire transaction from product browsing, through ordering and payment, to delivery is automated. The efficiency of the banks EDI systems is now such that transactions resulting in payments of less than $1 can now be carried out cost-effectively. A good example is MIX, the ManGlobe International eXchange (http://www.manglobe.com/index2.htm) which provides the backend services for retailers offering products on the web in collaboration with the Royal Bank of Canada.

A MIX retailer pays the cost of operating a web site together with a transaction fee of 5% with a maximum of $10 to ManGlobe for taking care of the administrative and financial aspects of the transaction including credit clearance, inventory management, delivery tracking and payment. An additional 1.5% is levied if ManGlobe handles a credit card transaction on behalf of the retailer. The ManGlobe technology is designed to ensure transaction security through the issue of confidential identifiers to customers that control access to their financial sources.

This model is directly applicable to the provision of learning modules as retail products through the web. It provides for the comparatively small financial transactions involved with a low administrative overhead and detailed tracking. Inventory management is relevant where modules have an associated human component such as email access to an instructor and it is important to control the numbers of students enrolled at the same time. The secure transaction technology provides the beginnings of a system for checking that a student being assessed is the one actually registered for the module, although that is a more complex problem than ensuring the security of a financial transaction.

An electronic commerce model of a higher education shopping mall may not seem attractive, or appropriate, to many academics, but it takes care of the administrative operation of a university that most of them do not perceive. From a pedagogical perspective, the issue will be one of developing educational modules that can be delivered effectively through the various means available, not only the web, but also through classes, seminars, self-study modules not on the web, and so on. The overall learning environment will be one of *team teaching* with the team extending to colleagues at a range of other institutions. It is often said that the administrative aspects of a university are a major influence in stifling innovation in the exploration of new teaching techniques and learning environments. The provision of a highly flexible and cost-effective administrative system through electronic commerce techniques could remove the major impediments to innovations in teaching and learning.

5 Conclusions

It is recognized that increasing costs and the convergence of computer and communications technologies are creating pressures on universities to transform their modes of operation to be more appropriate to modern society. This article has analyzed the transformation of educational institutions from a learning web perspective, detailing the critical drivers, obstacles and resources for transformation, and proposing some specific modes of operation for a networked higher educational system. It has suggested how the learning web may be implemented by increasing the flexibility and reducing the cost of university administration through electronic commerce systems.

The transformation of universities into a world-wide networked higher educational system that is responsive to the needs of post-modern society and the opportunities offered by the convergence of information technologies requires changes in many aspects of the operation of the university, not only in the teaching methodologies and learning environments but also in the adminstrative infrastructure. None of these changes affects the university system's fundamental role in society in supporting a community of scholarship providing open, critical inquiry into all aspects of our existence. The changes are in the way in which that role is carried out and in the opening of the community to transcend physical and other boundaries. The task of the scholar today is to preserve the integrity of the scholarly process while taking full advantages of technologies which extend the collegial domain to any person in any location world-wide.

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