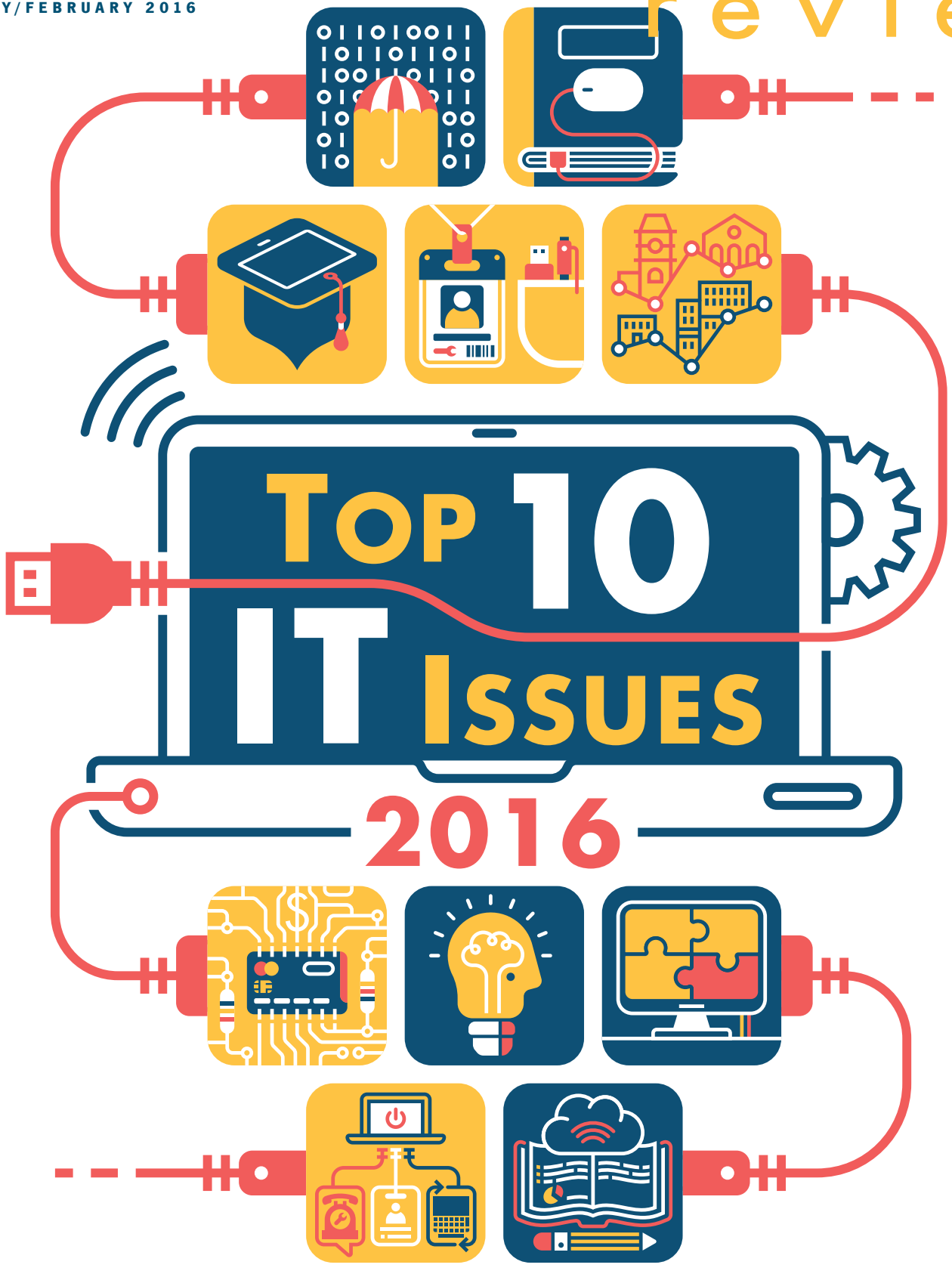
Why IT Matters to Higher Education

EDUCAUSE review

JANUARY/FEBRUARY 2016



Imagine delivering a personalized educational experience with Jenzabar.

Learn more: **jenzabar.com/educause**

JENZABAR®

Jenzabar student information systems are **chosen more often** than any other SIS.*

ERP Continuing Education Retention Managed Services Analytics LMS CRM
Recruitment SIS Advancement Consulting Services Portal Cloud Mobile

*Based on total new institution sales of higher education student information systems during the 2009 – 2014 period.

Why IT Matters to Higher Education
EDUCAUSE review
JANUARY/FEBRUARY 2016 VOLUME 51, NUMBER 1

FEATURE

In 2016, higher education IT organizations are *divesting* themselves of technologies that can be sourced elsewhere and of practices that have become inefficient and are *reinvesting* to develop the necessary capabilities and resources to use information technology to achieve competitive institutional *differentiation* in student success, affordability, and teaching and research excellence.

Including:

Why IT Matters to Higher Education
EDUCAUSE review

JANUARY/FEBRUARY 2016 VOLUME 51, NUMBER 1

EDUCAUSE Review is the general-interest, bimonthly magazine published by EDUCAUSE. With a print publication base of 22,000, *EDUCAUSE Review* is sent to EDUCAUSE member representatives as well as to presidents/chancellors, senior academic and administrative leaders, non-IT staff, faculty in all disciplines, librarians, and corporations. It takes a broad look at current developments and trends in information technology, what these mean for higher education, and how they may affect the college/university as a whole.

282 Century Place, Suite 5000
Louisville, CO 80027
phone: 303-449-4430;
fax: 303-440-0461
info@educause.edu
http://www.educause.edu/

For subscription information, contact EDUCAUSE: 303-449-4430 (phone) or 303-440-0461 (fax) or <er-subs@educause.edu>. For advertising information, phone 720-406-6752, or fax 303-440-0461, or send e-mail to <advertising@educause.edu>. Send editorial submissions or comments to <editor@educause.edu>.

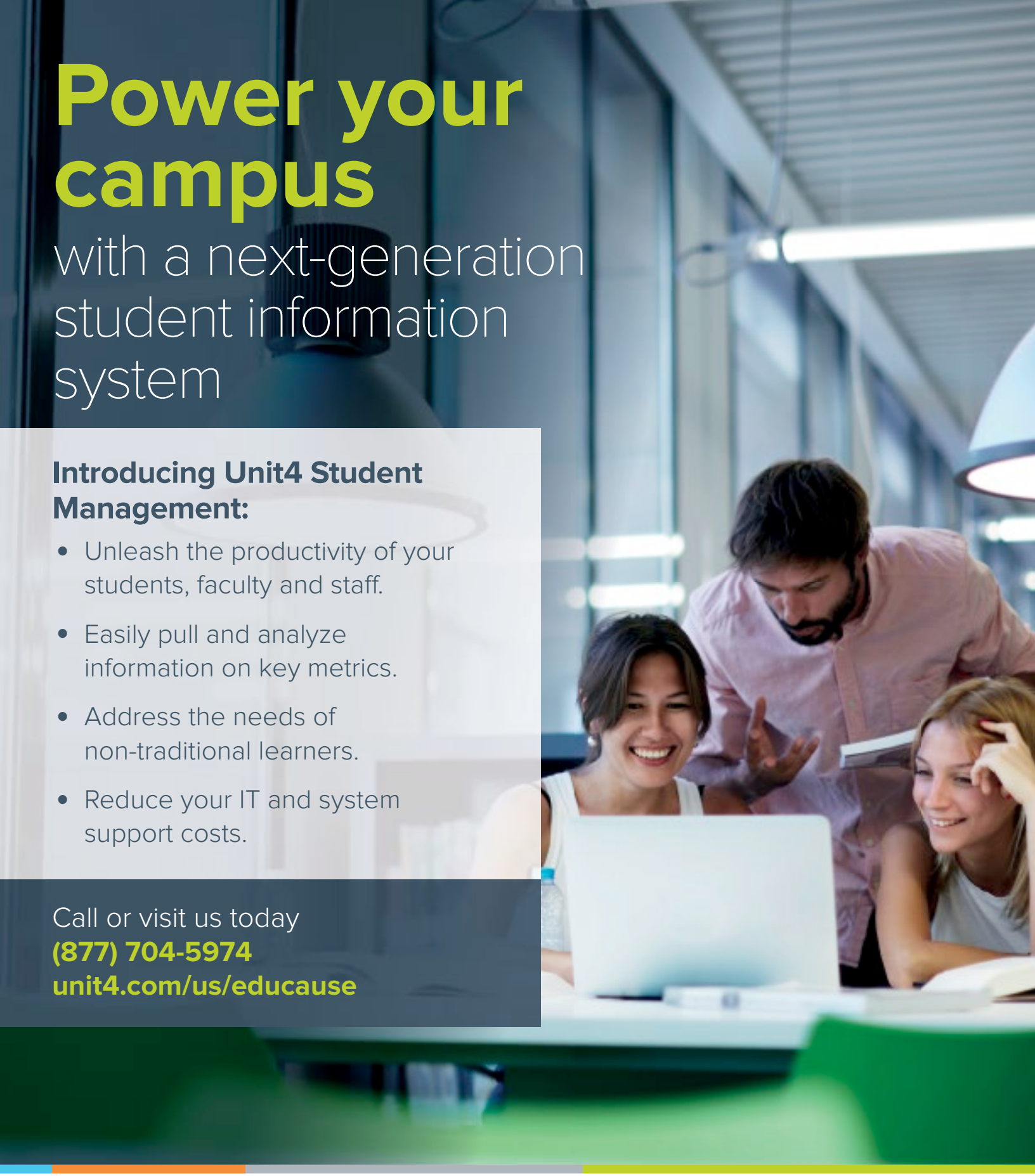
EDUCAUSE Review is also available online at <http://www.educause.edu/er/>.

COLUMNS

Volume 51, Number 1. *EDUCAUSE Review* (ISSN: 1527-6619) is published bimonthly (6 issues per year) by EDUCAUSE, 282 Century Place, Suite 5000, Louisville, CO 80027. Subscriptions are available at $48 per year ($78 per year outside North America) and to all academic libraries (North America and international) at $48 per year. Single copies are available for $10.00 each. Periodicals postage paid at Boulder, CO, and additional mailing offices. POSTMASTER: send address changes to EDUCAUSE, 282 Century Place, Suite 5000, Louisville, CO 80027.

Publications Mail Agreement #40033384
Return Undeliverable Canadian Addresses to:
Station A, PO Box 54
Windsor, ON N9A 6J5
e-mail: info@educause.edu

Cover: Chris Gilleard



Power your campus

with a next-generation student information system

Introducing Unit4 Student Management:

- Unleash the productivity of your students, faculty and staff.
- Easily pull and analyze information on key metrics.
- Address the needs of non-traditional learners.
- Reduce your IT and system support costs.

Call or visit us today
(877) 704-5974
unit4.com/us/educause

UNIT4
In business for people.

THREE RIVERS SYSTEMS
A Unit4 Company

By JOHN O'BRIEN

Suspended Animation

Remember those moments in the movie *The Matrix* when the action freezes momentarily, with a character in midair just before kicking someone (implausibly) 40 feet into a wall? Or what about that single second when you are at the top of the roller coaster—that elongated moment when time stands still just before the world drops out from under you? I think of this as *suspended animation*, as a time that is not so much a pause as it is a gathering of energy.

EDUCAUSE has reached a similar point of suspended animation as we begin our 2015–20 strategic planning. In October, the EDUCAUSE Board and EDUCAUSE senior leaders launched an ambitious strategic-planning process that considers the way forward based on an understanding of our association's current standing and future promise. As I complete my first half-year as EDUCAUSE president, I believe it is crucial to develop a strategic plan that will establish bold but achievable five-year goals and will pave the way for annual strategies that will ensure regular progress toward reaching those goals. And as I mentioned to attendees at the 2015 EDUCAUSE annual conference, we will hold ourselves accountable for results.

I can't stress enough that I am talking about a strategic plan—a gathering of energy—and not a pause. After all, there is a considerable amount of work already under way. Long before the doors opened for our 2015 conference in Indianapolis, for example, we were already hard at work planning for our 2016 annual conference in Anaheim. While we complete a detailed membership survey, conduct focus groups, and seek input in other ways from members as part of our strategic-planning process, we will continue to deliver on our work in progress, including improvements that you may have already noticed (the redesigned *EDUCAUSE Review* website: http://er.educause.edu/) and significant work that many will never directly notice (replacing the EDUCAUSE ERP system). In addition, we will soon be launching (1) the EDUCAUSE Benchmarking Service beta project featuring maturity and deployment indices (http://www.educause.edu/benchmarking) and (2) the Leading Academic Transformation program (http://www.educause.edu/LAT). At the same time we will be offering a new Management Bootcamp at Connect-Denver and Connect-Miami and a new CISO Leadership Seminar at SEC16 and will be expanding our professional development opportunities in other ways as well. Finally, we are convening a new presidential advisory committee, which we are calling the *EDUCAUSE Young Professionals Advisory Council* until the group selects its own name. The council will create new EDUCAUSE leadership opportunities and help ensure that we are listening to emerging, as well as seasoned, voices in our community.

I can't stress enough that I am talking about a strategic plan—a gathering of energy—and not a pause.

You will be seeing some of our efforts to strengthen connections within the higher education IT community in this very issue of *EDUCAUSE Review*, which features our inaugural column focused on community colleges. In Connections: Community College Insights, we will shine a light on the important two-year college landscape, with as much interest in pointing out differentiating value as in identifying points of commonality and shared interest among EDUCAUSE member institutions.

All institutions, not just community colleges, are today considering their points of commonality as well as their differential value. This duality is the primary theme of the 2016 Top 10 IT Issues. As detailed in this issue of *EDUCAUSE Review*, 2016's top issues reflect the ways in which higher education institutions are learning to use information technology more strategically in those areas where commonalities can be leveraged to differentiate themselves from other institutions in the way they enhance teaching and learning and improve student success. Part of the work IT organizations are undertaking involves *divesting* themselves of locally optimized and delivered services and processes to move instead

(continued on page 6)

Introducing the New

PowerBar60

Ideal for common areas where students "hang-out" between classes. Small footprint - only 18"D.

Starting at $550

Multi-Use

Starting at $795

For 27 years, Computer Comforts has been manufacturing innovative solutions for your computer labs. We are now your one-stop shop for ALL of your classroom furniture needs (Active Learning, General Purpose, Collaborative, etc.).

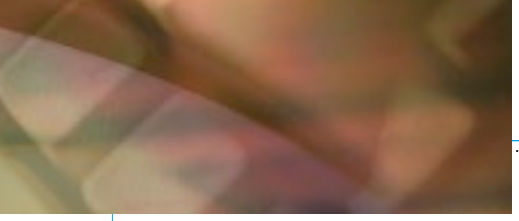
CCI

(281) 535-2288

computercomforts.com

Collaborative

Starting at $850



(continued from page 4)

to common standards, applications, and services. *Reinvestments* are needed as well, to adapt the IT workforce and organization to support new service models like cloud computing and IT service management and *differentiating* capabilities like analytics and e-learning. Cloud computing is also requiring IT leaders to consider reinvesting in IT funding models to accommodate a major rebalancing of capital and operating funds. In this way, the three themes for the 2016 Top 10 IT Issues summarize the IT challenges and IT opportunities for higher education: divest, reinvest, and differentiate.

One key challenge is, sadly, always animated and never suspended. The #1 IT Issue this year is *Information Security,* which feels much more like the steep drop of the roller coaster. IT organizations are struggling to maintain some semblance of control on the wild ride of managing new threats and bringing our institutions safely through breaches that seem to have become inevitable.

The lasting value of the EDUCAUSE annual Top 10 IT Issues list is not the list itself but, rather, the conversations it engenders. As we know from years past, the conversations will continue through the 50-plus face-to-face and virtual EDUCAUSE events each year. Using the annual Top 10 IT Issues list allows us a moment to take it all in—to pause amid the tremendous activity where higher education and information technology meet. When we know the biggest opportunities and the biggest challenges, we can navigate the future more effectively, and we can gather our energy in a thoughtful, productive way.

John O'Brien (jobrien@educause.edu) is President and CEO of EDUCAUSE.

That's the power of "&." With nearly 100 competitively awarded contracts from top suppliers, technologies to improve your sourcing processes and expert consulting services, we're here to help you save time and money and accomplish more with less.

E&I Cooperative Services

Sourcing. Strategy. Savings.

CONTACT US AND SAVE:

(877) 693-2634 info@eandi.org www.eandi.org

Technology: Reshaping Economy and Educational Goals

The emergence of ubiquitous Internet connectivity and broadly accessible personal computing over the last decade has created the prospect of a revolution in higher education. Many have claimed that these technological changes, which have already disrupted business models in many industries, will dramatically alter both business models and pedagogical models in higher education. According to this view, the combination of Internet connectivity and personal computers renders obsolete the traditional lecture model of educational delivery, with its expensive personnel and physical plant costs.

In place of classroom lectures, standardized courses of instruction—drawing on the talents of world-renowned instructors—will be delivered on the Internet. These efforts will be delivered at heretofore unimagined scale and, consequently, at a significantly reduced cost per student. In this approach, mass distribution of educational content will produce increases in educational productivity just as mass production and mass distribution have increased productivity in many other industries. The centuries-old model of instruction will finally evolve, heralding a new era of increased global access to low-cost higher education.

> The era of distributed production is here, and students will need new skills and abilities to thrive in it.

Although there have indeed been dramatic increases in the number of students participating in online education, this vision has been clouded by significant challenges. Many examinations of contemporary practices have demonstrated that mass instruction using Internet technologies is associated with very low course-completion rates.[1] Further, students who face academic and financial challenges—a key target group for expanded access—fare poorly in learning environments that emphasize delivery through technology rather than face-to-face interactions.[2] Moreover, and to the chagrin of both college/university presidents and chief technology officers, the per-student costs of online education have sometimes far exceeded optimistic estimates.[3] (I must admit to having learned the hard lesson that there is no such thing as a one-time technology cost.)

The question of how developments in information technology can change pedagogy in higher education is an important one, but a single-minded focus on this issue is diverting attention from an even more fundamental set of questions. How are ubiquitous Internet connectivity and widespread access to personal computing dramatically changing the economic structure of our society and, consequently, the educational preparation necessary for graduates to thrive? What are the critical implications not only for how students are taught but also for how broader educational goals and purposes are met?

At a general level, the relationships between a society's technological advances and its educational goals and purposes are obvious—especially when seen through the lens of history. The shift from the curricula of American colonial colleges, focused on instruction in Greek and Hebrew, to the curricula of U.S. land-grant universities, focused on agricultural production and other mechanical technologies, clearly reflected the nation's developing industrial technologies. The relationships between the development of specific technologies and specific academic degree programs are also evident—again, particularly with retrospective analysis—as aerospace engineering degrees emerged with manned flight and as molecular biology degrees followed a string of technical discoveries in genetics and biochemistry.

Clearly, this has also happened with contemporary developments in information technology, as undergraduate and graduate degree programs have grown dramatically in the fields of computer science, computer engineering, and information systems. However, the emergence of personal computing and the widely accessible Internet has educational implications that go far beyond the development of individual degree programs. These technologies are changing the relative importance of various cognitive abilities and processes—often referred to, in discussions of general education, as "habits of mind"—for *economic success.* I envision this shift will, over time, change the broad educational goals and purposes of higher education institutions.

An analogy to the development of the technologies of radio, television, and film may help clarify this process. These technologies allowed for the mass distribution of entertainment, and the mass marketing associated with these new media significantly increased the impact of marketing on our daily lives. This increase, in turn, amplified the importance of cognitive abilities related to marketing because of their growing influence on economic success in society. Specifically, the ability to persuade through marketing is now an essential skill in many professional fields, as is the ability to critically evaluate marketing messages.

By ELLIOT HIRSHMAN

Higher education institutions have responded to this change in the relative importance of marketing by increasing the role of communication and critical thinking in general education requirements and by developing specific degree programs in communications, public relations, marketing, and critical studies.

Yet the emergence of the omnipresent Internet and broadly accessible personal computing has still more fundamental implications. These technologies are dramatically democratizing the ability to produce economic products by providing instantaneous access to resources from around the globe. Everything from news and history to visual images, calculators, and expert analyses is readily available with the click of a button. Similarly, the computing power inherent in a watch or hand-held device can provide highly sophisticated real-time analyses of stock markets, weather forecasts, navigation guidance, and even medical diagnoses. The development of 3D printing, computer-aided design, and systems for the recognition and production of speech and visual images has dramatically enhanced the possibilities for decentralized production. Moreover, these resources are generally available at exceptionally low costs, removing the traditional cost barrier to production. Thus, a person in the average office cubicle (or lying at home on his/her couch) now has access to extraordinary resources for creating, producing, and distributing products, algorithms, services, and ideas without large up-front investments.

These developments create the possibility of an era in which small groups with relatively limited resources can become centers of innovation, production, and distribution. In a dramatic departure from the future envisioned by Marx and Engels, the tie between investment capital and the mechanisms of production has been weakened. We have already seen the disruption of the communications industry (i.e., advertising, public relations, and journalism), changes in the services industry with Uber and Lyft in transportation and Airbnb and FlipKey in lodging, and inroads in manufacturing as small companies use new technologies to make everything from auto parts to prosthetics. In this new environment, the ability to innovate and produce things—that is, the ability to design, create, and test—is at a premium, and educational programs must help students develop these abilities.

This framework raises a number of important challenges for those of us who are higher education administrators and technology officers. We must reframe our discussions of technology to go beyond questions regarding methods of education delivery to the more complex issue of how the societal changes associated with technology should alter our educational goals and programs. These discussions require that we generate and evaluate hypotheses about the effects of technology on society and consider the complex question of how to alter our educational goals to prepare students for this new world. For administrators and technology officers, this will mean discussing our curriculum and our co-curricular programs—topics generally viewed as the province of faculty members and student affairs professionals. Collectively, we must articulate the abilities and characteristics required by the societal changes, as well as the best ways to impart these to our students.

Given the breadth of such issues, different institutions will likely pursue them in different ways. At San Diego State University, two themes have already emerged that may be instructive. First, we are examining whether the evolving notion of *design thinking* is an ability that will help our students thrive in this new environment. Broadly defined, *design thinking* focuses on identifying important problems or challenges, bringing collaborators together to create solutions, simulating or rapidly prototyping the solutions, and iteratively testing and refining potential solutions. This constellation of abilities is about finding solutions to difficult problems; consequently, we believe that developing these abilities will strengthen our students' capacities to innovate and produce.

Second, our initial efforts have been focused on co-curricular programs. Specifically, we are incorporating design thinking into our entrepreneurship programs at the Zahn Innovation Platform and the Lavin Entrepreneurship Center, whose programs center on creating for-profit and social enterprises. We have focused on co-curricular programs because, in contrast to curricular programs, their administrative structures permit rapid changes that allow flexible development of new approaches. And we are concentrating on our entrepreneurship programs because the abilities to identify problems and to collaborate in finding and prototyping solutions are often essential to the creation of a new enterprise.

The era of distributed production is here, and students will need new skills and abilities to thrive in it. The discussions regarding how higher education should adapt to this new era are just beginning. The steps mentioned above are, admittedly, small ones. I look forward to a broader conversation with members of the academic community—a conversation in which technology leaders will play a critical role. ■

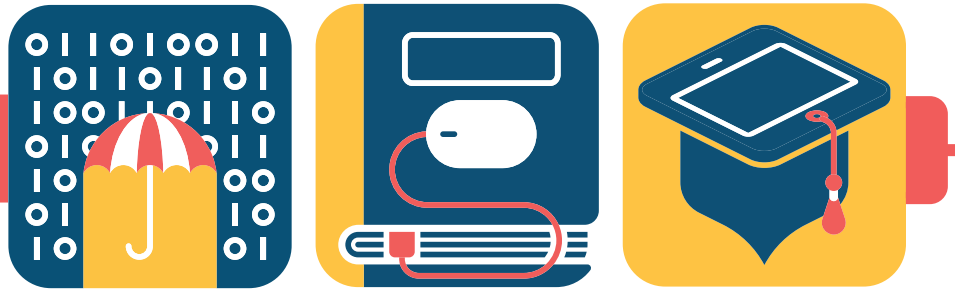
Notes

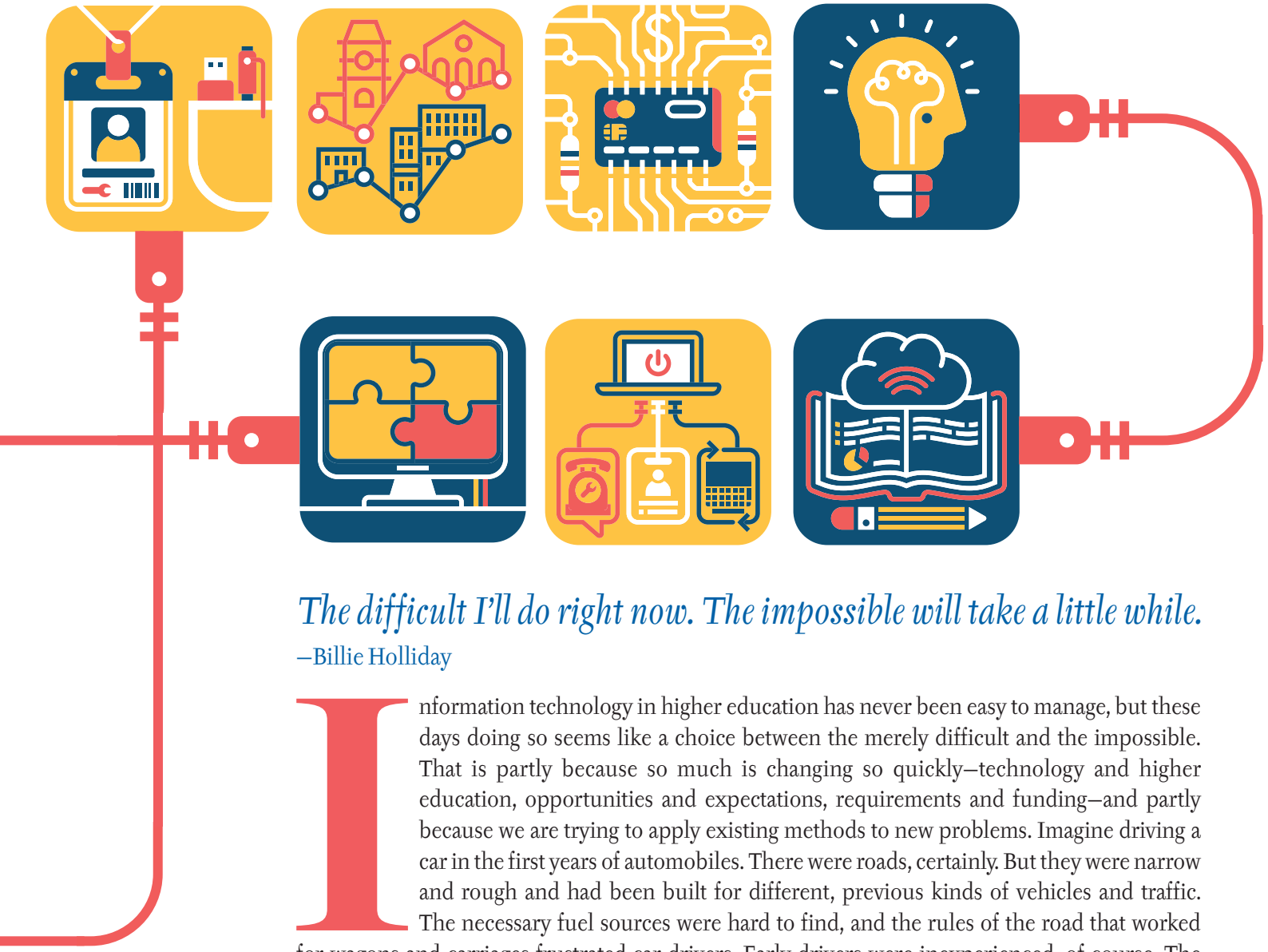
1. Justin Reich, "MOOC Completion and Retention in the Context of Student Intent," *EDUCAUSE Review*, December 8, 2014, http://er.educause.edu/articles/2014/12/mooc-completion-and-retention-in-the-context-of-student-intent.
2. Hans Johnson, Marisol Cuellar Mejia, and Kevin Cook, "Successful Online Courses in California's Community Colleges," Public Policy Institute of California, June 2015, http://www.ppic.org/main/publication.asp?i=1152.
3. Robert J. Koenig, "A Template for Analyzing Costs Associated with Educational Delivery Modes," *Journal of International Education Research* 7, no. 1 (2011), http://cluteinstitute.com/ojs/index.php/JIER/article/viewFile/3530/3577.

Elliot Hirshman is President of San Diego State University.

Divest, Reinvest, and Differentiate

Susan Grajek and the 2015–2016 EDUCAUSE IT Issues Panel





The difficult I'll do right now. The impossible will take a little while.
—Billie Holliday

Information technology in higher education has never been easy to manage, but these days doing so seems like a choice between the merely difficult and the impossible. That is partly because so much is changing so quickly—technology and higher education, opportunities and expectations, requirements and funding—and partly because we are trying to apply existing methods to new problems. Imagine driving a car in the first years of automobiles. There were roads, certainly. But they were narrow and rough and had been built for different, previous kinds of vehicles and traffic. The necessary fuel sources were hard to find, and the rules of the road that worked for wagons and carriages frustrated car drivers. Early drivers were inexperienced, of course. The existing infrastructure thus limited the potential of the new automobiles. In many ways, colleges and universities are similarly expecting the existing ecosystem—their people, processes, and culture—to be able to support, without change, today's new and very different technologies.

How can we align our timelines and change our ecosystem? The 2016 EDUCAUSE Top 10 IT Issues[1] offer a clear response: *divest, reinvest,* and *differentiate*. As will be explained below, the ten issues divide into these three categories. Higher education IT organizations are *divesting* themselves of technologies that can be sourced elsewhere and of practices that have become inefficient and are *reinvesting* to develop the necessary capabilities and resources to use information technology to achieve competitive institutional *differentiation* in student success, affordability, and teaching and research excellence.

Top 10 IT Issues, 2016

1. ***Information Security:*** Developing a holistic, agile approach to information security to create a secure network, develop security policies, and reduce institutional exposure to information security threats

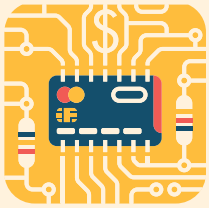
2. ***Optimizing Educational Technology:*** Collaborating with faculty and academic leadership to understand and support innovations and changes in education and to optimize the use of technology in teaching and learning, including understanding the appropriate level of technology to use

3. ***Student Success Technologies:*** Improving student outcomes through an institutional approach that strategically leverages technology

4. ***IT Workforce Hiring and Retention:*** Ensuring adequate staffing capacity and staff retention as budgets shrink or remain flat and as external competition grows

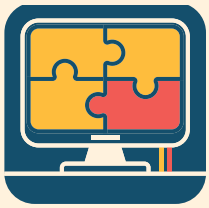
5. ***Institutional Data Management:*** Improving the management of institutional data through data standards, integration, protection, and governance

6. ***IT Funding Models:*** Developing IT funding models that sustain core services, support innovation, and facilitate growth

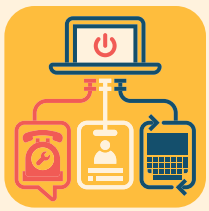


7. ***BI and Analytics:*** Developing effective methods for business intelligence, reporting, and analytics to ensure they are relevant to institutional priorities and decision making and can be easily accessed and used by administrators, faculty, and students

8. ***Enterprise Application Integrations:*** Integrating enterprise applications and services to deliver systems, services, processes, and analytics that are scalable and constituent centered



9. ***IT Organizational Development:*** Creating IT organizational structures, staff roles, and staff development strategies that are flexible enough to support innovation and accommodate ongoing changes in higher education, IT service delivery, technology, and analytics



10. ***E-Learning and Online Education:*** Providing scalable and well-resourced e-learning services, facilities, and staff to support increased access to and expansion of online education

FINALLY.

A TECHNOLOGY RESELLER EXCLUSIVELY DEDICATED TO THE EDUCATION INDUSTRY

For over 25 years JourneyEd.com has been the premier provider of software and technology products to K-12 and higher education institutions of all sizes.

SOFTWARE | **HARDWARE** | **IT NETWORK SOLUTIONS**

OUR SPECIALIZED FOCUS ON THE EDUCATION INDUSTRY PROVIDES YOU ACCESS TO:

- Dedicated account management and support
- Convenient access to the largest selection of education specific technology products
- Better pricing through wide-spread industry partnerships and resources
- Unparalleled expertise and support with acquiring complex volume licensing programs from Microsoft, VMWare, Adobe and many others

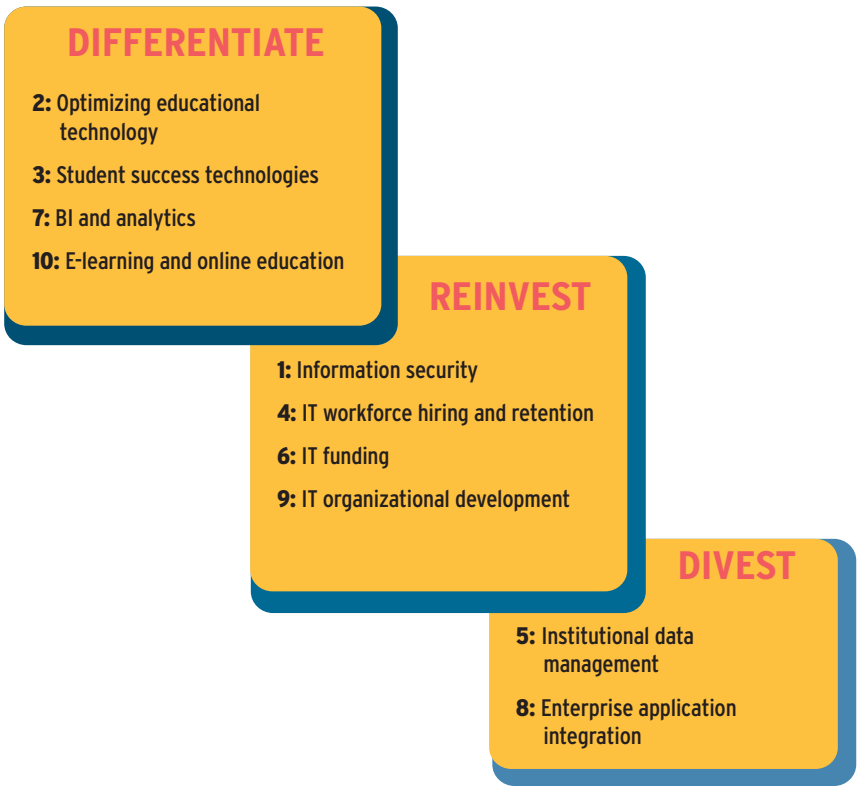
DOWNLOAD FREE eBOOK at
journeyed.com/freeadobe

journeyEd.com

Contact us Today!
800.876.3507 sales@journeyed.com

#1 Ranked Academic Software Provider | BBB ACCREDITED BUSINESS | 25 years SERVING EDUCATION

FIGURE 1. Themes of the 2016 Top 10 IT Issues



Divest

The only way to move higher education's people, processes, and culture into the developing future is by moving away from methods whose effectiveness is waning and by adopting practices that better fit that new world. Reform is insufficient, because it optimizes today's practices in lieu of developing tomorrow's. To make room for a new set of practices—a new infrastructure—we need to divest ourselves of today's practices. Higher education institutions are doing just that, with 58 percent of them reporting that business process redesign (not optimization) is a major influence on their IT strategy.[1]

Divestment also extends to technologies and services. Many colleges and universities have moved or are moving beyond the question of whether to run their own infrastructure and applications in the presence of reliable, effective, and up-to-date external solutions; IT organizations are reengineering and resourcing their systems and services. Moving from historical services onto emerging platforms is a major part of IT strategy at six in ten (61%) colleges and universities, and shared services is a major part of IT strategy for over half (54%).[3] Two of this year's Top 10 IT Issues focus on this divestment challenge:

Issue #5. Institutional Data Management
Issue #8. Enterprise Application Integrations

IT as a Service

How can institutions divest effectively to address both of these issues? IT as a Service is a model for running the IT organization more like a business—one that has to compete with alternative providers—and less like a cost center. The model focuses the IT organization on efficiency and transparency to contain and clarify costs and on service and agility to best meet the changing needs of the institutional community. IT as a Service includes methods to help IT organizations achieve a balance of efficiency and excellence.

Standardization and simplification are core principles of IT as a Service. Complexity kills efficiency. Copious, distributed, and disjointed, today's higher education's enterprise applications exemplify unintentional complexity. That complexity resulted from optimizing departmental authority and decision making. Now higher education needs applications and systems that can cost-effectively share data and processes to support services and analytics. Well-engineered systems integrations can meet current and future needs efficiently.

Systems integrations include data integrations, which require data governance and management and can address multiple objectives: developing effective analytics while reducing costs and risk. Data needs to be standardized and integrated to lay the groundwork for cost-effective, scalable, and valid analytics. Standards and integration are almost impossible to achieve without an institutional commitment to data governance. Using data in broader and more consequential ways increases its exposure and the potential impact of data breaches, making data protection more important than ever.

Reinvest

Divestment alone addresses only part of today's challenge. IT organizations need to lay the groundwork for using information technology to deliver meaningful value to higher education. They need to develop funding models that focus on information technology as an investment instead of a cost, and

they need to reinvest in their people (the organization's most important asset) and information security approaches. Reinvestment is a theme of four of the 2016 Top 10 IT Issues:

Issue #1. Information Security
Issue #4. IT Workforce Hiring and Retention
Issue #6. IT Funding Models
Issue #9. IT Organizational Development

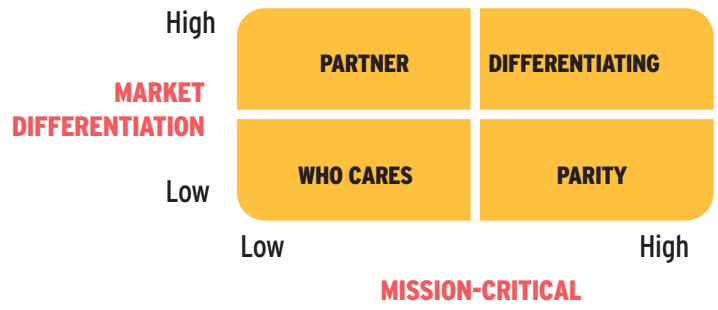
Feeling Insecure

Information security is the top issue for 2016, by a significant margin.[4] Our understanding of information security has deepened as the security ecosystem has advanced. Addressing the challenge of information security encompasses technical controls, policies, outreach and education, and risk management. The EDUCAUSE IT Issues Panel was clear that institutions need to constantly respond to changing circumstances and need to consider information security holistically rather than responding separately to each new threat, security layer, or component.

People

The changes under way are most disruptive to those in the IT workforce—those who must also design and implement the changes. IT organizations are shifting as surely as IT services and infrastructure. Many current roles are becoming obsolete, to be replaced by new roles.[5] Adapting both the workforce and the organization will require special skills of CIOs and IT managers and will place more emphasis on the partnership between the human resources (HR) and IT organizations. Yet organizational change is not the only workforce challenge for CIOs: many institutions are reducing budgets and benefits or flat-lining compensation at a time when new IT hires are essential to fulfilling institutional objectives, and an improved job market for IT professionals may make it hard to keep existing and prospective staff.

FIGURE 2. The Purpose Alignment Model



Source: Niel Nickolaisen, "Aligning to Purpose," *EDUCAUSE Review* 49, no. 3 (May/June 2014)

Follow the Money

Funding continues its unbroken streak of achieving a place in the EDUCAUSE Top 10 IT Issues list every year. The funding challenge remains unchanged from the previous two years: how to fund ongoing operations, growth in demand, and institutional innovation.

Panel members emphasized that to contain the IT budget, institutions need to introduce an ongoing discipline of continual divestment, replacing outdated foundations (services, processes, and technologies), and of continual reinvestment, ensuring that the IT workforce is agile and adaptable and that risks like information security are well-managed.[6]

Differentiate

The term *special snowflakes* has been used to describe institutions or departments that can't standardize or collaborate because they do things their own way.[7] To achieve value, IT organizations must distinguish between *difference* and *differentiation*. Niel Nickolaisen's Purpose Alignment Model (see figure 2) provides a framework for understanding when variability is meaningless and when variability adds value.[8] On the bottom half of the model, services with low market differentiation are good candidates for the most efficient yet effective solutions (for mission-critical needs like payroll or e-mail), the very lowest cost solutions, or even divestment (for needs that may no longer be relevant). Needs that are not mission-critical but are differentiating are uncommon (the model's top-left quadrant); when they exist, they provide opportunities to partner or share services to contain costs.

A few mission-critical services can also create market differentiation (the top-right quadrant). They provide opportunities to use information technology for a competitive advantage. In Nickolaisen's words, "These *differentiating activities* are the few things—somewhere between one and three in number—that we *must* do better than anyone else. They deserve our innovation and creativity because these are the things that create our competitive advantage, our unique value proposition." It is these genuinely special activities that the IT organization and the institution should invest in, not simply pay for. Differentiating activities will vary from institution to institution, however. Even when many institutions have the same differentiating activity, they will mold their solutions to reflect meaningful differences in mission, values, and constituents. E-learning, student success technologies, and analytics are priorities for many institutions,[9] and they can and should be designed to strengthen and extend each institution's unique value to the higher education marketplace.[10]

2015–2016
EDUCAUSE IT Issues Panel Members

Gerard W. Au
Associate Vice President, Information Technology Services
California State University, San Bernardino

Michael Bourque
Vice President, Information Technology Services
Boston College

Jonathan Brennan
Chief Information Officer
SUNY College of Technology at Delhi

Karin Moyano Camihort
Dean of Online Programs and Academic Initiatives
Holyoke Community College

Timothy M. Chester
Vice President for Information Technology
University of Georgia

Keelan Cleary
Director of Infrastructure and Enterprise Services
Marylhurst University

Andrea Deau
Information Technology Director
University of Wisconsin-Extension

Cory F. Falldine
Chief Information Officer
Emporia State University

Patrick J. Feehan
Information Security and Data Privacy Director
Montgomery College

Dwight Fischer
Assistant Vice President and CIO
Dalhousie University

Craig A. Fowler
Chief Information Officer
Western Carolina University

Darcy A. Janzen
E-Learning Support Manager
University of Washington Tacoma

Jim Jones
Interim Chief Information Officer
Gonzaga University

Brad Judy
Director of Information Security
University of Colorado System

Kirk Kelly
Associate Vice President and CIO
Portland State University

Deborah Keyek-Franssen
AVP, Digital Education and Engagement
University of Colorado System

John C. Meerts
Vice President for Finance and Administration
Wesleyan University

Celeste M. Schwartz
Vice President for Information Technology and College Services
Montgomery County Community College

William R. Senter
Chief Technology Officer
Texas Lutheran University

David Starrett
Provost and Vice President for Academic Affairs
Columbia College

Gordon Wishon
Chief Information Officer
Arizona State University

The EDUCAUSE IT Issues Panel comprises individuals from EDUCAUSE member institutions to provide feedback to EDUCAUSE on current issues, problems, and proposals across higher education information technology. Panel members are recruited from a randomly drawn and statistically valid sample to represent the EDUCAUSE membership.

Four of this year's Top 10 IT Issues reflect higher education's efforts to use information technology to differentiate:

- Issue #2. Optimizing Educational Technology
- Issue #3. Student Success Technologies
- Issue #7. BI and Analytics
- Issue #10. E-Learning and Online Education

Where to Differentiate

James Hilton, University Librarian and Dean of Libraries and Vice Provost for Digital Education and Innovation at the University of Michigan, has predicted: "The multivariant pressure on higher education going forward—over the next five years and beyond—is going to be to get better at telling a story that embraces differentiation."[11] Information technology can help. Information technology has begun to deliver services that can be directly mapped to higher education's most strategic priorities, including student success, affordability, excellence in research and teaching, and analytics. Integrated student planning and advising systems contribute measurably to student success. Institutions are starting to accrue cost savings from standardization and outsourcing. Research not only benefits from technology; it depends on it. We seem finally to have entered an era in which technology-supported education is fulfilling its aspirations to improve pedagogy and learning and to expand access to all types of underserved populations. And the use of analytics is enabling institutions to make more timely intelligent decisions to benefit themselves and individual members of their communities. These are examples of potentially differentiating activities that institutions identify as priorities that they "*must* do better than anyone else."

Mc Graw Hill Education

Education has changed. So have we. Come see us at ELI.

At McGraw-Hill Education, we deliver technology that harnesses an understanding of how learning happens to make each experience more engaging, efficient, and effective.

ELI Focus Group (February 2, 4:00pm-4:45pm) –
Join us at our ELI Focus Group to discuss Modular Content, Enterprise Insights, and Deep Linking

ELI Campus Partner Presentation (February 3, 1:45pm-2:30pm) –
Join us as we present with theAustin Community College math department and discuss their accelerator program addressing underprepared students

ELI Meet-Up (February 3, 5:00pm-6:30pm) –
Join us for a casual meet-up with drinks to discuss enterprise trends in education

ALEKS® SMARTBOOK® connect® LEARNSMART®

Because learning changes everything.™

How to Differentiate

These differentiating activities are innovations that require new investments. Innovation is an inherently inefficient process: close to 90 percent of innovations fail.[12] A financially beleaguered institution under intense scrutiny from a governing board and perhaps also a state legislature may have little appetite for spending money and for making bets with long odds.

Divestment and reinvestment are foundations upon which differentiation depends. Divestment paves the way for differentiation by developing the IT organization's ability to operate efficiently; the organization can institute needed simplifications, integrations, and new processes, and by achieving savings in one area, it can deploy those savings in another area to support differentiation. Reinvestment strengthens the organizational and technical foundations on which successful innovation depends.

Collectively, the Top 10 IT Issues represent enormous change, challenge, and promise. Though each deserves separate consideration, they are inseparable.

Top 10 Strategic Technologies

The EDUCAUSE IT Issues research is complemented by *Higher Education's Top 10 Strategic Technologies for 2016* (http://www.educause.edu/top10tech2016) from the EDUCAUSE Center for Analysis and Research (ECAR). The strategic technology reports provide a snapshot of the relatively new technological investments on which colleges and universities will be spending the most time implementing, planning, and tracking, as well as the trends that influence IT directions in higher education. Together, the trends and forecasts reported in the Top 10 IT Issues and Strategic Technologies research help IT professionals enhance decision making by understanding what's important and where to focus.

Issue #1: Information Security

Developing a holistic, agile approach to information security to create a secure network, develop security policies, and reduce institutional exposure to information security threats

Across the entire spectrum of higher education missions—from teaching and learning to business operations to community outreach to innovation and discovery—we rely on technology that is constantly under threat. Protecting the institution from the myriad of security threats is a fundamental challenge for IT leadership. Information security has evolved from a largely technical field to one that encompasses not only technology but also risk-management practices, user training and education, and business acumen. With information security now acknowledged as a field in which "perfection isn't nearly good enough," one security incident can ruin an IT leader's day(s), expose confidential data of users or the institution, lead to significant out-of-pocket costs connected with responding to the incident, and diminish an institution's reputation and consumer confidence. *A bad day indeed.*

Against this backdrop of constant threats is a higher education technology environment where the expectations and needs of the user community are wide-ranging and fast-changing. IT leaders anticipate that the time currently spent managing infrastructure and technical resources will shift to time spent managing services, vendors, and contracts.[13] Agility in the delivery of technology-based solutions and services is key—especially with the fast-paced adoption of cloud-based services (see figure 3). Services and solutions need to be architected so that they can be introduced, modified, and even retired in rapid fashion.

Without appropriate security measures, however, any open and agile solution lessens in value. Higher education is challenged to quickly design and build systems that include proper safeguards for reliability and security. This challenge is further exacerbated by the changing nature of IT service delivery and the move toward the cloud. Even though the number of institutional security and privacy professionals is increasing because of the changed nature of service delivery,[14] the central IT organization is still perceived as being slow to review and approve the implementation of cloud and other outsourced services. If the central IT organization cannot be agile enough in its review and implementation of cloud services, the path of least resistance for users may be to go it alone, without institutional IT involvement. In those instances, it is also entirely likely that the path of least resistance may not include effective security safeguards and that users may unwittingly put institutional and/or individual data at risk.[15]

The truth is that institutional information security is everyone's job. Recent news reports of high-profile data breaches have highlighted that organizational approaches to information security must be holistic, agile, and comprehensive. No longer content to merely "secure the perimeter," institutional approaches must encompass technical safeguards (i.e., those approaches implemented in technology solutions) and administrative safeguards (i.e., those approaches implemented in institutional policies), in order to be effective. Due to its unique mission and cultural need for transparency and openness, higher education has long adopted multifaceted information security approaches:

- 96 percent of institutions have an institutional IT acceptable use policy.[16]
- 92 percent of institutions have deployed malware protection technologies.
- 90 percent of institutions have deployed secure remote-access technologies.
- 78 percent of U.S. institutions have conducted some sort of IT security risk assessment.
- 71 percent of U.S. institutions have mandatory faculty/staff training on information security.[17]

Even with these numbers, institutions still have much work to do to secure networks, systems, and applications; develop security policies (only 27% of U.S. institutions have an information security policy that is fully approved by leadership[18]); educate campus IT users; and reduce institutional exposure to information security threats. Recent news reports of data breaches provide IT leaders with a springboard to launch discussions with institutional leaders about improving campus information security.

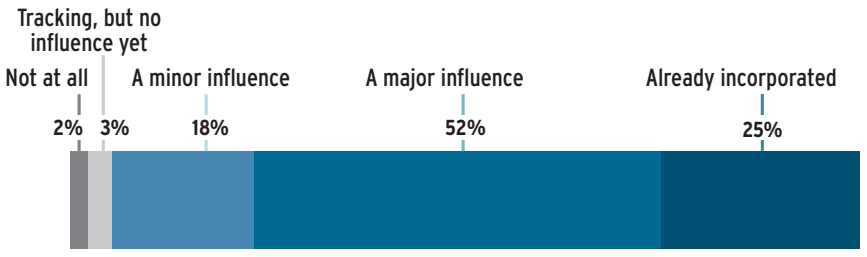
Information security can be a daunting topic for IT departments with limited resources: managing security effectively is not free. So there must be buy-in from the executive level to secure funding and create enforceable policies. All institutional departments and all users of IT resources (students, faculty, and staff) must understand and promote good information security practices to protect institutional data. Making modest institutional improvements in information security posture can give institutions and their IT departments the confidence to tackle the more challenging information security tasks that will inevitably arise as service-delivery approaches evolve.

> "The expectations and needs of the user community at an institution of higher education are wide-ranging and fast-changing—agility in our delivery of technology-based solutions and services is key. But, without appropriate security measures, any open and agile solution lessens in value."
>
> **—Michael Bourque, Vice President, Information Technology Services, Boston College**

Advice

- Create comprehensible and enforceable information security policies. Make sure that these policies are understandable and actionable by all community members, and post them conspicuously.
- Develop a comprehensive approach that addresses the information security concerns of mobile, cloud, and digital resources. The changing nature of service delivery is inevitable, and institutional leaders must develop strategies for handling an environment in which institutional data and services are located on third-party resources and are accessed by computing devices not owned or controlled by the institution.
- Develop a training framework for information security awareness to educate all members of the campus

FIGURE 3. The Influence of Cloud-Based Services on IT Strategy



The 2016 Top 3 Strategic Information Security Issues

Joanna Lyn Grama and Valerie Vogel

Information security is a perennial favorite on the EDUCAUSE annual Top 10 IT Issues lists, appearing 13 times since 2000. In 2016, information security returns to the top ranking (a spot it previously occupied in 2008). To help us better understand the nuance of information security issues in higher education, members of the Higher Education Information Security Council (HEISC)[1]—including Chief Information Officers (CIOs), Chief Information Security Officers (CISOs), IT directors and managers, and IT staff members—drilled down into the topic of information security and identified their top 3 strategic information security issues: (1) Ensuring that members of the institutional community (students, faculty, staff) receive information security education and training; (2): Developing an effective information security strategy that responds to institutional organization and culture and that elevates information security concerns to institutional leadership; and (3): Planning for and implementing next-generation security technologies to respond to evolving threats.

#1: Ensuring that members of the institutional community (students, faculty, staff) receive information security education and training

This issue was #2 on the 2015 list. There was great agreement this year that education and training is the most critical information security issue facing higher education. It was the top issue identified by all respondent roles—CIOs, CISOs, and IT directors, managers, and staff (see figure 1)—and was also the top issue at Associates, Masters, and Doctoral institutions (see figure 2).

Institutions continue to make headway providing information security awareness and training opportunities for students, faculty, and staff. In 2014, information security training was mandatory for faculty or staff at 71 percent of institutions and for students at 29 percent of institutions.[2] Since its inception in 2004, many institutions have also promoted National Cyber Security Awareness Month each October with campus activities, events, and targeted campaigns. To help institutions do an even better job with security awareness in 2016, the HEISC Awareness and Training working group has prepared ready-made content that security professionals and IT communicators can integrate into campus information security education communications (http://www.educause.edu/securityawareness).

#2: Developing an effective information security strategy that responds to institutional organization and culture and that elevates information security concerns to institutional leadership

This issue was #1 on the 2015 list. This year it features prominently in the top 3 issues for all institutional Carnegie classifications (see figure 2). Information security strategies outline the high-level priorities and goals of an information security program. These strategies demonstrate how information security relates to an

FIGURE 1. Top 10 Strategic Information Security Issues, by Responder Role

RANK	ALL RESPONSES (n=93)	CIOs (n=12)	CISOs (n=48)	IT DIRECTOR, MANAGER, STAFF (n=27)
1	Ensuring that members of the institutional community (students, faculty, staff) receive information security education and training. (50.5%)	Ensuring that members of the institutional community (students, faculty, staff) receive information security education and training. (50.00%)	Ensuring that members of the institutional community (students, faculty, staff) receive information security education and training. (50.00%)	Ensuring that members of the institutional community (students, faculty, staff) receive information security education and training. (51.9%)
		Developing an effective information security strategy that responds to institutional organization and culture, and that elevates information security concerns to institutional leadership. (50.00%)		
2	Developing an effective information security strategy that responds to institutional organization and culture, and that elevates information security concerns to institutional leadership. (44.1%)	(two issues tied for second place omitted from graphic)	Planning for and implementing next generation security technologies to respond to evolving threats. (45.82%)	(second place issue omitted from graphic)
3	Planning for and implementing next generation security technologies to respond to evolving threats. (38.7%)	Planning for and implementing next generation security technologies to respond to evolving threats. (33.33%)	Developing an effective information security strategy that responds to institutional organization and culture, and that elevates information security concerns to institutional leadership. (43.75%)	Developing an effective information security strategy that responds to institutional organization and culture, and that elevates information security concerns to institutional leadership. (44.4%)
		(three additional issues tied for third place omitted from graphic)	(one additional issue tied for third place omitted from graphic)	(one additional issue tied for third place omitted from graphic)
				Planning for and implementing next generation security technologies to respond to evolving threats. (29.63%) (Fourth Place)

FIGURE 2. Top 10 Strategic Information Security Issues, by Institutional Carnegie Class

RANK	AA (n=9)	BA (n=10)	MA (n=19)	DR (n=52)
1	Ensuring that members of the institutional community (students, faculty, staff) receive information security education and training. (66.7%)	Developing an effective information security strategy that responds to institutional organization and culture, and that elevates information security concerns to institutional leadership. (70.0%)	Ensuring that members of the institutional community (students, faculty, staff) receive information security education and training. (57.9%)	Ensuring that members of the institutional community (students, faculty, staff) receive information security education and training. (42.3%)
	Developing an effective information security strategy that responds to institutional organization and culture, and that elevates information security concerns to institutional leadership. (66.7%)	(one additional issue tied for first place omitted from graphic)		Planning for and implementing next generation security technologies to respond to evolving threats. (42.3%)
2	(second place issue omitted from graphic)	Ensuring that members of the institutional community (students, faculty, staff) receive information security education and training. (60.0%)	(second place issue omitted from graphic)	(second place issue omitted from graphic)
3	Planning for and implementing next generation security technologies to respond to evolving threats. (33.3%)	(third place issue omitted from graphic)	Developing an effective information security strategy that responds to institutional organization and culture, and that elevates information security concerns to institutional leadership. (42.1%)	Developing an effective information security strategy that responds to institutional organization and culture, and that elevates information security concerns to institutional leadership. (34.6%)
	(five additional issues tied for third place omitted from graphic)		(two additional issues tied for third place omitted from graphic)	(four additional issues tied for third place omitted from graphic)
		Planning for and implementing next generation security technologies to respond to evolving threats. (30%) (Fourth Place, tied with three other issues)	Planning for and implementing next generation security technologies to respond to evolving threats. (31.58%) (Fourth Place, tied with three other issues)	

institution's overall mission and how information security helps support the institutional mission and core values. "An information security strategy provides focus and direction for the institution," said Melissa Woo, CIO and Vice Provost for Information Services at the University of Oregon and HEISC co-chair. "It provides the campus a means for prioritizing resources and investments in information security."

#3: Planning for and implementing next-generation security technologies to respond to evolving threats

Although this issue did not appear in the top 3 issues in 2015, it seems fitting that a technology-focused issue would round out the list this year. With increasing concerns about cloud security, the Internet of Things, and other emerging, more sophisticated threats—as well as the ongoing challenge of limited campus resources (both financial and human)—finding new tools and technologies to help identify and mitigate threats more efficiently will continue to be of utmost importance to security and IT professionals. "Planning for next-generation security technologies must be done in concert with other technology enhancements and replacements," said Cathy Bates, Associate Vice Chancellor and CIO at Appalachian State University and HEISC co-chair. "This planning ensures that security technologies are an integrated component of IT architecture and infrastructure roadmaps and are represented in the overall budget needs for a secure and stable infrastructure."

■ ■ ■

Information security is of paramount importance to all colleges and universities, and with our connected world, this won't change anytime soon. We encourage institutions to continue the tradition of openly collaborating and sharing ideas to help move our community forward in the information security space.

Notes

1. HEISC supports higher education institutions as they improve information security governance, compliance, data protection, and privacy programs. The HEISC *Information Security Guide*, created *by* practitioners *for* practitioners, features toolkits, case studies, effective practices, and recommendations to help jumpstart campus information security initiatives. For more information, see the EDUCAUSE Cybersecurity Initiative: http://www.educause.edu/security.
2. *EDUCAUSE Core Data Service Almanac*, February 2015, https://net.educause.edu/ir/library/pdf/CDA1401.pdf.

Joanna Lyn Grama is Director of Cybersecurity and IT GRC Programs for EDUCAUSE.

Valerie Vogel is Program Manager for EDUCAUSE.

community about threats and how to take action to protect institutional data. The training framework should include initial training and ongoing educational opportunities.

- Continue to engage in proactive information security activities that adopt a defense-in-depth approach. Use scanning tools to identify and respond to system vulnerabilities; actively and aggressively identify and block malicious activity; implement reliable identity-management technologies; perform penetration testing and act on the results; collect logs and monitor for suspicious or concerning events; and back up critical institutional data and make sure data can be restored from those backups. Do not rely on a single control.
- Participate in organizations that work together to improve higher education information security. Organizations such as EDUCAUSE, Internet2, and the Research and Education Networking Information Sharing and Analysis Center (REN-ISAC) provide opportunities to improve understanding about information security practices in higher education, develop higher education information security professionals, and collectively respond to information security threats.
- Provide the institution's governing board with an annual IT security risk update, which can greatly help board members as they assess and govern the institution's overall enterprise risk assessment.
- Use the EDUCAUSE Information Security Maturity Index and the HEISC (Higher Education Information Security Council) Information Security Program Assessment Tool (http://www.educause.edu/library/resources/information-security-program-assessment-tool) evaluate the institution's current state of information security.

Issue #2: Optimizing Educational Technology

Collaborating with faculty and academic leadership to understand and support innovations and changes in education and to optimize the use of technology in teaching and learning, including understanding the appropriate level of technology to use

Today's collegiate classroom and pedagogy look very different from those of ten years ago.[19] Almost every institution is supporting a set of core educational technologies (e.g., LMS, technology-enhanced spaces, hybrid/blended courses), and most faculty are adopting them.[20]

Innovation comes in response to concrete problems. To find the most useful educational technology innovations, we should give thought to the issues and challenges that technology could help us address. For example, technology provides real opportunities to enhance both faculty-student and student-student interactions and to virtualize and extend the campus environment:

- *Faculty-student interactions.* Most current interactions outside the physical or digital classroom are asynchronous, via LMS or e-mail. However, students appreciate having their questions answered by instructors in real time. Holding virtual online office hours can create a number of benefits: meetings can take place at convenient times, and relevant discussions can be archived and shared with the entire class.
- *Student-student interactions.* Students who have the opportunity to communicate and work with each other become more effective and successful learners. According to the Pew Research Center, 92 percent of teens report going online daily, including 24 percent who say they go online "almost constantly."[21] Providing tools, training, and guidelines to reinforce formal and informal student-to-student interaction is a vital part of virtualizing the campus experience.
- *Student–campus environment interactions.* Today's students live in a digital environment that needs to be embraced to effectively engage students and prepare them for the future. Technologies such as gaming, simulations, open educational resources (OERs), and courseware are transforming the way faculty teach, the way students learn, and how the two groups interact with each other. New technologies such as alerts and pathways are also transforming other administrative and academic areas like advising and planning. Not all technologies translate well from personal to academic use: for example, students use social media extensively in their personal lives, but a growing majority prefer to keep their academic and social lives separate.[22]

The impact of these and other teaching and learning technologies needs to be assessed and shared to ensure that educational technology is truly effective and continues to flourish and evolve. Optimizing educational technology isn't actually about the technology. It's about understanding and working within the complex system in which postsecondary learning and teaching take place. It's about

SECURITY CHALLENGES ARE GROWING!

PEOPLE PROCESS TECHNOLOGY

We offer a full range of IT management and security services to help our clients identify exposures, remediate vulnerabilities and reduce risks, including:

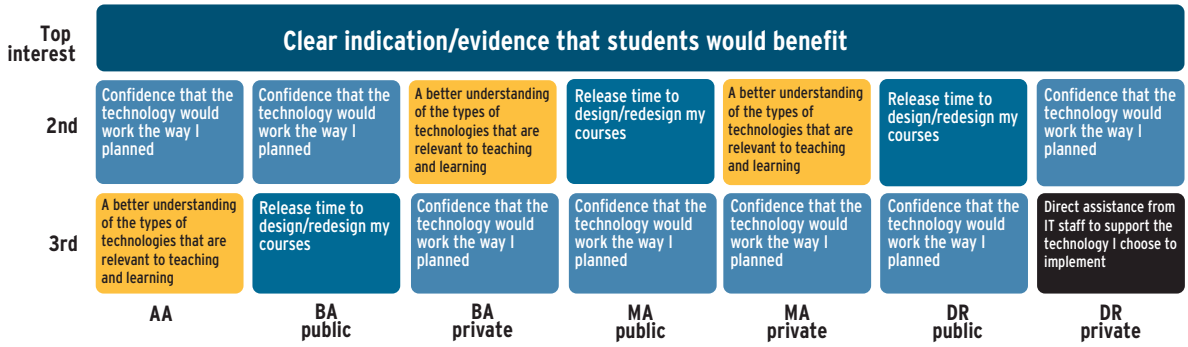
- Interim and Shared Information Security Officer (ISO)
- Security Policy and Education Development
- Risk Assessments
- Penetration Testing
- Identity and Access Management
- Endpoint Management and Security

Our actionable solutions are tailored to meet the needs and budgets of our clients.

MORAN
TECHNOLOGY CONSULTING

phone 888.699.4440
www.MoranTechnology.com

FIGURE 4. Factors Motivating Faculty to Integrate Technology into Teaching or Curriculum



Source: D. Christopher Brooks, *ECAR Study of Faculty and Information Technology*, 2015, figure 7

understanding learning objectives from the macro (institutional, disciplinary) to the micro (course, module, class period) level. It's about understanding what facilitates learning: strengthening and leveraging relationships (among faculty, students, and advisors), delivering relevant and engaging content, supporting active student learning, and helping students understand and focus on priorities.

Optimizing educational technology is also about understanding how faculty on a particular campus are, or aren't, rewarded for delivering excellent teaching and services, partnerships, and support—and also how they are motivated to do so. The most important motivator for faculty is clear indication or evidence that students benefit from technology. Faculty also want help with incorporating technology into their courses (see figure 4).[23]

Technology has many faculty at hello but loses them soon after. Trying a new technology in the learning environment is easy. It is much less easy for faculty to accurately and easily recognize how effectively the tool is working, whether learning is being enhanced, and whether and how to modify the use of the tools to make them more effective. Without evidence of impact, the majority of faculty will not be motivated to incorporate new technologies into their teaching. Without support, many will struggle to do so, even if they are motivated. Instructional design support can be an important component of optimizing the appropriate level of technology to use.

The evaluation of technology-based instructional innovations is

- a major part of IT strategy at 44% of institutions,
- a minor influence on IT strategy at 34% of institutions, and
- not considered at all at 19% of institutions.

—Susan Grajek, *Trend Watch* 2016 (ECAR, forthcoming)

Finally, increasing use of technology is not always the best way to improve teaching and learning. Students have made it clear that technology-enhanced learning is appealing. However, technology-dominated learning in the form of fully online courses is not: 61 percent of students say they learn best in courses with some online components, 18 percent prefer mostly online courses, and only 9 percent learn best in fully online courses.[24] Different levels and applications of technology are appropriate for different institutional missions, individual faculty, and individual learners. Ideally, learners will find the faculty and institutions that best fit them, and institutions and faculty will help students make those choices. IT leaders' roles are to help raise awareness of the possibilities and to execute with excellence. Academic leaders and instructors, not IT professionals, should determine the pedagogical and mission-driven priorities. Most effective is when all stakeholders—IT leaders, academics, advisors, and students—collaborate on solutions.

Advice

- Implement practices (don't start with technologies) that strengthen relationships: faculty to student, student to student, faculty to faculty. Secure collective acknowledgment that (a) strengthening relationships leads to learning, (b) certain practices strengthen relationships, and (c) certain technology tools can facilitate those practices.
- Consider how faculty curate and create relevant content (and partner with libraries for this). Then, make it easier

"As the availability of technology grows on our campuses, virtualizing and extending the campus environment and the faculty-student interaction becomes central."

—Karin Moyano Camihort, Dean of Online Programs and Academic Initiatives, Holyoke Community College

Vulnerability Scans Can Reduce Risk of Network Compromise

THE RISK IS REAL

In 2014, more than one billion personal records were illegally accessed—including health, financial, email and home address data, and other personal information, such as Social Security numbers.

2015 was no exception, as compromises at JP Morgan Chase and the US Office of Personnel Management gave hackers access to unprecedented amounts of personal information.

Network compromises can damage an organization's reputation, but can also lead to serious legal liabilities and costly settlements. Every organization—regardless of size—should take measures to protect itself against attacks on its network.

SECURITY IN EDUCATION

Educators face unique challenges in securing their students' sensitive data. Constant user turnover, combined with unprecedented numbers of web-based, third-party applications, are forcing schools to re-examine the security of their networks. Here are a few key issues schools have faced in recent months:

- Key-logging programs installed by students or third-party entities
- Outdated or obsolete patches in Windows or commonly used applications like Adobe Flash and Java
- Cisco ASA firmware vulnerabilities and misconfigurations, including open ports that allow malicious intrusions

It's better to be proactive—to understand your risk exposure and vulnerabilities, and fix them periodically—than to do nothing. Thorough scans can help discover and remediate your security vulnerabilities.

VULNERABILITY SCANS CAN HELP

Network engineers commonly list the following four reasons to perform a vulnerability scan and analysis.

- Prepare for security audits
- Comply with government cyber regulations
- Thwart motivated attackers
- Gain reassurance about the security of your data

Just performing a scan isn't enough, however. Comprehensive vulnerability scans are like an MRI—you need a trained specialist to analyze the results and provide holistic recommend-ations for moving forward.

ENGAGE AN EXPERT

Promenet Inc., founded in 1999, is one of New York's premier IT-consulting firms. Unlike other companies, which deploy software engineers focused on the application layer of systems, Promenet's team of experts has unparalleled expertise in systems infrastructure, including:

- Switching and routing
- Servers, SAN, and virtualization
- Wireless and mobility
- VDI
- Microsoft OS and Exchange platform
- Unified Communications
- Network security

Promenet's security specialists will perform a thorough scan of your systems and analyze the results. We'll provide your security team with a detailed report, concrete remediation steps and—best of all—peace of mind.

BY THE NUMBERS

ORGANIZATION	NO. OF RECORDS STOLEN
JP Morgan Chase	76M
US Office of Personnel Management	21.5M
IRS	100K
Experian/ T-Mobile	15M
Home Depot	56M
AOL	2.4M
Uber	50K
Target	70M
Ebay	145M
Apple	275K
Staples	1.16M
Adobe	36M
Facebook	6M
Snapchat	4.7M
Neiman Marcus	1.1M

Promenet

WWW.PROMENET.COM/VSCAN

212.968.0190

for them to curate, create, and provide access to that content through the use of OERs, videos, simulations, and other resources. Secure collective acknowledgment that (a) relevant content leads to and supports learning, (b) certain processes are involved with curating and creating that content, and (c) certain technology tools, services, and support can facilitate those processes.

- Promote active involvement by students in and out of the classroom. Understand how the brain works (e.g., using 10-minute chunks in lectures) and how to encourage student reflection. Secure collective acknowledgment that (a) active involvement of students promotes learning, (b) certain practices strengthen active involvement, and (c) certain technology tools can facilitate those practices.
- Keep students on-task/invested/engaged/persisting. Secure collective acknowledgment that (a) engaged, persistent students are more likely to be students who learn (and complete), (b) certain practices strengthen engagement and persistence, and (c) certain technology tools can facilitate those practices.
- Partner with other service units, faculty affairs, and administration to
  - *define* (learning objectives) or *inventory* (practices for strengthening learning relationships/community, curating and creating relevant content, promoting active learning, promoting student engagement and persistence);
  - *probe* for ideas for new practices;
  - *link* existing practices to current and desired tools, services, support; and
  - *pilot and evaluate* new tools and services, which might be different by discipline. Be careful not to overpilot (i.e., introduce too many different solutions) so that you can drive for a (hopefully flexible) standard offering.
- Tap into existing expertise in the faculty ranks, using effective practitioners as role models and facilitators.
- Provide appropriate and effective instructional design support and resources to maximize opportunithat ties for effective use of technologies.
- Develop ways in which faculty and students can share their experiences with one another and showcase innovative uses to campus stakeholders and leadership.

Teaching and Learning and IT Issues: Exploring the Intersections

Veronica Diaz and Malcolm Brown

Since 2011, the EDUCAUSE Learning Initiative (ELI) has been surveying the EDUCAUSE community in order to identify and track the key issues (formerly called content anchors) in higher education teaching and learning for the coming year (http://www.educause.edu/eli/initiatives/key-issues-in-teaching-and-learning).

One might ask: Why does EDUCAUSE conduct two separate surveys on significant issues for its community? The annual Top 10 IT Issues list, discussed in this issue of *EDUCAUSE Review*, provides a view of higher education seen primarily through the lens of the IT organization. It covers the full range of postsecondary "business," from administrative to academic pursuits. By contrast, the ELI Key Issues survey is more narrowly focused on teaching and learning. At the same time, however, it canvasses community members from a variety of campus areas, including IT organizations but also centers for teaching and learning, libraries, and the dean and provost offices. The additional perspective afforded by the ELI Key Issues is important in light of higher education's shift in emphasis away from technology per se and toward learning and instructional practices. Digital technology remains, of course, the key and strategic enabler, but it is no longer the centerpiece. Using faculty development as an example, today it is no longer a matter of getting faculty to "teach with technology." Instead, the issue is supporting faculty to adopt learner-centered instructional designs as a way to foster student success. Technology enables those designs, but it does not dictate them.

Taken together, these two EDUCAUSE surveys provide a rich and informative view on the top issues facing higher education today. Since they are complementary in nature, it is useful to closely examine the points at which they converge.

Optimizing Educational Technology, #2 on the EDUCAUSE Top 10 IT Issues list, closely aligns with several of the ELI Key Issues. *Faculty development* (ELI Key Issue #1) is about improving practice and enabling faculty members to support learning with the effective use of technology. *Academic transformation* (ELI Key Issue #2) is about using information technology creatively to support new teaching and learning models. *Learning analytics* (ELI Key Issue #5) refers to studying data about learners and their contexts in order to understand and optimize learning and the environments where it occurs. Finally, *working with emerging technology* (ELI Key Issue #3) is about having an ongoing awareness of innovations, developing an effective process by which to discover them, utilizing pilots, and considering full-scale implementation. Many, if not all, innovations from the past five years began with discovering the best ways to address an institutional challenge—such as first-year retention, developmental education, persistence or graduation—with the creative use of technology situated in new organizational models or approaches.

We've known for some time that in order to make progress on these particularly challenging issues, we must establish cross-organizational collaborations, involving key stakeholders who support learners not just in the classroom but all along their experience. Interestingly, the most significant teaching and learning innovations of the past five years have also required cross-organizational collaborations, cohort-based leadership, and institutional community building. Thus, *Optimizing Educational Technology* has the potential

to transform our institutions, from our classrooms to our very cultures. This issue is especially conspicuous if we think about the work being done in the area of integrated student advising systems. To further the work already under way in this area, the Next Generation Learning Challenges (NGLC) has recently awarded nearly 20 grants to support continued development for these tools (http://www.educause.edu/focus-areas-and-initiatives/teaching-and-learning/ipass-grant-recipients). These new grants will enable schools to further integrate data and its analysis, providing a more complete picture of a student's status, most often in real time, and offering the basis for more effective intervention. Here again, the interests of the IT organization and of the teaching and learning community converge, since these advances in advising systems will require the integration of an ever-wider range of data types and the creation of IT resources to perform the analyses.

We've known for some time that in order to make progress on these particularly challenging issues, we must establish cross-organizational collaborations, involving key stakeholders who support learners not just in the classroom but all along their experience.

Learning management system (LMS) services (ELI Key Issue #15) is another area of converging interests. According to EDUCAUSE Center for Analysis and Research (ECAR) data, 99 percent of institutions run at least one LMS, 85 percent of faculty use an LMS, and almost 75 percent feel the LMS is a useful tool. For an environment as diverse as teaching and learning, this is an extraordinary adoption rate. However, 15 percent of institutions anticipate changing their LMS application within the next three years.[1] This suggests that the teaching and learning community is looking past the current LMS, envisioning instead a broader, more comprehensive digital learning environment. Strategic core functions, such as customization and personalization, learning analytics, and collaboration, as well as accessibility and universal design, are emerging as key features for this new landscape. This means that the IT organization staff and teaching and learning staff will have a host of new collaboration opportunities in the coming years: the new landscape will require a blend of IT and pedagogical expertise to design and craft this next generation of digital learning environments for both instructors and students.[2]

Lastly, *online and blended learning* (ELI Key Issue #4) has been among the top five teaching and learning key issues since 2012. Since so many emerging innovations (i.e., learning analytics, adaptive learning, personalized learning) involve this context in one way or another, it remains highly relevant. According to *The State of E-Learning in Higher Education*, e-learning is ubiquitous, with more than 80 percent of institutions offering at least several courses online and more than 50 percent offering a "significant" number of courses online in 2013.[3] In addition, mature institutions that offer online and blended learning options to their students are beginning to evolve these models to discover the one that best fits their students. Personalized learning is an example of a model that provides a unique, focused learning path for each student. Technology systems and tools, along with rich data sets and analytics programs, can support a customized learning experience regardless of the student or institutional type by leading learners through learning experiences and offering the support they need, at the time they need those resources, and in a form well suited to them. Personalized learning is one of many new ways tools and processes are being integrated to reimagine ineffective, outdated models for the purpose of delivering an improved learning experience.

These points of contact between the key teaching and learning issues and the top IT issues can provide the basis of strategic and tactical discussions between the IT organization and the cohort of campus organizations supporting teaching and learning. Each roster of significant issues serves to illuminate the other, providing a better sense of direction as we move forward in support of the key mission of teaching and learning.

Notes

1. Eden Dahlstrom, D. Christopher Brooks, and Jacqueline Bichsel, *The Current Ecosystem of Learning Management Systems in Higher Education: Student, Faculty, and IT Perspectives*, research report (Louisville, CO: ECAR, September 2014), 4, 3, http://www.educause.edu/library/resources/current-ecosystem-learning-management-systems-higher-education-student-faculty-and-it-perspectives.
2. For a fuller description of this new digital learning environment, see Malcolm Brown, Joanne Dehoney, and Nancy Millichap, "The Next-Generation Digital Learning Environment," an ELI paper, April 2015, http://net.educause.edu/ir/library/pdf/eli3035.pdf.
3. Jacqueline Bichsel, *The State of E-Learning in Higher Education: An Eye toward Growth and Increased Access*, research report (Louisville, CO: ECAR, June 2013), 19, http://www.educause.edu/library/resources/state-e-learning-higher-education-eye-toward-growth-and-increased-access.

Veronica Diaz is Associate Director, ELI, and Director of Online Programs for EDUCAUSE.

Malcolm Brown is Director, ELI for EDUCAUSE.

Issue #3: Student Success Technologies

Improving student outcomes through an institutional approach that strategically leverages technology

Student success technologies involve the use of data collection and analysis tools at all levels to predict student success or risk, alert those who can intervene, and assess the effectiveness of those interventions. Student success technologies can be broken into three categories: (1) tools that support advising and other student services, (2) tools that support teaching and learning, and (3) tools that inform curricular design and institutional priorities.

In the first area—advising and student support services,—there has been interest over the past few years in the redesign of the advising process and the inclusion of early-alert technologies that provide opportunities for faculty and advisors to send manual alerts or to trigger automated alerts providing students with reasons for the alert, recommendations, and next steps. Student academic planning tools are also available at many institutions. Some institutions require each student to have an educational plan, which facilitates a more in-depth conversation with advisors and provides the institution with data to develop an academic course schedule that aligns with students' plans (see figure 5).

In the second area—teaching and learning—technologies that support student engagement and that provide students and faculty with learning analytics are being used to improve student outcomes. While technologies are being developed and enhanced to support student success, the institutional processes and usage of the tools contribute more to improvement than do the technologies themselves.

Finally, analytics also plays a major role in the third area: curricular design and institutional priority-setting. Metadata about student swirl—in and out of majors, in and out of courses, and in and out of institutions—can and should inform curricular design, academic programming, and even faculty assignment or development. It can also identify different pathways for students through a degree program. In addition, many student success technologies support interactions between the students and the institution.

Students are conceptually interested in having their instructors receive feedback about their performance: 59 percent are extremely or very interested, and only 13 percent are not interested. They are equally interested when instructors actually have access to this kind of feedback: 58 percent find these technologies extremely

FIGURE 5. Institution-Wide Deployment of Student Planning and Advising Systems

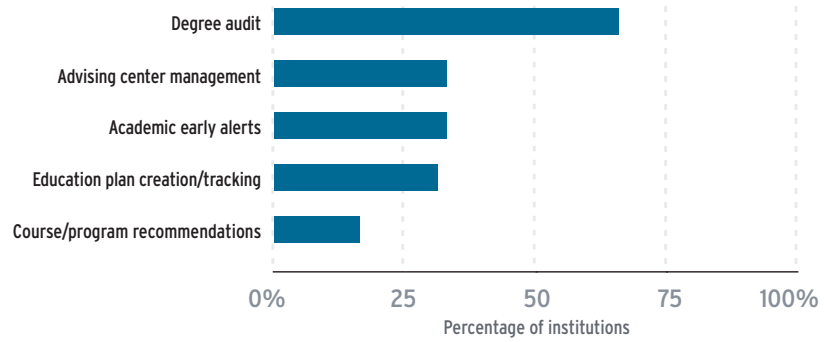
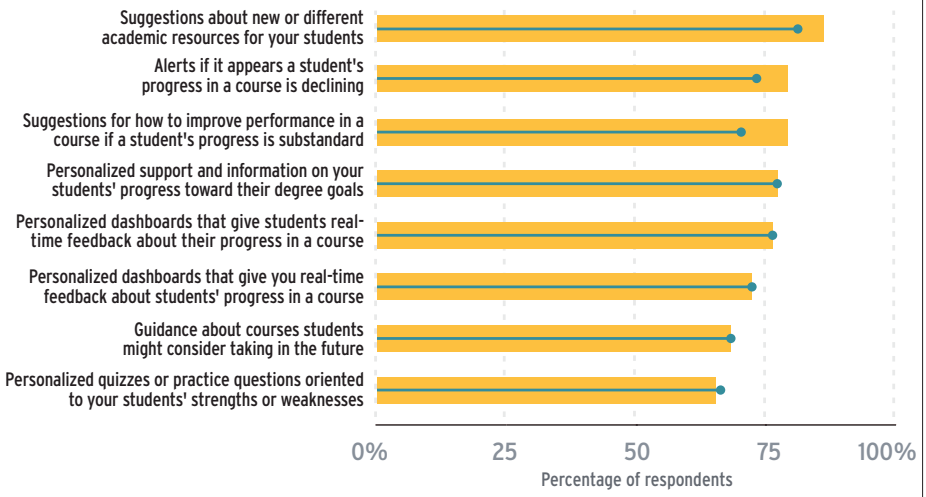


FIGURE 6. Faculty Ratings of Student Success Technologies



or very useful when their institutions provide them, and only 11 percent find them not very or not at all useful.[25]

The real challenge in the application of student success technologies to student outcomes is the institution's ability and willingness to embrace change. Faculty are unlikely to resist in large numbers. When asked about an array of technologies that use analytics to improve student success, faculty found them both highly interesting and useful (see figure 6).

New technologies are only one component of the design that supports improved student outcomes. Effective student success initiatives often entail institutional policy updates, redesigned processes, organizational and role changes, new governance structures, and implementation of tools that require training of and adoption by faculty and staff. Combining expert opinion and research, EDUCAUSE has identified six overall success factors that compose maturity in student success initiatives (see figure 7):

1. *Process and policy.* Policies and requirements for degree attainment, security, and access are clear and adaptable.
2. *Leadership and governance.* Initiatives have leadership support and oversight and adequate funding.
3. *Advising and student support*. Faculty, advisors, and others who work directly with students support the student success goals and use student success technologies.
4. *Collaboration and involvement.* IT, faculty, institutional research, students, staff, student affairs, and other key stakeholders collaborate and participate in decision making.
5. *Student success analytics.* Analytics initiatives and tools are used and useful.
6. *Information systems.* Needed student success technologies are deployed, their data is integrated, and end-users have sufficient training.

Almost one in four institutions have reasonably strong student success initiatives; the rest are still launching their efforts (see figure 8). Of course, student

FIGURE 7. Student Success Technologies Maturity Index

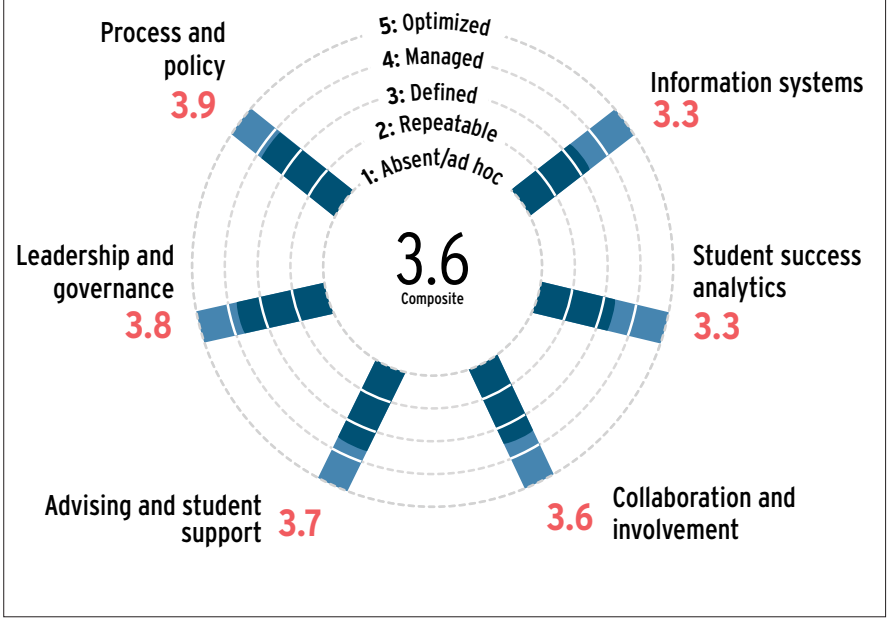
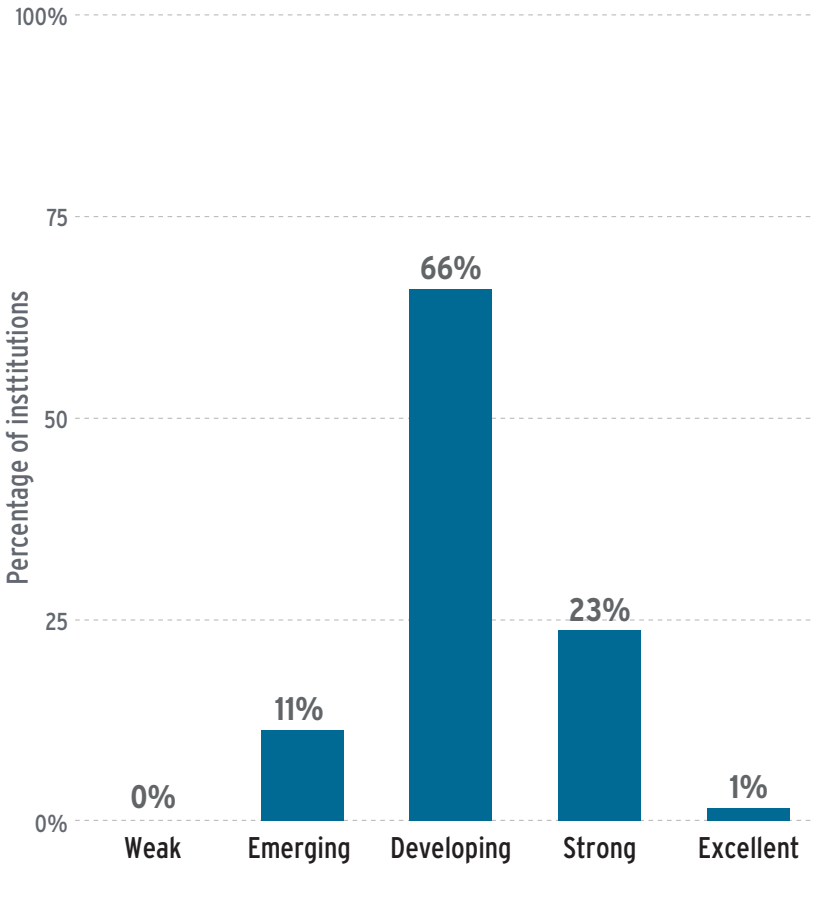


FIGURE 8. Distribution for the Student Success Technologies Maturity Index



EDUCAUSE RESEARCH SNAPSHOT

TOP 10 IT ISSUES 2016

DIVEST

Moving away from methods whose effectiveness is waning and adopting practices that better fit that new world

#5 ISSUE INSTITUTIONAL DATA MANAGEMENT

Improving the management of institutional data through data standards, integration, protection, and governance

#8 ISSUE ENTERPRISE APPLICATION INTEGRATIONS

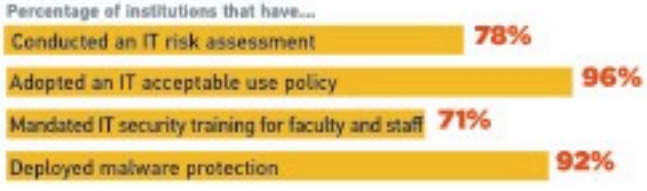
Integrating enterprise applications and services to deliver systems, services, processes, and analytics that are scalable and constituent centered

REINVEST

Laying the groundwork for using IT to deliver meaningful value to higher education

#1 ISSUE INFORMATION SECURITY

Developing a holistic, agile approach to information security to create a secure network, develop security policies, and reduce institutional exposure to information security threats



#4 ISSUE IT WORKFORCE HIRING AND RETENTION

Ensuring adequate staffing capacity and staff retention as budgets shrink or remain flat and as external competition grows

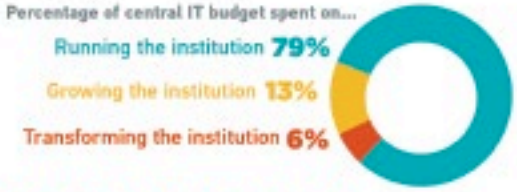
In 2013, 18% of IT professionals were at risk of leaving their current jobs.

Top factors that retain IT professionals

	Staff	Managers	CIOs
1	Benefits	Benefits	My staff
2	Quality of life	Quality of life	Quality of life
3	Work hours	Opportunity to build leadership skills	Opportunity to build leadership skills

IT FUNDING MODELS #6 ISSUE

Developing IT funding models that sustain core services, support innovation, and facilitate growth



IT ORGANIZATIONAL DEVELOPMENT #9 ISSUE

Creating IT organizational structures, staff roles, and staff development strategies that are flexible enough to support innovation and accommodate ongoing changes in higher education, IT service delivery, technology, analytics, and so forth

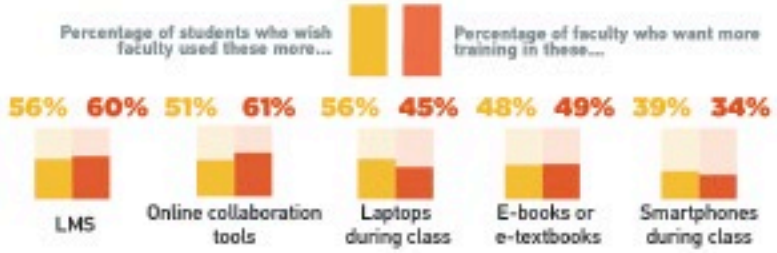
The 2016 EDUCAUSE Top 10 IT Issues offer a clear plan for today's changing landscape: divest, reinvest, and differentiate.

DIFFERENTIATE

Identifying areas where standardized IT practices versus specialized IT practices add value to the institution

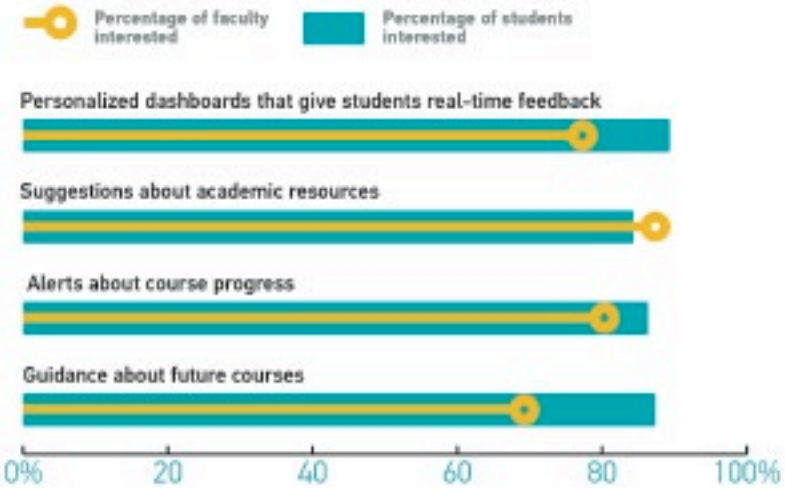
#2 ISSUE OPTIMIZING EDUCATIONAL TECHNOLOGY

Collaborating with faculty and academic leadership to understand and support innovations and changes in education and to optimize the use of technology in teaching and learning, including understanding the appropriate level of technology to use



#3 ISSUE STUDENT SUCCESS TECHNOLOGIES

Improving student outcomes through an institutional approach that strategically leverages technology



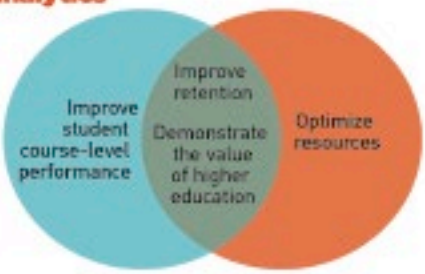
#7 ISSUE BI AND ANALYTICS

Developing effective methods for business intelligence, reporting, and analytics to ensure they are relevant to institutional priorities and decision making and can be easily accessed and used by administrators, faculty, and students

84% of institutions have a BI reporting system

76% of institutions have a data warehouse

Two of the top 3 factors for investing in **learning analytics** and **institutional analytics** overlap



#10 ISSUE E-LEARNING AND ONLINE EDUCATION

Providing scalable and well-resourced e-learning services, facilities, and staff to support increased access to and expansion of online education

success efforts are not a "one and done." New technologies will provide new opportunities. The institutions that are leading the way will constantly raise the bar for all. The most successful institutions will be those that adopt continuous improvement practices, so that the cycle of plan-do-check-act is incorporated into ongoing institutional management.

Advice

- Before technology selection, contact other institutions that have deployed similar tools to understand best practices in implementation and outcomes achieved.
- Before launching new student success initiatives, set goals and determine how to measure success.
- Include all stakeholders (e.g., faculty, students, advisors, academic leaders, IT managers) in the selection, implementation, and testing to ensure that the solution will be feasible, affordable, and useful.
- Don't stint on communication and training, which are key components of successful projects.
- Adopt continuous-improvement practices: assess success systematically, use the results to modify, and reassess, always with a goal of improving student outcomes.
- Prepare to play the long game: major change initiatives may take months or even years to bear fruit. Estimate a realistic ROI timeline to help make the decision of whether to stay the course or move on.
- Ensure the institution owns and can modify the algorithms that generate alerts. More important, design the business and support processes that will apply the alerts: determine which interventions will take place across which student service or academic units and how those will be communicated to those units and judged for effectiveness.
- Understand how to integrate data sources and manage private data across a spectrum of student services and academic units, ensure staff and faculty are trained accordingly, and develop a communication strategy so that uses of data are not perceived as intrusive or controlling.
- Complete the EDUCAUSE Student Success Maturity Index to benchmark institutional maturity.

> "Institutions must be able to generate the appropriate alerts for their students, and if institutions can't participate in tweaking algorithms that might be proprietary to a vendor, that's a red flag for me. More important, institutions benefit from having a full understanding of which interventions will take place across any number of student service or academic units, how those will be communicated across those units, and how they will be judged for effectiveness."
>
> **—Deborah Keyek-Franssen, AVP, Digital Education and Engagement, University of Colorado System**

Issue #4: IT Workforce Hiring and Retention

Ensuring adequate staffing capacity and staff retention as budgets shrink or remain flat and as external competition grows

Higher education is now using many of the same technologies as are corporations and private industries around the world, looking for the same technical and management skillsets, and thus competing for the same IT talent. In past years, academic institutions offered staff an appealing set of tangible and intrinsic benefits: more time off, more opportunities to apply technology creatively, the appeal of working in a campus setting with faculty and students, and a highly collaborative professional network—all of which more than offset the generally lower compensation. With the economic situation over the past several years, however, numerous IT organizations have experienced budget reductions, minimal salary increases, declining benefits, and relocations that have separated IT staff from the academic community. Many IT professionals would argue that the one increase they

Steelcase
EDUCATION

We work with leading educational institutions to create high-performance, active learning spaces that enhance student engagement and success.

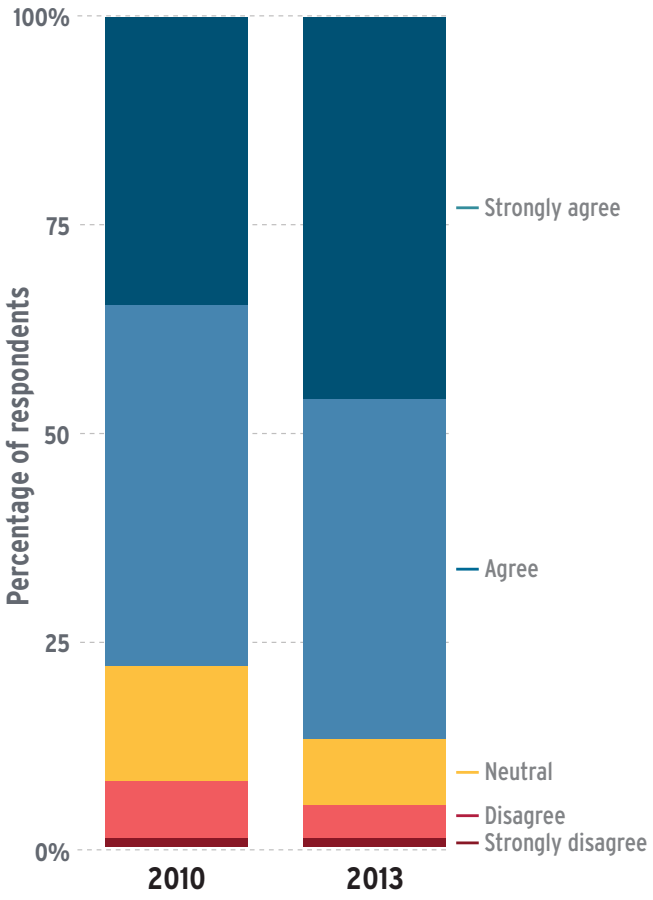
Learning has evolved. Has your classroom?

Steelcase®
EDUCATION

To maximize student success, classrooms must support the generative activities and peer-to-peer learning occurring in today's blended learning environments. We create learning places that enable problem solving, communication and collaboration — the skills demanded of today's students.

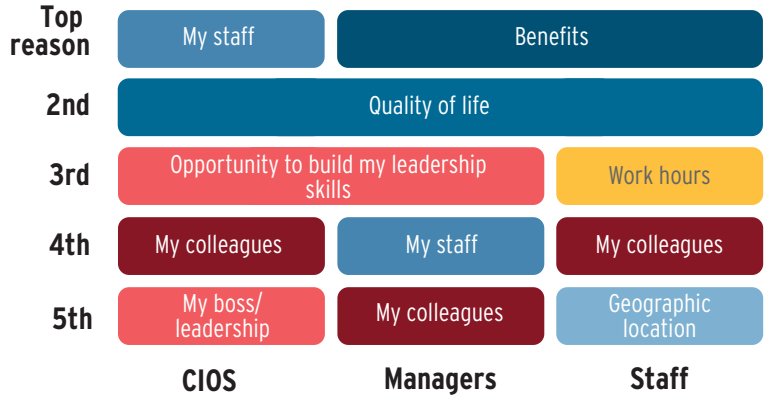
Read our research at Steelcase.com/blendedlearning

FIGURE 9. IT Workforce Perceptions of Workload Increases



Source: Jacqueline Bichsel, *Today's Higher Education IT Workforce*, research report (Louisville, CO: ECAR, January 2014), unreported data

FIGURE 10. Top Reasons CIOs, Managers, and Staff Stay in Their Jobs



Source: Jacqueline Bichsel, *Today's Higher Education IT Workforce*, research report (Louisville, CO: ECAR, January 2014), table 4

have seen is in workload and expectations, an untenable trend (see figure 9). Today, with cautious rebounds in the economy, particularly in technology jobs, IT talent is a hot commodity. As a result, higher education IT organizations are experiencing increased staff turnover, more aggressive staff recruitment, increasing market salaries they cannot match, and more failed searches. This is not an abstract concern: an estimated 1 in 8 CIOs, 1 in 6 managers, and 1 in 5 IT professionals are likely to leave their current institution.[26]

Retaining staff becomes a critical priority. In many technology areas, and particularly at small institutions, IT organizations are "one deep" in knowledgeable staff expertise; as a result, those departures could severely disrupt campus services. Many colleges and universities have difficulty offering salaries that are competitive with private industry, but a creative and proactive management team and HR department can improve the odds. Options such as completion bonuses after a long project or even a temporary stipend during a period of critical need can make a difference.

However, compensation is not what primarily attracts or retains most professionals.[27] The hard-driving, live-to-work Baby Boomers are giving way to Gen Xers and Millennials who want a better work-family balance. They expect more opportunities for flexible schedules, telecommuting, and updated family and parental leave. Boomers too are hoping to continue past traditional retirement ages in different roles or capacities that flexible organizations can provide. Professional development opportunities and new assignments or projects can also motivate staff to stay. But it is primarily people and quality of life (including the quality supported by good benefits) that retain staff, no matter their age or position (see figure 10). Managers who can develop and foster a collaborative and congenial workplace are the superpower of a stable, high-performing organization. They should

- **Employee and inventory management automation**
- **Computer lab usage optimization**
- **Software license costs reduction**

Run your computer labs like **well-oiled** machines

1-855-VERALAB
sales@veralab.com
www.veralab.com

VERALAB
MANAGE YOUR LAB WITH A MOUSE CLICK

> "Speaking on behalf of smaller institutions, I know there is little margin for error if a staff member does not fit within an IT group. It is thus very important for management to do whatever they can to retain good employees. Explore creative compensation ideas with your HR department. Don't be satisfied with the 'we have never done that before here' reasoning."
>
> —William R. Senter, Chief Technology Officer, Texas Lutheran University

be identified, developed, and nurtured.

Workforce diversity is increasingly understood to be both essential and beneficial. Higher education's cultural and organizational structures have evolved within the context of a majority population, a fact that may introduce unconscious and unintentional biases against non-majority students and staff. For IT organizations to be agents of change, IT staff and leaders need to better understand how organizational structures and culture continue to reflect the contexts of a majority population and must then improve those structures and culture to benefit all. And all will benefit. Diverse teams outperform homogenous teams, improving innovation, problem-solving, and productivity.[28] Conceptions of diversity should be broad and various: gender, race, age, religion, and sexual orientation are just the beginning.

Advice

- Ensure that staff witness and learn about the benefits of working at the IT organization and the institution. Ensure also that the best employees know their interests are being kept in mind over time.
- Set annual organizational and individual goals, and measure achievement so that staff feel valued and understand the contributions they make. Celebrate successes; have senior executives talk with staff about the role and value of the IT organization; link IT initiatives and services to student experiences, faculty accomplishments, new instructional approaches, and new business processes.
- Proactively manage the organization, roles, and careers. Regularly review staff and positions in the department to prepare for opportunities (e.g., new positions, vacancies) that arise. When vacancies develop, consider how work and roles could be restructured to provide growth opportunities for existing staff. Inform institutional leadership of organizational and staffing changes that are under consideration, so that they will have time to reflect, prepare, and support in advance.
- Develop backup and succession plans, starting with the roles that are most difficult to fill or are most mission-critical. Establish useful and measurable cross-training experiences. Find opportunities to share skills and resources within a state university system or other collaborative.
- Ensure that managers are highly effective, and develop management skills on an ongoing basis. Managing technical people is a very special skill, and few are good at it.
- Investigate options for flexible work arrangements and telecommuting.
- Don't settle. Before hiring, be sure you have (1) the right fit, (2) someone who has a passion for the mission of higher education, and (3) someone who shares the organization's values.
- Build and retain a diverse workforce through effective recruitment, retention, and advancement. Understand and try to prevent the effects of unconscious bias in recruitment, retention, and advancement.
- Include risks related to the IT workforce as part of the institution's enterprise risk analysis. Discuss with the chancellor, president, provost, CFO, and institutional board the human resource challenges the IT organization is experiencing. Leadership will likely be more receptive if the discussion is linked to the achievement of, or the risks of not achieving, institutional goals and strategic objectives.
- IT staff crave professional development and expect it to be an organizational priority. Establish a specific budget and a transparent process for requesting training. However, with tight funding, ensure that all development has a particular end in mind. Include staff professional development as part of each person's goals and each manager's and director's performance review.

Issue #5: Institutional Data Management

Improving the management of institutional data through data standards, integration, protection, and governance

Data is the engine that feeds the higher education mission. It is entrusted to us by faculty, students, alumni, parents, donors, staff, and others to support decisions related to admissions, financial aid, curriculum, research, employees, infrastructure, investments, purchases, and health care. As information technology systems and uses have proliferated over the years, managing the underlying data has become increasingly important.

Much data still exists in silos within our institutions today. This situation is a natural result of the decentralized nature of most colleges and universities and the organic growth of departmental services, often in response to the lack of centralized services and the limitations in the central IT organization's ability to support departmental needs and priorities. It also reflects a failure of most institutions, until very recently, to recognize the value of a strategy in which data is viewed as a strategic enterprise asset, to be leveraged to benefit institutional strategic objectives as well as departmental or operational objectives. Current efforts to identify risk factors to student and researcher success depend on data from disparate sources, internal as well as external to the institution, as do efforts to deliver increasingly personalized services to constituents. With many institutions still grappling with multiple answers to even the most basic data-informed questions—for example, how many students and faculty do we have?—higher education has its work cut out for itself.

Institutions must understand not only what data they possess, but how to care for the data through thoughtful governance and administration. *Data governance* is a structure empowered by institutional leadership to establish effective standards and practices for data handling and sharing and to arbitrate disputes over access to categories or elements of data. Many institutions begin by clarifying data ownership and by classifying data according to varying levels of confidentiality, compliance requirements, and desired uses. *Data administration* is a structure (or group) that operationalizes standards for institutional data handling and sharing (including integration) and is responsible for maintaining data integrity; data definitions; authorization, retention, and disposition practices and procedures; and technical architectures. Data management requires ongoing assessment and improvement to maintain compliance with new and evolving regulatory requirements and to retain agility and flexibility.

Institutions that report:

- We have policies that specify rights and privileges regarding access to institutional and individual data: 69%
- Our data are standardized to support comparisons across areas within the institution: 47%
- Our data are standardized to support comparisons across areas within institutions: 37%

—EDUCAUSE Core Data Service 2014

Though often viewed as an "IT issue," data governance is really a larger business issue. Multiple roles and responsibilities are associated with data management. Since all institutional constituents need to understand their roles and responsibilities, education, outreach, and training are critical components of effective data management.

Each institution will organize the work of data management differently, depending on existing organizational assignments and strengths. The 2015 ECAR study of analytics showed that depending on the institution, the CIO, institutional research (IR) director, chief academic officer, president, student success leader, and dedicated chief data or analytics officer are all likely leaders of analytics programs.[29] There is no one best practice, other than to designate *someone* to lead.

"Institutions should begin with identifying a framework for data management decisions: a data governance model. Ensure the model provides for accountability as well as agility. Data must be managed, but in a way that still allows for rapid development of new applications of the data."

—Brad Judy, Director of Information Security, University of Colorado System

Enterprise IT Perspectives on the 2016 Top 10 IT Issues

Betsy Tippens Reinitz

Members of the EDUCAUSE Enterprise IT Program Advisory Committee considered four of the 2016 Top 10 IT issues that are particularly relevant to enterprise information technology. Below they describe how these issues are addressed at their institutions and what opportunities the issues present for the future, and they provide advice for enterprise IT leaders who are tackling these issues. The following committee members shared their thoughts:

- **Mark I. Berman**, Chief Information Officer, Siena College
- **Geoffrey Corb**, Deputy Chief Information Officer, The Johns Hopkins University
- **Kyle Johnson**, Dean for Information Technology and Services, Chaminade University of Honolulu
- **James M. Maher II**, Executive Director of Information Technology Services, Saginaw Valley State University
- **Leslie Riester**, Director, Special Projects, Portland Community College
- **Angela M. Svoboda**, Associate Vice President for Digital Effectiveness, Information Technology, St. Edward's University

Issue #5: Institutional Data Management

Improving the management of institutional data through data standards, integration, protection, and governance

How is your institution addressing this issue?

Svoboda: A data access and delivery team with representation from multiple campus offices discusses data issues such as standards, naming conventions, definitions, and governance. We have been able to methodically address issues where data integrity is lacking.

Berman: We brought in a consultant who talked about the importance of data definitions. We are working to be sure everything is clearly defined and everyone understands the definitions.

Riester: We have data custodians who are in charge of data standards in each of their areas. They meet regularly to work toward consensus.

What advice would you give others?

Berman: Make sure the data is consistent as you move toward a data-driven culture. You need a data dictionary, and you need to make sure people stick with it.

Maher: When looking at vendor-provided reporting solutions, make sure to assess current data customizations and how well end users know their data.

What are the biggest opportunities for the future?

Svoboda: There are opportunities to use data as a campus asset and to build an understanding of the importance of data for decision making and predictive analysis.

Riester: There's a leadership opportunity for the IT organization in these conversations, particularly related to data governance and security.

Issue #7: BI and Analytics

Developing effective methods for business intelligence, reporting, and analytics to ensure they are relevant to institutional priorities and decision making and can be easily accessed and used by administrators, faculty, and students

How is your institution addressing this issue?

Berman: Historically, our decision making has been seat-of-the-pants, but we're starting to move toward data-informed decisions. We have the data, but we don't have the tools to work with it yet.

Maher: We recently purchased a new reporting infrastructure to put the data in the hands of the decision makers. Not every department has the skillsets to be report writers and data analysts, so we enable those who have that talent to help interdepartmentally.

What advice would you give others?

Svoboda: Analytics is critical, but without institutional data management and without a strategy for analytics, the efforts will fail. To get started, work with the offices—such as institutional research—that are onboard with business intelligence.

Berman: Work with institutional leaders to show the value of data-driven decisions. If people start asking for analysis, that's a big step toward a data-driven culture.

What are the biggest opportunities for the future?

Svoboda: There is an opportunity to collaborate across the institution to define the questions most important to the college/university.

Riester: Community colleges are very focused on access, but access by itself doesn't ensure student success. We have the opportunity to analyze what will help students be successful.

Maher: Analytics has the potential to solve a lot of the issues we're facing by helping us make decisions to align better with institutional missions and with what students need.

Issue #8: Enterprise Application Integrations

Integrating enterprise applications and services to deliver systems, services, processes, and analytics that are scalable and constituent centered

How is your institution addressing this issue?

Johnson: We have a group focused on system integration. We've moved past a world where we use one monolithic system for everything. Departments find systems they want to use, and they need to be able to share institutional data to be successful. They often come to us late in the process and ask us to integrate something they've already purchased. We continue to work hard to get involved very early on.

Svoboda: We assessed the state of identity issues that affect integrations and created a multiyear strategy and roadmap. We also created developer standards for data and business process integrations.
Maher: We're minimizing customizations and cleaning up our data. We now understand the difficulty of integrating solutions into our ERP. We convey that to stakeholders and build it into project costs and duration.
Riester: Enterprise vendors sometimes go right to the end users, and the IT organization doesn't get involved until users need integration. We try to market ourselves as people who want to help, so that we can be a part of the process from the beginning.

What advice would you give others?

Svoboda: Work to fully understand what people mean when they ask to have systems integrated. Educate them about identity integrations, data integrations, and business process integrations.
Corb: What was once hardcore development and software engineering is becoming systems integration, and you have to find the technologies that make it easier to do those integrations. With new systems to integrate and expectations for quick turnaround, it's important to know the technological options and understand the possibilities.
Johnson: Not all systems are housed on campus, so you need authentication that allows for the system to live somewhere else. Whether you use Shibboleth or some other authentication system, it needs to work for both on- and off-campus systems.

What are the biggest opportunities for the future?

Svoboda: Standards such as those developed by Internet2 are helpful.
Berman: With every IT acquisition, try to meet more than one need. Consolidation of IT resources and support can improve the overall efficiency of the institution and decrease the need for system integration.
Johnson: Standard data definitions that we can use between systems will help make things more plug-and-play. Every system integration is still work, but agreeing on definitions would help.

Issue #9: IT Organizational Development

Creating an IT organization structure, staff roles, and staff development strategies that are flexible enough to support innovation and accommodate ongoing changes in higher education, IT service delivery, technology, and analytics

How is your institution addressing this issue?

Maher: We're going through every service and thinking about what its future is going to be and whether a cloud solution is appropriate. Our goal is an infrastructure that's fluid and flexible so that we can shorten "time to market." And every year we put together a training plan to address staff skill issues related to upcoming projects.
Svoboda: We are rethinking our organization every time we have a vacancy. About half the time, we restructure a vacant position to meet new needs.
Johnson: We're developing project management and communication skills in existing staff. We're a small institution, so we don't have a separate project management or communications office. Soft skills make the difference, not the technical skills.

What advice would you give others?

Berman: Help institutional leaders understand that IT success is critical to institutional success. Participate in strategic planning to make sure the institutional leaders understand the IT resources that are necessary to be successful.
Riester: Set performance standards for new competencies, and then help staff reach them. Provide training, set expectations, and give positive support. But be prepared to take action if some staff are not able to meet new standards.
Corb: Fully understand your major vendors' product directions and roadmaps. You make a substantial investment in an ERP, and you'll have it for a long time, so you need to know vendors' plans for the future and be prepared to follow, align, and retool as necessary.

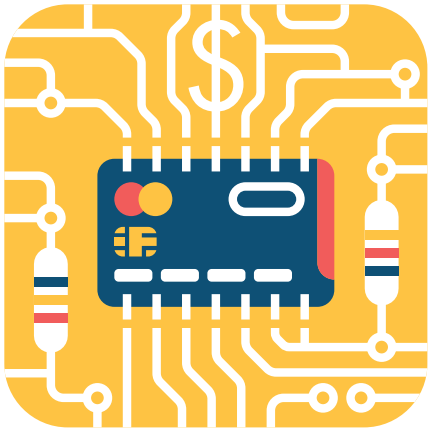
What opportunities do you see for the future?

Riester: You have to keep things running while you try out new things. We have a small staff, so the challenge *and* the opportunity is to carve out a small group of people who can do the testing, try out new technologies, and work actively with the user community on their ideas.
Corb: The IT organization of the past is not the same as the IT organization of the future. We used to live in a world where we had relative control of the environment. We have far less control now with BYOE and the cloud, and some institutions may not even have their own data centers anymore. This changes the shape of the IT organization, the services it provides, and the roles of the people involved—from leader down to staff and everybody in between. Rethinking what the IT organization is for is a huge opportunity in light of changing priorities and technologies. There may never be a better opportunity to partner with major campus stakeholders in areas traditionally served by information technology or in "growth areas."

Betsy Tippens Reinitz is Director of Enterprise IT Programs for EDUCAUSE.

Advice

- Design a data architecture and infrastructure that supports both enterprise and departmental needs. Carefully consider data flows and schema, data standards, and definitions to facilitate integration between applications, data security, privacy, retention and disposition policies, and effective governance and oversight.
- Ensure that institutional leadership is involved in data governance and is willing to support and endorse data management policies and procedures, which may become contentious.
- Ensure that data management activities are realistically resourced. This is an added responsibility and should be staffed and funded accordingly. Don't wait for a data breach or analytics initiative failure to invest in data management.
- Those just beginning to address data management should take a methodical approach:
  - *Investigate:* Bring together those with a vested interest in institutional data to discuss the pain points, needs, untapped opportunities, and questions. Get a conversation started about how to best manage institutional data.
  - *Define:* Select a data governance framework for assigning data ownership and accountability and for defining a decision-making process.[30]
  - *Inform:* Once data roles have been defined, start asking what information people in each role need in order to make informed decisions.
  - *Prioritize:* Focus on the largest pain points and greatest opportunities. This can be a very interesting process, as it will combine the priorities for different data groups. If data retention is the #2 issue for student data, but the #12 issue for HR data, where does that place the priority for data-retention processes overall?



Issue #6: IT Funding Models

Developing IT funding models that sustain core services, support innovation, and facilitate growth

IT funding is the only issue that has made the EDUCAUSE Top 10 IT Issues list every year. Since the challenges in 2016 are not appreciably different from those of 2015, the advice and analysis from last year are worth reviewing.[31]

The role of technology in higher education has undergone a metamorphosis, but the budget processes at many institutions have largely remained the same. At a time when information technology needs to be agile and flexible, financial resources are often stringently allocated and unavailable to assist institutions in transformational work. In 2014, respondents to the EDUCAUSE Core Data Survey reported that 79 percent of the central IT budget is allocated to running the institution, 13 percent to meeting growth in demand, and only 6 percent to transformation. This 6 percent level of spending on innovation is less than half the cross-industry average of 13 percent, according to Gartner.[32] The 2014 Core Data Survey also reported that the central IT organization's median spending as a percentage of institutional expenses was 4 percent. These numbers conflict with the realities of widespread interest in technology investments to improve student success, increase operational efficiency, and advance research. Considering the multidimensional challenges facing colleges and universities, campus communities should feel impelled to critically examine and address the issues that impede technology funding.

Most CIOs state that they long ago trimmed the budgetary fat. EDUCAUSE IT Issues Panel members reported:

- "IT organizations survived the recession by cutting and renegotiating contracts and agreements, but now they are running out of things to cut and there are many needs on campus."
- "It is becoming more and more difficult to sustain the giant infrastructure that we built and maintained over the past 10–15 years without a fundamental, sustainable budget. We have a $3 million investment in infrastructure and $50,000/year to replace it. That equipment needs to be updated or refreshed every 5–7 years. If we can't maintain that infrastructure, then eventually none of the other stuff will matter because the infrastructure won't be there."
- "Our institution leaders seem very willing to invest in new things and new services, but they don't want to hear the conversation about the millions of dollars in infrastructure and the fact that we never had a capital budget. Our one-time fund is gone. So leadership views requests for infrastructure maintenance as IT asking for money; but we view it as the money we used to have to maintain the infrastructure."

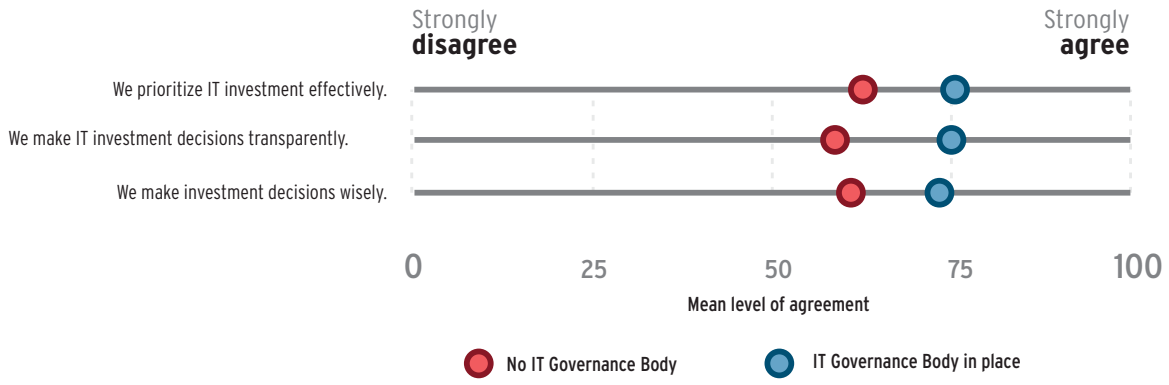
The solution involves improved financial management and reporting and more-effective IT governance. CIOs and CFOs need to develop a shared understanding of and commitment to realistic IT funding. CFOs have the financial

Add annotations and questions to YouTube, Vimeo, and your own videos to engage students, deepen understanding, and track progress. Zaption video lessons easily embed in your learning management system, and grades sync directly to your LMS gradebook.

EDUCAUSE 2015 PITCH COMPETITION WINNER

GET STARTED NOW: **ZAPTION.COM/HIGHERED**

FIGURE 11. Relationship between an IT Governance Body and IT Investment Decisions



Source: Jacqueline Bichsel and Patrick Feehan, *Getting Your Ducks in a Row: IT Governance, Risk, and Compliance Programs in Higher Education*, research report (Louisville, CO: ECAR, June 2014), figure 23

knowledge; CIOs understand the magnitude of the investments needed not only to complete a project but also to maintain ongoing operations. A strong partnership can resolve the IT funding challenge (see figure 11). CIOs working with CFOs thus need to make the case for IT investments. Funding for projects that directly affect the mission of the institution (e.g., teaching and learning) is always easier to get than is funding for obscure or hard-to-understand infrastructure. In addition, CFOs hate surprises (who doesn't?). CIOs need to use strategies to minimize surprises: prepare a long-range (five-to-ten years) financial plan for the IT department; present multiyear budgets to the CFO; ask to have carry-forwards to allow underspending in some years and overspending in other years, provided they cancel out within an agreed-upon time frame; and negotiate with the CFO for a fixed incremental amount (or percentage) every year as "new money" and commit to work within those constraints.

> "Savings, if they can be identified (even though not necessarily captured) are still important to highlight. Similarly cost avoidance."
>
> **—John C. Meerts, Vice President for Finance and Administration, Wesleyan University**

For years CIOs have struggled to demonstrate the value of information technology to higher education institutions. Too often "the value of IT" is shorthand for "why we are spending so much money on IT." This framing focuses purely on the cost of information technology and is actually about efficiency rather than value. Value is a function of efficiency *and* benefits. But when IT organizations are managed as cost centers, and when strategic IT conversations are restricted to expense, information technology will be viewed as necessary but also perhaps as dead weight; an encumbrance rather than an asset.

Advice

- Benchmark IT finances by participating in the EDUCAUSE Core Data Service.
- Ensure that IT projects build models for ongoing operational funding into project deliverables and expectations.
- Establish an institutional IT governance structure that is responsible for allocating funding, not just identifying IT priorities.
- Build the costs of growth and maintenance into funding models for core IT services.
- Tell the story of IT investments to help develop credibility. Help institutional leadership understand and remember the benefits and savings that came from previous investments.
- Work with the CFO to develop a budget model that shows all technology expenditures for the institution, even if they aren't all controlled by the central IT organization and even if they have to be adjusted each year (use forecast modeling). Advocate for IT funding and governance at the institutional level rather than the departmental level to reduce redundant spending and to ensure that the investments benefit the entire institution rather than just those areas that can afford them.
- Align IT services and investments with institutional goals and objectives to show information technology as an investment in the future of the institution rather than as an expense or cost center.
- Adopt ITSM (IT service management) methods for ongoing service management to contain operational costs.

Issue #7: BI and Analytics

Developing effective methods for business intelligence, reporting, and analytics to ensure they are relevant to institutional priorities and decision making and can be easily accessed and used by administrators, faculty, and students

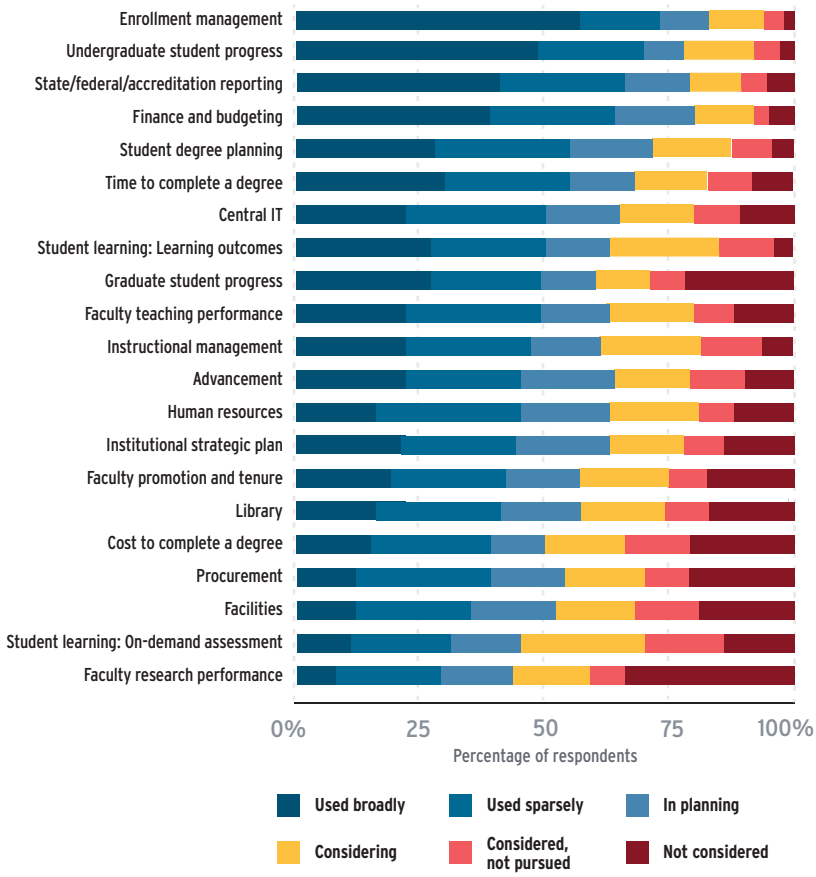
Higher education institutions must become more data driven to capably respond to demands to become more effective and flexible and to meet both mission objectives and regulatory requirements. Business intelligence (BI) and analytics are the keys to unlocking insights that are contained in the numerous institutional data stores. Being able to see trends, ask "what if" questions, discern correlations, move to predictive models, and use those models to take action is becoming a key strategic capability. As IBM CEO Ginni Rometty asserts: "Where code goes, data flows. Cognition will follow."[33]

IT organizations have developed and managed ever-growing stores of data on students, employees, alumni, and donors, along with a realm of other data from information systems. We have an abundance of data. We also have access to an abundance of technologies and tools. Industry advances in data and analytics are presenting higher education with new opportunities to leverage data and information. IBM Watson Analytics, for example, can take various sets of data from an institution and elsewhere and look for various patterns and information. Adaptive learning tools such as Acrobatiq and Realizeit are cropping up to facilitate and personalize learning. As is all too often the case, however, the real challenge, and the right starting point, is defining the objectives of an analytics initiative and then developing the processes, policies, culture, and people needed to achieve those objectives. As is equally all too often the case, many institutions are starting with the data at hand, purchasing new systems with black-box algorithms, and seeing whether anything useful transpires. Care to wager on the ROI this approach is likely to achieve?

Many colleges and universities have initially focused on applying analytics to the admissions process. Now more attention is being paid to student engagement analytics, individual student learning analytics, and analytics for student success (see figure 12 p. 44). Both students and faculty are quite interested in the use of student data to achieve these outcomes. Yet whereas institutions are rich in BI reporting dashboard and learning analytics systems, they are poor in predictive analytics for student success.[34] As indicated in the *NMC Horizon Report: 2015 Higher Education Edition*, measuring learning analytics will grow significantly over the next three years.[35] We can expect to see growth in higher education analytics for information visualization, in the use of analytics to personalize learning, and in predictive analytics providing actionable insights.

As the use of analytics evolves, institutions will need to advance their

FIGURE 12. Current and Planned Uses of Analytics



Source: Ronald Yanosky, with Pam Arroway, *The Analytics Landscape in Higher Education, 2015*, research report (Louisville, CO: ECAR, October 2015)

analytics maturity. That entails ensuring sufficient funding and resources; fostering a data-informed decision-making culture that results in clear improvements; developing policies for data and analytics security and access; ensuring that data is accurate, standardized, "clean" and useful; and strengthening partnerships between the IR and the IT organizations. EDUCAUSE has an Analytics Maturity Index against which institutions can assess their level of analytics maturity. Overall, higher education has made no measurable progress in analytics maturity in the past two years: fewer than 15 percent of institutional analytics programs might be described as strong or excellent.[36]

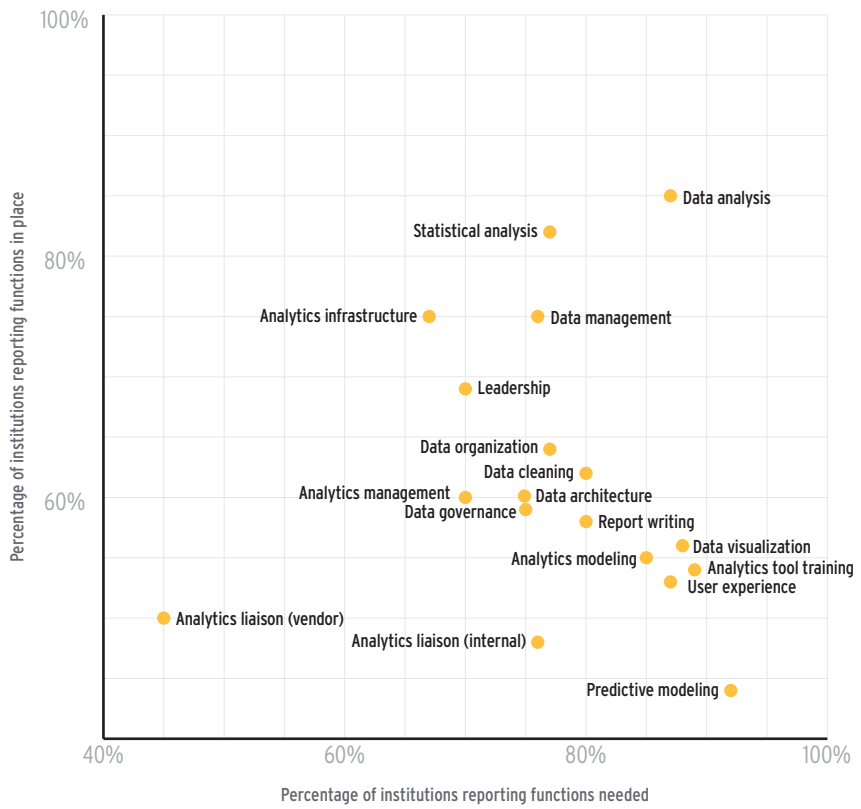
Some existing processes and policies will need to be changed. Data ownership and management currently conform to our highly decentralized leadership models: each office, department, division, or school owns its own data. That's an extremely useful model when the focus is on ensuring that each area has the data it needs to optimize its particular goals and mission and on limiting access to that data. It also works best when data elements are fully contained within individual distributed areas. However, when the focus moves to institutional objectives or when people, funding, and resources are fluid and have multiple "homes," decentralized data ownership can be a serious impediment to achieving such outcomes as student success, resource optimization, and greater transparency.

Institutions won't make progress with analytics without the right people. Higher education needs expertise to manage, analyze and model data; to present findings in creative and thoroughly useful ways; and to serve as gateways but not gatekeepers between decision makers and data and findings. Most institutions lack sufficient or any talent in key analytics roles, including analysis and modeling, data management and architecture, data visualization, and user experience (see figure 13).

Advice

- Identify the initial institutional objectives. Look for areas that have urgent, clear needs and want to get engaged. Work with them first. (Student success is often a good starting place.) Always ask what question the initiative needs to answer, how the data will be used, what actions and decisions will result, and what measures should be used to determine if the actions taken have made a difference.
- BI is a collaborative effort. No one has all the keys. A governance structure that consists of an executive steering group of key decision makers with funding authority, aligned with a cross-institution BI working group, can enable progress. At a minimum, the working group should include the IT, IR, and registrar offices.
- Ensure that the initiative has sufficient funding and the right resources. This is not a part-time effort that can be added to existing roles. Consider appointing or hiring an analytics lead whose sole responsibility is to make BI useful on campus. Such a position can provide the glue to keep the various critical data stewards and data users making focused progress and to align the workers with initiative leadership.
- Ensure that the initiative has the right data. Establish, document, and maintain an institutional data dictionary. Institute data management processes.
- After identifying analytics objectives, the data needed, and data governance models, consider business intelligence and data warehouse technology needs. Most institutions will find that initial

FIGURE 13. Analytics Staffing Needs



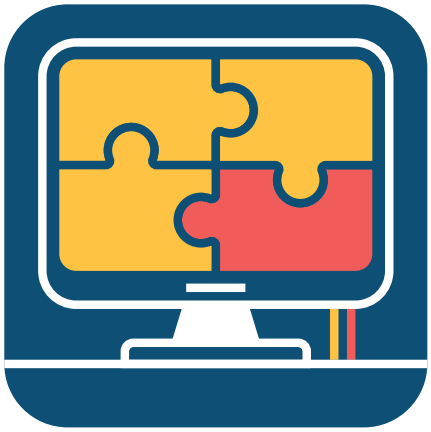
Source: Ronald Yanosky, with Pam Arroway, *The Analytics Landscape in Higher Education, 2015*, research report (Louisville, CO: ECAR, October 2015), figure 9

integrations begin with their ERP data.

- Use an agile, 30-day sprint methodology to provide focus and achieve measurable and timely results.
- Use the EDUCAUSE Analytics Maturity Index to assess the institution's current state of analytics maturity.
- Inventory the institution's current reporting and analytics, and classify items as reports, dashboards, or analytics. Further classify analytics as institutional or learning analytics. Share this taxonomy with others in the institutional community to help enrich their understanding.
- Predictive analytics can provide great insights, but the real test is the actions that are taken based on those insights.

"In order for institutions to continue to expand their analytics capabilities a focused and dedicated effort is needed. No matter the approach, institutions are recognizing that analytics can no longer be an add-on to someone's existing responsibilities."

—Celeste M. Schwartz, Vice President for Information Technology and College Services, Montgomery County Community College



Issue #8: Enterprise Application Integrations

Integrating enterprise applications and services to deliver systems, services, processes, and analytics that are scalable and constituent centered

Recent changes in the dynamics of the conversation about the value of higher education have caused more institutions to focus on improving constituent services to reduce barriers to student and faculty/researcher success. Today, virtually all services provided by institutions to constituents are delivered through or are supported by enterprise applications—not just those traditionally thought of as part of an ERP solution but also the constellation of ancillary applications that rely on data from the ERP applications or that deliver information in return.

Increasingly, the data contained in these enterprise applications is being used and leveraged through analytics in order to gain insights into what might place a student at risk or to predict certain outcomes and support interventions that might influence those outcomes. In addition, this data may provide insights into ways that service delivery can become more targeted and personalized for each constituent—reducing service "friction," improving constituent satisfaction, and helping to eliminate barriers to success.

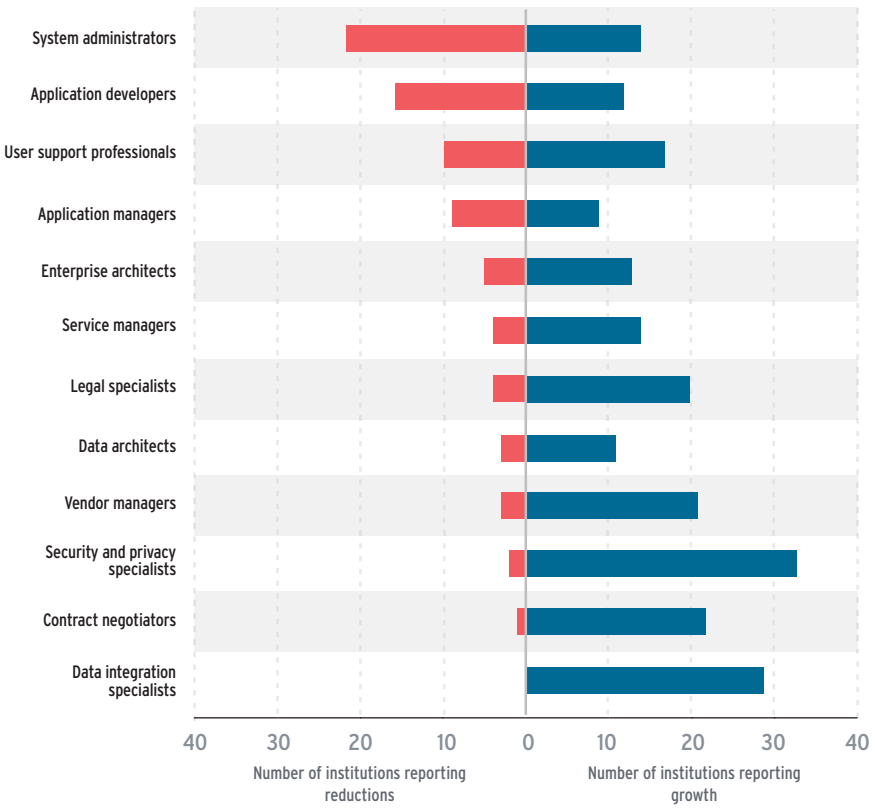
Percentage of faculty reporting that their institution

- maintains a highly qualified IT staff: 64%
- has an agile IT infrastructure approach that can respond to changing conditions and new opportunities: 31%

—Brooks, *ECAR Study of Faculty and Information Technology, 2015*

The wide range of services offered by institutions, coupled with a desire to capture and integrate an equally wide range of service-related data for further analysis, means that most institutions spend a great deal of effort to integrate those applications. The emergence of data architectures and applications that leverage APIs is making the integration challenge somewhat easier. At the same time, the number of applications and data sources is rapidly increasing, along with the amount of data being integrated, frequently resulting in very complex data and applications landscapes and increasingly emphasizing scalability (and supportability). Integration and regression testing becomes more complex and difficult

FIGURE 14. Changes in Roles/Positions Resulting from Moving Services to the Cloud



Source: D. Christopher Brooks, T*he Changing Face of IT Service Delivery in Higher Education*, research report (Louisville, CO: ECAR, August 2015), figure 4

> "For many institutions, service delivery is a competitive differentiator—the ability to deliver 'high-touch, high-quality' services to students, faculty, researchers, and other constituents at scale can have great impact on the level of engagement and, ultimately, the support an institution enjoys from its constituents, as well as on its ability to attract the most talented faculty and most qualified students."
>
> —Gordon Wishon, Chief Information Officer, Arizona State University

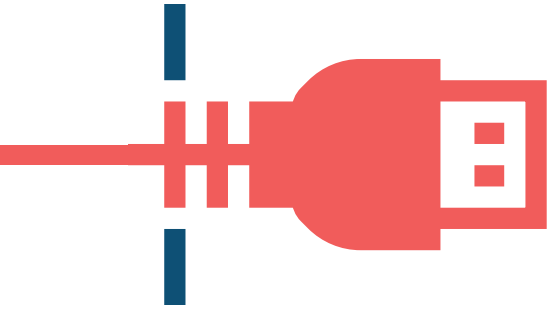
while institutional programming and scheduling demands continue to shrink windows of opportunities to upgrade/update and integrate these applications. In addition, constituents' expectations for the amount of time needed to deploy new systems and services have decreased significantly, and institutions have limited resources to manage and integrate systems and services.

This is a time when both homegrown applications and major ERP and LMS suites are being rethought, reformed, and replaced. Many solutions are moving or have moved outside the institution. It is tempting to believe that the outcome will be a much simpler and smaller IT organization. The reality is not so straightforward. Some management and technical roles are indeed diminishing. But they are being replaced by other, new roles that are essential to having secure, cost-effective, and integrated enterprise applications that meet the institution's business, service, and strategic needs (see figure 14). Most notably, institutions must develop competence in vendor and contract management, information security, enterprise architecture, application integration, and ITSM:

- Vendor and contract management can ensure that the institution is not overpaying, has appropriate terms and conditions, and is purchasing the right components and service levels.
- Information security can audit data and system security and ensure that best practices and policies exist to minimize the likelihood or impact of data breaches.
- Enterprise architecture can ensure that system and data integration is efficient, feasible, and extensible and meets business requirements.
- Enterprise application integration, or middleware, analysts can understand existing and emerging integration best practices and technologies and determine which are most appropriate for the current IT environment and business objectives.
- ITSM can ensure that IT infrastructure and services are well managed to enable fast diagnosis and resolution of problems and to minimize negative repercussions of deployments and changes.

Advice

- Identify the desired outcomes of enterprise application integrations to ensure that they guide the rest of this work.
- Ensure that institutional leaders understand the efficiency and strategic benefits of data and system standardization so that they can and will support the investments and changes needed to achieve these benefits. This work cannot succeed without leadership support.
- Develop an enterprise architecture that can take a holistic perspective on the systems, services, processes, and analytics the institution requires to meet its business needs and strategic priorities. This kind of upfront planning can enable efficiencies and flexibility later. Commit to maintaining it.
- Audit existing enterprise systems and the distributed systems that feed and connect to them to understand current data flows. When new systems and applications are purchased, consideration should be given to whether and how easily they and their data can integrate with existing systems and applications.
- Never lose sight of the importance of the data. Isolated data is of limited use. Vulnerable data is an ugly headline waiting to happen. Ensure that authority and responsibility for data governance, integration, and security are clearly assigned and accountable.



Issue #9: IT Organizational Development

Creating an IT organization structure, staff roles, and staff development strategies that are flexible enough to support innovation and accommodate ongoing changes in higher education, IT service delivery, technology, analytics, and so forth

The IT organization's ability to provide reliable, cost-effective support for daily operations and for innovations in teaching and research is critical to institutional and student success. With the pace of change and the pressures on budgets, an IT organization must be planning for constant and perhaps drastic change in workforce requirements and be preparing to keep those resources aligned with evolving strategies.

The IT organization needs to have a plan to optimize the allocation of human resources in order to maximize the productivity of the individual, the team, the IT organization, and the institution. Three layers should be kept in mind:

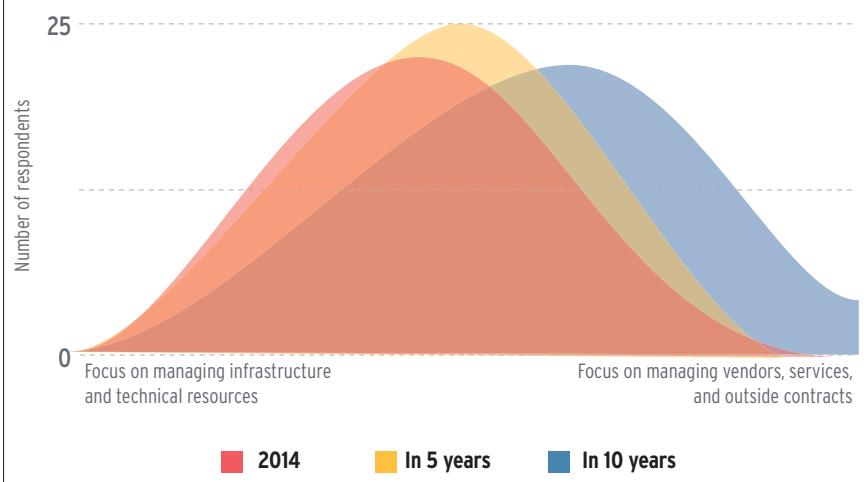
- How the IT function is organized and structured at the institution
- How individuals manage their careers and skills
- How the institution supports these activities

Given that IT infrastructures are essentially a very complex system of systems, we need a wide array of skillsets that quickly evolve, and we need a culture of teamwork that supports and encourages the growth of the individual and the team. Organizational development efforts must be part of a long-term and adaptable commitment addressing the people, process, and technology dimensions. Small institutions have very different needs from larger ones. Smaller institutions especially need generalists who have multiple talents and interests, who can thus incorporate several roles into a single job, and who can flex widely as the organizational structure and job duties change.

The organization and structure of the IT function will change over time (see figure 15). It can adapt organically in response to technology changes, personalities, funding changes, day-to-day demands, occasional crises, unclear strategies, and shifting priorities. It can also evolve intentionally to help achieve an institutional vision for using information technology to advance its missions and strategic priorities. The IT organization will change either way, but the outcome will be very different. Using strategy-based organizational development, CIOs can design the organizational structure, competencies and skillsets, and processes and behaviors that the institution needs. Institutional and IT leaders can determine how to most effectively source IT services and functions in order to guide decisions about outsourcing (including to the cloud), centralization versus distributed IT structures, shared services, and even, ideally, which services to stop offering. By doing so, the IT organization can start progressing up the maturity curve and deliver better, more consistent services.

Challenges abound. As technology continues to shift, the clear lines of authority and responsibility may blur, shrink, or even disappear altogether.

FIGURE 15. CIO Management Focus



Source: D. Christopher Brooks, *The Changing Face of IT Service Delivery in Higher Education*, research report (Louisville, CO: ECAR, August 2015), figure 1

Much attention is paid to the provision of IT services outside the central IT organization. However, silos can also develop *within* the IT organization. Without ongoing coordination among the IT leadership team, the IT organization can easily become a series of duplicate "services" centered on the systems and technology (or constituents) that each siloed team supports, rather than a cohesive and continually adapting collection of teams, activities, and roles organized around changing service needs.

People can expect to have ten to twenty jobs during the course of their careers.[37] So in addition to technical and soft skills, workers need career planning and management skills to optimize their working lives and earnings. Fortunate professionals with effective managers in well-run organizations will have clearly defined job duties and goals, regularly updated position descriptions, ongoing performance feedback, and specific professional development and growth plans (that advance the objectives of the IT organization and the individual). Others will not and will have to either self-manage or find a better place to work. The most competent professionals will understand and leverage their strengths, make learning and growth a habitual commitment, and nurture mentoring and collegial relationships and networks.

It all comes down to people. No matter the area or objective, that oft-repeated

> "Our ultimate challenge is shifting from high operations to high services. But these large systems did not just appear overnight, nor will they change that quickly. We need to have the long game in mind. If we do, our successors will look back favorably on our actions today."
>
> —Dwight Fischer, Assistant Vice President and CIO, Dalhousie University

statement holds true. Colleges and universities that understand the importance of their human capital will provide organizations and individuals with support for organizational and career development. HR organizations that are valued and empowered can make an enormous difference by ensuring that management practices are effective and by helping IT leaders with key practices such as succession and talent planning, performance development, and organizational development. They will also help the institution manage its talent by enabling professionals to move within and outside the IT organization. A strong HR function can also assist the IT organization in developing supportive and flexible working environments to offset salary and benefits competition from other industries.

Hiring a new employee and bringing that person fully up to speed costs from 1.5 to 3 times the actual salary.[38] A well-managed IT organization, a workforce of professionals who understand how to manage their careers, and an effective HR function can help make those investments last.

Advice

- Develop an IT organizational model based on "services" rather than on "systems." Allow for, promote, and encourage the "blending" of responsibilities across teams.
- Develop strategies and processes for the following:
  - Positions and teams, including roles, skills, sourcing, succession planning, career advancement
  - Organizational management, including funding, compensation/rewards, policies/procedures, communications
  - Organizational culture and engagement, including team building, motivation, expected behaviors, goal alignment, values
- Develop and annually review position descriptions and clear responsibilities for all staff. Create a culture of continual adaptation of jobs and of the organization to changing needs and conditions.
- Create a professional development and growth plan for *all* employees (including part-time). Don't limit plans to "training": incorporate individual professional growth needs as well. Start with a baseline set of professional development requirements for all employees.
- Professionals should understand that they are responsible for managing their own careers and lifelong learning/development.
- Use this article to stimulate a discussion with HR leaders to explore how the HR and IT organizations can work more effectively together.

The EDUCAUSE Top 10 IT Issues website

(http://www.educause.edu/ITissues)

offers the following resources:

- A video summary of the Top 10 IT issues
- Recommended readings and EDUCAUSE resources for each of the Top 10 IT issues
- An interactive graphic depicting year-to-year trends
- IT Issues lists by institutional type
- The Top 10 IT Issues presentation at the EDUCAUSE 2015 Annual Conference
- HTML and PDF links to this *EDUCAUSE Review* article

Issue #10: E-Learning and Online Education

Providing scalable and well-resourced e-learning services, facilities, and staff to support increased access to and expansion of online education

Online education is increasingly gaining legitimacy. According to a 2015 report, the proportion of academic leaders who believe online learning is critical to their institution's long-term strategy has grown from 48.8 percent in 2002 to 70.8 percent in 2014.[39] This is not a surprising finding when funding from states and the federal government continues to decrease and when the demand and growth rate for online enrollment continues to increase at a higher rate than the growth rate of the overall higher education student body. As the legitimacy of online learning grows, so does participation. More than 4 in 5 institutions (82%) offer at least several courses online, and more than half (53%) offer a significant number of courses online.[40] Almost half of students reported having taken an online course in the past year.[41] Though students choose online for a variety of reasons, the chief one is flexibility.[42] At the same time, academic leaders are

ELI

My, How Times Have Changed...

Register Now!

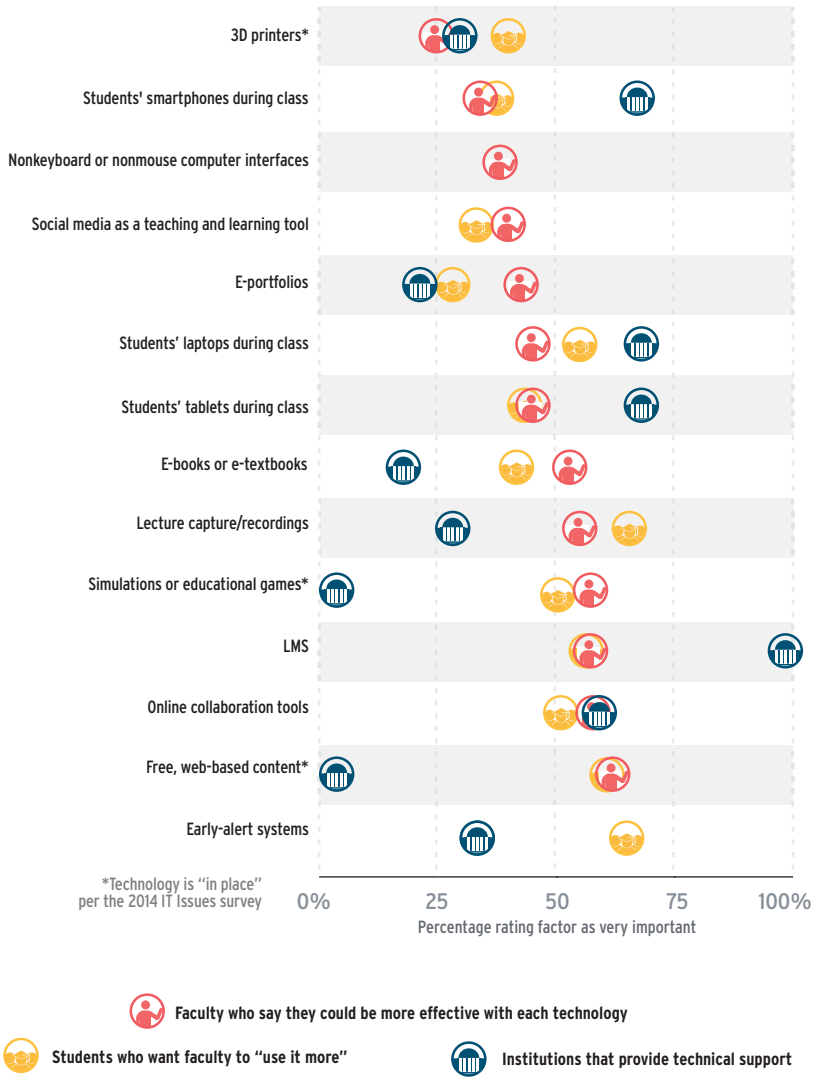
February 2–4, 2016 | San Antonio and Online
Crafting Our Future: Toward New Digital Learning Environments

Be sure to join *your* community at the ELI Annual Meeting.
Learn more at **educause.edu/ELI16**.

EDUCAUSE LEARNING INITIATIVE

EDUCAUSE

FIGURE 16. Educational Technology Interest and Support



Source: Eden Dahlstrom, Educational Technology and Faculty Development in Higher Education, research report (Louisville, CO: ECAR, June 2015), figure 6

increasingly concerned about retention of online students, especially minority and adult learners.[43]

Finding cost-effective ways to support students and to provide them with the resources usually offered on campus remains the main challenge. We need to try to reduce the cost of education and make the remaining investment a value that is worth the sacrifice that students and their families are making. Although student demand for more online classes will likely continue to increase, the growth of online will be influenced by the degree to which each institution is able to scale and virtualize all other aspects of the campus environment to support online learning and liberate resources to devote to online learning.

For many institutions, providing scalable and well-resourced services, facilities, and staff to increase access and expand the online offerings continues to be a challenge. Many institutions do not truly understand what is needed to make this a reality. Institutional leaders who are considering expanding their online offerings need to assess the readiness of institutional resources, and they should be prepared for a complicated answer. According to the EDUCAUSE E-Learning Maturity Index, effective e-learning requires five major elements:

1. *Engagement.* Involve the institutional community—faculty, students and staff—in e-learning and ensure that they are prepared to use e-learning technologies effectively (see figure 16).
2. *Operational effectiveness.* Have adaptable, scalable, and reliable e-learning services and technologies whose management is centralized and considered mission-critical.
3. *Governance, security, and accessibility.* Have appropriate policies and guidelines, effective decision making, and sufficient security and provide access to e-learning for students with disabilities.
4. *Priority.* Give priority to e-learning investments, strategy, leadership, and incentives.
5. *Analytics.* Use learning analytics to evaluate e-learning courses and use analytics to monitor the institution's strategic goals for e-learning progress.

The e-learning maturity of individual institutions varies. For 22 percent of institutions the maturity could be considered strong or excellent, for 61 percent it is still developing, and for 17 percent it is weak or emerging.

Online learning requires a broad range of technologies, including the LMS, course-delivery systems, lecture capture, e-portfolios, OERs, social networks, mobile apps, learning analytics, e-advising systems, adaptive learning technology, gaming, simulations,

Choose Your Program

EDUCAUSE Connect

Take part in this highly interactive, action-driven event focused on finding workable solutions, connecting people's experiences, and building professional networks. Connect is for anyone who wants to move ideas, understanding, and the profession forward.

New IT Managers

This Institute program provides the basic skills critical for managing and supervising people, processes, and projects. The program is for first-time managers with less than two years' experience or those who aspire to management roles within higher education IT.

Management Boot Camp

This new Institute program strengthens skills in communication, negotiation, and performance management. The Boot Camp is for those with at least 3-5 years' experience managing people, processes, and projects within higher education IT.

Dates and Locations

Denver, CO
March 2–4, 2016

Miami, FL
April 6–8, 2016

Find out more at educause.edu/events

EDUCAUSE

FIGURE 17. E-Learning Staffing Needs

Source: Jacqueline Bichsel, *The State of E-Learning in Higher Education: An Eye Toward Growth and Increased Access*, research report (Louisville, CO: ECAR, June 2013), figure 4

and the resources needed for technology support and project management to deploy and maintain these technologies. And of course, stuff needs staff. Most needed are instructional/course designers, professional development staff for e-learning, app designers/programmers, data analysts, videographers, graphic designers/animators, and support staff for enterprise IT systems (see figure 17). More than 60 percent of institutions reported needing staff in these areas, adding that they need to more than double their e-learning staff to be effective.[44]

Learning leaders must develop a strategy to ensure that faculty and staff develop courses suitable for online pedagogy, which differs from traditional face-to-face teaching. More than three in four institutions report that the technological know-how of faculty is a moderate or major concern about online learning.[45] Online education has unique needs and challenges, and it needs to be managed differently. It also needs to be reviewed for quality and effectiveness to ensure that learning objectives translate to an online format and to determine how student learning will be assessed.

In addition, institutions must define the role that online learning plays within the institutional mission. The biggest reason institutions do not offer online courses is lack of leadership interest. Aligning priorities will allow institutions to develop comprehensive and balanced online programs that will expand the institution's reputation. Infrastructure and resources need to be designed for long-term growth and evolution.

Higher education leaders have learned how to manage facilities maintenance and expansion, but they have not yet mastered the art of managing IT investments. This presents ongoing challenges to CIOs, who can find funding for capital (or initial) investments but do not receive sufficient ongoing funds when initiatives become operational. If institutions are to remain competitive with online learning, they will have to prepare for ongoing investments, operations, and updates to maintain state-of-the-art online learning environments. They may find themselves needing to make tradeoffs in physical-versus-online learning environments while both their students and their faculty expect access to the learning environment that best suits the pedagogical goal.

The learning infrastructure may constitute a growing share of institutional differentiation. Many higher education leaders are not prepared for the potential impact that technology will have on the ability to attract and retain students and rank-and-file faculty. Baseline technology has thus far been a necessary but not distinguishing feature of the institution. This may change as technology becomes more visible, differentiated, and integral to teaching and learning. The clothes make the man, as the saying goes. Perhaps the technology will make the institution.

> "With student debt at an all-time high, families are starting to question the value of a traditional college education. They will look to online education to provide some relief."
>
> **—Jonathan Brennan, CIO, SUNY College of Technology at Delhi**

2016 EDUCAUSE PROFESSIONAL DEVELOPMENT EVENTS

FEBRUARY

ELI Annual Meeting
February 2–4
San Antonio, TX,
and Online

MARCH

EDUCAUSE Connect
March 2–4
Denver, CO

New IT Managers Program
March 2–4
Denver, CO

Management Boot Camp
March 2–4
Denver, CO

NERCOMP Annual Conference
March 21–23
Providence, RI

APRIL

EDUCAUSE Connect
April 6–8
Miami, FL

New IT Managers Program
April 6–8
Miami, FL

Management Boot Camp
April 6–8
Miami, FL

Security Professionals Conference
April 18–20
Seattle, WA, and Online

ELI Spring Focus Session
April 27–28
Online

MAY

Enterprise IT Summit
May 2–4
New Orleans, LA

JUNE

Leading Change Institute
June 12–17
Washington, D.C.

Learning Technology Leadership Program
June 27–July 1
Austin, TX

Management Program
June 27–July 1
Austin, TX

JULY

Leadership Program
July 18–22
Austin, TX

OCTOBER

Annual Conference
October 25–28
Anaheim, CA,
and Online

Ongoing

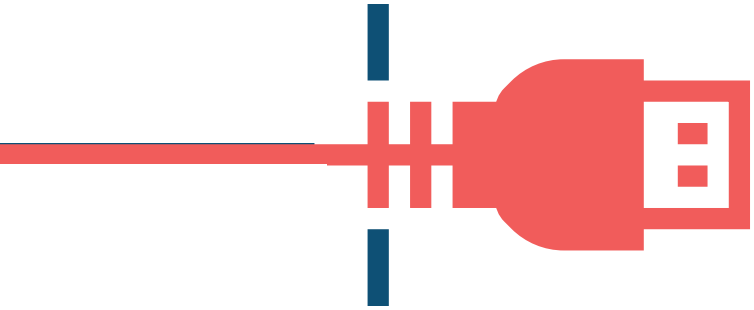
***EDUCAUSE Live!* Webinar Series**

EDUCAUSE Learning Initiative Online Courses

Keep growing.

For a comprehensive list of upcoming events, including webinars, please visit **educause.edu/Events**.

EDUCAUSE



Advice

- Develop an online learning technology plan and architecture. Provide solid support for standard technologies (e.g., the LMS and collaboration tools such as Google Apps or Microsoft Office 365). Provide guidelines and best practices for adopting new technologies and mobile apps.
- Align online offerings, infrastructure, and staffing with student demand metrics to allow the institution to scale up operations seamlessly at planned intervals.
- Give technologists and the institutional community opportunities to experiment and innovate. Keep abreast of emerging technologies and continuously assess their potential to advance the institution.
- With buy-in and advocacy from the academic leadership, develop course-quality standards linked to the institution's mission to ensure a base level of quality across all courses. Using a peer-tested quality assurance rubric, such as Quality Matters, the institution will be sure that courses are being evaluated in a uniform way. Establish design standards for all courses that specify template requirements for course sites.
- Take the EDUCAUSE E-Learning Maturity Index to benchmark the institution's e-learning readiness.
- Collect data on impact, such as faculty and student feedback and expectations. Share the results with the entire institutional community.
- Invest in the faculty. Recruit faculty who have experience teaching in an online environment and who truly believe it can be successful. Provide incentives and resources to encourage faculty to explore this new modality. Build a comprehensive training program. Faculty need to learn the differences between online and traditional classes and how to apply their content knowledge in a new way. Consider offering a summer program similar to the iTech Fellows at the University of Washington, Tacoma. Faculty take an intensive one-week "prep" course looking at design standards, best practices, and pedagogy and can begin building out their course sites. Later in the summer, they come back together for peer-review. Faculty who successfully complete this program become campus peer-reviewers and online mentors for future faculty.
- Provide training and support for students. While today's students are generally more technically able, institutions should help them get up to speed quickly on the technologies they are likely to use in their coursework.

Conclusions

The EDUCAUSE community selected the Top 10 IT Issues from a slate of 15 issues identified by the IT Issues Panel members. The 5 issues that did not make the overall Top 10 were

- *Change Management:* Increasing the IT organization's capacity for managing change, despite differing community needs, priorities, and abilities;
- *New Generation of Technologies:* Consolidating, evolving, and retiring historical services and technologies and adopting new platforms (e.g., moving from listservs to Office365 groups);
- *IT and Higher Education "Industry" Transformation:* Identifying and communicating the ways in which information technology can be used to help the institution address disruption and advance the business of higher education;
- *Digital Literacy:* Ensuring that faculty, staff, and students are informed about, and have the skills to make the most effective use of, new IT services, technologies, and applications; and
- *Open Standards for Enterprise IT:* Working in collaboration with other institutions and vendors to develop enterprise IT architectures that incorporate open standards and can respond to changing conditions and new opportunities.

The first three were among the Top 10 lists of some types of institutions.[46] Specifically, a number of institutions picked *Change Management* among their Top 10: associates, bachelors, private doctorals, non-U.S. institutions, institutions with 4,000-7,999 or over 15,000 FTEs, and institutions that tend to adopt technology later than or at the pace of their peers. *New Generation of Technologies* was among the Top 10 for bachelors institutions, private doctorals, specialized U.S. institutions,[47] smaller institutions (less than 4,000 FTEs), and institutions that tend to adopt technology earlier than others. Public doctoral universities, specialized U.S. institutions, and non-U.S. institutions chose *IT and Higher Education "Industry" Transformation* among their Top 10 issues. Most noteworthy was how close the voting was for all but the first-ranked and last-ranked issues (see figure 18 p.58).

Commonalities

It's the Data, Stupid

Information security was the highest-rated issue for all but one (specialized U.S. institutions, where it was #3) of the overlapping demographic groups tracked by EDUCAUSE. The goal of information security is to protect data.

When we come together, we can do transformative things.

Join your peers at the NERCOMP Annual Conference and celebrate 60 years of a unique community.

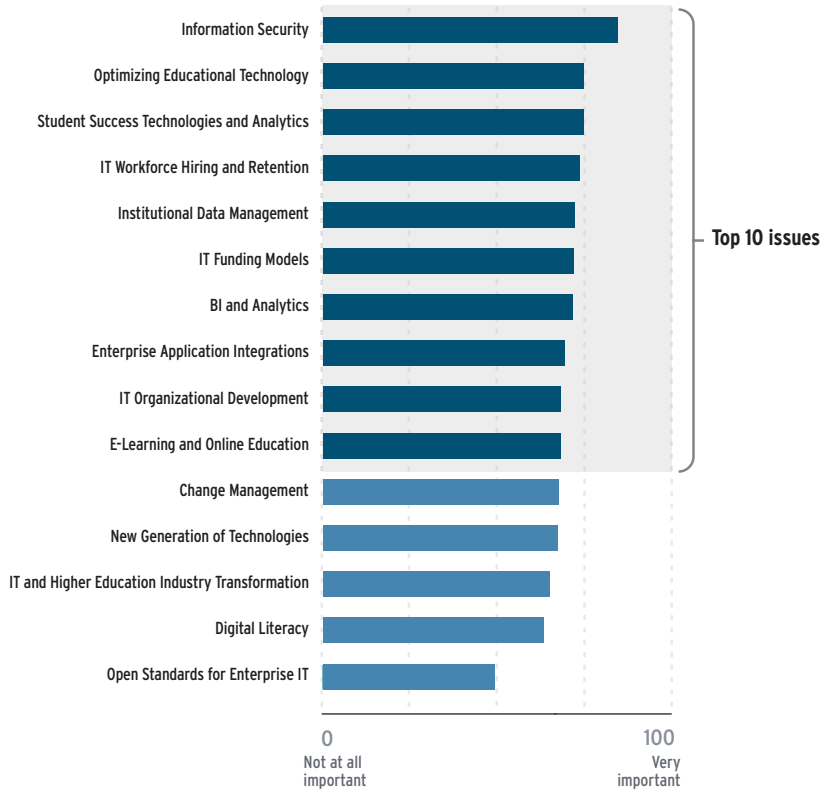
NERCOMP
NorthEast Regional Computing Program

NERCOMP Annual Conference | March 21–23, 2016 | Providence, Rhode Island
To learn more, visit **educause.edu/nc16**.

NORTHEAST REGIONAL COMPUTING PROGRAM

EDUCAUSE

FIGURE 18. Ratings of All 15 IT Issues



Managing, securing, and using data was common to 5 of this year's Top 10 IT issues:

1. Information Security
3. Student Success Technologies
5. Institutional Data Management
7. BI and Analytics
8. Enterprise Application Integrations

Data issues are pertinent to divestment, reinvestment, and differentiation. The data challenge of divestment is how to move away from local control in order to adopt institution-level data governance, standardization, and integration. Because data is critical to the ways in which institutions are hoping to achieve strategic differentiation—including student success, e-learning, and analytics—IT organizations need to reinvest in information security to secure this data, which is increasingly important and increasingly at risk.

Securing, managing, and integrating data is foundational to achieving higher education's most strategic technology needs. The role of data will become only more important and differentiated over time. Analytics is being applied to numeric, text, image, and even video data. However, data is only the fuel for the models and algorithms that will drive alerts, customizations, triggers, and other tools for personalized learning, student success services, and additional applications of analytics (e.g., to optimize resources, contain costs, improve service quality, increase productivity). Data is necessary and critical, but not sufficient, to produce analytics useful enough to inform decision making. Ultimately the models derived from data will prove to have more value than the data itself. In future years, the data concerns of higher education will likely extend to governing, securing, and optimizing analytic algorithms.

Leadership as the Multiplier

Again and again, the EDUCAUSE IT Issues Panel members emphasized the importance of leadership. If information technology is to have a meaningful impact, institutional leaders must be enduringly, enthusiastically, and publicly committed to investing in information technology and to accommodating institutional practices to IT solutions. IT leaders are masters of the workaround: they know how to adapt, pivot, and make do in the face of roadblocks and setbacks. But there are no workarounds for tepid or reluctant leadership.

Information technology is now embedded in every institutional activity and mission. IT organizations can accomplish little on their own.

> "IT professionals should adopt the perspective, culture, values, and language of a business professional and frame their work within this context. Once viewed as a business professional in their own right, managing change within the broader community of end users becomes much, much easier."
>
> **—Timothy M. Chester, Vice President for Information Technology, University of Georgia**

Security Professionals Conference

Data, Intelligence, Risk, and Value: Security and Privacy in Higher Ed

April 18–20, 2016 | Seattle, Washington, and Online

Higher education information security and privacy teams do so much more than just manage firewall rules and antivirus systems, and the value that they provide extends far beyond the IT department. Information security and privacy teams play a vital role in institutional risk management activities, provide actionable intelligence in institutional operations, and offer seasoned advice in one of the most challenging environments to date.

Join us for the only conference that facilitates community dialogue and professional development activities for higher education information security and privacy professionals.

SECURITY PROFESSIONALS

EDUCAUSE

> "How do we know when is the right time to implement a new technology? How close to the 'bleeding edge' should we be? How do we know when we've stepped over the edge? How do we overcome the natural resistance to change, especially when the cost/pain of change is high? How do we gauge an institution's readiness for change? How do we influence it?"
>
> —**Gordon Wishon, CIO, Arizona State University**

Even divestment decisions cannot be taken without some business leader's support. Moving to the cloud and outsourcing carry potential risks that institutional counsel must approve. Application integration means data integration. And that means negotiating data standards and definitions with constituent stakeholders. Information security affects usability and so must be negotiated and communicated with the institutional community. Leadership commitment to information technology facilitates buy-in, which is critical for success.

An Existential Threat?

IT leaders and professionals face high stakes in this changed and changing world. The stakes are even higher for colleges and universities. Is the transformative ability of information technology the promise of a new, more enlightened, and empowered age of learning, scholarship, and research—enabling knowledge to be created, preserved and disseminated to previously unimagined extents? Will information technology destroy as well as create?

IT professionals have certainly seen both sides. Many jobs that were the bedrock of IT organizations have disappeared, prompting some professionals to switch roles but forcing many others to retire earlier than they had hoped. Nonetheless, IT organizations' staffing needs are not diminishing (to the dismay of budget managers). But they are changing, and a gap exists between the skill and experience requirements of the new roles and the preparedness of many existing staff. Some staff will bridge the gap, with perseverance, energy, and (critically) leadership support. Others will not and have not. That is when the HR department needs to lead creatively, help those staff at risk of displacement to reimagine and re-create their professional identity, advocate for them, and assist them in locating new jobs.

Estimates vary, but some predict that as many as 30 percent of colleges and universities are in significant financial jeopardy because their operating models are not sustainable.[48] This is one of the reasons why institutions are exploring the potential of information technology to reduce operational expenses through greater automation and to make learning more affordable and accessible. Another motivator is the competition arising from new nontraditional alternatives to higher education, many of which are applying information technology innovatively to the learning and student experiences. Using technology as a strategic differentiator might indeed make the difference between success and failure for some institutions.

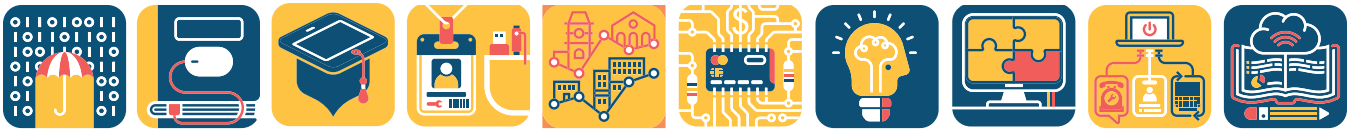
Information technology is shrinking, enriching, and remaking the world just as surely as (and perhaps even more dramatically than) transportation technology did over a century ago. Higher education is trying to navigate this new opportunity, this new challenge. The 2016 Top 10 IT Issues provide institutional IT leaders with a clear roadmap:

- *Divest* technical encumbrances such as custom infrastructure that has become a commodity in the market, idiosyncratic processes that are expensive to automate, and redundant and nonstandard data and systems.
- *Reinvest* in the IT workforce and in the IT organization to best plan, manage, and optimize the technology assets and services of the institution. Expand information security investments to manage security proactively rather than reactively.
- *Differentiate* the institution by making technology investments in its most strategic priorities. Translate what is most distinctive about the institution's mission into the rapidly developing new technology-enabled paradigms.

Information technology offers tremendous potential to higher education, if we can harness it. By divesting, reinvesting, and differentiating, we will be able to embrace—and also flourish in—this digital age.

Acknowledgments

Members of the EDUCAUSE IT Issues Panel collectively and collaboratively identify the top IT issues for each coming year. A similar collective of EDUCAUSE staff collaborates tirelessly in the creation of this article each year. Joanna Lyn Grama is instrumental to the ongoing operations of the EDUCAUSE IT Issues Panel. She manages their meetings, recruits panel members, and spearheads members' contributions to this article. More than that, she provides wise and critical feedback on the many drafts of this article. Eden Dahlstrom, Kate Roesch, and Pam Arroway



are the data and visualization mavens who ensure the data and graphics in this article are accurate relevant, and appealing (thank you, Kate!). Teddy Diggs is an extraordinary and generous editor, who makes sure this article makes sense and flows well. EDUCAUSE members supported by EDUCAUSE staff: that is the magic of EDUCAUSE.

Notes

1. Once a year, members of the EDUCAUSE IT Issues Panel select a slate of 15-20 topics they believe will be the most strategic IT-related issues facing higher education institutions. EDUCAUSE members receive a survey with those issues and are asked to prioritize them. The 10 issues with the highest priority scores become the Top 10 IT Issues. This methodology also enables EDUCAUSE to determine the Top 10 IT Issues among various types of institutions. For 2016, of the 10,140 EDUCAUSE member representatives who received an e-mail invitation to complete the survey, 338 (3%) responded.
2. Susan Grajek, *Trend Watch 2016* (ECAR, forthcoming).
3. Ibid.
4. The issue scores ranged from 84 for #1 to 49 for #10. Issues #2 through #9 were clustered, with scores ranging from 75 to 68.
5. Jacqueline Bichsel, *IT Service Delivery in Higher Education: Current Methods and Future Directions,* research report (Louisville, CO: ECAR, April 2015), http://www.educause.edu/library/resources/it-service-delivery-research.
6. For more on where to divest and where to reinvest, see the EDUCAUSE Maturity Indices on the EDUCAUSE Higher Education IT Assessment and Benchmarking Projects web page: http://www.educause.edu/focus-areas-and-initiatives/enterprise-and-infrastructure/higher-education-it-assessment-and-benchmarking-projects.
7. Brian Voss, "Special Snowflakes?" *EDUCAUSE Review,* September 6, 2013, http://www.educause.edu/blogs/bdvoss/special-snowflakes.
8. Niel Nickolaisen, "Aligning to Purpose," *EDUCAUSE Review* 49, no. 3 (May/June 2014), http://er.educause.edu/articles/2014/5/aligning-to-purpose.
9. Jacqueline Bichsel, *The State of E-Learning in Higher Education: An Eye Toward Growth and Increased Access,* research report (Louisville, CO: ECAR, June 2013), http://net.educause.edu/ir/library/pdf/ers1304/ERS1304.pdf; Ronald Yanosky, with Pam Arroway, *The Analytics Landscape in Higher Education, 2015,* research report (Louisville, CO: ECAR, October 2015); Ronald Yanosky, *Integrated Planning and Advising Services: A Benchmarking Study,* research report (Louisville, CO: ECAR, March 2014), https://net.educause.edu/ir/library/pdf/ERS1312.pdf.
10. EDUCAUSE has curated a relevant set of resources at http://www.educause.edu/library/integrated-planning-and-advising-services-ipas.
11. "Embracing Differentiation and Reclaiming Audacity: An Interview with James Hilton," *EDUCAUSE Review* 50, no. 6 (November/December 2015), http://er.educause.edu/articles/2015/10/embracing-differentiation-and-reclaiming-audacity-an-interview-with-james-hilton.
12. Anne Fisher, "Why Most Innovations Are Great Big Failures," *Fortune,* October 7, 2014, http://fortune.com/2014/10/07/innovation-failure/.
13. Bichsel, *IT Service Delivery in Higher Education.*
14. D. Christopher Brooks, *The Changing Face of IT Service Delivery in Higher Education,* research report (Louisville, CO: ECAR, August 2015), http://www.educause.edu/library/resources/it-service-delivery-research.
15. EDUCAUSE research shows that in educational data breaches from 2005 to 2013, user error, such as unintentional disclosures and lost devices, was a greater threat than hacking. See Joanna Lyn Grama, *Data Breaches in Higher Education,* Just in Time research (Louisville, CO: ECAR, May 2014), https://net.educause.edu/ir/library/pdf/ECP1402.pdf.
16. EDUCAUSE Center for Analysis and Research, *2015 Strategic Information Security Issues,* infographic (Louisville, CO: ECAR, April 2015), http://net.educause.edu/ir/library/pdf/HeiscInfographic15.pdf.
17. Except where otherwise noted, all data points were first published in the *2014 EDUCAUSE Core Data Service Almanac,* "All Non-Specialized U.S. Institutions," February 2015, https://net.educause.edu/ir/library/pdf/CDA1401.pdf.
18. ECAR, *2015 Strategic Information Security Issues,* infographic.
19. Comparisons of the 2005, 2010, and 2015 ECAR studies of undergraduate students and technology show massive shifts in mobile device ownership and substantial growth in learning support services and technology-enabled classrooms. In 2005, 56% of undergraduates owned a laptop, and smartphone and tablet technologies were nascent. In 2015, 91% of undergraduates owned a laptop, 91% owned a smartphone, and 54% owned a tablet. See Eden Dahlstrom, with D. Christopher Brooks, Susan Grajek, and Jamie Reeves, *ECAR Study of Students and Information Technology, 2015,* research report (Louisville, CO: ECAR, November 2015), http://www.educause.edu/library/resources/2015-student-and-faculty-technology-research-studies. Institutions are adapting practices to support students' nearly ubiquitous ownership of mobile technology. Teaching and learning support services have been on the rise: 75% of institutions report having a faculty teaching/excellence center, 73% offer special grants/awards for innovative use of instructional technology, and 87% employ instructional designers to help faculty develop courses and course materials in order to leverage students' mobile devices for teaching and learning. See EDUCAUSE Core Data Survey, 2014.
20. EDUCAUSE Core Data Survey, 2014; D. Christopher Brooks, *ECAR Study of Faculty and Information Technology, 2015,* research report (Louisville, CO: ECAR, October 2015), http://www.educause.edu/library/resources/2015-student-and-faculty-technology-research-studies.
21. Amanda Lenhart, "Teens, Social Media and Technology Overview 2015," *Pew Research Center,* April 9, 2015, http://www.pewinternet.org/2015/04/09/teens-social-media-technology-2015/.
22. According to ECAR research, 73% undergraduates prefer to keep their academic lives and social lives separate, a figure that has risen steadily from 57% in 2012 (Dahlstrom, Brooks, Grajek, and Reeves, *ECAR Study of Students and Information Technology, 2015).* See also danah boyd, *It's Complicated: The Social Lives of Networked Teens* (New Haven: Yale University Press, 2014).
23. Brooks, *ECAR Study of Faculty and Information Technology, 2015.*
24. Dahlstrom, Brooks, Grajek, and Reeves, *ECAR Study of Students and Information Technology, 2015.*
25. Ibid.
26. Based on rated importance of working in higher education combined with reported likelihood of pursuing opportunities outside the institution. From Jacqueline Bichsel, *Today's Higher Education IT Workforce,* research report (Louisville, CO: ECAR, January 2014), http://net.educause.edu/ir/library/pdf/ers1310/ers1401.pdf.
27. Ibid.
28. Catherine Ashcraft, "How Can Companies Promote Innovation with Diverse Employees?" *National Center for Women & Information Technology,* https://www.ncwit.org/resources/how-can-companies-promote-innovation-diverse-employees/how-can-companies-promote; J. Richard Hackman, *Leading Teams: Setting the Stage for Great Performances* (Boston: Harvard Business Review Press, 2002).
29. Yanosky and Arroway, *The Analytics Landscape in Higher Education, 2015.*
30. See *The Compelling Case for Data Governance,* ECAR Working Group paper (Louisville, CO: ECAR, March 2015).
31. Susan Grajek and the 2014–2015 EDUCAUSE IT Issues Panel, "Top 10 IT Issues, 2015: Inflection Point," *EDUCAUSE Review* 50, no. 1 (January/February 2015), http://er.educause.edu/articles/2015/1/top-10-it-issues-2015-inflection-point.
32. Linda Hall, Shreya Futela, and Disha Gupta, "IT Key Metrics Data 2015," summary, *Gartner,* December 15, 2014, https://www.gartner.com/doc/2939218/it-key-metrics-data-.
33. Ginni Rometty, "Prepare for the Cognitive Computing Era," Gartner Symposium, Orlando, FL, October 6, 2015.
34. EDUCAUSE, "Key Questions for Personalized Pathways: Navigating Higher Education," August

2014, http://net.educause.edu/ir/library/pdf/ekq02.pdf.
35. *NMC Horizon Report: 2015 Higher Education Edition* (Austin, Texas: New Media Consortium, 2015), http://www.nmc.org/publication/nmc-horizon-report-2015-higher-education-edition/.
36. As measured by the percentage of institutions scoring 4.0 or higher on the 5.0-point EDUCAUSE Analytics Maturity Index.
37. In January 2014, the median number of years that wage and salary workers had been with their current employer was 4.6 years. U.S. Department of Labor, Bureau of Labor Statistics, Employee Tenure in 2014 (September 2014).
38. Annie Mueller, "The Cost of Hiring a New Employee," *Investopedia,* November 13, 2015, http://www.investopedia.com/financial-edge/0711/the-cost-of-hiring-a-new-employee.aspx.
39. Online Learning Consortium, *Grade Level: Tracking Online Education in the United States,* February 2015, http://onlinelearningconsortium.org/press-release-online-learning-survey-report-2014/.
40. Bichsel, *The State of E-Learning in Higher Education.*
41. Dahlstrom, Brooks, Grajek, and Reeves, *ECAR Study of Students and Information Technology,* 2015.
42. Carol B. Aslanian and David L. Clinefelter, *Online College Students 2012: Comprehensive Data on Demands and Preferences* (Louisville, KY: Learning House, 2012), http://www.learninghouse.com/files/documents/resources/Online%20College%20Students%202012.pdf.
43. Daphne Koller, Andrew Ng, Chuong Do, and Zhenghao Chen, "Retention and Intention in Massive Open Online Courses," *EDUCAUSE Review,* June 3, 2013, http://er.educause.edu/articles/2013/6/retention-and-intention-in-massive-open-online-courses; Floralba Arbelo-Marrero, "Staying the Course: Engaging and Retaining Non-Traditional Students in Online Education," *EvoLLLution,* March 4, 2015, http://evolllution.com/opinions/staying-course-engaging-retaining-non-traditional-students-online-education/.
44. Bichsel, *The State of E-Learning in Higher Education.*
45. Ibid.
46. For Top 10 IT Issues lists for different types of institutions, see the EDUCAUSE Top 10 IT Issues website: http://www.educause.edu/research-and-publications/research/top-10-IT-issues. EDUCAUSE research examines institutional differences within (a) major Carnegie groups plus non-U.S. institutions, (b) institutions of varying size, and (c) institutions with different paces of technology adoption (late, mainstream, early).
47. These institutions have a specific disciplinary (such as engineering, health, business, faith, technology, law, or art) or constituent (tribal) focus. EDUCAUSE research tracks this group separately from non-specialized associates institutions, bachelor's institutions, private and public master's institutions, and private and public doctoral institutions.
48. Jeffrey J. Selingo, "Colleges Struggling to Stay Afloat," *New York Times,* April 12, 2013, http://www.nytimes.com/2013/04/14/education/edlife/many-colleges-and-universities-face-financial-problems.html?_r=1.

Susan Grajek (sgrajek@educause.edu) is EDUCAUSE Vice President for Data, Research, and Analytics.

Strengthening Higher Education Together

Our corporate members play a critical role in helping higher education deliver on its mission.

EDUCAUSE thanks our 2016 Corporate Partners for their continued support!

Dell
Ellucian
Gartner
Jenzabar
Sonic Foundry
Verisign
Workday

Amazon Web Services
Campus Management Corporation
CDW-G
Cisco Systems
Citrix
D2L
Epson
Google
IBM
Kaltura
McGraw-Hill Education
Microsoft Corporation
Moran Technology Consulting
Oracle Corporation
Pearson
Steelcase
Unit4

Computer Comforts
Extron Electronics
Laserfiche
Lenovo
lynda.com

Blackboard
Canvas
Cengage Learning
Echo360
Extreme Networks
Fischer International Identity
GovConnection
Hobsons
Hyland Software
Learning Objects
Modo Labs
NEC
Panasonic
Spectrum Industries
Visix
VMware

We also thank over 280 additional corporations that support our mission.

To learn more, visit **educause.edu/Corporate-Partners**.

EDUCAUSE

UNCOMMON THINKING FOR THE COMMON GOOD

Corporate Resource Guide

Advertiser Index

Company	Contact	Website	Page
Advantiv Solutions	1-866-966-2911	www.advantiv.com	65
Computer Comforts –An EDUCAUSE Silver Partner	1-281-535-2288	www.computercomforts.com	5
E&I Cooperative Services	1-877-693-2634	www.eandi.org	7
GetSet Learning	1-312-278-3784	www.getset.com	6
Jenzabar –An EDUCAUSE Platinum Partner	1-800-593-0028	www.jenzabar.com	inside front cover
JourneyEd.com	1-800-876-3507	www.journeyed.com	13
Laserfiche –An EDUCAUSE Silver Partner	1-800-985-8533	www.laserfiche.com/leader	inside back cover
McGraw-Hill Higher Education Group –An EDUCAUSE Gold Partner	1-212-904-2892	www.mheducation.com	17
Moran Technology Consulting –An EDUCAUSE Gold Partner	1-888-699-4440	www.MoranTechnology.com	23
Promenet	1-212-968-0190	www.promenet.com/vscan	25
Steelcase –An EDUCAUSE Gold Partner	1-616-248-7552	www.steelcase.com	33
Unicon	1-480-558-2400	www.unicon.net	65
UNIT4 Business Software –An EDUCAUSE Gold Partner	1-888-247-3776	www.unit4.com/us	3
Veralab	1-855-837-2522	www.veralab.com	35
Workday –An EDUCAUSE Platinum Partner	1-925-951-9000	www.workday.com	back cover
Zaption	1-925-366-7474	www.zaption.com	41

What If All of Our Wildest Dreams Come True?

U.S. community colleges are getting a lot of attention of late. It may be that the nation will soon fund community college attendance similarly to how it has funded high schools in the last century. This has been an issue for the Obama administration for some time.[1] The American Association of Community Colleges and the Association of Community College Trustees have come together to support President Obama's College Promise Campaign (http://headsupamerica.us/).[2] Funding higher education overall has also become a presidential campaign issue for both Democrats and Republicans.[3] Although there still seems to be some disagreement about whether public higher education in general should be free, both political parties appear to support making community college attendance a no-cost proposal for students. A number of states are already moving in this direction: Oregon, Minnesota, and Tennessee have passed legislation; Oklahoma, New York, Maine, and Illinois have legislation pending.[4]

The national conversation on college cost and value is continuously escalating. The current level of student debt nationally is over $1.3 trillion dollars and growing at a rate of more than $2,700 per second.[5] Students, their families, and political leaders are demanding a solution to the high cost of postsecondary education and subsequent high student debt.

At the same time, the demand for college-educated individuals in the workforce has never been higher. The Georgetown University Center on Education and the Workforce projects that the U.S. economy will need five million more individuals in the workforce with a bachelor's degree by the year 2020. The Public Policy Institute of California projects that California alone will need over one million more bachelor-degreed individuals in the state workforce by the year 2030. Most significantly, the Lumina Foundation projects that by 2025, more than 60 percent of Americans will need a college education—a goal that Lumina predicts the nation will fall short of by nearly twenty million degrees and certificates. Regardless of which indicator proves to be most accurate, the demand is extraordinary and unprecedented.[6]

Whether the political winds blow in favor of reducing costs for students or increasing the qualifications of the national workforce—or both—the likelihood is very high that a significant change in the way the United States funds community colleges, and higher education in general, is imminent.

So, what if all of our wildest dreams come true, flooding the nation's community colleges with students heavily subsidized by state governments or the federal government? Do community colleges have the capacity to serve this deluge of students? What might this mean for the infrastructure of our institutions?

- Would our classrooms be prepared and equipped to serve more students? Given typical IT staff levels and current classroom utilization levels, staff are already challenged to keep instructional facilities maintained and updated. If classroom utilization levels increase by 10 or 20 percent, will they continue to function effectively? Will we have the capability to keep classrooms current technologically? *Optimizing Educational Technology* is identified in the top 5 (#5 for associate institutions, #2 overall) of the EDUCAUSE Top 10 IT Issues for 2016.[7]
- Do the numerous information systems we use to support students have the capacity to serve hundreds or thousands of new students? Can administrative systems handle substantially higher demand at peak periods such as registration? Have we adequately licensed instructional systems such as the LMS to provide access to a potentially much larger student population? Associate institutions identified *E-learning and Online Education* as the #7 issue, whereas the higher education community overall ranked this as #10 in the 2016 Top 10 IT Issues.
- On a typical college campus, the network infrastructure is often already oversaturated—particularly the wireless network. With hundreds or thousands of additional students coming to campus and bringing with them an average of three mobile devices each, are we capable of accelerating our plans for expanding and upgrading our network infrastructure to accommodate a tidal wave of new students and their data-hungry devices? Developing a secure network and effective security policies—*Information Security*—wins the spot as #1 among IT Issues for both associate institutions and the higher education community overall.
- What about instructional support spaces such as libraries, computer labs, tutoring centers, and student unions? All of these spaces will be impacted by a significant influx of students. We may have few options to physically expand these facilities quickly, but technology can virtually expand these facilities nearly overnight. Have we made the appropriate infrastructure investments to rapidly ramp up these services through technology? Do our IT organizations have effective working relationships with our academic and student support colleagues to expand the virtual instructional support environment in meaningful and manageable ways? All segments of higher education identified *Student Success Technologies* in the top 5 of the 2016 IT Issues (#2 for associate institutions, #3 overall).

By JOSEPH MOREAU

Given these challenges and this environment of change, it is certainly noteworthy that in the EDUCAUSE Top 10 IT Issues for 2016, *Change Management* appears on the list for associate institutions, but not on the overall list. Conversely, *IT Organizational Development* has a spot on the overall EDUCAUSE Top 10 IT Issues list for 2016 but did not make the top 10 on the associate institutions' list.

The idea of free community college tuition is attractive to many Americans. For students who have struggled with finding ways to pay for postsecondary education, free tuition appears to be the key to unlocking their dreams. However, tuition typically covers only a fraction of the cost of educating a student. Are community colleges, state governments, or the federal government prepared to make additional investments to meet this new level of student demand?

These challenges do not stop at the boundaries, physical or virtual, of the community colleges. Nationally, 80 percent of community college students are seeking a bachelor's degree and 25 percent of community college graduates transfer to a four-year school within five years.[8] If a community college education is suddenly free for students, a four-year degree is now also dramatically more affordable. A greater number of currently enrolled community college students are likely to seek to transfer. A typical percentage of the new students who would arrive under a free community college system would also likely seek to transfer. Are four-year institutions prepared to accept the subsequent deluge of transfer students?

A Call to Action

My colleagues at community colleges: We will have to be better prepared than ever to employ the most creative solutions to support a student population we may never have seen before. This may include advocating for investment in technology in new ways. Clearly this is a concern for all of higher education, since *IT Funding Models* is a prominent issue: #3 on the associate institutions' list and #6 on the overall list. If we allow ourselves to get blindsided by this, the results may be devastating.

My colleagues at four-year institutions: Don't ignore these developments by thinking these are exclusively community college challenges. A significant proportion of community colleges students will be seeking to become one of your students very soon. Are you prepared for a significant influx of upper-division students?

All of us in the higher education community: We must all—from community colleges to doctoral institutions—stand together and help each other prepare for these changes. The well-being of our students, our economy, our society, and our nation depends on it. By working collaboratively across higher education segments and systems, we can make the case for renewed public investment in the common good of a well-educated citizenry. ■

Steve McCracken © 2016

Notes

1. Office of the Press Secretary, White House, "Fact Sheet: President Obama's Blueprint for Keeping College Affordable and Within Reach for All Americans," January 27, 2012, https://www.whitehouse.gov/the-press-office/2012/01/27/fact-sheet-president-obama-s-blueprint-keeping-college-affordable-and-wi.
2. Walter G. Bumphus, "Joining Together to Move the Conversation on Tuition-Free College Forward," *The EvoLLLution*, October 21, 2015, http://evolllution.com/attracting-students/accessibility/joining-together-to-move-the-conversation-on-tuition-free-college-forward/.
3. The Briefing: Hillary for America: "College Compact: Costs Won't Be a Barrier," https://www.hillaryclinton.com/p/briefing/factsheets/2015/08/10/college-compact-costs/; GOP: "Renewing American Values," https://www.gop.com/platform/renewing-american-values/.
4. National Conference of State Legislatures: "Free Community College: State Action," September 10, 2015, http://www.ncsl.org/research/education/free-community-college.aspx#Free%20Community%20College%20Legislation.
5. See The Borrowers Hotline website: http://theborrowers.org/.
6. Georgetown University Center on Education and the Workforce, *Recovery 2020*, http://scs.georgetown.edu/departments/5/center-for-continuing-and-professional-education/news/1052/report-recovery-2020-job-growth-and-education-requirements-through-2020; Public Policy Institute of California: "Will California Run Out of College Graduates?" http://www.ppic.org/main/publication_quick.asp?i=1166; Lumina Foundation: "A Stronger Nation," http://strongernation.luminafoundation.org/report/main-narrative.html.
7. Susan Grajek and the 2015–2016 EDUCAUSE IT Issues Panel, "Top 10 IT Issues, 2016: Divest, Reinvest, and Differentiate," *EDUCAUSE Review* 51, no. 1 (January/February 2016).
8. Davis Jenkins and John Fink, "What We Know about Transfer," Columbia University, Teachers College, Community College Research Center, January 2015, http://ccrc.tc.columbia.edu/media/k2/attachments/what-we-know-about-transfer.pdf.

Joseph Moreau (MoreauJoseph@fhda.edu) is Vice Chancellor of Technology at Foothill–De Anza Community College District.

The M Word: The Good, the Bad, the Ugly

For the past few months, I have been working with many wonderful colleagues to construct an overarching theme for the 2016 E-Content department in *EDUCAUSE Review*. We eventually settled on *Libraries, the Academy, and Data: A Renewed Focus on the "M Word."* We chose this topic for good reason. Recent years have seen the primacy of data in the research process explode across the academy—from sciences, social sciences, and traditional STEM areas to the digital arts and humanities. Libraries, as the stewards of knowledge, have embraced new programs to mine scholarship in massively digitized collections and in massively parallel ways to enable the archiving, preservation, and publication of data to support open and replicable research in all disciplines. Although not all of the data that libraries seek to provide is open access (at least not yet), libraries as a whole are starting to deploy new areas of data support for higher education. For this first column in 2016, Julie Hardesty and I will focus on some new uses of data around the threads of the "M word": *Metadata.* ~RHM

People have a tendency to label, well, everything. Giving things labels and describing things is a major tenant of discovery in the sciences and is how we move through the world. These labels and descriptions, often called *metadata,* flow through the academy from all aspects of the research process and are changing in higher education just as rapidly as they are in society overall. The expectations are that metadata will be clean and understandable, secure and accessible when appropriate, and easily shareable. The reality is that although this is all possible, it certainly doesn't happen naturally or without concerted effort and cooperation within areas of information policy, design, and practice. Libraries know the potential fallibility of metadata created by hand, and as a result, the academic research library has a long history of working with metadata to ensure good storage, maintainability, shareability, and most importantly, accessibility.[1]

Altmetrics and Their Impact on the Academy

Altmetrics, the practice of tallying online activity around a scholarly publication, is one area affecting the academy and its perception of itself. The walled-off print world of journals contained only in physical academic library buildings does not exist anymore. Online publications not only are more widely available but also are under pressure to be "open access" as grant-funding agencies and public pressure require more quantifiable evidence. Libraries are becoming more engaged in the scholarly publishing process by teaming up with university presses and by facilitating open-access and "new model" (i.e., data, software) journals to enable researchers to make their findings more openly available on a faster timeline than through traditional publishing.[2] As Stacy Konkiel and Dave Scherer have noted, altmetrics can help supplement information about the impact of scholarly publications through online and social media connections that regular usage statistics from journals do not track.[3] Being able to show the impact of research through online use and distribution means altmetrics are not so much "alt" anymore.

Full-Text and Metadata Mining

Now that libraries have access to massively digitized collections such as the HathiTrust Digital Library (https://www.hathitrust.org) and other collections of society and journal literature, we are seeing a research trend of wanting to use these collections in new and novel ways. Many researchers call this a "meta-use" of the collection. Much as in the realm of pharmaceutical research, many academics are now wanting to utilize library collections from a machine-oriented perspective, processing massive collections of full-text and metadata through the lens of the application programming interface (API) while using the power of institutionally based, high-performance computational instruments. Key to enabling this use is the capability to reuse data in a scientific workflow and the policy support to overcome such issues as intellectual property rights and new cost models for information access at this level.

Data, Society and Libraries

An increasingly popular source for large research datasets (i.e., Big Data) can be found in data produced by individuals on social media. danah boyd, founder of the research institute Data & Society (http://www.datasociety.net), and Kate Crawford have raised questions of ethics in gathering and using these Big Data sets.[4] In order for Big Data to be considered a reliable source of research data within the academy, details about its provenance need to be as transparent as possible. Academic libraries, in cooperation with college/university central technology infrastructure, are often at the center of caring for, maintaining, and preserving research data sets, through institutional and other types of digital repositories. Though generally time-separated from the research process for gathering data, libraries are interested in data-set provenance for preservation

E-Content Editor: **Robert H. McDonald**

By ROBERT H. McDONALD and JULIET L. HARDESTY

Steve McCracken © 2016

and reusability. Clearly there is potential for misuse of data when it encompasses potentially personal information and location-tracking through social networks. So how can libraries offer new services to support educational opportunities for the ethical use of societal data?

Creating Open Data for Instructional Opportunities

As James L. Hilton wrote in a 2014 *EDUCAUSE Review* E-Content column, learning management systems—used in nearly every academic learning environment in higher education—have a problem similar to that encountered with journal publishing, in that the academy "buys back (or, more often, rents back) the content that its members produce."[5] Libraries see a growing trend toward open data and open educational resources (OER) for use in instruction and are actively developing models for open content subvention.[6] This encompasses open electronic textbooks as well as new forms of collaborative textbooks that serve the central need for core courses across an academic curriculum. Some of the novel uses for this type of collaboration can be found in the work of the Open Textbook Library (http://open.umn.edu/opentextbooks/) and MOOCulus (https://mooculus.osu.edu/). How can libraries enable these open-content initiatives to thrive in their current uses and retain that record of scholarship for the long-term archives of their institutions?

Publishing Software for Sustainability

In addition to the new role that data has enabled in the scholarly process, software has also become a critical component of that workflow. In our own library at Indiana University, we are seeing data publishing that includes entire virtual machines whose goal is to enable reproducible experimentation in cloud computational environments. This has led to the creation of scholarly journals—for example, *Journal of Open Research Software* (http://openresearchsoftware.metajnl.com) and *SoftwareX* (http://www.journals.elsevier.com/softwarex)—that exist to publish software with the hope that the publication will enable long-lived community support for the software. This publication also provides inventive researchers with a way to assign credit to those who have built the software infrastructure that enables their experiments. Libraries must find ways to become a part of this archival process that enhances software reuse among discipline-specific communities.

Conclusion

Libraries have experience with metadata and data management and are often the right agency to serve as a neutral mediator for collaborations among researchers. Innovative directions of engagement with data in the research process are creating new roles and opportunities for libraries to help in preserving, managing, publishing, and accessing data. Libraries are also housing the physical spaces used for collaborative data endeavors (e.g., visualization labs, maker spaces, and computational support) and are developing connections to scholarly social networks—such as ResearchGate (http://www.researchgate.net) and VIVO (http://vivoweb.org)—that enable new research connections for use in building research teams and models. Libraries are engaging higher education through these new data working relationships. In the coming months, the expectation is to engage you, the EDUCAUSE community, in this theme of *Libraries, the Academy, and Data: A Renewed Focus on the "M Word."* ■

Notes

1. The writer Cory Doctorow humorously demonstrated the issues around people-generated metadata. See Cory Doctorow, "Metacrap: Putting the Torch to Seven Straw-Men of the Meta-Utopia," August 26, 2001, http://www.well.com/~doctorow/metacrap.htm.
2. Ann Okerson and Alex Holzman, *The Once and Future Publishing Library,* CLIR Publication No. 166 (Washington, DC: Council on Library and Information Resources, 2015), 7–14, http://www.clir.org/pubs/reports/pub166/pub166-pdf.
3. Stacy Konkiel and Dave Scherer, "New Opportunities for Repositories in the Age of Altmetrics," *Bulletin of the Association for Information Science and Technology* 39, no. 4 (April/May 2013), 23, https://asis.org/Bulletin/Apr-13/AprMay13_Konkiel_Scherer.html.
4. danah boyd and Kate Crawford, "Critical Questions for Big Data," *Information, Communication & Society* 15, no. 5 (June 2012), 671–673.
5. James L. Hilton, "Enter Unizin," *EDUCAUSE Review* 49, no. 5 (September/October 2014), http://er.educause.edu/articles/2014/9/enter-unizin.
6. Carolyn Walters et al., "A Study of Direct Author Subvention for Publishing Humanities Books at Two Universities," a report to the Andrew W. Mellon Foundation by Indiana University and University of Michigan, October 6, 2015, http://hdl.handle.net/2022/20408.

Robert H. McDonald (rhmcdona@indiana.edu), Associate Dean for Library Technologies and Deputy Director for the Data to Insight Center at Indiana University, is the 2016 E-Content Editor for *EDUCAUSE Review*. **Juliet L. Hardesty** (jlhardes@iu.edu) is an Assistant Librarian and Metadata Analyst at Indiana University.

Networked Learning as Experiential Learning

What kind of educational experiences change lives? As an answer to that question, George Kuh's monograph on high-impact practices has been enormously influential throughout higher education.[1] When Kuh published his monograph in 2008, an emphasis on the global economic competitiveness of the United States was framing the value of a college/university degree increasingly in terms of an individual's potential for lifetime earnings as well as the nation's human capital available for research, development, and production. Education was becoming more about careers and "competencies" (a word Kuh himself used, although in a larger sense than others have) and less about inquiry, meaning-making, and a broadly humane view of human capacity. Kuh's essay implicitly recognized that one of the great costs of abandoning these more expansive views of the purpose of higher education was that students might become alienated from their own learning experiences. He was right. Even as "student-centered learning" became the mantra, the increased attention to outcomes and objectives served (and still serves) to enable a narrowing, behaviorist focus on easily measured, easily described outcomes linked to detailed prescriptions, policies, and penalties, all contained within the *course contracts* (i.e., course syllabi).

By contrast, Kuh's "high-impact practices" sought to bolster and, in some cases, restore the idea of learning primarily as an adventure in discernment and self-actualization within a deeply relational social context, an adventure in synthesis and integration. Kuh's conceptual framework assumed a progressive culture of education, one that would emphasize individual learning within a growing network of connections ranging from the personal to the highly conceptual. Such a network is what Jerome Bruner called, fifty years ago, "the web of social reciprocity."[2] In Kuh's framework, support for the networked discovery of connections would be at the center of both the learning environment as designed by faculty and the learning environment as experienced by students.

Kuh listed ten high-impact practices, arranged in a cornerstone-to-capstone design that explicitly merged curricular and cocurricular (i.e., not course- or classroom-defined) learning. His design addressed the need for a comprehensive approach to student learning at the undergraduate level; as he noted: "On almost all campuses, utilization of active learning practices is unsystematic, to the detriment of student learning." Within Kuh's design are practices, mostly but not entirely in the cocurricular area, that have come to be called *experiential learning:* study abroad, internships, service learning, and community engagement. Depending on the institution, undergraduate research may also be included in the category of experiential learning. The common denominator is a real-world context that provides deeply integrative opportunities for classroom-based learning to be applied to complex and complexly situated problems or opportunities.

Yet one crucial item does not appear on Kuh's list: networked learning by means of the Internet, particularly the World Wide Web. In *Turing's Cathedral: The Origins of the Digital Universe,* George Dyson observed: "The stored-program computer, as conceived by Alan Turing and delivered by John von Neumann, broke the distinction between numbers that *mean* things and numbers that *do* things. Our universe would never be the same."[3] Unfortunately, most of higher education has overlooked, ignored, or flatly denied this crucial turning point, even as we rightly valorize and seek to preserve earlier forms of networked learning implicit within the very word *university.*

Although the management structures of course schedules, credit hours, online registration (so akin to online banking), "learning management," and all the mechanics of "student success" may make the experience of learning more compartmentalized and fragmented, there is still a core set of pre-digital networked learning experiences at the heart of higher education. Go into your nearest college or university library. Ignore the computer stations and the digital affordances. Enter the stacks, and run your fingers along the spines of the books on the shelves. You're tracing nodes and connections. You're touching networked learning—slow-motion and erratic, to be sure, but solid and present and, truth to tell, thrilling. The founders of the age of digital networked computing—dreamers and builders such as Vannevar Bush, J.C.R. Licklider, Douglas Engelbart, Ted Nelson, Alan Kay, and Adele Goldberg—sought to amplify the reach and impact of networked learning and the collective intelligence of the species. They quickly realized the intoxicatingly experiential nature of the cyberspace they helped to invent—a thrill like that of learning what a library truly represents. Why not offer students an experience of the sense of exhilarating possibility within the cyberspace they take for granted, the cyberspace that LMSs and apps have begun to remove from our view?

As we consider high-impact practices in light of contemporary culture, we must add digitally mediated networked learning to Kuh's list, because the experience of building and participating within a digitally mediated network of discovery and collaboration is an increasingly necessary foundation for all other forms of experiential learning in a digital age. Moreover, the experience of building and participating within a digitally mediated network of discovery is itself a form of experiential learning,

New Horizons Editor: **Shelli B. Fowler**

By GARDNER CAMPBELL

indeed a kind of metaexperiential learning that vividly and concretely teaches the experience of networks themselves. With networks replacing ladders and trees as a primary metaphor to describe the structures of knowledge, digitally networked learning becomes marvelously recursive as a site of integration: the very experience deepens learners' understanding of the condition of learning itself within a strongly social context that can mobilize communities of practice quickly and effectively.[4] If there is anything that the Internet and the web should have taught us, it is that what Engelbart called a "dynamic knowledge repository" is a computer-mediated manifestation of the collective work of civilization, a manifestation as real as any other form of mediated experience and, in light of Dyson's observation, one that has properties as powerful, and malleable, as language itself.

No one believes that knowing the alphabet and sounding out words mean that a person possesses the deep literacy needed for college-level learning. Yet our ideas about digital literacy are steadily becoming more impoverished, to the point that many of my current students, immersed in a "walled garden" world of apps and social media, know almost nothing about the web or the Internet. For the first time since the emergence of the web, this past year I discovered that the majority of my sophomore-level students did not understand the concept of a URL and thus struggled with the effective use and formation of hyperlinks in the networked writing class that VCU's University College affectionately calls "Thought Vectors in Concept Space" (http://thoughtvectors.net)—a phrase attributed by Kay to Engelbart and one that describes the fundamentally experiential aspect of networked learning.[5] My students appeared not to be able to parse the domains in which they published their work, which meant that they could not consistently imagine how to locate or link to each other's work by simply examining the structure of the URLs involved. If one cannot understand the organizing principles of a built environment, one cannot contribute to the building. And if one cannot contribute to the building, certain vital modes of knowing will be forever out of reach.

Yet educators seeking to provide what Carl Rogers called the "freedom to learn" continue to work on those digital high-impact practices.[6] It is a paradoxical task, to be sure, but it is one worth attempting—particularly now, when "for the first time in the still-short span of human history, the experience of creating media for a potentially large public is available to a multitude."[7] Students' experience of what Henry Jenkins has articulated as the networked mediation of "participatory culture" must extend their experience to school as well.[8] School as a site of the high-impact practice of learner-built, instructor-facilitated, digitally networked learning can transform the experience of education even as it preserves, and scales, our commitment to the education of the whole person.

The web was designed for just this kind of collaboration. One does not need permission to make a hyperlink. Yet one does need "the confident insight, the *authority* of media-making" to create meaning out of those links. Such confidence and authority should be among the highest learning outcomes available to our students within what Mimi Ito and others have described as "connected learning."[9] Learner-initiated connections that identify both the nodes and the lines between them, instead of merely connecting the dots that teachers have already established (valuable as that might be), co-create what Lawrence Stenhouse argues is "the nature of knowledge . . . as distinct from information"—"a structure to sustain creative thought and provide frameworks for judgment." Such structures can encourage an enormously beneficial flowering of human diversity, one that lies beyond the reach of prefabricated outcomes: "Education as induction into knowledge is successful to the extent that it makes the behavioural outcomes of the students unpredictable."[10]

Offering students the possibility of experiential learning in personal, interactive, networked computing—in all its gloriously messy varieties—provides the richest opportunity yet for integrative thinking within and beyond "schooling." If higher education can embrace the complexity of networked learning and can value the condition of emergence that networked learning empowers, there may still be time to encourage networked learning as a structure and a disposition, a design and a habit of being. ■

Notes

1. George D. Kuh, *High-Impact Educational Practices: What They Are, Who Has Access to Them, and Why They Matter* (Washington, DC: Association of American Colleges and Universities, 2008).
2. Jerome S. Bruner, *Toward A Theory of Instruction* (Cambridge, MA: Belknap Press of Harvard University, 1966).
3. George Dyson, *Turing's Cathedral: The Origins of the Digital Universe* (New York: Pantheon Books, 2012), ix.
4. For an elegant exposition of the paradigm shift to networks, see the TED Talk by Manuel Lima, "A Visual History of Human Knowledge," TED2015, March 2015, http://www.ted.com/talks/manuel_lima_a_visual_history_of_human_knowledge.
5. See Doug Engelbart, Alan Kay, Ted Nelson, and Tim Berners-Lee, panel discussion, MIT/Brown Vannevar Bush Symposium, Cambridge, Massachusetts, October 13, 1995, http://cs.brown.edu/memex/Bush_Symposium_Panels.html#Day%202%20Panel.
6. Carl R. Rogers, *Freedom to Learn: A View of What Education Might Become* (Columbus, OH: C. E. Merrill, 1969). George Siemens's work on connectivist learning is vital in this regard.
7. Scott Rosenberg, "Doing Is Knowing: 'Sweet Jane' and the Web," *Wordyard Project*, August 10, 2014, http://www.wordyard.com/2014/08/10/doing-is-knowing-sweet-jane-and-the-web.
8. Henry Jenkins et al., *Confronting the Challenges of Participatory Culture: Media Education for the 21st Century* (Cambridge: MIT Press, 2009), https://mitpress.mit.edu/sites/default/files/titles/free_download/9780262513623_Confronting_the_Challenges.pdf.
9. For Ito's most recently published thoughts on this topic, see Henry Jenkins, Mizuko Ito, and danah boyd, *Participatory Culture in a Networked Era: A Conversation on Youth, Learning, Commerce, and Politics* (Malden, MA.: Polity Press, 2015).
10. Lawrence Stenhouse, *An Introduction to Curriculum Research and Development* (London: Heinemann, 1975), 82.

Gardner Campbell (gardner.campbell@gmail.com) is Vice Provost for Learning Innovation and Student Success and Dean, University College, at Virginia Commonwealth University (VCU).

Engaging on Purpose in Higher Education

In the world of higher education, the needs are great, possibilities powerful, and partners diverse. Students are facing a future that increasingly requires deeper learning *and* labor-market-valued credentials, along with relevant work experience *and* civic engagement opportunities to help them take meaningful steps on the path toward living well and actively participating in today's rowdy digital democracy. In the United States, state and federal governments, foundations, and associations are constantly calling for more—and more diverse—students to successfully complete higher education journeys to fuel the economy and brace us for a road ahead that promises innovation and uncertainty. Finding funding for these needs has been challenging, to say the least. The painful "new normal" is significantly lower funding with significantly higher expectations. Addressing this new normal will require a purposeful engagement of *all* members of the higher education sector.

Thankfully an explosion in new tools, techniques, policies, and practice is at hand. Walk the halls of leading higher education membership association events (e.g., AASCU, AAC&U, APLU, AACC), the EDUCAUSE annual conference, or an ASU GSV Summit, for example, and one can't help but be wowed by the possibilities. Those of us who are educators and who love experimenting to improve and expand education opportunities should do our best to make the most of the moment. We are entering a golden age of learning fueled by societal needs, economic imperatives, compelling digital tools, imaginative educational practice, and advanced data analytics that together can truly help us all, across the higher education sector, stretch the boundaries and improve the outcomes of our educational systems.

> If we can all engage *on purpose*, we're more likely to make the most of the golden age of learning.

Not surprisingly and quite appropriately, these innovations and experimentations are accompanied by conversations about intentions and impact, calls for scale and sustainability, and dialogues about age-old truths versus seriously limiting folklore. The reverberations of these conversations are ringing in strategic planning sessions, among faculty senates, and even with students. Regarding the last, I wrote an "open letter" to students in the July/August 2012 issue of *EDUCAUSE Review*. There I made the case that we will be hardpressed to make a difference with all of this technology innovation and energy if the students themselves don't commit to finding their purpose, engaging deeply, and bringing the best of growth mindsets and tenacious attitudes into the mix.[1]

Furthering these innovations and conversations in the golden age of learning demands on-purpose and intentional engagement among all sector players. Throughout my more than twenty years of work in higher education, I've had the great fortune of serving the field in academic, administrative, association, foundation, and corporate roles. Moreover, I've consulted with civic bodies, regional collaborations, statehouses, federal agencies, and foreign governments. From each of these vistas, I have seen a different view of the possibilities, problems, people, politics, and more. Based on this experience, I've learned it is vital to do the hard work of catalyzing real engagement around the shared interests of education sector players, early and often, to allow needed change to take hold.

For example, regardless of how significant the impact of new technology tools or teaching practice is in improving student learning, without accreditors or regulators to establish policy that makes the exciting tools accessible or the innovative practices practical, they are unlikely to make a difference for most students outside of well-meaning pilot programs. In another example, if a regional education ecosystem of K–12, community college, and university players can't effectively engage one another and partner around improving student outcomes, students will often find themselves needing to hop from an island of innovation into another sector and being punished by a lack of curriculum transferability or technology compatibility.

An especially important and often neglected area for purposeful collaboration is between higher education institutions and the vendor community serving this space. Often, irresponsible actors or standing traditions have kept these connections at bay. However, at their best, these collaborations can be marked by authentic engagement, shared learning, and catalytic innovation. The Society of College and University Planning (SCUP) embraces this type of deep engagement with the vendor community, emphasizing that to lead in infrastructure, academic, and financial planning, its members must sit side-by-side with vendors to solve problems.

Likewise, in October 2015 I had the pleasure of co-chairing, with Tracy Schroeder, the first meeting of the EDUCAUSE Corporate Membership Advisory Committee (http://www.educause.edu/about/mission-and-organization/governance-and-leadership/member-committees/corporate-membership-advisory-committee). In the meeting, members made it clear

Viewpoints Editor: **John Suess**

By MARK MILLIRON

that they were most interested in "real conversation" with educators in a sector that is changing quickly. Many noted that this could be *the* strategic value of their EDUCAUSE corporate membership, even more so than the impressive exhibit floor of the EDUCAUSE annual conference. They wanted deeper dialogues around coming trends, shared learning in different sector dynamics (e.g., community colleges, four-year institutions), and conversations about what educators see as their biggest needs. Indeed, several members noted that without this engagement, *they are in danger of simply providing high-tech instrumentation to the practice and policy status quo*. Or worse, some vendors might design tools and technologies that are so far afield that they sound good in a pitch meeting for venture capitalists but carry no resonance with educators or students.

If, however, there are more vehicles for authentic engagement between the education field and the vendor community on tough problems such as developmental education, student retention, deeper learning, credential completion, and the need for relevant life and job skills, *hundreds of millions of dollars and thousands of hours of time and effort in research and development could be put into helping the education field address its most pressing problems*. For these reasons, Charles Thornburgh and I founded Civitas Learning as a social-purpose organization, adopting a mission stating that we wanted to work closely with leading colleges and universities to help them make the most of their data in order to enable a "Million More" students each year learn well and finish strong (http://www.civitaslearning.com/mission/). We especially wanted to inform innovation on the front lines of learning, to democratize data for faculty, advisors, and students. With organizations like EDUCAUSE catalyzing engagement around powerful purpose in education, especially during this dynamic time in our field, higher education vendors will be better positioned to bring significant resources and stellar talent to bear to support learning and completion goals. For example, ERP vendors can be ready earlier with capabilities to manage innovative financial aid strategies, LMS vendors can power competency-based models, advising services vendors can enable nontraditional advising strategies, publishers can integrate open education capabilities, and analytics systems can help institutions better leverage the diverse and deeper active-student data at hand to gain insight, take thoughtful action, and continue learning as they develop and implement new practice and policy.

Of course, the vendor sector does include some self-interested people who are not focused on improving student learning and completion. I'm not denying that. Engaging with these folks can be exhausting and nonproductive and should be avoided at all costs. By the way, I've also met, in all sectors in and around higher education, plenty of other self-interested people who are not focused on improving student learning and completion, and the same admonitions apply. Thankfully, however, those people who are not focused on student success are greatly outnumbered by the incredibly talented people who want to help dedicated educators thrive and hard-working students strive. It's why they chose the sector in the first place; it's the purpose that drives their work. And if we can all engage *on purpose*, we're more likely to make the most of the golden age of learning while making a difference in the lives of millions of students traveling on higher education pathways. ■

Note

1. Mark David Milliron, "An Open Letter to Students: You're the Game Changer in Next-Generation Learning," *EDUCAUSE Review* 47, no. 4 (July/August 2012), http://er.educause.edu/articles/2012/7/an-open-letter-to-students-youre-the-game-changer-in-nextgeneration-learning.

Mark Milliron (mark.milliron@civitaslearning.com) is Co-Founder and Chief Learning Officer of Civitas Learning and is Co-Chair of the EDUCAUSE Corporate Membership Advisory Committee.

Why IT Matters to Higher Education
EDUCAUSEreview

How to Implement an Accessibility Policy

Lucy Greco and Anna Gazdowicz

The University of California at Berkeley follows the precept "accessibility equals usability," as demonstrated in its accessibility policy and website review team of system-wide collaborators. »

educause.edu/ERO

Search

The EDUCAUSE 2016 Top 10 IT Issues

This video provides an introduction to this year's top concerns in higher education information technology, as chosen by members of the higher ed IT community who live with these problems on their campuses and often deal with them daily. »

Leading an Effective Briefing with Board Executives about Information Security

Brian Basgen and Tammy Clark

Educating your institution's governing board about information security gives them a clearer picture of organizational cybersecurity challenges and the potential costs to your institution of failing to manage cyber threats and risks. »

Responding to Targeted Cyber Attacks

David Nevin

More dangerous than opportunistic cyber attacks, targeted attacks display a sophistication and effectiveness that can seriously damage a university's cybersecurity and reputation. Security experts share their advice on responding to these incidents. »

The Time "Next Business Day" Bit Us

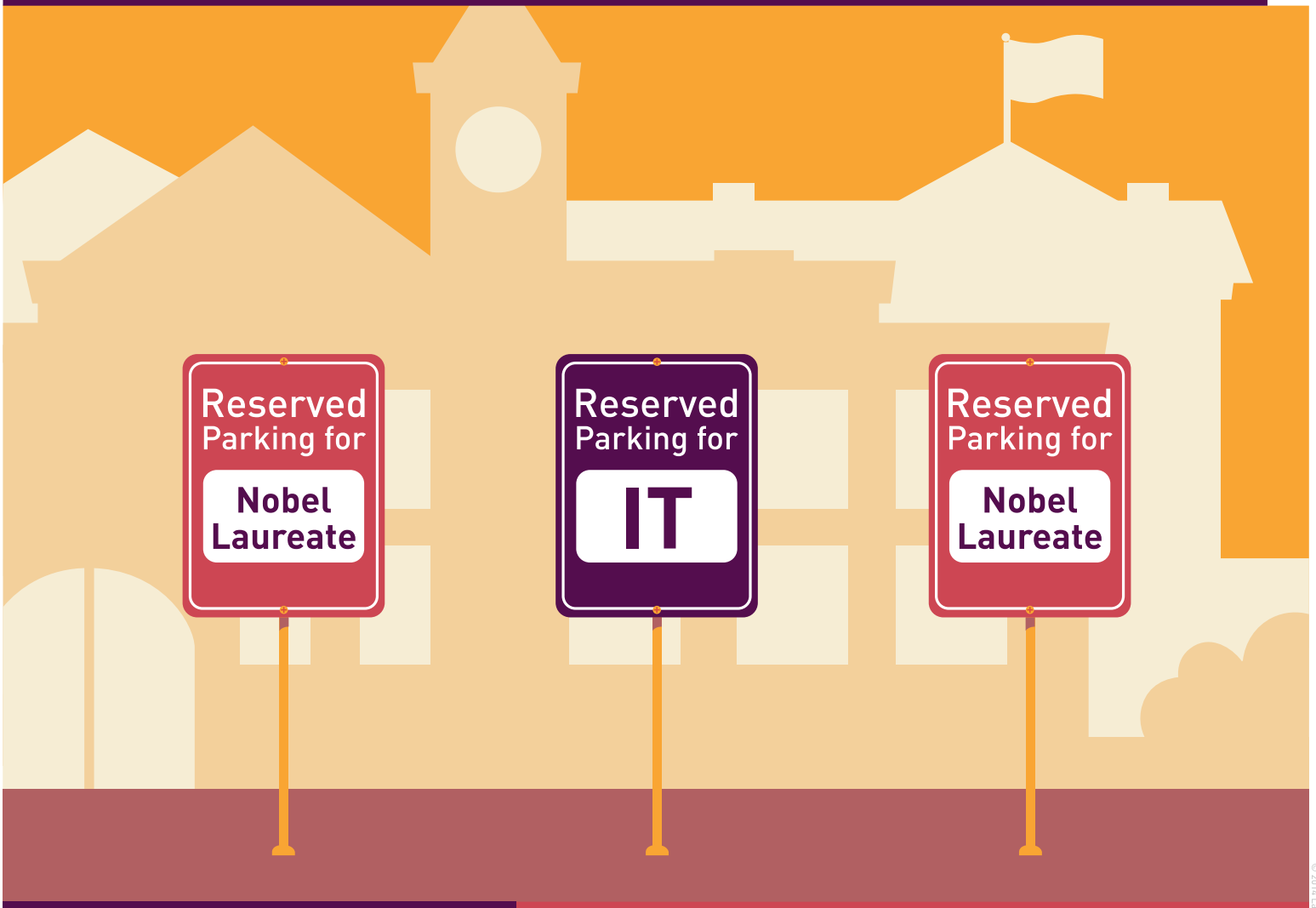
Jason Whitaker

Learn why carefully reviewing IT service contracts must be part of every institution's annual disaster recovery audit: the terms of service can come back to bite you, as this university discovered. »

Upcoming issues will focus on personalized learning, the future of work, the Internet of Things, and analytics. Share your work and ideas with *EDUCAUSE Review*—contact **editors@educause.edu**.

EDUCAUSE

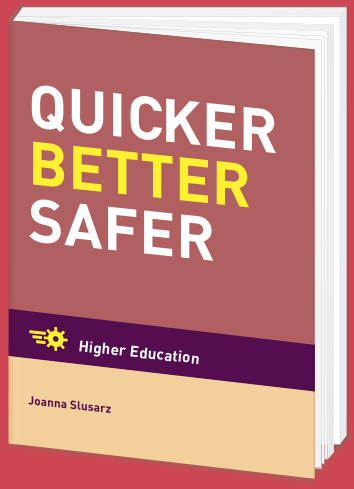
Document Management Solutions That Secure Your Spot



10 back-office projects to make IT the front-of-mind campus leader in administrative excellence.

Download a **FREE COPY** of Quicker Better Safer, a book of 10 business process solutions written by IT professionals from Texas A&M University System, California State University, University of Oklahoma and more.

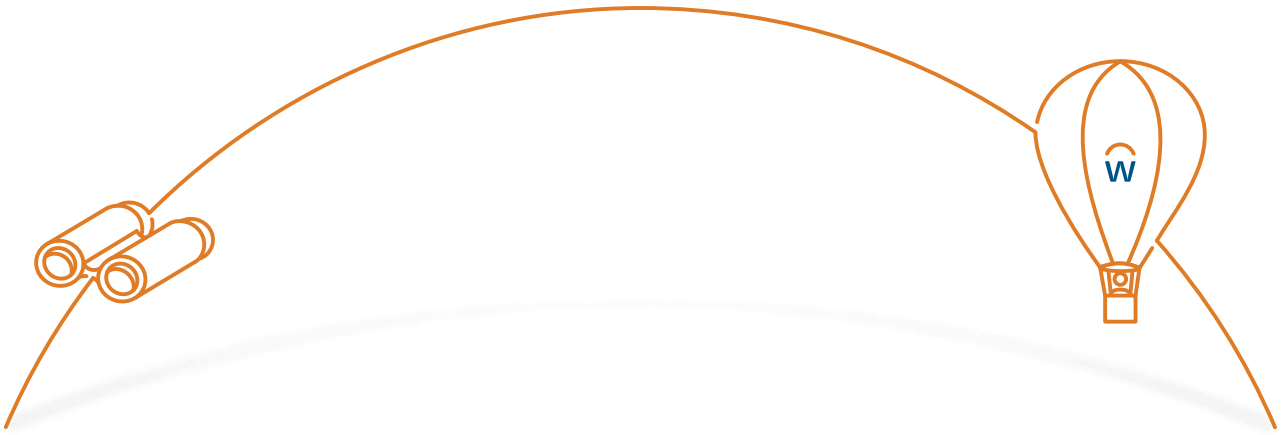
- Academic Advising
- Financial Aid
- Contract Management
- Records Management



laserfiche.com/leader

Run Smarter®

Laserfiche®



Should my finance, HR, and student systems help me rise above the challenges facing higher education?

Absolutely.

Workday gives you complete visibility across your entire institution.
From recruitment to retirement, you can manage growing challenges in the student and facutly lifecycle. Only our modern system can unify faculty, student, and administrative information in a single application built for the cloud.

workday.
Built for the future.™

workday.com/edu