

An Educator's View of the Impact of Information Technology on Higher Education and the University of Utah

We read daily about the rapid changes in technology and see firsthand the impacts on the social, economic and technological fabric of society. Andy Grove, past president of Intel, uses the metaphor of a duck calmly gliding through the water to describe the advancement of information technology (IT). From the surface the duck is moving through the water, but below the water line we see the rapid activity of the fins propelling the duck through the water. Much of the relentless advancement of technology is unseen, and the changes IT produces many times catch us unaware.

Much of the change is welcomed. The positive upside to IT is the democratizing impact of greater access to information in print and media in all formats from all parts of the world. Determining and teaching the relative value and accuracy of that information is the job of education. Internet delivery of information is cheap and has an instantaneous impact on markets, technology and social change. The primary driver in the information age is access free from place or time, when I want it, where I want it, in the form I want it and presented in a way so I can contribute. The information age has spawned a generation who wants greater control of what they read, watch, and listen to with greater participation in providing their view of life preferably in a way where they can interact with someone else. The scheduled format of broadcast television or any other deliver system is doomed except for live events.

Technology Disruption

The Internet and computing are the most disruptive technologies in history. One needs only site the Internet's impact on the music, newspaper, movie, television and the publishing industry to mention a few, to see examples of technologies' disruptive force. Rather than embrace the technology, these industries have fought it, and they are losing or have lost their market share. Once a file is digitized and released to the Internet, it can instantaneously be shared with millions of people globally. Markets can flourish or vanish; but, with the Internet, successful companies like Google and Amazon clearly understand that the consumer is in control. To some extent, control in higher education is shifting to students.

Impact of IT on Higher Education

So what is the likely impact of IT on higher education? What is the strategic importance of IT to the University of Utah? The mission of colleges and universities as creators and consumers of valuable knowledge and information can no doubt be greatly improved if IT is strategically and proactively embraced in support of the institution's mission. If we are reactive, IT may have the opposite disruptive effects.

Open Content

Many aspects of higher education are moving online for the convenience and savings of time and effort for students, faculty and staff. Many syllabi, lectures, class exercises, tests and simulations are now

available on the Internet globally. In many disciplines this is well underway for the mutual improvement of research and teaching at all participating universities and colleges. Students now have greater choice in what is taught, how it is taught and who it is taught by. What will we export and what will we import? If we import and export, will materials ultimately come back to compete against us at a lower price? MIT has now moved its coursework online and exported it to the world at no charge. It is accessed by 56 million current and prospective students, alumni, professors and armchair enthusiasts around the world. The MIT curriculum helped to jump start the engineering programs of China and India.

Open content is now an international movement following the popular trend of computing open-source software programs. It has now spread to include more than 200 institutions in 32 countries posting courses or parts of courses called learning objects online, some with scholarly review, in an Open Course Ware Consortium. How will this affect teaching -- will it be disruptive or improve teaching and learning? Is it an opportunity or a threat? No one is claiming that an LCD monitor can and should replace the most fully textured university experience, at least not yet. But it could certainly represent an upgrade in opportunity for those who can't afford college.

Improved Teaching

With technology, university education can more easily provide many methods for teaching a subject and improve teaching and learning by better matching the way we are taught with the way we learn. According to recent studies in neuroscience, we all learn differently. If a student has access to many different ways to learn and master a subject, they are much more likely to succeed. Learning outcomes can be identified and matched with the technology that can best deliver the content and be built into a systematic learning experience, where outcomes align with proven teaching methodology, including technology and measurement. Courses can be built by teams based on learning research and validated results that have, in fact, been effective with students' learning.

IT is a part of the educational process in many other ways. IT is pervasive in the academic, research and business processes of the university. IT services at the University of Utah are categorized into "service portfolios"-- a term borrowed from the investment community. Examples of services provided are listed below. They include:

Student Services such as:

Admission, registration, tuition and fee payment, financial aid, student portals, fees and activities, library and research information, course materials and management systems, degree audit system, directory, homework assignments, course management systems, tests, video lectures and resources, online labs, distance interactive courses, online courses, and course evaluations.

Faculty Services, many of which are listed above, but additionally include services such as:

Communications and collaboration with students, staff and colleagues, distribution of course information, online classrooms (Wimba), IP video services, learning objects, media on demand, lecture video capture and web posting, recording of student grades, online faculty activity reports, faculty profiles web sites, faculty database, online RPT and locate a researcher, online collaboration tools for research and teaching, computational research, data storage, classroom scheduling, IT supported classrooms and faculty portal.

Financial Services include:

Budgeting, accounting, financial reporting, inventory, asset tracking, purchasing, travel, development, credit card transactions, bank transfers, journal entries, campus orders, and purchasing cards.

Auxiliary Services include:

Security cameras, building entry, emergency alert system, directories, identity management, sprinkling system controls, tickets, parking, UCard identity tracking, shuttle tracking, GIS campus maps, space management, facilities management, control of HVAC systems, ecommerce sites, online purchase of software licensing, housing registration, administrative dashboards, video conferencing, University web sites, blogs, wikis, Facebook and other social media sites.

IT Infrastructure serving all campus entities:

Data Centers, networks internal and external, wireless, UMail, server hosting, desktop support, help desk, disaster recovery, privacy and security, fiber, wiring, monitoring, telephone directory, voice mail and services, cell phone towers and antennas.

Employee Services:

Payroll, direct deposit, position management, employee provisioning and de-provisioning, ePAF, new hire application process, benefits management, time and attendance, tax information, employee evaluations and employee portals.

Medical Services:

Electronic medical record (EMR), Computer Physician Order Entry (CPOE) process for defining the treatment, tests, drugs needed for patient care, digital X-rays, MRIs, cat scans and images, billing, insurance claims, are now digitized and online.

Research Services:

PI portal awards, stimulus awards reporting, Oracle grants module, automated proposal submission, institutional review and approval, and a full-service electronic OSP.

These services aggregate information and data, store it in archives and retrieve it where and when it is needed. They provide current information and metrics of performance for dashboards and mash-ups to better present current data to the administration and faculty to guide the strategic direction of the University and provide reporting for accreditation. Some services automate paper processes and financial transactions for more convenience and more efficiency with fewer people needed and quicker processing. Students and faculty tell us they want services online, not in line. These automated processes often systemize, improve processes and make them available online. They provide an internal and external transparency to better inform those interested in our research outcomes, expose technology that can be transferred for business use and introduce faculty to possible interdisciplinary and international collaborations. We become a part of a global academic enterprise. IT provides communications in email, texting, instant messaging, social media, voice mail, interactive video, standard and mobile telephones and mobile data devices into a unified communications system. IT also provides and maintains 399 technology classrooms.

Distance Education

Technology for distance education is widely available. Its use is primarily focused in the graduate programs of our professional colleges such as Nursing, Social Work, Engineering, Law, Education and Medicine. It is difficult for a professional college to offer a successful graduate program without distance learning. Busy professionals find it increasingly difficult to leave their job, come to campus and complete graduate work. Several for profit and non-profit universities are creatively using distance education as a competitive advantage in providing convenient education to the working professional. University graduate programs have seen the need to provide a comparable service. The University of Utah currently teaches 447 courses in various technology formats.

Availability

All of these systems must be available twenty-four hours a day and seven days a week or there is a great loss of productivity. They must be secure and private. They must have sufficient capacity and speed to maintain productivity on campus. Network and server capacity has doubled each year over the last 15 years. With the increased use of video on our internal networks and the Internet, capacity is expected to grow by 500% in the next five years.

We currently have well over 85,000 computing devices on our networks, made up of computers, printers, sensors, cameras, switches, etc. We estimate over 100,000 application currently operate on our systems.

The Utah Education Network

The University of Utah provides Internet connectivity to all public schools, libraries, applied technology centers, colleges, universities, and state government through the Utah Education Network in its statewide role. This places the University at the hub of the electronic highway, a key strategic academic, research and economic advantage. A university connected with limited tail circuit is like a city bypassed

by the interstate and the related economic activity, at the end of dead-end road. Robust and redundant connectivity is critical for the success of any academic enterprise.

All of these services are governed by faculty-focused councils and committees, the most notable being the Information Technology Council (ITC). The success of any IT service is alignment of the technology service to the needs of faculty, students and staff. IT services are focused on the end user throughout the development and operational process. We firmly believe there are certain IT decisions that IT people should not make. Engaging the end user in the decision, prioritization and planning of IT supported services is critical to success.

The Future

So what is next in IT that might be applied to higher education? We know IT should be adopted based on the needs and mission of the university, but we need to be equally focused on the ever-changing landscape of IT. IT is forever changing the environment and tools for higher education. Individual IT tools such as the computing platform are driven by the consumer. It has been difficult for education to adopt any technology that has not been first proven in the market place. It can be expensive to be on the bleeding edge in the adoption of technology but maybe wiser to be a rapid follower. Adopting programs still in beta can cost millions, but several new technologies are gaining traction for higher education that need to be investigated. Here are a few:

Video has now come to the Internet, with standards of quality up to high definition ease of capture, editing, posting to the web and playback. It can be streaming video, interactive video, video-on-demand, or even in a broader context, media-on-demand. Video has quickly grown to be the major application on the Internet. Students' first site for questions about education is now YouTube or Edu Tube with Google as a close second. Video in all its forms puts humans in front of humans for an educational experience, particularly in an interactive experience such as tele-presence, where students and faculty can better pick up important non-verbal cues important in teaching some processes. Video documentary, simulations, animations, and visualizations can now be used in full high definition formats. Gone is the postage stamp sized Internet video lecture and intensely text-oriented courses.

Other technologies due to enter into the mainstream of higher education include digital rights management, grid computing, open source E-learning applications, customer resource management (CRM) for students, federated identity management, e-textbooks, broadband wireless, wikis, tablet PC's, social networking in education, E portfolios, IT infrastructure utility, web and application hosting, cyberinfrastructure and hosted virtual desktops. Each of these will be investigated by IT architecture teams and departments on campus who may have an interest in the application of these technologies.

Recommendations

So what are some key recommendations for the University of Utah to consider to maintain its relevance in the information age?

1. Faculty need to be informed about the new technologies and current IT services available for their use. Faculty are the change agents. This can be accomplished through the active involvement of the Technology Assisted Curriculum Center (TACC) in the Marriott Library, other media services in the Marriott Library, Media Solutions, Instructional Media Services and other on-site local college support groups.
2. We need to standardize our IT purchases, acquisitions and campus-wide IT architecture. Millions of dollars can be saved if this is done. It will also improve our ability to collaborate across campus and to gain access to isolated silos of information.
3. Commodity IT such as networks, telephones, wireless, email, mobile antennas, data center server support and, in some cases, desktop should be centrally managed in close coordination with college IT managers. This will allow these managers to focus on college-specific applications that would help faculty adopt new technologies.
4. We need to continue to invest in technology so our systems are always available and secure. This will help us adopt new technologies that can be utilized for greater access to information, improve and automate business process for greater efficiency and improve the quality and accessibility of teaching, learning, and research.
5. We need to look at technology as a tool that will help us to think more strategically to do things more efficiently and wisely and reduce the overall cost of higher education.

Technology is one of the few tools available that can provide greater access, improve quality, increase efficiency, and facilitate collaboration and communication at a lower cost. We must be proactive and wise in its use.

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