

Top Campus IT Challenges for 2001

The second annual EDUCAUSE current issues survey finds administrative systems challenges have escalated, the IT staffing crisis continues, distance education is steady state, and security management has the potential to explode

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Last year, EDUCAUSE conducted a survey developed by the Current Issues Committee in conjunction with the EDUCAUSE staff to capture information from members about their most pressing campus IT-related challenges. Approximately 37 percent of the 1,241 primary representatives who were asked to participate responded to the Web-based survey. This survey asked recipients to check 3 issues from a grid of 33 (and provided an opportunity to supply an "other" issue) in response to each of four questions (see Table 1). The survey results were published in *EDUCAUSE Quarterly* as well as on the EDUCAUSE Web site (see <http://www.educause.edu/issues/survey2000.html>).

In February 2001, we repeated the survey (with minor changes) using the same methodology and approach. Primarily as a result of suggestions from last year's respondents, several issues in the grid were slightly reworded and seven new issues were added (see Table 2 and <http://www.educause.edu/issues/survey2001/questions.html>). In addition, survey respondents were asked to select up to five rather than three issues in response to each question. This year the e-mail message soliciting survey participation went to 1,535 primary representatives, with 567 individuals participating for the same return rate of 37 percent.

Table 1

The Four Questions

1. Which of the IT-related issues below are most important for your campus to resolve for its strategic success?
2. Which of the IT-related issues below have the greatest potential to explode in the future in terms of their strategic impact?
3. Which of the IT-related issues below are you as an IT leader or administrator spending most of your time addressing?
4. On which of the IT-related issues below is your campus spending the most human and/or financial resources?

An analysis of the respondents' demographics (such as institution Carnegie classification, size, and control) revealed that the percentages of the respondents in these categories for the most part match the percentages of these categories in the EDUCAUSE membership, with medium-large institutions somewhat overrepresented and community colleges somewhat underrepresented.

Like last year, the analysis shows that the four questions produced some notable differences in the way mem-

bers viewed the importance of an issue. We aggregated the numbers for each issue into a percentage based on the total number of times respondents picked an issue as important in response to the question. Each issue's ranking depends on this aggregate.

Overall 2001 Survey Findings

As expected, some distinct differences appeared within the top ten items for each of the four questions. What IT leaders spend their time on isn't necessarily where their institution spends the most human and/or fiscal resources overall. Moreover, the issues most important to resolve for an institution's strategic success, or that may explode in the future, aren't necessarily the same as those demanding the most expenditures. Overall, however, there's far more congruence than divergence. Comparing the top ten issues for the entire survey population across all four questions, three issues emerge as important from all four perspectives; three others are on the top-ten lists for three of the four questions (with the exception for each noted in parentheses):

- Administrative systems/ERP
- IT staffing and human resources management
- Distance education
- IT funding strategies (a top-ten issue for all but Question 4)

- Maintaining network and IT infrastructure (a top-ten issue for all but Question 2)
- Online student services (a top-ten issue for all but Question 3)

So much for similarities — what about differences? Three issues unique to the list of how IT leaders spend their time are change management, IT organization and service delivery models, and leadership for IT. This isn't surprising, given the continually shifting IT landscape and the consequent transformation it spurs on campus. Notably, however, seven of the ten top ten issues that consume the CIO's time relate to management and planning issues, while only three of the ten issues thought to be of strategic importance to the institution could be classified as management or planning related. In addition, four of the top ten issues of strategic importance to the institution relate to teaching and learning, while only one of those issues (distance education) made the top-ten list of issues consuming the CIO's time.

Another interesting finding is that the four issues unique to the top-ten list of issues with potential to explode in the future all relate to campus networking:

- Emerging network technologies
- Security management
- Ubiquitous computing/universal access
- Advanced networking

Finally, on the top-ten list of IT-related issues demanding the greatest expenditure of human and fiscal resources are two unique issues: desktop computing management and Web-based systems development and integration. Desktop computing management involves technology refreshment cycles, clearly one of the most resource-intensive IT-related challenges, although not strategic, explosive, or time-consuming for CIOs. However, Web-based systems development and integration just barely missed the top-ten rankings for both current strategic importance and potential explosiveness, perhaps indicating that expenditure of resources in

this area anticipates its emerging strategic importance.

What Has Changed?

How do these results compare to last year's? Table 3 presents the top-ten issues for all respondents in all four question areas for 2000 and 2001.

The issue of administrative systems/ERP demands special note, as it jumped substantially in rank from last year across all four questions. Last year the issue was called enterprise administrative systems/ERP, with a clear focus on enterprise systems. This year the issue was expanded to include other administrative systems challenges. Clearly ERP was at the top of the list for requiring the most institutional resources last year (and again this year), but its jump from fifth to

first place for Question 1 suggests that administrative systems (with an emphasis on ERP implementations) have achieved a more elevated status as an issue of strategic importance to institutions, not just one that's sucking up resources and requiring an intense IT leadership focus.

Note also that advanced networking appears to have become a less pervasive challenge across all institutions, ranking lower in explosive potential and dropping off the top-ten lists for strategic importance and expenditures. One possible explanation may be that connection speeds have increased to the point that for most common applications (for example, e-mail and Web browsing), the differences are incremental, and it's only the high-end users who have pressing needs for

Table 2

Survey Issues

Advanced networking	Java implications
Administrative systems/ERP ¹	Knowledge management systems
Benchmarking/assessment	Leadership for IT*
Business continuity/disaster recovery*	Network and IT infrastructure — maintaining ³
Business process reengineering	Network technologies — emerging
Change management*	Online student services
Collaboration/partnerships*	Outsourcing
Data management	Security management ⁴
Desktop computing management	Software site licenses
Digital libraries	Standards for hardware and software
Digital records management and preservation	Student computing
Distance education	Support services
E-commerce	Teaching and learning strategies ⁵
Electronic classrooms/technology buildings*	Ubiquitous computing/universal access*
Enterprise/institutional information portal ²	Vendor relations
Faculty development, support, and training	Web management and policy
Information policy development	Web-based systems development and integration*
Intellectual property management	
IT funding strategies	
IT organization and service delivery models	
IT staffing and human resources management	
IT strategic planning	
IT training campuswide	

* This term was new to the 2001 survey grid.

¹ This term was listed as "enterprise administrative systems/ERP" last year.

² This term was listed as "portals" last year.

³ This term was listed as "network technologies — basic" last year.

⁴ This term was listed as "middleware/network security" last year.

⁵ This term was listed as "electronic learning environments" last year.

Table 3
Comparison of Top-Ten Issues from 2000 to 2001

2000 Survey Results	2001 Survey Results	2000 Survey Results	2001 Survey Results
Question 1: Importance to Institution's Strategic Success		Question 3: Demanding IT Leader's Time	
1. Funding IT	1. Administrative Systems/ERP ¹	1. IT Staffing and HR Management	1. IT Strategic Planning
2. Faculty Development, Support, Training	2. IT Funding Strategies	2. IT Strategic Planning	2. Administrative Systems/ERP ¹
3. Distance Education	3. Faculty Development, Support, Training	3. Support Services Demands	3. IT Staffing and HR Management
4. Electronic Learning Environments ²	4. IT Staffing and HR Management	4. Funding IT	4. IT Funding Strategies
5. Enterprise Administrative Systems/ERP ¹	5. Distance Education	5. IT Organization and Service Delivery Models	5. Support Services
6. IT Staffing and HR Management	6. Teaching and Learning Strategies ²	6. Enterprise Administrative Systems/ERP ¹	6. Change Management*
7. IT Strategic Planning	7. IT Strategic Planning	7. Faculty Development, Support, and Training	7. IT Organization and Service Delivery Models
8. Online Student Services	8. Online Student Services	8. Distance Education	8. Maintaining Network and IT Infrastructure ³
9. Advanced Networking	9. Maintaining Network and IT Infrastructure ³	9. Information Policy Development	9. Leadership for IT*
10. Support Services Demands	10. Electronic Classrooms/Technology Buildings*	10. Online Student Services	10. Distance Education
Question 2: Potential for Explosive Strategic Impact		Question 4: Expenditure of Most Institutional Resources	
1. Distance Education	1. Distance Education	1. Enterprise Administrative Systems/ERP ¹	1. Administrative Systems/ERP ¹
2. Electronic Learning Environments ²	2. Emerging Network Technologies	2. Support Services Demands	2. Maintaining Network and IT Infrastructure ³
3. Emerging Network Technologies	3. Security Management ⁴	3. Desktop Computing Management	3. Desktop Computing Management
4. Advanced Networking	4. Ubiquitous Computing/Universal Access*	4. Basic Network Technologies ³	4. Support Services
5. Funding IT	5. Teaching and Learning Strategies ²	5. Advanced Networking	5. IT Staffing and HR Management
6. E-commerce	6. IT Staffing and HR Management	6. IT Staffing and HR Management	6. Faculty Development, Support, Training
7. Online Student Services	7. IT Funding Strategies	6. Online Student Services	7. Web-based Systems Development and Integration*
8. IT Staffing and HR Management	8. Online Student Services	8. Student Computing	8. Distance Education
9. Support Services Demands	9. Advanced Networking	9. Faculty Development, Support, Training	9. Electronic Classrooms/Technology Buildings*
10. Faculty Development, Support, Training	10. Administrative Systems/ERP ¹	10. Distance Education	10. Online Student Services

* This issue was new to the 2001 survey grid.

¹ Enterprise Administrative Systems/ERP became Administrative Systems/ERP in the 2001 survey grid, with new subtopics provided that broadened this issue to include more than just enterprise (ERP) systems.

² Electronic Learning Environments became Teaching and Learning Strategies in the 2001 survey grid. The descriptive subtopics provided remained essentially the same.

³ Basic Network Technologies became Maintaining Network and IT Infrastructure in the 2001 survey grid. There were no subtopics in either case.

⁴ Middleware/Network Security became Security Management in the 2001 survey grid. The descriptive subtopics provided were broader than just middle-ware and network security, although these were included.

high-speed connectivity. It could also be that many institutions have achieved more bandwidth, so the issue has been supplanted by other, more pressing challenges.

Last year support services demands made the top-ten list for all four questions, while this year that issue dropped off the top-ten lists for Questions 1 and 2. This suggests that this issue might be perceived as less strategic in importance, that institutions may be beginning to find solutions to meeting the support demands that were so overwhelming just a few years ago, and/or that those demands may be lessening as users become more familiar with the technologies and require less support. Note, however, that support for faculty is still a key concern, with faculty development, support, and training making the top-ten list for Questions 1 and 4.

Another interesting finding is that while e-commerce made the top ten for Questions 2 and 3 overall last year, it's not on the top-ten lists for all respondents for any of the questions this year, although it nearly made the list of potentially explosive issues. This isn't the case, however, if we analyze the rankings of issues by different sizes and types of institutions (see below).

Security management garnered a number-three ranking for Question 2 this year, but didn't make the top-ten list for any question last year. Possibly the name change, from middleware/network security, influenced this change. While network security might have been on the minds of respondents last year, the initial word "middleware" might have misled them. In addition, it may simply be that network security has become a much more pressing issue within the past year with the proliferation of e-mail viruses and network hacking and their widespread public exposure. It's interesting to note the differences in importance of this issue that emerge when looking at the demographics of Carnegie classification (see below).

The emergence of maintaining network and IT infrastructure and electronic classrooms/technology build-

ings into the top-ten list for Question 1 suggests a growing recognition that an institution's IT infrastructure has strategic implications for the fulfillment of its educational mission.

Demographic Similarities and Differences

In addition to looking for differences by enrollment size and public versus private (control), we looked at Carnegie classifications, using the old classifications and collapsing several categories to reduce the number of groups: research 1 and 2 and doctoral-granting 1 and 2 are grouped into research + doctorate (R+D); master's 1 and 2 are collapsed into master's; baccalaureate 1 and 2 are collapsed into baccalaureate; and the fourth group is associate of arts (two-year colleges). See Tables 4 and 5 for the top-ten issues in each of these groupings.

Responses to Question 1 show remarkable congruence across institutions of all sizes, control, and Carnegie class. The following issues appear in the top-ten list of current strategic issues for each of these demographic categories:

- Administrative systems/ERP
- IT funding strategies
- IT staffing and HR management
- Faculty development, support, and training
- IT strategic planning

What issues are important to some types of institutions but not to others?

- Electronic classrooms/technology buildings is a current top-ten strategic issue only for private and baccalaureate schools, while distance education is not among current top-ten strategic challenges for those schools. This finding isn't surprising, as these schools are usually residential and thus more likely to focus on use of technology to enhance teaching and learning on campus.
- Security management is a current strategic issue for larger, public, and R+D institutions, and emerging network technologies appears only in the R+D group, perhaps because the complexity of these institutions and

their leading-edge technology environments have put these challenges early on their radar screens. Security management is among the top ten potentially explosive issues for both public and private institutions and institutions of all sizes and Carnegie classes, with one exception: two-year colleges.

- E-commerce is on the top-ten lists of potentially explosive issues for all Carnegie groupings except baccalaureate schools; there may be less need or motivation for such schools to move toward online business transactions, with their emphasis on personal interaction with students.
- Ubiquitous computing/universal access is a potentially explosive issue for all Carnegie classes except two-year colleges, likely because their students aren't usually residential and thus take more responsibility for their own computing and network access.

While the rank order varies, IT leaders across all demographic categories report that they spend most of their time addressing the following issues:

- Administrative systems/ERP
- IT funding strategies
- IT staffing and HR management
- IT strategic planning
- Maintaining network and IT infrastructure

Some notable differences in this area include

- Web management and policy is a top-ten issue for IT leaders only at small schools.
- Distance education isn't among issues warranting top-ten attention from IT leaders at small, master's, baccalaureate, or private schools.
- Electronic classrooms/technology buildings made the top-ten list only for IT leaders at master's institutions.
- IT leaders at baccalaureate schools spend time on faculty development, support, and training.
- Web-based systems development and integration is capturing the attention of community college IT leaders.
- IT leaders at large institutions

Table 4

Issue Rankings by Institution Size and Control (Public Versus Private)

QUESTION 1: The issues most important for campuses to resolve for strategic success.

Small (under 2,000)	Medium (2,000 – 7,999)	Medium-Large (8,000 – 17,999)	Large (Over 18,000)	Private	Public
Faculty development, support, and training	Administrative systems/ERP	Administrative systems/ERP	Administrative systems/ERP	Faculty development, support and training	Administrative systems/ERP
Administrative systems/ERP	IT funding strategies	IT staffing and human resources management	IT funding strategies	Administrative systems/ERP	IT funding strategies
IT funding strategies	IT staffing and human resources management	IT funding strategies	Distance education	IT funding strategies	IT staffing and human resources management
IT strategic planning	Faculty development, support, and training	Distance education	IT staffing and human resources management	Teaching and learning strategies	Distance education
IT staffing and human resources management	Teaching and learning strategies	Faculty development, support, and training	Faculty development, support, and training	IT staffing and human resources management	Faculty development, support, and training
Distance education	Distance education	Network and IT infrastructure — maintaining	Teaching and learning strategies	IT strategic planning	Network and IT infrastructure — maintaining
Teaching and learning strategies	Online student services	Security management	Network and IT infrastructure — maintaining	Online student services	Teaching and learning strategies
Online student services	IT strategic planning	Teaching and learning strategies	Security management	Electronic classrooms/technology buildings	IT strategic planning
Web-based systems development and integration	Network and IT infrastructure — maintaining	Online student services	IT strategic planning	Network and IT infrastructure — maintaining	Online student services
IT training campuswide	Advanced networking	IT strategic planning	Advanced networking	Distance education	Security management

QUESTION 2: The issues with the greatest potential to explode in the future terms of strategic impact.

Small (under 2,000)	Medium (2,000 – 7,999)	Medium-Large (8,000 – 17,999)	Large (Over 18,000)	Private	Public
Distance education	Distance education	Distance education	Distance education	Distance education	Distance education
Network technologies — emerging	Network technologies — emerging	Security management	Security management	Network technologies — emerging	Security management
Online student services	Ubiquitous computing/universal access	Network technologies — emerging	E-commerce	Teaching and learning strategies	Network technologies — emerging
IT funding strategies	Teaching and learning strategies	Teaching and learning strategies	Administrative systems/ERP	Ubiquitous computing/universal access	IT staffing and human resources management
Web-based systems development and integration	Security management	IT funding strategies	Network technologies — emerging	Security management	Administrative systems/ERP
Ubiquitous computing/universal access	IT staffing and human resources management	Ubiquitous computing/universal access	Teaching and learning strategies	IT funding strategies	IT funding strategies
Security management	IT funding strategies	IT staffing and human resources management	Network and IT infrastructure — maintaining	IT staffing and human resources management	Ubiquitous computing/universal access
IT staffing and human resources management	Advanced networking	Administrative systems/ERP	IT staffing and human resources management	Web-based systems development and integration	Teaching and learning strategies
Support services	Online student services	Advanced networking	IT funding strategies	Online student services	Advanced networking
Teaching and learning strategies	Administrative systems/ERP	Web-based systems development and integration	Advanced networking	Faculty development, support, and training	Online student services

QUESTION 3: The issues IT leaders or administrators are spending most of their time addressing.

Small (under 2,000)	Medium (2,000 – 7,999)	Medium-Large (8,000 – 17,999)	Large (Over 18,000)	Private	Public
IT strategic planning	IT staffing and human resources management	IT funding strategies	IT strategic planning	IT staffing and human resources management]	IT funding strategies
IT funding strategies	IT strategic planning	Administrative systems/ERP	IT funding strategies	IT strategic planning	Administrative systems/ERP
Administrative systems/ERP	Administrative systems/ERP	IT staffing and human resources management	IT staffing and human resources management	Administrative systems/ERP	IT strategic planning
IT staffing and human resources management	IT funding strategies	IT strategic planning	Administrative systems/ERP	IT funding strategies	IT staffing and human resources management
Support services	Support services	IT organization and service delivery models	Network technologies — emerging	Support services	IT organization and service delivery models
Change management	Change management	Leadership for IT	Distance education	Network and IT infrastructure — maintaining	Network and IT infrastructure — maintaining
Network and IT infrastructure — maintaining	Network and IT infrastructure — maintaining	Change management	Advanced networking	Change management	Change management
Faculty development, support, and training	IT organization and service delivery models	Network and IT infrastructure — maintaining	Network and IT infrastructure — maintaining	IT organization and service delivery models	Distance education
IT organization and service delivery models	Leadership for IT	Support services	Leadership for IT	Faculty development, support, and training	Support services
Web management and policy	Distance education	Network technologies — emerging	Information policy development	Leadership for IT	Leadership for IT

QUESTION 4: The issues campuses are spending the most human and/or fiscal resources on.

Small (under 2,000)	Medium (2,000 – 7,999)	Medium-Large (8,000 – 17,999)	Large (Over 18,000)	Private	Public
Administrative systems/ERP	Administrative systems/ERP	Administrative systems/ERP	Network and IT infrastructure — maintaining	Administrative systems/ERP	Administrative systems/ERP
Network and IT infrastructure — maintaining	Network and IT infrastructure — maintaining	Network and IT infrastructure — maintaining	Administrative systems/ERP	Network and IT infrastructure — maintaining	Network and IT infrastructure — maintaining
Desktop computing management	Desktop computing management	Desktop computing management	Support services	Desktop computing management	Support services
Support services	Support services	Support services	Advanced networking	Support services	Desktop computing management
IT staffing and human resources management	IT staffing and human resources management	IT staffing and human resources management	Web-based systems development and integration	IT staffing and human resources management	Distance education
Electronic classrooms/technology buildings	Faculty development, support, and training	Distance education	IT staffing and human resources management	Faculty development, support, and training	IT staffing and human resources management
Faculty development, support, and training	Distance education	Web-based systems development and integration	Desktop computing management	Web-based systems development and integration	Electronic classrooms/technology buildings
Web-based systems development and integration	Web-based systems development and integration	Advanced networking	Teaching and learning strategies	Electronic classrooms/technology buildings	Web-based systems development and integration
Distance education	Electronic classrooms/technology buildings	Electronic classrooms/technology buildings	Online student services	Teaching and learning strategies	Faculty development, support, and training
Student computing	Online student services	Online student services	Faculty development, support, and training	Online student services	Online student services

Table 5

Issue Rankings by Carnegie Classification

QUESTION 1: The IT-related issues most important for campuses to resolve for strategic success.

Research + Doctorate	Master's	Baccalaureate	Associate of Arts
Administrative systems/ERP	Administrative systems/ERP	Faculty development, support, and training	Distance education
IT funding strategies	IT funding strategies	IT funding strategies	IT staffing and human resources management
IT staffing and human resources management	Faculty development, support, and training	IT strategic planning	Administrative systems/ERP
Faculty development, support, and training	Distance education	Administrative systems/ERP	Faculty development, support, and training
Distance education	IT staffing and human resources management	IT staffing and human resources management	IT funding strategies
Security management	Teaching and learning strategies	Teaching and learning strategies	IT strategic planning
Teaching and learning strategies	Online student services	Online student services	Online student services
Network and IT infrastructure — maintaining	Network and IT infrastructure — maintaining	Network and IT infrastructure — maintaining	IT training campuswide
IT strategic planning	Support services	Advanced networking	Web-based systems development and integration
Network technologies — emerging	IT strategic planning	Electronic classrooms/technology buildings	Network and IT infrastructure — maintaining

QUESTION 2: The IT-related issues with the greatest potential to explode in the future terms of strategic impact.

Research + Doctorate	Master's	Baccalaureate	Associate of Arts
Distance education	Distance education	Network technologies — emerging	Distance education
Security management	Ubiquitous computing/universal access	Distance education	Online student services
Network technologies — emerging	IT funding strategies	Ubiquitous computing/universal access	IT funding strategies
Administrative systems/ERP	Security management	Security management	Network technologies — emerging
E-commerce	IT staffing and human resources management	Advanced networking	Teaching and learning strategies
Teaching and learning strategies	Network technologies — emerging	Web-based systems development and integration	Advanced networking
IT staffing and human resources management	E-commerce	Online student services	IT staffing and human resources management
Ubiquitous computing/universal access	Teaching and learning strategies	Teaching and learning strategies	Web-based systems development and integration
IT funding strategies	Faculty development, support, and training	IT staffing and human resources management	E-commerce
Intellectual property management	Administrative systems/ERP	IT funding strategies	Support services

QUESTION 3: The IT-related issues IT leaders or administrators are spending most of their time addressing.

Research + Doctorate	Master's	Baccalaureate	Associate of Arts
IT funding strategies	IT staffing and human resources management	IT strategic planning	IT strategic planning
Administrative systems/ERP	Administrative systems/ERP	IT staffing and human resources management	IT funding strategies
IT strategic planning	IT funding strategies	Administrative systems/ERP	IT staffing and human resources management
IT staffing and human resources management	IT strategic planning	IT funding strategies	Distance education
IT organization and service delivery models	Support services	Support services	Administrative systems/ERP
Network and IT infrastructure — maintaining	Network and IT infrastructure — maintaining	Network and IT infrastructure — maintaining	Change management
Leadership for IT	Change management	Change management	Support services
Support services	Leadership for IT	IT organization and service delivery models	Network and IT infrastructure — maintaining
Distance education	IT organization and service delivery models	Leadership for IT	IT organization and service delivery models
Advanced networking	Electronic classrooms/technology buildings	Faculty development, support, and training	Web-based systems development and integration

QUESTION 4: The IT-related issues campuses are spending the most human and/or fiscal resources on.

Research + Doctorate	Master's	Baccalaureate	Associate of Arts
Administrative systems/ERP	Administrative systems/ERP	Administrative systems/ERP	Administrative systems/ERP
Network and IT infrastructure — maintaining	Network and IT infrastructure — maintaining	Network and IT infrastructure — maintaining	Network and IT infrastructure — maintaining
Support services	Desktop computing management	Desktop computing management	Desktop computing management
Desktop computing management	Support services	Support services	Distance education
IT staffing and human resources management	IT staffing and human resources management	Faculty development, support, and training	Web-based systems development and integration
Faculty development, support, and training	Electronic classrooms/technology buildings	IT staffing and human resources management	Support services
Distance education	Distance education	Web-based systems development and integration	Faculty development, support, and training
Advanced networking	Web-based systems development and integration	Electronic classrooms/technology buildings	Online student services
Electronic classrooms/technology buildings	Online student services	Student computing	IT staffing and human resources management
Data management	Faculty development, support, and training	Software site licenses	Electronic classrooms/technology buildings

Potentially Explosive Issues

Emerging Network Technologies

Challenges associated with emerging network technologies have common underlying themes of support, cost, and bandwidth use. The educational initiatives and policy issues that arise from the implementation of these new technologies will have a major influence over their success or failure at a given institution. Some of the challenges associated with emerging network technologies include the following:

- While many institutions can come up with one-time funding in the form of grants or internal project funds for initial investment, how should the maintenance, ongoing infrastructure support, and upgrade of these technologies be funded?
- Should bandwidth be regulated or centrally funded and freely available to all? If bandwidth becomes a rate-based service, how will the charges be allocated? What risks do our campuses face from the growth of file-sharing services?
- With the advent of low-cost, high-processor-speed desktop machines, the ability to do desktop videoconferencing well is rapidly becoming a reality. Can the hardware and software for desktop videoconferencing be made simple enough and cheap enough to be broadly deployed?
- What impact will the standardization of wireless technologies have on campus network planning, communications policies, and security management? Will PDAs and wearable computing devices have significant implications for educational and infrastructure strategies?
- Advanced networks promise the capability of recentralizing and/or outsourcing major systems to simplify management or reduce total costs. What are the implications of ASPs (application service providers) for higher education? How can our campuses best evaluate options in this rapidly evolving environment?
- Public Key Infrastructure (PKI) is believed to be an essential foundation for many networked services in the future. How can we best implement this important but complex mix of technologies and policies?
- What is the importance of XML standards to data and information exchange on our campus networks? Will XML survive, or is it this decade's Gopher?
- The challenge related to portal technology is no longer simply how to build the portal itself but one of integration with our systems. How can we create the "glue" needed to provide personalized access not only to online resources but also to the applications people use throughout the institution?
- Streaming video is a technology that promises to provide numerous edu-

cational and administrative applications, but how can we reliably and cost effectively produce and present the material when the required hardware and software are so expensive and trained technicians are needed to do this well?

Security Management

Colleges and universities are becoming more aware of a need for increased security for our networks. Unfortunately, higher education is a prime target for hacker attacks. Some of the attraction lies in the sensitive nature of our data, including everything from credit card numbers and social security numbers to institutional financial records and research data. Campus networks are also targeted because they contain a large number of computers that sometimes can be taken over for use in launching denial-of-service attacks on other computer systems elsewhere on the Internet. To develop an effective strategy for dealing with security in the complex environment of academe, institutions should consider the following issues:

- How will your institution integrate the need for security with the tradition of open and free networking within the academic culture? Is it possible to isolate and secure the mission-critical areas of your network? How will a secure network impact the relationships of trust that

spend more time addressing advanced networking, emerging network technologies, and information policy development.

Finally, when it comes to IT spending, again, more similarities appear than differences across institutions of all types and sizes. The following are among the top-ten challenges commanding significant expenditures at all types of institutions (with exceptions noted in parentheses):

- Administrative systems/ERP

- Maintaining network and IT infrastructure
- Desktop computing management
- Support services
- It staffing and HR management
- Faculty development, support, and training (except for medium-large institutions)
- Electronic classrooms/technology buildings (except for large institutions)
- Web-based systems development and integration (except for R+D)

Some resource allocation differences worth noting are that large and private institutions spend greater resources on teaching and learning strategies; baccalaureate schools spend significantly on software site licenses; and R+D institutions invest heavily in the data management area.

Top Ten Current Issues for 2001

So, what are the top-ten current issues for 2001? Below, the Current

exist between departments at your institution and other networks?

- What policies are currently in place at your institution with regard to security? What policies are critical for a secure network? What strategies can be used to increase the buy-in required from leadership and the community to implement a secure network?
- How will your institution react to a known attack? Do your policies include mechanisms for engaging appropriate law-enforcement agencies? What actions are permissible within your campus policies for securing the campus from a known attack? Has your campus considered the liability issues associated with the failure to secure the campus network from use by the hacker community?
- How will you prepare your institution for the increased resources needed to establish a secure network? Will increased buy-in from leadership solve this problem, or will it be necessary to explore partnerships or other alternatives?
- Many campuses are developing PKI technologies as a means of authenticating the identities of users of the network and authorizing their access to licensed content and other valuable resources. What role can these PKI technologies play in the security of the network itself? Why is system and network security important for the successful operations of PKI?

Ubiquitous Computing/ Universal Access

Computing on campus becomes ubiquitous when all teaching and all administrative system design may proceed on the realistic assumption that every member of the college community has seamless access to a baseline of IT resources, including convenient and affordable access to a personal computer connected to the campus network at any time and from any place. At least 150 colleges now explicitly require student ownership of a specific (or comparable) computer. Ubiquitous computing as a topic is hot right now because most colleges are in awkward transition. They recognize ubiquity as a necessity, but aren't yet sure how best to achieve it. Key issues include the following:

- Should standardization for student computing be at the level of identical machines, several machines in a single vendor family, identical software loads, and/or same threshold requirements? Should the standard machine be a more powerful (for the money) desktop, a more portable laptop, or a more convenient and less expensive PDA? Do the additional advantages of mobile computers justify the additional costs?
- Should the standardization throughout the student body extend to the faculty, staff, and others, such as physical plant employees, governing board members, and alumni using the campus system?

- Should the standardization of hardware and software be accompanied by standardization in the domains of course management systems, of classroom presentation systems, and of computer peripherals (for example, printers for all students)?
- What kind of funding model is best, and what are the advantages of a leasing versus ownership approach? If the college owns the computers, should ownership be transferred to students upon graduation? Should students leaving before graduation be allowed to buy "their" computers? Can the college creatively sell in bulk the used computers that students don't take with them?
- How should the phasing in of a ubiquitous computing program occur? How should the college handle the logistics of machine distribution, student orientation, insurance and security, maintenance and breakage, and training and support?
- When learning becomes dependent upon computer access, how can we best assure access for persons with disabilities?
- Is the college or university responsible for providing remote access to the campus intranet for off-campus students, or should they be expected to use an ISP?
- What is the continuing role, if any, for computer labs and other transient on-campus public access facilities?

Issues Committee (and selected other individuals¹) have described the top-ten IT-related issues most important to resolve for institutional strategic success (based on the survey results for Question 1 for all respondents), as well as three unique issues among the top five potentially explosive issues (see the sidebar "Potentially Explosive Issues"). The survey results offer a way for you to compare and validate your campus issues with those of other, like institutions, and to get a

glimpse of what you and your colleagues see as emerging challenges.

Administrative Systems/ Enterprise Resource Planning

With Y2K compliance no longer a forcing function, and with many ERP systems projects late and over budget, colleges and universities are carefully reviewing options for their administrative systems and business processes. The generally successful Y2K efforts highlighted several key issues: Our

institutions depend increasingly on a large and complex set of central and distributed systems, of varying origins and technologies, which often lack sufficient personnel and other resources to ensure their reliable operation, security, ongoing maintenance, and ability to withstand a major disaster.

ERP projects have demonstrated the ongoing technical and management challenges inherent in changing applications software, system architectures, and institutional business practices,

especially in institutions seeking consensus decision-making on large, multi-year projects. Some institutions are focusing on smaller, more manageable projects with faster returns on investment. Progress is evident in such areas as easy-to-use Web interfaces for legacy systems; anytime, anywhere self-service functions; portals to integrate and personalize access to online resources and transaction services; data warehouses to improve access to disparate data sources; and replacement of internal and external paper-based systems with workflow and e-commerce systems.

Whether large or small, central or distributed, administrative systems raise a set of fundamental issues:

- Should we buy, build, or integrate? Some institutions have found success with building and maintaining custom applications. Others purchase integrated packages and implement them “plain vanilla.” Most follow a mixed strategy of modifying and integrating packages using locally developed components, middleware, and interfaces.
- Should or does software drive or constrain business processes? If “the way it’s always been done” is no longer sensible, how best to change? Do we buy a package with best practice embedded, or engage in business process reengineering first, then find (or build) the software to match?
- How can we balance production versus innovation? Given scarce resources, how can a responsive IT organization accommodate user needs for “minor enhancements” while exploring next-generation solutions?
- How can we provide adequate user training and support? This is a clear mandate when systems are new, yet few steady-state users are true experts.
- How do we move away from the mindset that administrative systems are for administrators only? Faculty members manage grants, students select courses, prospects apply online, parents pay bills,



How much do our institutions spend on IT today? This is often difficult to determine given that IT investments are made at various levels of the institution.

alumni check sports team results and make donations. The look, feel, functioning, and reliability of administrative systems determine, to a remarkable extent, the perceived quality of our colleges and universities. How can we ensure that our institutions understand this new role that administrative systems play?

Information Technology Funding Strategies

Funding the acquisition, deployment, and support of information technology is a major challenge for many institutions today. That challenge manifests itself at various levels — from institutional administration to central IT organizations to college and departmental units. Unfortunately, it’s a systemic challenge that often receives fragmented consideration at best. Addressing this problem requires examination of the following:

- How do we build support for funding IT? For example, is it possible

to address the funding issue without an institutional plan for IT? How much should an institution invest in IT?

- How do we design a financial plan for IT that’s compatible with institutional structure and culture? Is centralized better than decentralized structure? In either case, who should take responsibility for planning for and funding IT?
- What criteria should we use to determine the appropriate funding mechanism for any given area of IT? Many institutions fund IT from a myriad of mechanisms. These include tax assessments, student technology fees, fees for service, external grants and gifts, reallocations, cost-shifting, new monies, bridge funding, and loans.
- How much do our institutions spend on IT today? This is often difficult to determine given that IT investments are made at various levels of the institution. Yet, this may hold the key to a rational plan for how to deliver and fund IT services. For example, it’s difficult to assess the cost-benefit results of outsourcing without knowing our institution’s present scope of and investments in IT.
- Many institutions consider total cost of ownership (TCO) in trying to control IT costs. How can we use TCO to its fullest extent? What factors affect TCO at our institution? What are the interdependencies of technology infrastructure (networks, shared central processing and file systems, and so forth), desktop equipment, and user support? Who is responsible for what piece, and how do we manage TCO within that framework?
- How do we institutionalize lifecycle funding for IT within our framework? IT requires levels of investment comparable to if not greater than brick-and-mortar capital investment. The latter typically requires major initial outlay and lasts for a very long time. However, IT lifecycles are much shorter and driven to be even more compressed

with rapid advances in the field. How do we work with existing institutional policies on capitalization, purchasing, and leasing?

Faculty Development, Support, and Training

The debate is over. Most faculty in most disciplines acknowledge the importance of having the new tools of technology available for those who wish to use them, raising a host of new challenges in this area. We're coming to realize that successful faculty development and training must be specific to the discipline, the teaching circumstance, the experiences of faculty and students, and the timing of need. Successful campus programs are multifaceted, flexible, and systemic. The most important ingredient is faculty confidence in these programs. While their importance is acknowledged, their relevance must be proven case by case.

The questions below are presented from a faculty member's perspective to embed IT support and training challenges within the broader context of pedagogical as well as practical concerns:

- Which new teaching methods offer the highest return in learning with the least risk of failure? To what extent will I be rewarded for quality teaching, with or without technology? Where can I find the time to simultaneously teach current students and learn new methods?
- How should I divide my time with regard to locating new resources versus supplementing my classroom presentations with multimedia versus moving course mechanics to the Internet versus using these new tools to increase faculty-student communications?
- Can I be comfortable in the belief that my institution's choice of hardware and software as well as its technology policies have been decided by people who understand my teaching tasks and needs? Is there someone in the institution who understands my discipline as well as technology?
- At last there are tools that allow my teaching to be more interactive, to involve more controversy and debate, to customize assignments for students, to involve professionals from around the world, and to stay in touch with my students between classes. What specific techniques are others in my discipline using to pursue these goals? Can you teach them to me just before I need them?
- How can I take advantage of what professors in other departments and other colleges and universities know about the uses of technology in teaching? Where can I find reliable, tested, interactive components for my courses when national projects such as MERLOT don't have what I need?²² To what extent do training consortia make sense?

IT Staffing and Human Resources Management

Few issues are more important, or possibly more frustrating, to a college or university information technology manager than recruiting and retaining skilled IT workers. Factors such as lower-than-market compensation, highly specialized and perishable skills, and ever-tightening budgets exacerbate this issue. Of equal importance, however, is the challenge of effectively managing and retraining our present workforce.

- How can we effectively communicate unique IT staffing challenges and ensure ongoing attention to the problem at the institutional level? How can we get our institutions to focus attention on the relationship between IT staffing and strategic institutional objectives?
- How can we create a partnership with our campus human resources departments to benefit from their expertise? How can we work with HR to foster positive recruitment and retention initiatives, especially to streamline recruitment processes to compete more effectively in today's market?
- How can we make higher education IT salaries more competitive with industry salaries? Can we restructure our compensation systems to be more skill- and performance-based, allow for greater job flexibility and options such as telecommuting or job sharing, and provide more benefits such as daycare and study leaves?
- With limited salary availability, what other items can we offer that will attract new staff? Can we envision the jobs of the new century and create new ways of working that will provide stimulating work environments to help retain staff?
- Will the failure or restructuring of many dot-com firms help fill our IT worker vacancies? Will there in fact be an abundance of IT workers to draw from? If so, how can these workers be targeted and encouraged to pursue careers within our colleges and universities?
- How can we encourage our institutions to spend more time and money to promote themselves as an attractive place to work? How can we enhance the recruiting techniques of IT managers and the HR staff? Can we do a better job of recruiting our own students? Can we expand our workforce by selecting staff without IT skills and teaching them to be IT professionals?
- With the need for continuing technical education increasing and the cost for that training rising, how do we address these financial challenges? How can we predict the next generation of required skills? How can we adequately train our existing staff to meet the new technology challenges?

Distance Education

Pressure to provide educational services at a distance has not abated in the past year. Many more institutions are conducting real-world tests on the economics of delivery as well as gaining expertise with the frailties of operation. The advantage of the ensuing changes has been that IT and library professionals do have some operational issues to occupy our time. Even though the following list contains many IT-related issues, it's still very

important to ensure that leadership for distance education initiatives stays firmly in the academic community.

- Are we prepared for more change in the courseware delivery systems market? Can we migrate courseware from one (defunct) product to an operational one?
- What is the successful implementation model? Which things work in which environments and into which communities? Should distance education be part of every department, or will Continuing Education (who have the most experience) gain academic recognition and be legitimized as the deliverer?
- How much of an effect will the large contract awards (Department of Defense, for example) have on the rest of us? Which consortial model will work for general course delivery? Will we be able to provide complete degree programs using distance delivery, especially for advanced and terminal degrees?
- Since distance education also increasingly means asynchronous delivery, how will we cope with 24 × 7 support?
- What percentage of our students will choose to take up our distance delivery offerings for scheduling convenience, rather than out of necessity? How will this strain our resources?
- Will the various commissions and accrediting agencies develop complementary policies to guide us in the provision of services? Will systems and consortia have flexibility in designing programs around available courses? Will the inevitable reporting requirements represent a bearable burden?
- Will increasing collaborative behavior push libraries to develop more widely held digital holdings? How will we fund such activities? In the broadest sense, will the primary focus continue to be related to standards of local service or move to best practice in the use of information technology to support all learners?

- How do we deal with rights management for information resources available to virtual learners? Will IT develop a successful authentication model for services, and will we be able to convince vendors to use it rather than static IP addresses? Is there a place for commercial ventures as options for online library service (for example, <http://www.egloballibrary.com>)?
- How can residential campuses capitalize on distance learning tools, knowledge, and expertise to meet their on-campus learning and teaching needs?

Teaching and Learning Strategies

Technology-enhanced teaching and learning is no longer of interest only to faculty members working in distance education programs. Many mainstream faculty have begun to rethink their teaching and learning strategies in the face of evolving technologies, the need to contain institutional costs, and the changing expectations of students, who arrive on campus with an information-age mindset and different learning approaches and habits. Critical issues that need to be addressed in this area are

- How can our institutions make instructional technology an integral part of academic programs for the purpose of enhancing student learning? How can the use of IT help students develop the higher level, context-dependent technology skills essential for lifelong learning, such as problem solving, critical thinking, information ethics, and effective communication?
- How can we design an electronic environment that supports learning objectives? How can the network be used to create new resources to enrich teaching, for example international learning experiences?
- Are instructional management systems best designed locally or purchased? If we decide to buy, how do we choose among the many

commercial systems available? Is it best to experiment with several systems while waiting for a standard to emerge? Can more efficient or effective learning models be designed through collaboration between for-profit and not-for-profit entities?

- What are the tradeoffs between campuswide instructional technology standards and the support costs of a diverse technology infrastructure? Is it desirable for instructional strategies to be a collaborative departmental effort with agreed-upon methods and goals?
- What is the relationship between educational theory and educational outcomes? Does student productivity increase with the use of electronic books, digital textbooks, e-reserves, and digital libraries? How can we best assess whether instructional technology results in better learning?
- What opportunities does advanced networking offer for enhancing teaching and learning strategies, especially Internet2 applications? Is real-time Internet videoconferencing a reliable option for classroom use? What are the implications of wireless technology for teaching and learning?

IT Strategic Planning

It's 2001, the NASDAQ bubble has broken, and relief has spread throughout the higher education IT community. The diminishing hype of IT introduces the possibility for truly rational IT planning on our campuses, more than at any time in a decade. A renewed interest in making IT investments is tightly coupled with academic business plans.

While IT remains a rapidly changing landscape, more effort goes to return-on-investment and total-cost-of-ownership issues than to dynamic, cutting-edge implementations. With a more conservative economic picture facing our institutions, challenges are more likely to be resolved by reasoned planning

than by simply throwing money at them. In this environment, some of the key issues in strategic planning include

- How do we choose the best planning process for IT investment and development on our campus? Is there a more comprehensive institutional planning process to tie into? Is there an accepted campus planning and policy development process? What benchmark processes are currently used?
- What are the costs and value associated with using consultants for planning? To what extent do corporate models of IT planning fit the academy?
- Are the institutional goals that IT supports clearly articulated and accepted campuswide? If not, can IT planning work in a vacuum? Do senior campus leaders understand and support the potential for IT-enabled transformation?
- Are our campus IT organizations respected for services and products, or is campus IT leadership in conflict? Have previous planning exercises delivered successful outcomes?
- What are the roles of various constituent groups on campus, including IT staff, faculty, students, and administrators? Is there an IT advisory group or a series of task forces?
- Who is providing input on new and developing IT products and services, and who estimates costs of specific projects for planning decisions? Is there a pre-established budget into which the plan must fit, or is the plan driving funding levels?
- What are institutional expectations for IT development? If unrealistic, how can priorities and funding be aligned? How can the IT planning process be integrated into the academic planning processes so the allocation and use of resources are mutually supportive?

Online Student Services

Today's students assume the Internet is the place to turn for all of their needs. Increasingly, they include an evaluation of the campus technology environment



What can we do to ensure that campus strategies for online student services are student-centered rather than driven by administrative processes and procedures?

in selecting the college or university they will attend, and online student services are an important aspect of that environment. (See the EDUCAUSE Guide for Evaluating Information Technology on Campus at <http://www.educause.edu/consumerguide/>). Integration of online student services into the overall institutional e-business strategy is critical. Developing a campuswide, student-centered approach raises a number of key questions:

- How do we ensure that the campus IT unit plays a strategic role in the development of such an environment? What are the roles of central administrative systems personnel, the faculty, student services personnel, business office staff, public relations, and other units on campus? What can we do to ensure that campus strategies for online student services are student-centered rather than driven by administrative processes and procedures?
- As more online student services

become available for implementation, how do we prioritize their implementation? How will these services affect the campus technology architecture and direction? How can we provide not only the basics but also the customized transactions students are beginning to expect?

- How can we ensure that students receive the same level of service whether they live on campus or use Web-based services from a distance? How do we evaluate online services to improve our processes and drive towards equal service levels?
- How do we determine what type of student portal to implement at our institution? What are the most effective approaches to developing Web portals to serve students? What new opportunities will a portal approach provide for creating new relationships with prospective and current students and alumni?
- What does a customer relationship management (CRM) approach mean in higher education? How and by what office(s) should CRM be developed and coordinated? How do we ensure that such an approach will be integrated into the implementation of new administrative information systems?
- What partnerships or consortiums can be established to deliver services to online students cost effectively? How are the costs for student online services incorporated into the organizational budget? Are there additional training issues for office staff who work with student services?

Maintaining Network and IT Infrastructure

You are confronted with building an infrastructure for applications users haven't decided they need yet and maintaining an infrastructure for a performance standard that can be disrupted overnight. System design and management requires a significant investment in both human and capital resources. The work is made significantly more difficult when the element of surprise is added to the equation. Did anyone

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from Napster give you a heads-up on their plans so that you could adjust your bandwidth to accommodate the increased traffic? Addressing these critical issues can be very stressful.

■ How much infrastructure is really enough? Do we need T1, T3, 100 Mbps, fiber, gigabit, ATM, wireless, DMZ, VPN, or whatever? How should decisions be made about adopting and supporting emerging new technologies, and how can we integrate the adoption of new technologies into campus business plans? Is there an awareness on our campuses that infrastructure issues and decisions aren't just for the IT division to address, but should be made within an institutionwide strategic planning process?

■ How can we plan for infrastructure changes when the future changes and uses of IT are unknown? Were we prepared for multimedia applications or, as alluded to above, the excessive use of bandwidth as a result of the Napster phenomenon? Can we develop plans and budgets fluid enough to accommodate the rapidly changing user demands?

■ Is it possible to measure the return on our investment or know what the performance gain will be? What are the funding sources or mechanisms for handling the just-in-time network and systems demands we face? Is it ever possible to have enough staff to handle the maintenance needs plus the plan-

ning processes, not to mention the continual upgrades necessary to stay abreast of new technologies?

- Do we have the appropriate diagnostic tools to keep our systems and network performance optimized? Is our staff sufficiently trained in using these tools?
- Are we keeping ourselves prepared to handle system and network disasters, or have we forgotten these concerns now that Y2K has come and gone?

Electronic Classrooms and Technology Buildings

As the technological sophistication of our faculty increases, so too does the demand for facilities that contain more than an overhead projector. The creation and support of electronic classrooms and technology buildings has always challenged IT organizations. With early faculty adopters, who tolerated and even relished technological challenges, the issues were simply finding the funds to create a few technology-enhanced rooms and supporting these entrepreneurial faculty with appropriate IT staff. But mainstream faculty members require that the technology be as reliable as whiteboards, and their numbers demand that the technology be as ubiquitous. We face increasing financial and support demands, and the need to answer such questions as

- How are decisions made regarding the deployment of technology into classrooms or the development of special-purpose technology buildings? Is there a coordinated planning effort engaging all relevant campus constituencies (physical plant, IT, the library, the registrar, faculty)? Once these spaces are created, are they scheduled for use in a way that reaps the maximum return on investment (including support)?
- Should we build instructional technology centers and, if so, what are the critical elements that make such centers successful? Do planners of such centers recognize that it takes more than a sophisticated

technology building to develop, support, and sustain faculty in the use of technology?

- What are the lifecycle plans for the funding and replacement of classroom technologies, and who controls those budgets? Is there a plan for regular preventive maintenance for these demanding, and heavily demanded, spaces?
- Is the technology in the campus facilities consistent, or is there a consistent interface to simplify faculty training? Are the same technologies available in large lecture halls also available to smaller classes in traditional classroom or seminar rooms?
- What are optimum ways to organize to support the facilities and the faculty who use them? Are support staff available to assist with problems whenever these facilities are in use?
- Although many of us have been

considering the impact that wireless technologies will have on our classrooms, are we looking ahead to the next wave of technologies, such as personal digital assistants (PDAs) or other dedicated devices, which hold the potential to offer many of the same services as desktop (and laptop) computers at a fraction of the cost?

- What is the right mix of “bricks and clicks” overall for our campuses as distributed education for many institutions moves steadily to a Web-based environment? Are we thinking far enough into the future in our space planning efforts?

In a profession where change is a constant, there will always be new issues to capture our attention. We encourage you to check the EDUCAUSE Current Issues Web site for resources on the latest issues and for a link to a full report and detailed tables

for the 2001 survey (<http://www.educause.edu/issues/issues.html>). *e*

Endnotes

1. The EDUCAUSE Current Issues Committee appreciates the contribution of issue descriptions by Laurie Antolovic, Krystal Bullers, Bret Ingerman, Jan Thomson, and Dan Updegrove.
2. The MERLOT (Multimedia Educational Resource for Learning and Online Teaching) project provides tools that allow faculty to share teaching and learning resources over the Web [<http://www.merlot.org>].

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