

A Technology Environment Overview

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In the early 1980s as the use of personal computers was just beginning to spread, and the network upon which the Internet is based was still in the hands of government researchers and computer scientists, William Gibson coined the term, "cyberspace". This notion depicted an interactive information future in which anyone and everyone used personalized, high-tech multimedia tools to gain access to all of the data and information available. That information future is being realized in the early 21st century.

"Cyberspace. A consensual hallucination experienced daily by billions of legitimate operators in every nation, by children being taught mathematical concepts. A graphic representation of data abstracted from the banks of every computer in the human system. Unthinkable complexity. Lines of light ranged in the nonspace of the mind, clusters and constellations of data."

William Gibson, *Neuromancer*¹

The environments in which information and technology exist change rapidly and regularly. One of the factors contributing to this change is the exponential growth in both the amounts and types of data and information available. Further, many varied technologies support the creation, use and maintenance of this data and information; and these technologies change constantly, as well. What were once separate and distinct types of equipment for data manipulation, machines for entertainment and devices for communication are being merged into personal multifunctional tools. The Internet and World Wide Web (WWW) are at the core of much of this expansion, fostering broader availability of data and information, and providing expanded opportunities for people to communicate and share knowledge.

A few years ago, the world was in the information age. However, there has been an explosion of information through media, print, and more

importantly, flowing across the Internet. The tools available for creating and sharing information have evolved and given people the opportunity to perform the jobs of writers, artists, editors, journalists, and many others who previously controlled the flow of information. Personal web sites have allowed artists to create and share their works on a public scale previously unavailable to them. Camera phones have created instant reporters/journalists. Blogs allow individuals to editorialize, report on events and share opinions on nearly any subject. Sites such as Amazon, the Wikipedia and other participatory ventures give people the opportunity to be literary critics and historians. In addition, there are many other specialized sites that foster social interactions of various kinds, give people the opportunity to select and personalize their entertainment, or provide shared computing power through a global community concept such as Access Grid.

In higher education, these changes are affecting a wide range of activities covering the traditional areas of teaching, learning, research, and service, as well as the administrative functions that make these activities possible. Students, faculty, staff, alumni and other stakeholders expect the institutions with which they are affiliated to be aware of and provide access to information and technology. As the use of the Internet and WWW has soared, "googling" has become a verb in the English language and a major research method. The Net Generation, also known as Millennial students, have brought their techno-culture to campus, including such devices as camera phones, I-pods, and Blackberry communicators. Other members of the campus community feel free to express their opinions and thoughts publicly through weblogs (blogs). Scholars are engaging in collaborative research across distances and developing new ways to disseminate the results of their work through open access tools. Institutions of all sizes are being challenged on all technology-related fronts to meet the expectations of their technology users.

EXPECTATIONS VERSUS REALITIES	
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High degree of personalized service.	Limited number of available support staff.
Problem-free technology environment.	Technology not fool proof.
Access to newest high tech tools and information sources.	Availability of funding and applicability within the institution.
Same capabilities for both learning and entertainment outside of the institution.	Determination of what is practical and possible within as constraints of the institution.
Expect instant results.	Need to increase understanding of capabilities and limits of the technology.

In a special section of the *Chronicle of Higher Education* that appeared in the issue dated January 30, 2004, a lead article entitled, “10 Challenges for the next 10 years”², outlined ten of the key areas that higher education would need to address in the coming decade. According to the article, during the last ten years, information technology had spread across the campus and become ubiquitous. The article went on to suggest that the focus of the next ten years would be on improvements in the management and uses of technology, as well as the ways in which technology will support transformation in institutions of higher education. The ten challenges were:

The 10 Challenges

- Collaboration
- Big Systems
- Wireless Networks
- Course Management
- Managing Bandwidth
- Security
- Distance Education
- Archiving
- Fund Raising
- Intellectual Property

To face these challenges, a variety of technologies, including hardware, software, communications tools, multi-media capabilities, and other specialized gear are required. At the same time, users expect that the services and training they will need in order to use these technologies effectively will be available. As a result, the conventional organizational

functions and services that normally both provide support for or who are the users of these technologies will undergo significant change, as well. Many of them will need to be redefined for this new environment; and in some cases, new skill sets will be required to perform these jobs.

The most recent annual EDUCAUSE³ survey of the top ten issues that are most important to senior IT managers in higher education listed the items shown below. Technology management and information delivery are the most critical areas impacted by technological change. Many universities and colleges have been working to change both their physical and operating environments to meet these many challenges; however, they face a number of significant barriers.

EDUCAUSE Top Ten Issues⁴

- 1 Funding IT
- 2 Security and Identity Management
- 3 Administrative/ERP/Information Systems
- 4 Strategic Planning for IT
- 5 Infrastructure Management for IT
- 6 Faculty Development, Support and Training
- 7 E-learning/Distributed Teaching and Learning
- 8 Governance, Organization and Leadership for IT
- 9 Enterprise Level Portals
- 10 Web Systems and Services

These topics represent the information technology management view of the world. Similarly, new ways of teaching and learning are an important part of the challenges that academic institutions

face. A recent study, subtitled “*Convenience, Connection Control and Learning*”⁵, performed by the EDUCAUSE Center for Applied Research (ECAR) reviewed students’ use of technology. The conclusions of this study were that current college students use technology in very personal ways and see it as a means to ease access to and use of information. The implications of these attitudes are reflected in other new approaches to teaching and learning described in the literature.

In an article entitled, *The Changing Landscape and the New Academy*⁶, Carol Barone identified nine patterns of transformation in the teaching and learning environments of universities. These changes add value to institutions and can help them to be more successful in the future. According to Barone, the “New Academy” is a result of the interplay of changing technology, pedagogy and behavior. It involves new structures, different funding models, and changes in professional skills, as well as new relationships, accountability, and leadership roles. Characteristics of the “New Academy” include:

- **New structures and funding models.** More fluid and responsive organizational structures and conventions are needed.
- **New professional staff.** Learning designers and knowledge-management professionals can help transform the campus teaching and learning environment.
- **New accountability.** Accountability and assessment are used to track progress toward goals and identify the next steps needed. This requires institutional commitment and alignment.
- **New leadership roles.** Leaders guide the alignment of institutional thinking in terms of its vision, the role of technology, revision of policies, and allocation or reallocation of resources to remove barriers to attaining the vision, while honoring the institution’s values and unique culture.

Many colleges and universities are entering a new era for technology that reflects these four characteristics. The new approach will include an organization whose leadership and professional staff embody these distinctive elements of the

new academy. Educators and institutions are exploring improved means to create, manage and share course content, as well as the results of scholarly work. Distance learning and e-learning have become core functions in many institutions of higher learning. Collaboration and team activities are being integrated into more learning activities; and university and college faculty members are finding new approaches to traditional styles of learning.

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These changes will have an impact on institutional faculty. In some cases, colleges and universities both encourage and expect their faculty members to use more technology in the instructional environment. Further, increases in the number of “smart” classrooms, the availability of either wired or wireless access to the Internet across the campus and student use of laptop computers and other devices in the classroom are among the factors changing the teaching milieu. In addition, the use of various instructional technologies often provides opportunities to expand student learning.

In many cases, faculty needs for additional and different types of support for their uses of technology are increasing. Colleges and universities are employing more individuals trained in instructional design and related skill sets. These specialty staff members are being made available to faculty members in a variety of ways. This support may range from their incorporation into traditional information technology or academic computing support organizations to the creation of teaching centers in which faculty members are exposed to technological innovations, learn the use of instructional technologies and exchange ideas with colleagues.

As implied above, the knowledge and experience levels and learning styles of the millennial students are driving some of the institutional transformation taking place on college and university campuses, though it is not merely the influence of these members of the younger generation. Older students and working adults are a part of the student mix that depends upon technology outside of the college and university environment. They expect to continue using technology in familiar ways when they enter the educational environment, too.

Other elements contributing to institutional change include: the introduction of different multi-media, communications and computing tools; increased availability of and access to data and information; a rise in electronic communication; and a renewed emphasis on life long learning. These factors all affect the changes in strategies for technologies to support the institutional mission and values.

A recent article in the *EDUCAUSE review*, entitled "Tomorrowland: When New Technologies Get Newer"⁷, noted that wireless, portals, outsourcing, gaming and collaboration are all evolving technologies that will have significant impact on colleges and universities in the very near future. Together with the patterns of transformation described above, new approaches to teaching and learning for institutions of all sizes will include the use of such tools and methods as:

- Increased collaboration
- Team/group work
- Information sharing (instant messaging, weblogs, podcasts)
- Extended inter- and intra-campus faculty collaborative activities
- Growth of the "centers" concept
- Communities of interest.

Additionally, the copyright and intellectual property discussions continue. More and more, institutions are seeking ways to share the results of scholarly work in a more open way, and to provide their students with readily accessible, on-line materials to support their studies. One of the trends through

which institutions hope to achieve this desire is the move toward open systems and tools that foster sharing. In his article, "The Next Wave: Liberation Technology" that was featured in *The Chronicle Review* in January of 2004, John Unsworth of the University of Illinois Graduate School of Library and Information Science, noted at the start of the article that the technology environment has moved from the "e-" decade of the 1990s to the "open-" decade of the 2000s. Many types of institutions in the educational and not-for-profit sectors, as well as in the for-profit arena are supporting open source, open systems, open standards, etc.⁸ The "open" environment includes:

- Tools and standards for developing systems that can be interoperable and compatible
- Ways to open up information to a broader community that was formerly available only to a particular or narrowly defined society
- Means for scholars in different institutions to collaborate on projects in much more efficient and effective ways than have previously been available.

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He notes that the Human Genome project is an example of the "open-" concept applied to a function in the real world of scholarship.

As implied by the second bullet point above, the "open" concept can be applied to intellectual property, as well as the hardware/software environment. The issues with respect to content in the "open" environment are influenced by laws and regulation. The issues revolve around ownership, rights, permissions, credit for producing the intellectual property, etc. The related concerns range from downloading of copyrighted music and video content to whether or not an institution recognizes scholarly work published on the web, rather than in paper-based journals.

In this “open” atmosphere, institutions of higher education will need to re-think how they configure and manage their own technology environments when using open products and standards. By their very nature, these products and services are malleable and require a more structured approach to programming and customization than is usual in the academic technology world. At the same time, the overall cost of ownership is lower than for many commercial tools; and, in some cases, it may be both faster and cheaper for the institution to develop new applications using such tools.

The convergence of a broad range of technologies that have been seen as discrete sets of equipment and services in the past is causing many institutions to review and seek the most effective organizational structures for delivery of services in this changing environment. On one hand, information technology is an indispensable area of institutional operations that has generally been placed among the administrative functions. On the other hand, the library and, frequently, the media center, have always been a part of the academic support organization.

Since the early 1990s, many organizations have experimented with merging or melding the technology and library functions. In some models, the two organizations merely report to the same person. In others, they have been formally integrated within a single organizational structure. Among the most prevalent modes of bringing all service and support for technology together has

been the information commons idea. The information commons concept supports a variety of organizational structures; however the distinguishing feature is that it provides needed information and technology resources and services to students, faculty and others in a relatively seamless way.

Changes in the instructional technology landscape have increased these desires to find the appropriate model for service delivery. The growth of digital classrooms, the expansion of online learning and the introduction of blended learning courses emphasize these needs. Knowledge of a variety of equipment and different sets of knowledge-based skills are required to support the intersection of multi-media technologies with computing tools and information resources. This situation opens the way for increased interaction among the information and technology organizations of every institution of higher education.

Frequently, what is expected of an institution’s technology environment exceeds its capacity. However, those expectations remain high because of the myriad opportunities presented by the technologies and challenges described above. Through effective planning and structuring of its information and technology organizations and services, a college or university can enrich the opportunities that it provides for its students, faculty, staff and other constituents. Finally, it can add value to services provided in ways that these users may not encounter in other venues.

¹ William Gibson. *Neuromancer*. New York: Ace Books, 1984.

² “10 Challenges for the Next 10 years”. *The Chronicle Review, Information Technology, The Chronicle of Higher Education, Section B*, January 30, 2004. Pp. B1, B3.

³ A not-for-profit institutional membership association composed of institutions of higher education, companies providing products and services to education and related organizations. The mission of EDUCAUSE is to promote intelligent use of information technology to advance higher education.

⁴ Leslie Maltz, Peter B. DeBlois and the EDUCAUSE Current Issues Committee. “Top-Ten IT Issues 2005”. *EDUCAUSE review*, May/June 2005. Pp. 15-16, 18, 20, 22-28.

⁵ Robert B. Kvik and Judith B. Caruso. *ECAR Study of Students and Information Technology 2005: Convenience, Connection, Control, and Learning*. (Research Study from the EDUCAUSE Center for Applied Research, Volume 6, 2005.) Boulder, CO: EDUCAUSE, 2005.

⁶ Barone, Carol, A. *The Changing Landscape and the New Academy*. *EDUCAUSE review*, September/October 2003, pp. 41-44. 46-47.

⁷ Bonnie Neas and the EDUCAUSE Evolving Technologies Committee. “Tomorrowland: When New technologies Get newer”. *EDUCAUSE review*, November/December 2005. Pp. 14-16, 18, 20,22, 24, 26, 28, 30

⁸ John M. Unsworth, “The Next Wave: Liberation Technology”. *The Chronicle Review, Information Technology, The Chronicle of Higher Education, Section B*, January 30, 2004. Pp. B16, B20.

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