

ELECTRONIC TECHNOLOGY - THE UNIVERSITY'S TWO EDGED SWORD

Presented to University System of Georgia Chief Academic Officers
Sea Palms Island
July 11, 1998

by

G. Wayne Clough
President
Georgia Institute of Technology

Good evening. It is a pleasure to be with the chief academic officers of the University System of Georgia. I have been asked to share with you some thoughts on the changes being wrought in educational delivery by technology and telecommunications and the implications of this for the future. Let me note at the outset that everyone should understand that just because Georgia Tech is an "Institute of Technology," this does not mean our teaching and learning environment, and incentives to change in this environment, are any different than those in any other school. Yes, many of our faculty are at the forefront of research in telecommunications and educational technology, but such efforts are a far divide from implementing wholesale changes in the curriculum, revising the student/faculty equation, or undertaking large scale delivery of educational services using advanced telecommunications. It has been only recently that we undertaken institution-wide efforts to integrate advances in educational technology and telecommunications into our core curriculum and mission. This work derived largely from faculty-led studies that recommended the changes with our administration serving primarily to facilitate faculty initiatives.

I don't think it would be unreasonable to say that today we all, to some degree or another, are benefiting from advances in telecommunications and educational technology. Yet at the same time we all understand that there is an element of threat in the rapid emergence of alternative methods of educational delivery. With Georgia Tech home to one of the largest collection of faculty in the nation doing research on telecommunications and computing, I periodically get the feeling that I can hear some of them sawing on the limb we are sitting on.

This is an awkward time for educational leaders. In a sense, we are in a race and feel we should be running faster than we are, but we don't know which direction to run in, or how far the finish line is from where we are today. Most of us are leery, if not a bit cynical, of the claims of the technological wizards, since most of us at one time or another have taken a turn at riding the forefront of the technology wave. Nine times out of ten this has proven to be a short and embarrassing ride. Too often the technology you invested in

proved to be leapfrogged by another before the lab is assembled, turned out to be incredibly costly to maintain, required a massive investment in faculty time to create something of value, or had little true educational value.

No institution, and none of us, wants to be in that situation, but we are faced with hard facts that tell us we cannot simply wait for the smoke to clear. The use of computing and telecommunications technology is becoming so pervasive, the expectations of our customers will not allow us to play a pat hand.

Consider the following:

1. Ownership of personal computers has reached 1 out of 4 homes in the U.S.; in the Atlanta Metropolitan area, a recent survey showed as many as 65% of the households owned computers with fully 50% of these linked to the Internet.
2. Use of computers by teens is extensive, with 90 percent reportedly using this technology at least several times a week. Fully 92% of teenagers are reported to think computers will improve their educational opportunities; these computer literate teens come to education with a different mode of thinking than past generations, with more emphasis on self-learning and interactive dialog via the network.
3. Growth of Internet use is explosive and shows no signs of diminishing. There is particularly rapid expansion now spreading beyond U.S. boundaries.
4. Use of electronic course delivery is growing; it is estimated that one million people received courses via video and other media this past year. This figure is up considerably from previous years and approaches one tenth of the number receiving courses in traditional classrooms. Phoenix University, a virtual institution of higher education, now enrolls 48,000 students with plans to grow to 100,000 shortly.
5. Expectations by employers for high-level computer skills are at an all time high. The case of the design of the Boeing 777 is illustrative. This incredibly complex plane was designed by 500 companies in 12 different countries using software systems that were compatible. No model was ever made before the prototype took its maiden voyage. The future of design has been changed forever.
6. Moore's Law, which predicts the power of the computer chip will double each year, continues to be accurate, meaning the past exponential rise of computing power will continue into the future. And there are good reasons to think that the power of fiber transmissions and wireless networks will follow similar paths for years to come, adding to the amazing growth in information and communications access.

Perhaps no more dramatic illustration of the impact of new technology on education could be demonstrated than by the explosion of interest in the Mars Pathfinder mission through Internet access to the NASA Pathfinder homepage. Millions of students all over the world followed the progress of this mission on a daily, if not hourly, basis. In many

ways universities are already being transformed by these kinds of dynamics. Illustrations of some exciting developments that are either in the pilot stage or close to implementation include:

- Classrooms with video feed and electronic whiteboards that allow faculty lectures to be directly recorded, along with student notes from their own electronic pads, then immediately accessed by students' in-room computers.
- Multi-location design project interaction where team-to-team information is exchanged via electronic whiteboards and the Internet.
- On-demand learning offerings delivered directly to desktop machines at the home, office, or dorm room via the Internet.
- Instant access to knowledge through linked libraries and custom-designed search engines using personal agents that know your own preferences and needs.
- Widespread delivery of university services such as health care using tele-medicine.

Yet in spite of the impressive potential that lies in technological innovation, universities have been slow to capitalize in many areas, one of the central ones being in the core of academe, the classroom. In his book, *Being Digital*, Nicholas Negroponte contrasts the case of a surgeon and a faculty lecturer from the 17th century who are both transported to the 21st century. In the operating theater of a modern hospital the 17th century surgeon would recognize little and be unable to do anything. But, the 17th century faculty lecturer would feel right at home in most of today's classrooms. The lecturer's clothes might even be taken as a new wave of fashion.

Because of our slowness to respond and the pace of introduction of new technology, there are jeremiads predicting the university, as we know it is on the verge of becoming obsolete. Well-known management consultant Peter Drucker said in the March issue of *Forbes* magazine, "Thirty years from now the big university campuses will be relics. Universities won't survive. It's as large a change as when we first got the printed book...Higher education is in deep crisis. Already we are beginning to deliver more lectures off campus via satellite or 2-way video at a fraction of the cost. The college won't survive as a residential institution."

An earlier, and more thoughtful, alarm for the university as we know it was sounded by Dr. Eli Nome, director of the Columbia Institute for Tele-Information, who said "while new communications technologies are likely to strengthen research, they will also weaken the traditional major institutions of learning, the universities. Instead of prospering with the new tools, many of the traditional functions of universities will be superseded, their financial base eroded, their technology replaced and their role in intellectual inquiry reduced."

If Drucker and Nome are right, the phrase "connecting education to the future," could mean doing so without much help from the traditional university. They have a strong point, and doubtless some colleges and universities are going to be left behind in the future. Yet their analysis assumes an "either/or" scenario which neglects certain important factors. First, much of the present growth of electronic educational delivery meets a different demand than that satisfied by traditional higher education. This is evidenced by the simultaneous growth of enrollments in both the electronic and traditional educational sectors, a trend that will continue for some time into the future. Second, the "either/or" assumption does not recognize that many universities will be aggressive in use of telecommunications and educational technology in expanding outreach and in enhancing their campus-based missions. The latter observation is validated in that the exciting projects I cited earlier are drawn from efforts underway at traditional educational institutions, including my own.

In fact, universities have a number of inherent advantages over virtual education suppliers, at least for the time being. For starters, virtual institutions haven't yet found a way to field a football or basketball team. They even haven't picked up on the need for funny looking mascots and school colors that only an alumnus could love.

More seriously, there are other advantages that will hold for the traditional university for at least the next decade:

- For undergraduates students especially, time spent living on campus or nearby is a learning experience in itself--a rite of passage if you will. In this sense, the university assumes responsibility for the growth of the individual in a holistic sense.
- A virtual educational experience does not provide the opportunity for personal interaction between faculty and student. (However, I will admit this is something there may be too little of in the modern research university as well!)
- In many fields such as science and engineering, laboratories and the experiences in them are essential. Although virtual experiences can enhance the physical, they cannot replace the learning that comes by actually "doing it."
- Universities provide for faculty interaction, hands on teaching of students, and facilities for research, and this forms the basis for much of the nation's knowledge creation.
- Finally, most people still place high value on the reputation of the institution where the degree is obtained. For example, while the "Western Governors Virtual University" is an interesting idea, a degree from hundreds of high-quality traditional universities has more built-in value because it comes with the name and the quality of the institution behind it.

The advantages of traditional universities are substantial and represent fundamental values that can be further enhanced by the appropriate use of telecommunications and educational technology. Yet, we must be realistic and admit we face serious challenges.

- **Physical Plant and Technology Infrastructure**

You can begin with the matter of the facilities and fixed assets that universities and colleges own. Nationwide, too little attention has been given to maintaining existing facilities with a resultant significant deferred maintenance problem. Using modern technology to deliver education in 50- to 100-year old classroom buildings is difficult, if not impossible. Providing adequate communications links to campus buildings that may be underserved by the basics like sewer and water, is a problem of major proportions. Finally, most conventional classrooms are configured for lectures, and in the future there will be an increasing emphasis on self-learning along with group and studio type work. Finding the means to tackle the modernization of the campus physical plant is one of the most difficult issues we face.

- **Incentives versus Disincentives**

Campus incentives and disincentives are another issue we have to address. Universities, and the structures they must work within, often have built-in disincentives to change. For example, what is the incentive to change from the culture of teaching by lecturing to one of reliance on self-learning, if faculty reward systems do not recognize curriculum innovation? How will outside oversight agencies accommodate a system, which emphasizes less time in the classroom when there is already pressure to have more of this? Will enough flexibility exist within state regulated systems to allow public universities to compete on a level playing field with private universities in delivery of distance education? How will we resolve territorial issues between units of public university systems? Hesitation in answering these questions can significantly delay response by traditional institutions to the new market forces, and force them into at best a defensive posture, or at worst, a position from which all good markets are closed to them.

- **The Need for Deliberate Speed**

While we need to work to eliminate unnecessary barriers, we also should respect that there are real reasons to proceed with due deliberation. In spite of the expectations of true believers, educational technology is not a panacea, nor is it going to eliminate the need for faculty. Implementation of new technology should be planned so that the focus is on improving quality, such as adding to the amount of time a faculty member can spend with students or utilizing the much greater access to information and simulation that is being provided. Careful research and assessment is required and pilot programs are needed to see what works and what don't. Finally, successful systems should be tested for scalability to determine if pilots can really work for larger applications.

- **Telecommunications System Security**

Finally, with growing use of networks for information transfer and access, protection of the security of information becomes ever more important. This is one issue that transcends both traditional and virtual educational delivery. Former Georgia Senator Sam Nunn, a defense expert, is quoted as saying that 250,000 known hacker attacks are made annually on U.S. defense computing and information systems. It is not known how many of these are successful, or how many other attempts are made. While university systems are not associated with the life or death issues of our national defense, they must be secure if they are to be trusted.

To this end, Georgia Tech recently established a national center for cybersecurity, and this has proven a very popular concept. Interest has come from a variety of industries, including the banking and credit sector, records keepers, supply system managers as well as from governmental agencies, including the CIA.

The challenges I have mentioned make it clear that the path to the future is going to require creative and resourceful efforts to provide solutions. To a large extent, universities need to remember the wisdom of the old Georgia swamp philosopher, Pogo, who said "we have met the enemy and he is us." There is much work that can, and should be, done internally. I am sure none of us has all of the answers to the challenges we face. Yet there are some avenues available to us that will allow us to move forward while we wait out the technological wave.

First, consider the perplexing matter of division of labor within a state between public universities that desire to deliver distance learning. Resolution of this problem is vital for public institutions since virtual learning providers or private schools have wide flexibility in designing their strategy to deliver distance learning. The latter institutions can pick and choose choice educational and geographic markets, charge what the market will bear, and not be concerned if they are competing with the local established state institutions.

On the other hand, public universities are constrained to service limited geographical regions, have tight controls on the tuition and fees that can be applied, and are expected to deliver a wide variety of educational offerings. One solution to part of this conundrum is to treat the state in terms of a state-wide educational marketplace, and service it by assigning one institution responsibility for coordination of offerings for a certain segment of the market, such as engineering, business or computer science. The responsible institution, in coordination with the governing agency, then sees to the delivery of the "best practice" offerings from all of the public institutions in the state. In this way the public system creates an advantage over private or virtual providers by allowing students access to a robust variety of courses and those that are the best from each institution.

To implement a "state-wide" market concept, public universities have to overcome an aversion to competition. One largely misplaced fear is that institution-bound students will opt for distance learning over a comparable campus offering. Most students who use distance learning will be part of the emerging market that is not presently served.

That is, they represent an expanding pie, not one that is sliced into smaller pieces. In the off chance that an institution finds campus students opting to take the “best practice” distance learning course, then this should be taken as a sign that they need to improve on-campus offerings to make them competitive.

Second, while our hierarchical structure is often a problem for us, we can use the diversity found in the University System to our advantage. I noted earlier the risk involved in getting out in front of the technology wave. However, this risk is acceptable if it is encouraged by the System in the form of pilot programs from which each of us can learn. The System needs to be ready to encourage innovation to the extent of accepting that failure of some of the pilots is part of the process.

We can also find strength in the diversity of our system if pilot projects are undertaken that span different types of institutions. For example, there is no reason that students in the RETP institutions cannot participate with students on Georgia Tech’s campus in design projects using the technology pioneered by Boeing. This would help the RETP students transition to our campus since they would have already worked with Atlanta-based students before they arrive. Dozens of similar projects could be undertaken for non-engineering students that would help them transfer between our institutions. We should seek to find technological developments that can be used to link the students from differing types of institutions.

Finally, we should empower those faculty who are willing to take the risks associated with use of educational technology and encourage them to work with those in sister institutions. For example, when Ga. Tech undertook its computer requirement for entering freshmen, we completely revised our calculus course using computer systems to provide visualization tools for complex solutions. Finding out that others were doing similar things, faculties from Tech and 11 other schools set up a quarterly GSAMS session where they share ideas and accomplishments. A good example of how empowered faculty find the best ways to use technology for our benefit.

In conclusion it is my opinion that we cannot wait any longer to become aggressive in the utilization of the new tools of information and educational technology. While there are issues to be resolved, if we wait, others will dominate markets that are important to our future. We must move with dispatch, but with a view to maintaining quality. An underlying principle that should guide us is to engage our faculties so that they are full partners in the plans that evolve. Lets get our track shoes on and get into a trot so we will be warmed up enough to be able to catch up when we see the course more clearly. Finally, as we re-design our curricula and learning environments, lets remember that those that employ our graduates are still looking for well-rounded people, those who can solve human problems, and communicate with their fellow workers. Our graduates are expected to be able to use high-tech computing and communication tools, but this is a second priority to the broader abilities needed to succeed in life.

Elliott Visconsi was named the first chief academic digital officer at the University of Notre Dame in 2013. He also serves as both an associate professor of English and associate professor of law at Notre Dame.Â Wheeler: That is a double-edged sword. First off, not every good football player makes a good coach. Not every good coach makes a good TV commentator.Â CT: Have you studied what chief digital officers are doing at other universities or do you look outside higher education for inspiration and ideas? Sreenivasan: The first person I called when I was contemplating taking the CDO job at Columbia was Perry Hewitt, chief digital officer at Harvard [MA], but her role is different. The University of Georgia, colloquially known as UGA or Georgia, is a public flagship research university in Athens, Georgia. Founded in 1785, it is one of the oldest public universities in the United States. The university is classified by the Carnegie Classification as an "R1: Doctoral University with very high research activity (the highest classification)," and as having "more selective" undergraduate admissions, its most selective admissions category, while the ACT Assessment Student Report