Why IT Matters to Higher Education

EDUCAUSE review

JULY/AUGUST 2018

20 YEARS

A Look at Where We've Been and Where We're Heading

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Why IT Matters to Higher Education
EDUCAUSE review
JULY/AUGUST 2018 VOLUME 53, NUMBER 4

FEATURES

Why IT Matters to Higher Education
EDUCAUSE review

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.

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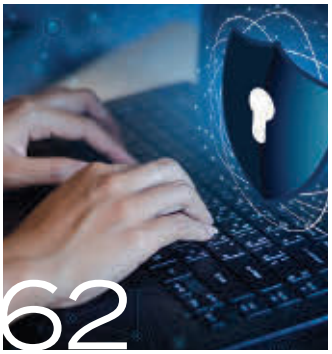
JULY/AUGUST 2018 VOLUME 53, NUMBER 4

COLUMNS



Volume 53, Number 4. *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 $54 per year ($84 per year outside North America) and to all academic libraries (North America and international) at $54 per year. Single copies are available for $11 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: Jon Valk

20 Years of Higher Ed IT

Looking for more?

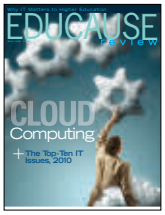
Explore these *EDUCAUSE Review* articles and issues.

Analytics

September/October 2011

September/October 2016

Cloud



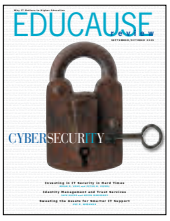
May/June 2010

Collaboration

Bryan Alexander, "Web 2.0: A New Wave of Innovation for Teaching and Learning?" (March/April 2006)

Cyber Risks/ Security/ Privacy

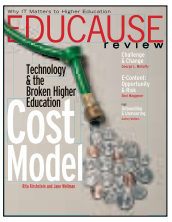
September/October 2006



September/October 2009

Defunding of Higher Education

November/December 2004



Rita Kirshstein and Jane Wellman, "Technology and the Broken Higher Education Cost Model" (September/October 2012)

Internet

Vint Cerf, "Musings on the Internet": Part 1 (January/February 2002); Part 2 (January/February 2004)

Michael M. Roberts, "Lessons for the Future Internet: Learning from the Past" (July/August 2006)

Larry Sanger, "Individual Knowledge in the Internet Age" (March/April 2010)

Erik Huizer, "Freedom, Permissionless Innovation, and a Successful Internet" (November/December 2016)

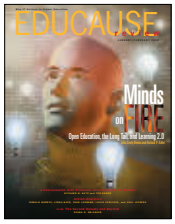
Mobile

March/April 2011

Gardner Campbell et al., "The Wild-Card Character of 'Bring Your Own'" (March/April 2013)

Open

Charles Vest, "Open Content and the Emerging Global Meta-University" (May/June 2006)



John Seely Brown and Richard Adler, "Minds on Fire: Open Education, the Long Tail, and Learning 2.0" (January/February 2008)

Catherine Cronin, "Open Education, Open Questions" (November/December 2017)

Social Media & Networking

Howard Rheingold, "Attention, and Other 21st-Century Social Media Literacies" (September/October 2010)

danah boyd, "Streams of Content, Limited Attention: The Flow of Information through Social Media" (September/October 2010)

Strategic Technology

Milton D. Glick, with Jake Kupiec, "The Answer Is Still Technology—Strategic Technology" (November/December 2001)

By JOHN O'BRIEN

The Pencil Lines of Our Past and Future

Like many other youngest siblings, when I had a birthday as a kid, I always wanted to be older than I was, actively chasing after the impossible dream of catching up to my siblings. My son measured his birthdays differently, with pencil lines on his closet wall to mark, year after year, his ever-increasing height. Anniversaries are subjective experiences. Two people can look back over the same history and see it completely differently, noting different trends and milestones and drawing different conclusions from the very same landmarks. As we celebrate the first twenty years of EDUCAUSE and also look ahead in this issue of *EDUCAUSE Review*, we offer multiple opportunities for readers to revel in our collective history and future from unique and varying points of view.

To capture personal perspectives, we asked our members four questions, and in "Twenty Years: EDUCAUSE and Higher Education IT" we share these remembrances, predictions, and insights from across our community. The reflections begin with "15-in-20," the fifteen most significant developments in the past twenty years. With a wide variety of nominations, the internet was nevertheless the clear winner. As Jennifer Sparrow noted, access to internet resources "changed who has access to knowledge and how we can leverage it to create curiosity in our learners." Many members' contemplations are personal in nature, since our sense of the past is persistently defined by the events that affected us most powerfully. Depending on your own journey, different voices will speak to you more directly. I found myself drawn to observations of the sweeping changes in information technology. For instance, David Smallen notes: "Institutions of all types have recognized IT as a strategic resource, and CIOs have increasingly become part of institutional leadership at the highest levels. IT has been recognized as foundational/strategic in most areas of college and university life." And I particularly appreciated Damien Koemans's insight that "the most significant moments were not those that came to be but the ones that didn't." While MOOCs are his example, we could all name our own technology dreams that never quite materialized.

Two people can look back over the same history and see it completely differently, noting different trends and milestones and drawing different conclusions from the very same landmarks.

Meanwhile, in his article "Twenty Years of Edtech," Martin Weller, Professor of Educational Technology at Open University, recognizes that educational technology is inherently such a forward-looking enterprise that we typically don't make the time to reflect on our own history, even when ideas come and go and often reemerge years later under new management. While Weller's wonderful concatenation of historical milestones since the birth of EDUCAUSE is valuable in many ways, I find this thread of ideas coming and going and being reborn particularly interesting. In his broad vision, one can see how wikis (1998) are connected to blogs (2003) and ultimately to MOOCs (2012)—and may yet come again in another form. Weller's history will remind some readers of the countless hours spent building education islands in Second Life (2007), but he understands that this technology too lies waiting possible rebirth as AR and VR become mainstream: "Virtual worlds for learning may be one of those technologies due for a comeback."

Following this look to the past, Southern New Hampshire University President Paul LeBlanc focuses on the future. His view of EDUCAUSE in 2038 shares my fascination with examining the point where the past, the present, and the future come together in surprising ways. LeBlanc concentrates on what he calls "signals from the future," technological developments that—even if unsuccessful—can powerfully presage future trends. For example, he tells the story of his first introduction to the Newton PDA from Apple twenty years ago. While that device did not survive, it begat the PalmPilot, which begat the Blackberry, which begat the iPhone and eventually the iPad. Just as the Newton was a signal

(continued on page 6)

PRODUCTS @ WORK SERIES

Large Active Learning project using round clusters (9 seats per cluster)

In 2015 California State University created a 180 seat Active Learning space on their Dominguez Hills Campus.

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(continued from page 4)

from the future, so too were the computer game *Myst*, Google Glass, and Fitbit. LeBlanc concludes with some suggestions for what other signals may lie ahead on the road to our fortieth anniversary. For me, LeBlanc's perspective suggests that rather than waiting for decade milestones to take stock of where we are and where we're headed, we should be future-aware every year, continually watching for signals.

At one point or another, the insights from our members, Weller, and LeBlanc note that as we round out the last twenty years, we are entering a new period in the evolution of higher education information technology—one with less focus on the technology itself and more attention on the implications of the technology. If the first wave of higher education information technology was establishing technology as a utility, followed by a second wave in which technology became recognized as strategically critical, there is strong evidence that the next wave will find us grappling not with what technology is or what it does but with what it *means* for society and humanity. For example, LeBlanc looks to "EDUCAUSE 2038" to provide an understanding of the ethics, morality, and philosophy of emerging technologies and advises: "We will need as many ethicists and sociologists at EDUCAUSE gatherings as IT staff and edtech vendors." Susan E. Metros extends this imperative to students: "As IT professionals, we need to provide services and invent tools that will help students sort through the moral and ethical issues of seeing while questioning whether to believe."

Along these lines, Weller, in his consideration of data analytics, stresses the need to embed an ethical dimension into our use and commodification of student data. When it comes to artificial intelligence (reborn from the intelligent tutoring systems of the 1980s and 1990s), he sees the ethical issues as "more significant" than the technological ones. AI assumptions will shape how education is realized and how learners are served: "If learners don't fit that conceptual model, they will find themselves outside of the area in which compassion will allow a human to alter or intervene." Marty Ringle compellingly summarizes the challenge and the opportunity as he recalls a course he taught more than forty years ago: "I went to great lengths to emphasize that the thrill of inventing new technologies needed to be tempered by an understanding of how those technologies might alter society and impact individuals." Now, as we undertake implementing this decade's set of new technology tools, he stresses: "The need to be mindful of the ethical implications of what we do—especially in education—is greater than ever." His caution? "Let's not screw it up."

The pencil lines that mark EDUCAUSE's next twenty years will, I believe, track a unique and more crucial set of accomplishments.

Perhaps our most important and consequential milestones are ahead of us, because they involve humanity with a capital H. As Deborah Keyek-Franssen observes, we still need to learn how to balance "the uses of technology with the values of human interaction." The pencil lines that mark EDUCAUSE's next twenty years will, I believe, track a unique and more crucial set of accomplishments. Maybe this is what the enigmatic Bill Hogue means when he says we must "seek questions hidden by answers."

The challenges, like the technologies, will come and go, and the jumble of competing ideas is confounding and inspiring, unclear and concrete. Ultimately, the EDUCAUSE community represents the best chance of tackling the hurdles instead of being tackled by them. Bob Flynn comments: "The establishment of organizations like EDUCAUSE gave voice to and fostered community among those whose work plays an increasingly fundamental role in support for, enablement of, and innovation in the core research and academic missions of our institutions. As we move into the future, both known and unknown, we should not lose sight of those important foundations. That is the source of the strength of EDUCAUSE and the institutions it serves." That collective strength tells the story of the founding of EDUCAUSE in July 1998, our thriving community today, and the promising years of collaboration ahead.

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

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IT and Governing Boards: A Conversation with Richard Legon

In November 2017, the Board of Directors of the Association of Governing Boards of Universities and Colleges (AGB) issued a best-practice statement on the challenges associated with encouraging and supporting a culture of innovation. The *AGB Board of Directors' Statement on Innovation in Higher Education* not only made the case for building a culture of innovation on campus but also recognized the essential nature of information technology to such an effort.

EDUCAUSE CEO and President John O'Brien was a member of the task force charged with developing this statement. Earlier this year, he followed up with Richard Legon to talk further about how technology can help create a culture that welcomes innovation.

JOHN O'BRIEN: *Do you think college and university boards are lagging in their approach to technology innovation?*

RICHARD LEGON: There is a clear recognition among higher education leadership, including governing bodies, that technology has a direct bearing on how students learn and how students are recruited and enrolled. But boards have historically seen technology as a tactic that *supports* an institution's priorities rather than as a strategy in itself. And so in today's more volatile and uncertain environment for higher education, boards are responsible for asking about the cost/benefit of more expansive investments in technology. Is the cost worth the benefit? Specifically, what is the benefit of investing boldly in technology—and will the institution be able to maintain its currency?

Happily, we see boards asking the right questions about technology at the strategic level. Presidents are engaging boards on the complex issues that are linked to technology. Some boards have established committees or task forces on the subject of innovation and technology. For a few trustees this is a learning curve, with boards enjoying the opportunity to learn and to ask the right kind of questions. In the end, boards need to add value by participating in the technology decision-making process, working with and supporting presidents, CIOs, and other institutional leaders. The process is part of both today's challenges and tomorrow's opportunities, and it relates directly to a willingness to assume risk on the path to innovation.

> Your board may not support all of your ideas, but you should—we all should—be taking "shots on goal." Some will go in.

O'BRIEN: *You just explained, rather convincingly, why technology innovation is such a challenge. But this sounds a bit like jumping on a train that may or may not have already left the station.*

LEGON: Sure, except the train is driven by competing priorities and stakeholder interests. This is where governing boards need to temporize their input: they need to balance interest and curiosity in and assessment of risk tolerance with their responsibility to support effective institutional leadership. Boards shouldn't get so granular that they are selecting which cars make up the full train. It's a very tricky balancing act between appropriate board engagement and respect for administrative and academic leadership. The good news is that boards realize that for institutions to compete in today's higher education environment, innovation becomes almost non-optional. And they know that innovating requires touching technology very directly and aggressively.

O'BRIEN: *When you decided to develop a statement on innovation, you invited me to be a part of this effort. For me that was a powerful statement because EDUCAUSE has been working hard to ensure that information technology is "at the table" on campus.*

LEGON: AGB's board leaders and staff saw the challenges, across the sector, of addressing the changes confronting higher education. They believed that a governing board's most essential contribution to the process of innovation is to set a tone (or to develop a culture) in which institutional stakeholders can find sufficient common ground to address the future collaboratively. From the start, they were intentional about technology. Clearly, institutional IT leaders are at the tables today—both the CEO's and the board's.

O'BRIEN: *If I'm a senior IT leader, how and when should I interact with my board? Some would say that being on the board's radar is great, and some might find the experience unnerving.*

LEGON: I think the dynamic has changed—and certainly it should. I'm currently on the Board of Trustees at Spelman College, and we receive periodic updates from the CIO. His plans are relevant to our future as an institution that is changing for a very different future. The CIO should be an essential part of a president's team. Likewise, IT administrators should be a part

By RICHARD LEGON

Fabio Consoli © 2018

of a board's agenda—or of the agenda of an appropriate committee. Being on the board's radar is important, and we need to keep in mind that as institutions establish specific funding campaigns, technology has become an increasingly important funding priority. Boards need to hear this and learn.

O'BRIEN: *Information security risk seems to be on a lot of board agendas.*

LEGON: Absolutely. It's essential that the board is fully informed, in an organized manner, about the scope of all institutional risks. The board needs to be certain that a comprehensive risk-assessment process is in place across the institution. Ultimately, the board should be made aware of those risks that pose the greatest threat and/or are being "watched" by the administration. A governing board must understand the nature posed by those risks that are presented as being high-potential/high-impact—and the board must be comfortable with how such risks are being addressed. Governing boards should be cognizant of their responsibility to support administration initiatives to anticipate risks as well to address those that are immediate threats.

O'BRIEN: *What would you tell a CIO from one of our member colleges or universities about how to be effective in working with his/her board?*

LEGON: Work with your supervisor to be sure that you have periodic airtime with the governing board or an appropriate committee. If you do present to the board, be certain that you frame the conversation in a manner that informs without getting too deep into the weeds. Keep in mind that your board has a strategic focus and a responsibility to ensure that the institution's mission is being met. What you do is a vehicle for meeting the latter priority. Most governing boards appreciate the changing role of technology in their institution, and they want to hear from you.

Today's higher education requires some bold thinking. Boards don't punish creativity or bold ideas. Your board may not support all of your ideas, but you should—we all should—be taking "shots on goal." Some will go in. ■

Richard Legon is President of the Association of Governing Boards of Universities and Colleges (AGB).

ILLUSTRATION BY JON VALK, © 2018

EDUCAUSE & Higher Education IT

On July 1, 1998, EDUCAUSE was created through a merger between CAUSE and Educom, with an original mission to advance higher education by promoting the intelligent use of information technology.[1] To commemorate this anniversary, we hoped not only to review the monumental changes in the higher education IT field over the past two decades but also to glimpse into the future. And since we wanted to share broader perspectives from across our community, we gave you—our members—a chance to reflect on the anniversary. We asked you four questions as a way to solicit your opinions about the past, the future, and the intersection between the two.

We received approximately fifty responses—from EDUCAUSE members across professional titles, institutions, and years in the field. While not a quantitative study, the remarkable insights from members like you are valuable in other ways, creating a picture of the breadth and depth of members' perspectives.

Part 1 and Part 2 highlight significant moments observed in the past and predicted for the future. Impressions of the past twenty years produced fifteen events that fell quite distinctly into three levels and generated consensus on the #1 development. However, respondents listed numerous and varied additional suggestions, resulting in Runners-up (2 nominations each) and Honorable Mentions (1 each). Interestingly, our respondents were much more unified in their view of the future, with just two developments coming in (with approximately equal votes) far ahead of all others. Part 3 and Part 4 offer our respondents' insightful forecasts for the years ahead, followed by their sage advice for dealing with the dynamic higher ed IT environments to come.

Enjoy!

EDUCAUSE review

Note

1. "Roots of EDUCAUSE," EDUCAUSE (website), accessed May 21, 2018.

PART 1: 15-IN-20

What do you consider to be the most significant moments (e.g., developments, activities) in higher ed IT over the last twenty years?

LEVEL ONE

Internet → WWW → Mosaic

The rise of global connectivity and networked applications supported by internet technology, especially Mosaic/Netscape and the web, produced a whole new set of stresses on academia and forced a holistic view of IT as a technology base affecting all teaching and research activities.

—MIKE ROBERTS

Sure, the internet was a big deal. But without the truly functional web browsers and good search engines that appeared beginning in the late 1990s and early 2000s, we would not have been able to redesign enrollment management, course instruction/learning, and most every other tool we use every day and now take for granted. (*Hint*: Remember what it was like attempting to do integrated functions on SIS+?)

—JOHN C. CAVANAUGH

The growth of the internet and the web. In about 1995, a group I managed in a research center started making full-text research papers available on the web (with permission of authors, of course). We were told we could not make them available with links in the main campus library because it would set user expectations too high—users might expect other articles and papers to be available in full text. And at the time, that argument was somewhat reasonable. Now we're at a point where if something is *not* available in full text on the internet, we're surprised.

—ELIZABETH A. EVANS

***Widely available internet resources and the wireless access to these resources.* This is important as it has changed who has access to knowledge and how we can leverage it to create curiosity in our learners.**

—JENNIFER SPARROW

The development of internet identity, first within higher ed and then more broadly in the marketplace, was essential in adding a layer to the original internet that allowed scalable use of the network. If the original internet connected machines together, internet identity connected people together.

—KEN KLINGENSTEIN

Almost all higher education institutions are now connected to the internet. This has been the most transformative technological development impacting education over the last twenty years because it has opened at least the possibility of demolishing the parochialism of the traditional classroom experience, making education a truly global experience for the first time in human history.

—TOM HAYMES

Even in the 1990s, universities were still islands unto themselves, in large part. But the interconnectedness that has resulted from information technology and the development and pervasiveness of internet connectivity has led to the need for all of higher education to become much more of a regional, national, and global community of scholars. Organizations like EDUCAUSE have excelled by bringing the humanware together, just as the hardware and software were brought together by networking.

—BRIAN D. VOSS

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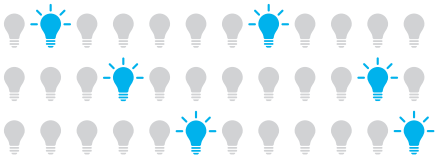

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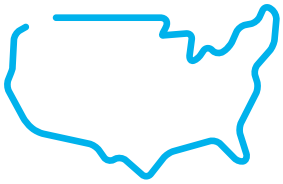

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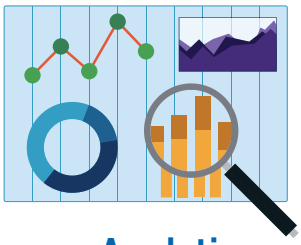
LEVEL TWO



Analytics

Analytics, whether structured or unstructured (AI), allow us to use facts/data to understand everything from student success to business intelligence.

—SUE WORKMAN

Cloud

Cloud services represent a major shift impacting pace of innovation, staffing, policies, and overall capabilities of the higher education institution.

—JEFF BOHRER

EDUCAUSE (founding)

I was chair of the Educom Board during the merger and was the inaugural chair of the EDUCAUSE Board. I think the merger was one of these significant moments. It represented the recognition by higher ed IT professionals of the evolving commonalities between academic [Educom] and administrative [CAUSE] systems and also between the integrative element of the internet, which had been the domain of academic technologies, and telephony/telecomm, which had been the domain of the administrative side of the house.

—DON RILEY

Strategic IT

The most significant changes/moments for higher education IT in the last twenty years have not been technological but, rather, have been in the areas of leadership and management. Institutions of all types have recognized IT as a strategic resource, and CIOs have increasingly become part of institutional leadership at the highest levels. IT has been recognized as foundational/strategic in most areas of college and university life.

—DAVID SMALLEN

Mobile

Mobility offered the opportunity to untether teaching and learning from the constraining boundaries of the classroom. Mobility in the form of laptops and mobile devices changed the way students interacted with knowledge in relation to where to find it, when to find it, and how to find it. Knowledge is no longer regulated to the confines of a textbook—it is ubiquitous. Students can look something up by swiping a finger or by uttering a question out loud. This empowers students to think critically, question the status quo, and expand on a topic to explore it more deeply.

—SUSAN E. METROS

By far the most significant moment in higher ed IT was the creation twenty years ago (on July 1, 1998) of EDUCAUSE through the merger of Educom and CAUSE. That was the moment that higher ed IT left its adolescence and became a cornerstone of higher education.

—MARTY RINGLE

Cyber Risks/ Security/ Privacy

The rise of Google as an indispensable infrastructure to find information, the economics and innovative power of cloud-sourced software services, and the abilities and ubiquity of mobile devices all combined to form the cumulative challenge of cyber risks.

—BRAD WHEELER

Online Learning/ Education

Online education brought the university into homes and made higher education available to people who were otherwise more limited in their options.

—MEGGAN LEVITT

LEVEL THREE

Collaboration

The continuing collaboration between universities, organizations, and nations to share their experiences with the aim of improving outcomes for students worldwide.

—STEVE JOHNSTON

Defunding of Higher Education

The defunding of higher education across the nation led to the student debt boom and to growing disbelief in higher education as a valuable investment.

—JIM PHELPS

Email

Ubiquitous email: everyone has an account, and everyone communicates about everything in email, including sending bills and grades notices.

—THERESA ROWE

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Learning Management Systems

The development of functional learning management systems. The ability to integrate electronic course materials, lectures, shared documents for student work, videos, and academic support services, along with grading and faculty tools, revolutionized instruction and spurred the development and deployment of high-impact practices. It also led directly to increased student academic success and degree completion through the ability to embed tutorial and other smart systems.

—JOHN C. CAVANAUGH

Open Technology & Open Educational Resources

The emergence and legitimizing of "open" technology projects ranging from Linux to Mozilla to Apache and more recently to Chromium, Android, and OpenFlow, and now to Kuali—may they continue indefinitely!

—ERIC DENNA

Social Media/Networking

With social media, students in classes can create community in a way that is fast, easy, and can be outside the control of faculty. The rapid spread of information through social networks can be good or bad, depending on the information but not depending on any control higher ed IT has on it.

—ELIZABETH A. EVANS

Wireless

Pervasive campus-wide wireless networking has enabled learning and services anywhere, anytime.

—THERESA ROWE

RUNNERS-UP

Accessibility
Enterprise Systems & Y2K
Google
Internet2/Net+ (founding)
Professionalization of the Higher Ed IT Field
Student-Centered Approaches (Design, Support)
Teaching & Learning Technologies

Celebrating Twenty Years of Community

EDUCAUSE

UNCOMMON THINKING
FOR THE COMMON GOOD

HONORABLE MENTIONS

Adaptive Learning
Ad Revenue Subsidized Search
Commoditization of Technology
ELI (founding)
Integrated Classroom AV Equipment
Movable Furniture
Server Virtualization
Students as Citizen Scholars
User Control
Videoconferencing
VR/AR

NON-MOMENTS

The most significant moments were not those that came to be but the ones that didn't. We spent the better part of five years being certain that MOOCs were going to revolutionize the industry, not unlike the iPad presaged the demise of the laptop. We didn't realize they were complementary. The same could be said for the gamification of education, specifically with badges.

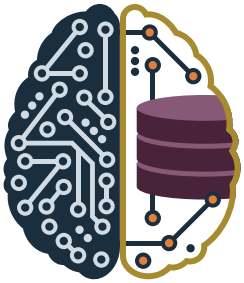
—DAMIEN KOEMANS

I don't know that there was a moment. I think one day each of us looked up and noticed that technology had enabled (and forced) a shift to a new, post–traditional learner and learning environment. Across the nation, at different moments, we each said: "Toto, I have a feeling we're not in Kansas anymore."

—COLLEEN CARMEAN

PART 2: TWO FOR THE FUTURE

What do you believe will be the biggest developments in the next twenty years?



Artificial Intelligence & Machine Learning

It will be fascinating to see where we can go with augmented intelligence. We are only in the very beginning stages of understanding how AI can improve efficiency and reach otherwise underserved populations.

—SHARON BLANTON

The biggest development over the next twenty years will be the continued development of the role of AI in student success: student services, learning, and engagement.

—CELESTE SCHWARTZ

Learning analytics, machine learning/AI, and adaptive learning will continue to be great developments for higher ed IT in the next twenty years. With new capabilities to inform students of their individual progress, customize student paths to their goals, and target content to students when they need it, universities can focus their limited resources more effectively on the student experience and help our students achieve at the highest levels.

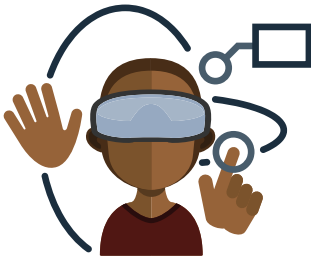
—MEGGAN LEVITT

AI must be properly used for educational purposes. Keeping in mind that education is from humans for humans, we can teach machines to do some of our tasks.

—JORGE BETANCOURT

AI (and X reality) will continue the "personalization" of education, perhaps fragmenting learning to where the outcome is not a degree but a full understanding of a specific discipline.

—GREG KOVICH



X Reality (eXtended Reality) & Immersive Learning

Augmented reality (AR) and virtual reality (VR) will also continue to transform learning experiences. More "choose-you-own-adventure" style AR/VR content will provide new opportunities for students to empathize with people, places, and contexts they may never have the opportunity or capability to experience in person. Experiential learning will be enabled to reach new heights.

—MEGGAN LEVITT

The separation of the virtual classroom from the face-to-face classroom will become nonexistent over time. Immersive learning is in its infancy; the impact on student success will cause expansion and innovation of the technology.

—GEOFF CIRULLO

We're going to see a growth in the ability to offer students experiences they can't get other than through virtual reality, augmented reality, and simulations. We have some really big issues to solve (e.g., accessibility by those with different physical abilities and the availability of quality content), but surely in the next twenty years, we'll have those solved. (I hope!)

—ELIZABETH A. EVANS

The use of virtual reality in teaching/learning will become ubiquitous. And we thought seeing was believing . . . ha! Immersion is not only believing, it's the next-best thing to actually being there—and sometimes it's even better.

—JOHN C. CAVANAUGH

ADDITIONAL CONTENDERS

Access; alternative credentials; analytics; blockchain; business model disruption; cloud services; data privacy; disaggregation; funding reductions; instructional models; internet of things; lifelong learning; mobile; nonacademic education; open education; pedagogical innovations; personalized learning; seamless connectivity; security; social media; wearable computing

OTHER PREDICTED DEVELOPMENTS IN THE NEXT TWENTY YEARS?

If I could answer that, I'd be in a different profession.

—BOB FLYNN

We are having a hard time predicting the next five years—twenty is absurd.

—DAMIEN KOEMANS

The "contagion" era of the internet is ending. The next decades will be devoted to response/reaction events as we adopt constraints on antisocial/pathological behavior that jeopardizes the common good. Doing this in a way that preserves privacy and individual autonomy will be difficult.

—MIKE ROBERTS

While the R&E design of internet identity enabled scaling privacy, the subsequent developments in the marketplace failed to adopt those capabilities and in fact exploited them for commercial purposes. New forces (e.g., GDPR, the recent Facebook, Google, and soon Amazon scandals of privacy abuses) will slowly rebalance privacy on the network.

—KEN KLINGENSTEIN

The traditional IT organization will be completely absorbed into the business areas of the institution, with "pure IT" activities such as networking and telecommunications residing with infrastructure support groups. Technology will continue to advance, allowing easier integration of small, bite-sized services that together provide ancillary business functions outside our core ERP services, which will be cloud-based and vendor-supported. The best career opportunities will be for those with strong technical skills but also the competencies that guide the business in the best use of technology to add value.

—TIMOTHY CHESTER

Software-as-a-service (SaaS) could mean the end of traditional software, freeing up huge amounts of installation, configuration, and maintenance effort, turning "administrators" into "developers" and "solutions engineers."

—JONATHAN WHITE

Our workforce will transform from technology implementers to technology enablers.

—CURT HILLEGAS

Higher education itself will change, and IT will have to change ahead of it to serve the teaching, learning, research, and administrative challenges.

—SUE WORKMAN

Higher education is going through a transition. We saw it hit a fever point in 2012 with the rise of the "massive open online courses" (or MOOCs), and a rubicon was crossed. While that fever has abated from a panic/crisis situation, the underlying impact on information technology and the more traditional way universities operate is still happening and accelerating—though perhaps not as loudly with all the sound of fury of the MOOC crisis. Higher education must adapt to changing student needs, new technology tools, competitors, funding pressures from competition, and government withdrawal from supporting it. In the 2020s, those universities that don't find ways to adapt, improvise, and overcome the challenges will, like the snows of yesteryear, be gone from this earth.

—BRIAN D. VOSS

The high-level impact of technological change will continue to be unpredictable and relentless. The biggest challenges that higher education IT will face in the future will be ones of leadership and management at all levels. Building high-performing teams and organizations that can effectively deal with technological change will be more important than the approach taken to IoT, ERP, LMS, or the latest technology. Global changes in the workforce, including increased diversity and generational changes, will require that IT organizations continue to evolve to be successful. Intra- and inter-institutional collaborations will be key to successfully navigating the next twenty years.

—DAVID SMALLEN

My hope is that we will finally start to pay attention to systems, not just tools. Systems involve process, data, roles, and tools. The intellectual innovation that emerges from the research enterprise in higher education dwarfs the administrative innovation across the higher ed landscape. How long will this be tolerated? If higher education does not begin to focus on serious improvements in the systems used to get its work done, the dire predictions offered by Clay Christensen in 2011 (and by others before and since) will prove true. Many will be surprised, wondering what happened, not having recognized the numerous indicators that have been in evidence for a long, long time.

—ERIC DENNA

Cultures take a long time to digest change. The next twenty years will be spent redefining education in the context of the modalities offered to us by the new tools, both physical and virtual, that the digital world affords us. We have not yet fully realized the potential of Claude Shannon's vision of a digital information society for cultural reasons, not technological ones. Repositioning our institutions and decision-making structures around the implications of this shift will pose major challenges to industrial-based educational systems (as well as almost all other governmental, societal, and cultural organizations) at all levels.

—TOM HAYMES

The capacity of information services to reach anywhere, allowing all to pick and choose where they work and live, will have a huge impact on how communities are defined.

—SHARON P. PITT

Our future will see a shift from *technologies* as drivers to *values* as drivers for how we adopt and adapt 21st-century teaching and learning approaches.

—JENNIFER SPARROW

We will have to figure out a way to validate all of this readily available knowledge. We no longer know what is fake and what is real—whether it be text, audio, visual, or virtual reality. I am particularly concerned about our ability to discern visual imagery. The technology today, and what lies on the horizon, is so sophisticated that it is nearly impossible to decipher what is real and what is manipulated. We teach our students to read, but not to see, even though we live in a visually saturated world. As educators, we need to teach our students new literacies: how to comprehend visuals and how to communicate visually. As IT professionals, we need to provide services and invent tools that will help students sort through the moral and ethical issues of seeing while questioning whether to believe.

—SUSAN E. METROS

In the immortal words of Yogi Berra: "The future ain't what it used to be." Clearly, we are going to see radical examples of artificial intelligence, virtual reality, and augmented reality applied to higher education, as to every other aspect of life. But the biggest development is likely to come from a reconceptualization of "higher" education (facilitated by technology) rather than a revolution in technology itself. The relationships between the workforce, career options, credentialing, and educational institutions have been in flux for the past decade and, within the coming decade, will transform the landscape in unfamiliar ways. Inevitably, technology will play a pivotal role in this transformation. What this means for higher ed IT organizations remains to be seen. The only certainty is that they won't look anything like today's organizations. So brace yourself; it's going to be a bumpy ride.

—MARTY RINGLE

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PART 3: FROM PAST TO FUTURE

What does our past mean for our future?

As George Santayana said, "Those who cannot remember the past are condemned to repeat it."

—COLLEEN CARMEAN

We should learn from the past and continue to evolve. IT changes on a daily basis, so we should get comfortable with that as the norm and not fight against it.

—NICK YOUNG

We must be masters of change and model what we preach, keeping our eye on the ball. The ball is the "business" of the institutions we serve: the faculty, the administration, the staff, and especially the students (our "product," educationally)—and the general publics we serve.

—DON RILEY

Our past allows us to use experiences to shape our future. We often see large pendulum swings in technology, and that will likely continue as we use new and developing technologies to improve experiences and costs. Higher education itself will change, and we must prepare our faculty, staff, students, and leadership to move quickly and be prepared to deliver IT in this new environment.

—SUE WORKMAN

Cross-institutional collaborations will be important, since the pace of change will not slow down. Organizations will have to rapidly learn, test, and implement new technologies at a continued breakneck pace.

—JEFF BOHRER

Higher education institutions don't change overnight, and education cannot be disrupted in the same way the consumer space can. Our institutions are literally hundreds of years old. We've changed, faster than we ever have, but not like the private sector. The support mechanisms for education adapt, but the fundamentals remain.

—DAMIEN KOEMANS

The rate of change continues to accelerate. Understanding and leveraging the IT relationship with faculty, staff, and students will encourage and enable whatever changes are ahead.

—GEOFF CIRULLO

The challenges of the past continue. We need to look at how we addressed those challenges and understand what worked and why.

—GREG KOVICH

We must look back and notice just how much change has occurred in higher education (and IT specifically) in the past twenty years and understand that this rate of change not only will be maintained but will accelerate. We must continue to look for ways to adapt our thinking to changes in the landscape—technological, political, and pedagogical. What we must learn from the past is that change is going to happen, and fighting it can be done for only a short period before it overcomes us. Will we learn these lessons of our past? Will we be able to not only catch our breath from the pace of change but also set our keels deep for even rougher waters ahead? This is a question for us all to ponder. I hope the answer is yes, we will learn and we will be part of change, not part of trying to hold back the tide.

—BRIAN D. VOSS

The French have a saying: *Plus ca change, plus c'est la meme chose.* ("The more things change, the more they remain the same.") Yes, every day the world of higher ed IT looks different from the day before. Yet many of the underlying objectives, methods, and principles embedded in the enterprise of applying technology to teaching, learning, and research remain the same. Understanding the evolution of technology in higher education is an invaluable asset to those change agents whose vision is focused squarely on the future. At the very least, knowledge of the past can help them avoid the mistakes made by their predecessors.

—MARTY RINGLE

The past shapes our approach to current and future events. We interpret the current time and the future based on where we come from, and we establish expectations and goals based on previous realizations and patterns of development.

—JACOB E. LARSEN

The past provides us with perspective and trend data that helps us chart the path for the future. The hope is always that the past will aid in keeping us from making too many mistakes in the future, but I don't think that promise has been realized. The challenges of the future will be different, more complex.

—SHARON BLANTON

Higher education institutions will be slow to cede our local independence to the formidable economic shift to digital scale on many common services. An economically driven market shakeout will thin the number of institutions by at least one-third by 2030, if not sooner. Internal intransigence that blocks innovation/adaptation will prove fatal for some institutions.

—BRAD WHEELER

Based on history, at some point we will likely pull back from the cloud and go on–premises again. But I hope not.

—MELINDA SAMPSON

IT has transformed from a campus core service to a cloud service based on departmental learning requirements. IT is no longer strategic as a division but becomes strategic as a service owned by departments.

—DOYLE NELSON FRISKNEY

Baby boomers are retiring, so much good data and knowledge will be lost.

—MARK REYNOLDS

The past can hold us back if we keep applying old ways of how people learn.

—AIMEE DENOYELLES

Knowledge, in its many forms, is omnipresent. We are globally connected. We are mobile. We are easily accessible. We have voices that can be heard far and wide. Yet the academy has been slow to accept a model in which technology serves as a conduit to support learning. We still question the benefits of online learning, we discourage students from bringing mobile devices to class, we require our students to invest in outdated print resources, and we test on knowledge that is obsolete. As educators, as stewards of knowledge, we need to take advantage of the inherent qualities that technology affords us. Our past should not define our future.

—SUSAN E. METROS

The past was marked by increasing debt, decreasing funding, and a sense of historical baggage—the "that is not the tradition of Whatsamatter U." Higher education has also been made the scapegoat (education in general, actually) by well–funded special interests. We must find ways around these issues going forward.

—JIM PHELPS

Innovation will continue in higher education, and technology will play a supporting role, with the ongoing challenge of process redesign and acceptance of change.

—CELESTE SCHWARTZ

Scripting and automation will allow for more time to innovate and create.

—IRMA HERMIDA

Everything will change. Some changes will be better than others, but overall there will be ongoing progress.

—THERESA ROWE

The main lesson I draw from the past is that the initial implementation of technology is experienced as "all good." But it does not take long for the dark side to emerge. The lesson from this for the future is that the sooner we reflect on the potential dark side from a new technology, the better we will be able to design and deploy that new technology. We must also temper our tendency to think that technology is anything more than a tool. Finally, just because we can design it and deploy it and use it does not automatically mean we should do any of that.

—JOHN C. CAVANAUGH

Our past serves a dual purpose. In the pessimistic view, it is an anchor that prevents us from progressing to the new. In the optimistic view, it is a teacher that prepares us for the changes ahead.

—CURT HILLEGAS

The past gives us the knowledge and skills to achieve great things in the future. It is through learning from our past failures and successes that we will be able to develop new ways of working and learning for the future.

—ELIZABETH COOK

IT has a cyclical path. We must learn all that we can now, because the foundation for many innovations has been a process improvement on something that has evolved over decades.

—TERI ABBO

Issues related to leadership and management of organizations have a long history. An organization's ability to successfully adapt to unpredictable and rapid technological change is more about its organizational culture than the size of staff or budget. IT leaders need to become more knowledgeable about the challenges facing higher education in general to better shape their organizational development.

—DAVID SMALLEN

The past means everything and nothing for our future. There's more work to do.

—STEVE JOHNSTON

Now more than ever, higher education institutions can't go it alone. This is especially true for IT. From information security risk management to innovative teaching and learning methods, we need to work together and learn with each other.

—BARRON KORALESKY

A strong community investing in our profession's future has been and will be vital to the growth and evolution of our profession.

—TIMOTHY CHESTER

We are a distinctive vertical, with the most urgent needs to collaborate between organizations in flexible ways. Those needs drove the original internet, internet identity, and the web, among others. Those needs to collaborate will continue to drive our innovation and its broader adoption.

—KEN KLINGENSTEIN

The establishment of organizations like EDUCAUSE gave voice to and fostered community among those whose work plays an increasingly fundamental role in support for, enablement of, and innovation in the core research and academic missions of our institutions. As we move into the future, both known and unknown, we should not lose sight of those important foundations. That is the source of the strength of EDUCAUSE and the institutions it serves.

—BOB FLYNN

The knowledge sharing and shared efforts in initiatives such as EDUCAUSE show that this is a consolidated way forward to achieve greater benefits with less effort.

—LLUÍS ALFONS ARIÑO

EDUCAUSE is still very much seen as a resource for IT employees, when in reality there are many rich opportunities within EDUCAUSE for those from the academic side of the house. EDUCAUSE must rebrand and reposition itself so that it appeals to both IT and academic staff and becomes more relevant to community colleges.

—MICHELLE PACANSKY-BROCK

The formative motto for EDUCAUSE was its continuing mission "to advance higher education by promoting the intelligent use of information technology." For some, that may border on head-nodding cliché, but it will always be as fresh and energizing for IT professionals as when Brian Hawkins first rapped his metaphoric gavel in 1998.

—PETER DEBLOIS

Our past is a truly unique sense of purpose and community that will also be our foundation in the future. When we are stuck intellectually, we seek guidance and help from our colleagues. We don't hesitate to reach out to people at other institutions to ask how they are doing something and to learn from our shared wisdom. Many of us are also part of systems, organizations, or consortiums (including EDUCAUSE) that help us to collaborate even more closely and openly. No matter what technology may come next, I am confident our strength as a sharing and open culture will guide us on how to make the technology work for higher education.

—MEGGAN LEVITT

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PART 4: REFLECTIONS

As you consider the past, present, and future of the higher ed IT field, do you have any other thoughts you'd like to share with our community?

The past should always teach us humility. Many visions of our glorious future have emerged since the beginnings of the digital revolution going back seventy years or more. Technology has often limited the realizations of these visions in the short term, but almost all of the technological hurdles have been overcome in the longer term. What is often missing in those visions is the capacity of human societies to change. That factor has fundamentally dictated the kind of present we now experience. We should not lose sight of this as we look forward to the next twenty years. The possibilities opened by digital technology are exploding at an exponential rate. However, the capacity of our societal institutions to keep up with that rate acts as a brake on change. As a result, technological proliferation is stunted, redirected, and transformed in unexpected ways as we adapt tools to suit our preconceptions of what "technology" means. Humans have been doing this for millennia, but never before at this rate. It remains to be seen how we adapt.

—TOM HAYMES

The great strength of higher education in addressing social and economic challenges in a time of change is its commitment to intellectual inquiry and evidence-based conclusions. Buttressed by the enormous energy of successive generations of young minds, this gives a basis for optimism about the future.

—MIKE ROBERTS

We haven't yet learned to balance workforce development with the values of liberal education, the uses of technology with the values of human interaction. I hope we can avoid glamorizing the bright, shiny technological things on increasingly short hype cycles and double down on our sacred mission: the creation, dissemination, and preservation of knowledge for the public good.

—DEBORAH KEYEK-FRANSSEN

Stay engaged.

—THERESA ROWE

Engage your peers. Listen. Dream with them about what's possible.

—JENNIFER SPARROW

Collaborate, share, build, inspire, lead.

—STEVE JOHNSTON

Continue to be excellent to each other. We are brighter, bolder, stronger, and more effective together.

—BOB FLYNN

Always have a plan/vision, and review that plan annually, because five years out is a moving target in technology. Also, implement and own your new technology decisions. Leverage and build on what exists while not being scared to restart—with a plan . . .

—GEOFF CIRULLO

Stay on track. From my perspective, students want to cross the finish line. Stabilize student technology so that their technology roadmap is clear. Think about accessibility from the build so that the digital playing field is level from the beginning. Students will thank you for helping them complete their education in a timely manner.

—LAURIE VASQUEZ

Do what you do best. Do it better, do it cheaper, do it smarter, but don't all chase the same thing. That is a downward spiral where everyone loses. We are in the business of education, not disruption, and our primary focus shouldn't be chasing down the next big thing. We are the stabilizing force for civilization, and we should not lose sight of that.

—DAMIEN KOEMANS

Make sure we don't lose the things that we most value.

—SHARON P. PITT

If you are looking for the future of technology in higher education, look to the human, not the machine.

—TOM HAYMES

We need to be asking questions about who benefits and who doesn't, who gets the best that technology has to offer in learning (e.g., tools that help students create) and who gets shunted off to the side (e.g., AI-driven drill-and-kill software).

—MARC LENTINI

As a graduate student more than forty years ago, I taught a course on the ethics of technology to a group of (mostly) IBM software engineers. I went to great lengths to emphasize that the thrill of inventing new technologies needed to be tempered by an understanding of how those technologies might alter society and impact individuals. The engineers were intensely appreciative of the course and spoke frequently about the parallels between their work and the development of nuclear arms technology three decades before. They felt the weight of their responsibility to use their knowledge and skills to make the world a better place. Now, as we embark on the practical implementation of artificial intelligence (and tools like IBM's Watson), the need to be mindful of the ethical implications of what we do—especially in education—is greater than ever. Let's not screw it up.

—MARTY RINGLE

We must be highly proactive, and we must find ways to fund truly groundbreaking education and research. We need to form a unified marketing and outreach effort to push the great common-good contributions of higher education.

—JIM PHELPS

It is not just that our community is among the best and brightest. It is that we have the most difficult problems as well, and our worst-case engineering has served us, and the world, well.

—KEN KLINGENSTEIN

Higher ed IT leaders and IT organizations must be reliable, committed partners within their institutions. IT leaders must put a high priority on professional development for their staff. Organizations such as EDUCAUSE can be an important resource for these leaders.

—DAVID SMALLEN

The field of higher education IT will continue to be valued so long as IT staff are actively involved in supporting and improving processes that align with the institution's strategic plan.

—CELESTE SCHWARTZ

IT has always struggled to be a partner in institutional decisions. At some institutions, this is less of a problem than others, but it is always there.

—WARREN WILSON

As IT professionals, we have a duty to guide the academic communities we serve to help them understand, advance, and adopt new literacies that should be inherent in the services, processes, and tools we build and support on our campuses and beyond.

—SUSAN E. METROS

More than ever, higher education institutions need to attract and maintain the brightest minds in the field. We cannot afford to be relegated to "consumers" of various technologies that we must somehow adapt to the teaching and learning mission. We must seek to actively and forcefully impact the directions in which areas such as LMSs, VR, and mobile learning are moving. A governmental effort to support and enhance innovation in the educational IT area would be very welcome. Far too few ideas and products that originate from the higher ed environment get developed into commercial products and successes. If we want the right tools to support the best-possible learning in the future, we need more influence and control and support for bright, creative minds to develop these tools, rather than waiting until a private company sees a way to profit from developing them.

—JACOB E. LARSEN

We need to continue to think mobile-first in all that we do; however, we must do so with a responsibility as educators to continue to teach the importance and relevance of face-to-face communication skills and the power of the human connection.

—TERI ABBO

I have been fortunate, in a career spanning over forty years in higher education, to witness the senior leadership posts in our profession be elevated from second-class campus citizenship to the highest level of academic policymaking. Many have worked hard for that visibility and now enjoy the stressful burdens of the continuing limelight as challenge after challenge confronts the higher ed IT world.

—MIKE ROBERTS

Our biggest challenge is to maintain the role of intermediaries between secondary education and the business sector, through digital transformation, integrating IT into the core of the business model.

—LLUÍS ALFONS ARIÑO

We are in this together, and we need to find new ways to share effective work in real time. Time moves too quickly now. Collaboration is happening in real time, not in yearly get-togethers.

—COLLEEN CARMEAN

The future is exciting and will continually evolve, but perhaps at an increased pace due to our technological advances (if we can keep up with them all!).

—ELIZABETH COOK

The days of stable technology are over. We need to be able to identity, evaluate, and deploy/use/support/recommend technology that has a much shorter shelf-life than what we might want.

—ELIZABETH A. EVANS

The best opportunities will continue to flow to those individuals who have the capacity and willingness to embrace change.

—TIMOTHY CHESTER

Change has been, is, and always will be the nature of information technology. If we embrace change and help our institutions to leverage new capabilities, we will help them succeed into the future.

—CURT HILLEGAS

IT positions continue to evolve and require differing skill sets. I think the biggest thing we have learned is to never stop learning. The jobs will probably change, at an even faster pace. We must all get comfortable with change and become flexible with our work expectations.

—SHARON BLANTON

One thing we know about IT, including higher ed IT, is that it will change. We must prepare not only our technology environments for this change, but also our people. It is tremendously important that we continue professional development for our staff, teach our future leaders how to lead in a new environment, challenge our own thinking so that we do not resist change, and embrace the good to support our institutions and further education and learning for generations to come.

—SUE WORKMAN

I remain concerned that campus senior leaders—presidents, their cabinets, and their governing boards—are not yet fully grasping what is happening around us and what will be in store for us. I fear that like dinosaurs, many will continue to eat and live in the moment and not adapt to changing conditions. Simply put, most campus leaders do not grasp the transformation under way, do not understand that it is IT-centric and IT-driven, and continue to view IT as some sort of luxury or extravagance rather than as a fundamental component of their future success (and survival). EDUCAUSE must go beyond gathering the IT clergy together and must reach outside of this audience to better engage those organizations that perform similar functions for the rest of institutional leadership. The message must get out to these leaders, and EDUCAUSE must play a bigger and stronger role in getting that message out.

—BRIAN D. VOSS

Years ago I was introduced to a quote by Eric Hoffer that has been as durable as it has become endearing: "In times of change learners inherit the earth, while the learned find themselves beautifully equipped to deal with a world that no longer exists." To the extent we have become learners in higher education, I believe the future looks bright. Innovation expands opportunity, unless you are wed to the past. I have long been moved by Karl Fisch's video "What If?" After listing a variety of what proved to be ignorant statements about various forms of emerging technologies, Fisch concludes: "What if . . . we'd listened?" I wonder if something I have said that argued for a limitation as to what would be possible will someday be included in Fisch's presentation. My hope is we can be learners always, challenging ourselves to think differently about the systems we currently help to define, design, implement, maintain, improve, and retire.

—ERIC DENNA

CONCLUSION

Past

Google hatches. Jobs
dent our world. Mobility
flies, privacy dies.

Future

Time speeds, life forms blur.
Madness is divinist sense.
God is a fractal.

Past Informs Future

Ignoring the past dooms us,
said George. Seek questions
hidden by answers.

—BILL HOGUE

The Numbers Are Impressive...

Over **8,000** Participants

All **50** States

And **46** Countries

1,800 Institutions & Organizations

700 Presenters

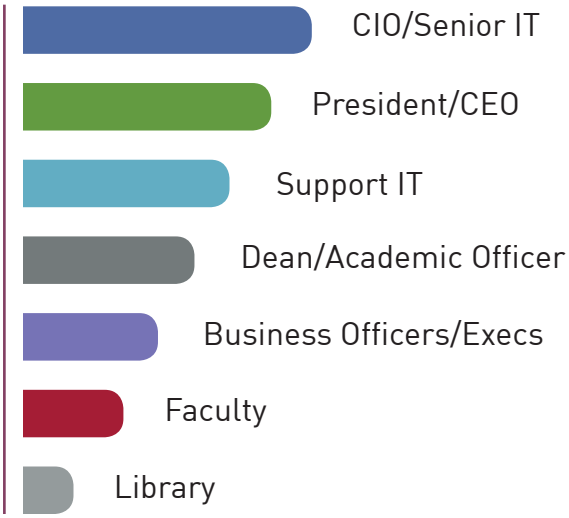
1,300 Minutes of Programming

287 Exhibitors

6 Program Tracks

1. Creating a Culture of Data-Informed Decision-Making
2. Evolving Infrastructure and Enterprise IT
3. Exploring Innovation in Teaching and Learning
4. Leading and Partnering across the Institution
5. Managing and Reducing Information Technology Risk
6. Transforming the Student Experience

Who You'll Meet



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Twenty YEARS OF EDTECH

By Martin Weller

An opinion often cited among educational technology (edtech) professionals is that theirs is a fast-changing field. This statement is sometimes used as a motivation (or veiled threat) to senior managers to embrace edtech because if they miss out now, it'll be too late to catch up. However, amid this breathless attempt to keep abreast of new developments, the edtech field is remarkably poor at recording its own history or reflecting critically on its development. When Audrey Watters recently put out a request for recommended books on the history of educational technology,[1] I couldn't come up with any beyond the handful she already had listed. There are edtech books that often start with a historical chapter to set the current work in context, and there are edtech books that are now part of history, but there are very few edtech books dealing specifically with the field's history. Maybe this reflects a lack of interest, as there has always been something of a year-zero mentality in the field. Edtech is also an area to which people come from other disciplines, so there is no shared set of concepts or history. This can be liberating but also infuriating. I'm sure I was not alone in emitting the occasional sigh when during the MOOC rush of 2012, so many "new" discoveries about online learning were reported—discoveries that were already tired concepts in the edtech field.

ILLUSTRATION BY MARK ALLEN MILLER, © 2018

The twentieth anniversary of EDUCAUSE presents an opportune moment to examine some of this history. There are different ways to do so, but for this article I have taken the straightforward approach of selecting a different educational technology, theory, or concept for each of the years from 1998 through 2018. This is not just an exercise in nostalgia (although comparing horror stories about metadata fields is enjoyable); it also allows us to examine what has changed, what remains the same, and what general patterns can be discerned from this history. Although the selection is largely a personal one, it should resonate here and there with most practitioners in the field. I have also been rather arbitrary in allocating a specific year: the year is not when a particular technology was invented but, rather, when it became—in my view—significant.

Looking back twenty years starts in 1998, when the web had reached a level of mainstream awareness. It was accessed through dial-up modems, and there was a general sense of puzzlement about what it would mean, both for society more generally and for higher education in particular. Some academics considered it to be a fad. One colleague dismissed my idea of a fully online course by declaring: "No one wants to study like that." But the potential of the web for higher education was clear, even if the direction this would take over the next twenty years was unpredictable.

1998: Wikis

Perhaps more than any other technology, wikis embody the spirit of optimism and philosophy of the open web. The wiki—a web page that could be jointly edited by anyone—was a fundamental shift in how we related to the internet. The web democratized publishing, and the wiki made the process a collaborative, shared enterprise. In 1998 wikis were just breaking through. Ward Cunningham is credited with inventing them (and the term) in 1994. Wikis had their own markup language, which made them a bit technical to use, although later implementations such as Wikispaces made the process easier. Wikis encapsulated the promise of a dynamic, shared, respectful space—the result partly of the ethos behind them (after all, they were named after the Hawaiian word for *quick*) and partly of their technical infrastructure. Users can track edits, roll back versions, and monitor contributions. Accountability and transparency are built in.

Wikis encapsulated the promise of a **dynamic, shared, respectful space**—the result partly of the ethos behind them (after all, they were named after the Hawaiian word for *quick*) and partly of their technical infrastructure.

With *Wikipedia* now the default knowledge source globally with over 5.5 million articles (counting only those in English), it would seem churlish to bemoan that wikis failed to fulfil their potential. Nevertheless, that statement is probably true in terms of the use of wikis in teaching. For instance, why aren't MOOCs conducted in wikis? It's not necessarily that wikis as a technology have not fully realized their potential. Rather, the approach to edtech they represent—cooperative and participatory—has been replaced by a broadcast, commercial publisher model.

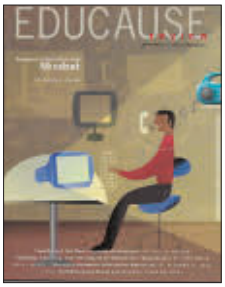
1999: E-Learning

E-learning had been in use as a term for some time by 1999, but the rise of the web and the prefix of "e" to everything saw it come to prominence. By 1999, e-learning was knocking on the door of, if not already becoming part of, the mainstream. Conventional and distance colleges and universities were adopting e-learning programs, often whenever the target audience would be willing to learn this way. One of the interesting aspects of e-learning was the consideration of costs. The belief was that e-learning would be cheaper than traditional distance-education courses. It wasn't, although e-learning did result in a shift in costs: institutions could spend less in produc-

1998 1999 2000

WIKIS
Wikis embody the spirit of optimism and philosophy of the open web.

E-LEARNING
E-learning set the framework for the next decade in terms of technology, standards, and approaches.



LEARNING OBJECTS
A learning object was roughly defined as "a digitized entity which can be used, reused or referenced during technology supported learning."

tion (by not using physical resources and by reusing material), but there was a consequent increase in presentation costs (from support costs and a more rapid updating cycle). This cost argument continues to reoccur and was a significant driver for MOOCs (see year 2012).

E-learning set the framework for the next decade in terms of technology, standards, and approaches—a period that represents, in some respects, the golden age of e-learning.

2000: Learning Objects

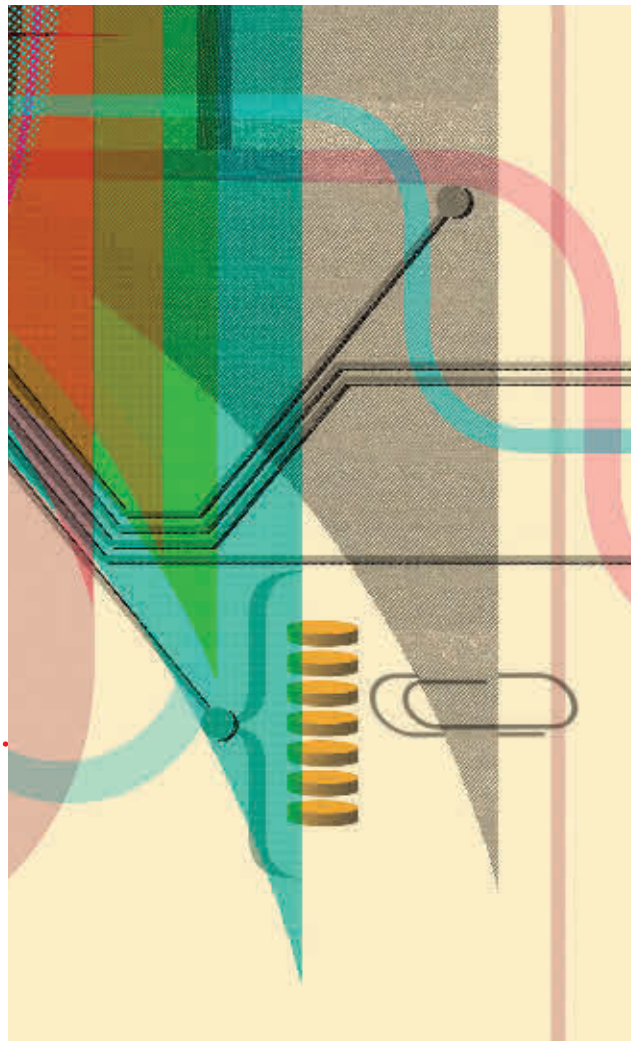
E-learning was accompanied by new approaches, often derived from computer science. One of these was learning objects. The concept can be seen as arising from programming: object-oriented programming had demonstrated the benefits of reusable, clearly defined pieces of functional code that could be implemented across multiple programs. Learning objects seemed like a logical step in applying this model to e-learning. As Stephen Downes argued:

> There are thousands of colleges and universities, each of which teaches, for example, a course in introductory trigonometry. Each such trigonometry course in each of these institutions describes, for example, the sine wave function. . . .
>
> Now for the premise: the world does not need thousands of similar descriptions of sine wave functions available online. Rather, what the world needs is one, or maybe a dozen at most, descriptions of sine wave functions available online. The reasons are manifest. If some educational content, such as a description of sine wave functions, is available online, then it is available worldwide.[2]

This made a lot of sense then, and it still makes a lot of sense today. A learning object was roughly defined as "a digitized entity which can be used, reused or referenced during technology supported learning."[3] But learning objects never really took off, despite the compelling rationale for their existence. The failure to make them a reality is instructive for all in the edtech field. They failed to achieve wide-scale adoption for a number of reasons, including over-engineering, debates around definitions, the reusability paradox,[4] and the fact that they were an alien concept for many educators who were already overloaded. Nevertheless, the core idea of learning objects would resurface in different guises.

2001: E-learning Standards

By the turn of the millennium, e-learning was seeing significant interest, resulting in a necessary concentration of efforts: platforms that could be easily set up to run e-learning programs; a more professional approach to the creation of e-learning content; the establishment of evidence; and initiatives to describe and share tools and content. Enter e-learning standards and, in particular, IMS. This was the body that set about to develop standards that would describe content, assessment tools, courses, and more ambitiously, learning design. Perhaps the most significant standard was SCORM, which went on to become an industry standard in specifying content that could be used in virtual learning environments (VLEs). Prior to this, considerable overhead was involved in switching content from one platform to another.



2001

E-LEARNING STANDARDS
The interest in e-learning led to e-learning standards—in particular, IMS and SCORM.

E-learning standards are an interesting case study in edtech. Good standards retreat into the background and just help things work, as SCORM has done. But other standards have failed in some of their ambitions to create easily assembled, discoverable, plug-and-play content. So while the standards community continues to work, it has encountered problems with vendors[5] and has been surpassed in popular usage by the less specific but more human description and sharing approach that underlined the web 2.0 explosion (see year 2006).

2002: Open Educational Resources (OER)

Now that the foundations of modern edtech had been laid, the more interesting developments could commence. In 2001, MIT announced its OpenCourseWare initiative, marking the initiation of the OER movement. But it was in 2002 that the first OER were released and that people began to understand licenses. MIT's goal was to make all the learning materials used in its 1,800 courses available via the internet, where the resources could be used and repurposed as desired by others, without charge.

Like learning objects, the software approach (in particular, open-source software) provides the roots for OER. The open-source movement can be seen as creating the context within which open education could flourish, partly by analogy and partly by establishing a precedent. But there is also a very direct link, via David Wiley, through the development of licenses.[6] In 1998 Wiley became interested in developing an open license for educational content, and he directly contacted pioneers in the open-source world. Out of this came the Open Content License (OCL), which he developed with publishers to establish the Open Publication License (OPL) the next year.

The OPL proved to be one of the key components, along with the Free Software Foundation's GNU license, of the Creative Commons licenses, developed by Larry Lessig and others in 2002. These went on to become essential in the open-education movement. The simple licenses in Creative Commons allowed users to easily share resources, and OER became a global movement. Although OER have not transformed higher education in quite the way many envisaged in 2002 and many projects have floundered after funding ends, the OER idea continues to be relevant, especially through open textbooks and open educational practice (OEP).

The general lessons from OER are that it succeeded where learning objects failed because OER tapped into existing practice (and open textbooks doubly so). The concept of using a license to openly share educational content is alien enough, without all the accompanying standards and concepts associated with learning objects. Patience is required: educational transformation is a slow burn.

2003: Blogs

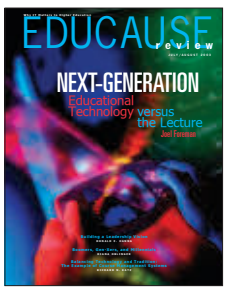
Blogging developed alongside the more education-specific developments and was then co-opted into edtech. In so doing, it foreshadowed much of the web 2.0 developments, with which it is often bundled.

> No other edtech has continued to develop and solidify (as the proliferation of WordPress sites attests) and also remain **so full of potential** as have blogs.

Blogging was a very obvious extension of the web. Once people realized that anyone could publish on the web, they inevitably started to publish diaries, journals, and regularly updated resources. Blogging emerged from a simple version of "here's my online journal" when syndication became easy to implement. The advent of feeds, and particularly the universal standard RSS, provided a means for readers to subscribe to anyone's blog and receive regular updates. This was as revolutionary as the liberation that web publishing initially provided. If the web

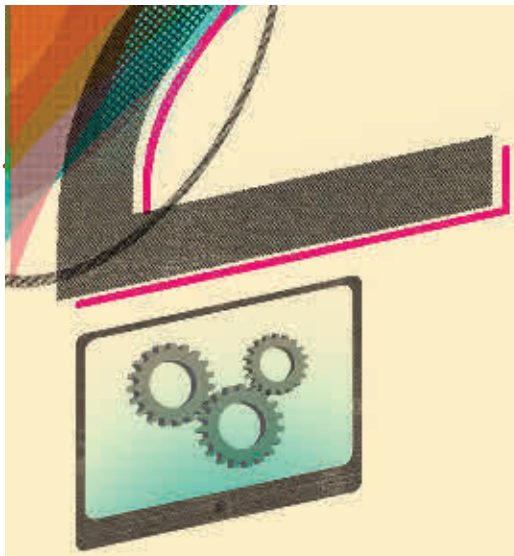
2002

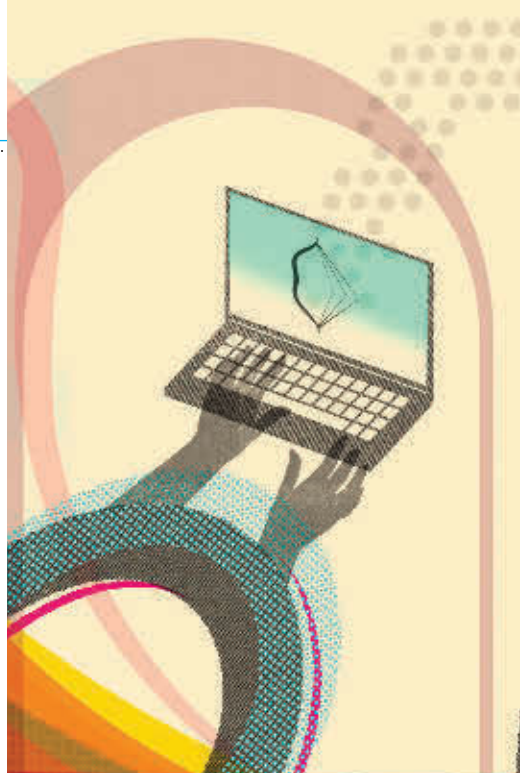
OPEN EDUCATIONAL RESOURCES (OER)
The open-source movement can be seen as creating the context within which open education and OER could flourish.



2003

BLOGS
Blogs and RSS-type distribution were akin to giving everyone superhero powers.





made everyone a publisher, RSS made everyone a distributor.

People swiftly moved beyond journals. After all, what area isn't impacted by the ability to create content freely, whenever you want, and have it immediately distributed to your audience? Blogs and RSS-type distribution were akin to giving everyone superhero powers. It's not surprising that in 2018, we're still wrestling with the implications. No other edtech has continued to develop and solidify (as the proliferation of WordPress sites attests) and also remain so full of potential. For almost every edtech that comes along—e-portfolios, VLEs, MOOCs, OER, social media—I find myself thinking that a blog version would be better. Nothing develops and anchors an online identity quite like a blog.

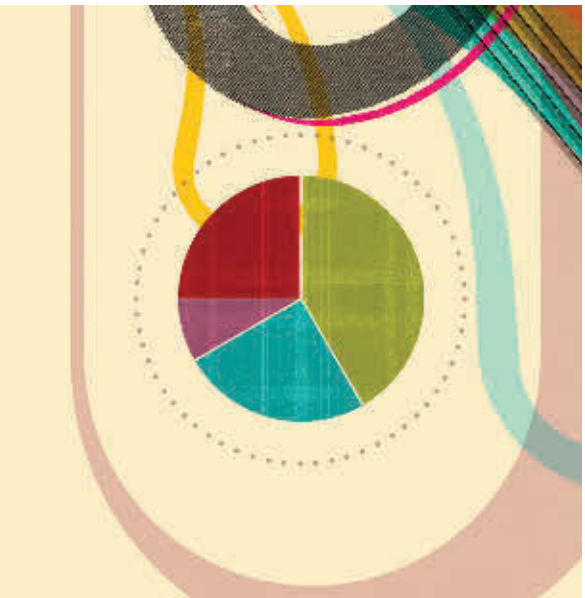
2004: The LMS

The learning management system (LMS) offered an enterprise solution for e-learning providers. It stands as the central e-learning technology. Prior to the LMS, e-learning provision was realized through a variety of tools: a bulletin board for communications; a content-management system; and/or home-created web pages. The quality of these solutions was variable, often relying on the enthusiasm of one particular devotee. The combination of tools also varied across any one higher education institution, with the medical school adopting one set of tools, the engineering school another, the humanities school yet another, and so on.

As e-learning became more integral to both blended-learning and fully-online courses, this variety and reliability became a more critical issue. The LMS offered a neat collection of the most popular tools, any one of which might not be as good as the best-of-breed specific tool but was good enough. The LMS allowed for a single, enterprise solution with the associated training, technical support, and help-desk. The advantage was that e-learning could be implemented more quickly across an entire institution. However, over time this has come to be seen more as a Faustian pact as institutions found themselves locked into contracts with vendors, most famously with providers (e.g., Blackboard) that attempted to file restrictive patents.[7] More problematically, the LMS has become the *only* route for delivering e-learning in many institutions, with a consequent loss of expertise and innovation.[8]

2005: Video

YouTube was founded in 2005, which seems surprisingly recent, so much has it become a part of the cultural landscape. As internet access began to improve and compression techniques along with it, the viability of streaming video had reached a realistic point for many by 2005. YouTube and other video-sharing services flourished, and the realization that anyone could make a video and share it easily was the next step in the broadcast democratization that had begun with HTML. While the use of video in education was often restricted to broadcast, this was a further development on the learning objects idea. As the success of the Khan Academy illustrates, simple video explanations of key concepts—explanations that can be shared and embedded easily—met a great educational demand. However, colleges and universities for the most part still do not assess students on their use of video. In some disciplines, such



2004 2005

THE LMS
The LMS, which offered an enterprise solution for e-learning providers, stands as the central e-learning technology.

VIDEO
As internet access began to improve and compression techniques along with it, the viability of streaming video reached a realistic point.

as the arts, this is more common, but in 2018, text remains the dominant communication form in education. Although courses such as DS106 have innovated in this area,[9] many students will go through their education without being required to produce a video as a form of assessment. We need to fully develop the critical structures for video in order for it to fulfil its educational potential, as we have already done for text.

2006: Web 2.0

The "web 2.0" tag gained popularity from Tim O'Reilly's use in the first Web 2.0 Conference in 2004, but not until around 2006 did the term begin to penetrate in educational usage, with Bryan Alexander highlighting the relevance of social and open aspects of its application.[10] The practical term "web 2.0" gathered together the user-generated content services, including YouTube, Flickr, and blogs. But it was more than just a useful term for a set of technologies; it seemed to capture a new mindset in our relation to the internet. After O'Reilly set out the seven principles of web 2.0, the web 2.0 boom took off.[11]

Just as the fascination with e-learning had seen every possible term prefixed with "e," so the addition of "2.0" to any educational term made it fashionable. But soon the boom was followed by the consequent bust (a business plan was needed after all), and problems with some of the core concepts meant that by 2009, web 2.0 was being declared dead.[12] Inherent in much of the web 2.0 approach was a free service, which inevitably led to data being the key source for revenue and gave rise to the oft-quoted line "If you're not paying for it, you're the product being sold."[13] As web 2.0 morphed into social media, the inherent issues around free speech and offensive behavior came to the fore. In educational terms, this raises issues about duty of care for students, recognizing academic labor, and marginalized groups. The utopia of web 2.0 turned out to be one with scant regard for employment laws and largely reserved for "tech bros."

Nevertheless, at the time, web 2.0 posed a fundamental question as to how education conducts many of its cherished processes. Peer review, publishing, ascribing quality—all of these were founded on what David Weinberger referred to as filtering on the way in rather than on the way out.[14] While the quality of much online content was poor, there was always an aspect of what was "good enough" for any learner. With the demise of the optimism around web 2.0, many of the accompanying issues it raised for higher education have largely been forgotten—before they were even addressed. For instance, while the open repository for physics publications (arXiv) and open-access methods for publication became mainstream, the journal system is still dominant, largely based on double-blind, anonymous peer review. Integrating into the mainstream the participatory culture that web 2.0 brought to the fore remains both a challenge and an opportunity for higher education.

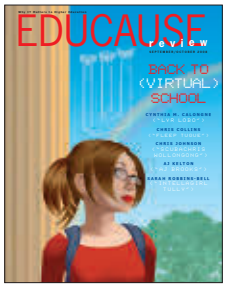
Integrating into the mainstream **the participatory culture** that web 2.0 brought to the fore remains both a challenge and an opportunity for higher education.

2007: Second Life and Virtual Worlds

Online virtual worlds and Second Life had been around for some time, with Second Life launching in 2003, but they begin to see an upsurge in popularity around 2007. Colleges and universities began creating their own islands, and whole courses were delivered through Second Life. While the virtual worlds had strong devotees, they didn't gain as much traction with students as envisaged, and most Second Life campuses are now deserted. Partly this was a result of a lack of imagination: they were often used to re-create an online lecture. The professor may have been represented by

2006 2007 2008

WEB 2.0
As Web 2.0 gathered together user-generated content services including YouTube, Flickr, and blogs, it also captured a new mindset in our relation to the internet.



SECOND LIFE AND VIRTUAL WORLDS
By 2007 colleges and universities were creating their own islands and delivering whole courses through Second Life.

E-PORTFOLIOS
The e-portfolio was a place to store all the evidence a learner gathered to exhibit learning, both formal and informal, in order to support lifelong learning and career development.

a seven-foot-tall purple cat in that lecture, but it was a lecture nonetheless. Virtual worlds also didn't manage to shrug off their nerdy, role-playing origins, and many users felt an aversion to this. The worlds could be glitchy as well, which meant that many people never made it off Orientation Island in Second Life, for example. However, with the success of games such as *Minecraft* and *Pokémon Go*, more robust technology, and more widespread familiarity with avatars and gaming, virtual worlds for learning may be one of those technologies due for a comeback.

2008: E-Portfolios

Like learning objects, e-portfolios were backed by a sound idea. The e-portfolio was a place to store all the evidence a learner gathered to exhibit learning, both formal and informal, in order to support lifelong learning and career development. But like learning objects—and despite academic interest and a lot of investment in technology and standards—e-portfolios did not become the standard form of assessment as proposed. Many of their problems were similar to those that beleaguered learning objects, including overcomplicated software, an institutional rather than a user focus, and a lack of accompanying pedagogical change. Although e-portfolio tools remain pertinent for many subjects, particularly vocational ones, for many students owning their own domain and blog remains a better route to establishing a lifelong digital identity. It is perhaps telling that although many practitioners in higher education maintain blogs, asking to see a colleague's e-portfolio is likely to be met with a blank response.

2009: Twitter and Social Media

Founded in 2006, Twitter had moved well beyond the tech-enthusiast bubble by 2009 but had yet to become what we know it as today: a tool for wreaking political mayhem. With the trolls, bots, daily outrages, and generally toxic behavior not only on Twitter but also on Facebook and other social media, it's difficult to recall the optimism that we once held for these technologies. In 2009, though, the ability to make global connections, to easily cross disciplines, and to engage in meaningful discussion all before breakfast was revolutionary. There was also a democratizing effect: formal academic status was not significant, since users were judged on the value of their contributions to the network. In educational terms, social media has done much to change the nature of the relationship between academics, students, and the institution. Even though the negative aspects are now undeniable, some of that early promise remains. What we are now wrestling with is the paradox of social media: the fact that its negatives and its positives exist simultaneously.

2010: Connectivism

The early enthusiasm for e-learning saw a number of pedagogies resurrected or adopted to meet the new potential of the digital, networked context. Constructivism, problem-based learning, and resource-based learning all saw renewed interest as educators sought to harness the possibility of abundant content and networked learners. Yet *connectivism*, as proposed by George Siemens and Stephen Downes in 2004–2005, could lay claim to being the first internet-native learning theory. Siemens defined connectivism as "the integration of principles explored by chaos, network, and complexity and self-organization theories. Learning is a process that occurs within nebulous environments of shifting core elements—not entirely under the control of the individual."[15] Further investigating the possibility of networked learning led to the creation of the early MOOCs, including influential open courses by Downes and Siemens in 2008 and 2009.[16] Pinning down exactly what connectivism was could be difficult, but it represented an attempt to rethink how learning is best realized given the new realities of a digital, networked, open environment, as opposed to forcing technology into the service of existing practices. It also provided the basis for MOOCs, although the approach they eventually adopted was far removed from connectivism (see 2012).

2009

TWITTER AND SOCIAL MEDIA
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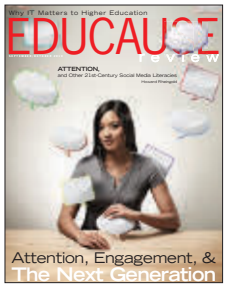

2010

CONNECTIVISM
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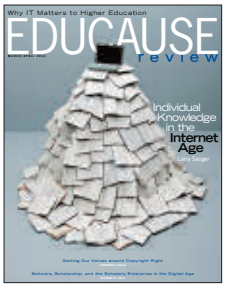

2011: PLE

Personal Learning Environments (PLEs) were an outcome of the proliferation of services that suddenly became available following the web 2.0 boom. Learners and educators began to gather a set of tools to realize a number of functions. In edtech, the conversation turned to whether these tools could be somehow "glued" together in terms of data. Instead of talking about one LMS provided to all students, we were discussing how each learner had his/her own particular blend of tools. Yet beyond a plethora of spoke diagrams, with each showing a different collection of icons, the PLE concept didn't really develop after its peak in 2011. The problem was that passing along data was not a trivial task, and we soon became wary about applications that shared data (although perhaps not wary enough, given recent news regarding Cambridge Analytica[17]). Also, providing a uniform offering and support for learners was difficult when they were all using different tools. The focus shifted from a personalized set of tools to a personalized set of resources, and in recent years this has become the goal of personalization.

2012: MOOCs

Inevitably, 2012 will be seen as the year of MOOCs.[18] In many ways the MOOC phenomenon can be viewed as the combination of several preceding technologies: some of the open approach of OER, the application of video, the experimentation of connectivism, and the revolutionary hype of web 2.0. Clay Shirky mistakenly proclaimed that MOOCs were the internet happening to education.[19] If he'd been paying attention, he would have seen that this had been happening for some time. Rather, MOOCs were Silicon Valley happening to education. Once Stanford Professor Sebastian Thrun's course had attracted over 100,000 learners and almost as many headlines,[20] the venture capitalist investment flooded in.

Much has been written about MOOCs, more than I can do justice to here. They are a case study still in the making. The raised profile of open education and online learning caused by MOOCs may be beneficial in the long run, but the MOOC hype (only ten global providers of higher education by 2022?)[21] may be equally detrimental. The edtech field needs to learn how to balance these developments. Millions of learners accessing high-quality material online is a positive, but the rush by colleges and universities to enter into prohibitive contracts, outsource expertise, and undermine their own staff has long-term consequences as well.

2013: Open Textbooks

If MOOCs were the glamorous side of open education, all breathless headlines and predictions, open textbooks were the practical, even dowdy, application. An extension of the OER movement, and particularly pertinent in the United States and Canada, open textbooks provided openly licensed versions of bespoke written textbooks, free for the digital version. The cost of textbooks provided a motivation for adoption, and the switching of costs from production to purchase offers a viable model. As with LMSs, open textbooks offer an easy route to adoption. Exploration around open pedagogy, co-creation with students, and diversification of the curriculum all point to a potentially rich, open, edtech ecosystem—with open textbooks at the center.[22] However, the possible drawback is that like LMSs, open textbooks may not become a stepping-stone on the way to a more innovative, varied teaching approach but, rather, may become an end point in themselves.

2011 2012 2013

PLE
PLEs were an outcome of the proliferation of services that suddenly became available following the web 2.0 boom.

MOOCs
The MOOC phenomenon can be viewed as the combination of preceding technologies including OER, video, connectivism, and web 2.0.

OPEN TEXTBOOKS
An extension of the OER movement, open textbooks provided openly licensed versions of bespoke written textbooks, free for the digital version.

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2014: Learning Analytics

Data, data, data. It's the new oil and the new driver of capitalism, war, politics. So inevitably its role in education would come to the fore. Interest in analytics is driven by the increased amount of time that students spend in online learning environments, particularly LMSs and MOOCs. The positive side of learning analytics is that for distance education, it provides the equivalent of responding to discreet signals in the face-to-face environment: the puzzled expression, the yawn, or the whispering between students looking for clarity. Every good face-to-face educator will respond to these signals and adjust his/her behavior. If in an online environment, an educator sees that students are repeatedly going back to a resource, that might indicate a similar need to adapt behavior. The downsides are that learning analytics can reduce students to data and that ownership over the data becomes a commodity in itself. The use of analytics has only just begun. The edtech field needs to avoid the mistakes of data capitalism; it should embed learner agency and ethics in the use of data, and it should deploy that data sparingly.[23]

2015: Digital Badges

Providing digital badges for achievements that can be verified and linked to evidence started with Mozilla's open badge infrastructure in 2011. Like many other edtech developments, digital badges had an initial flurry of interest from devotees but then settled into a pattern of more laborious long-term acceptance. They represent a combination of key challenges for educational technology: realizing easy-to-use, scalable technology; developing social awareness that gives them currency; and providing the policy and support structures that make them valuable.

Of these challenges, only the first relates directly to technology; the more substantial ones relate to awareness and legitimacy. For example, if employers or institutions come to widely accept and value digital badges, then they will gain credence with learners, creating a virtuous circle. There is some movement in this area, particularly with regard to staff development within organizations and often linked with MOOCs.[24] Perhaps more interesting is what happens when educators design for badges, breaking courses down into smaller chunks with associated recognition, and when communities of practice give badges value. Currently, their use is at an indeterminate stage—neither a failed enterprise nor the mainstream adoption once envisaged.

The edtech field needs to avoid the mistakes of data capitalism; it should **embed learner agency and ethics** in the use of data, and it should deploy that data sparingly.

2016: The Return of AI

Artificial intelligence (AI) was the focus of attention in education in the 1980s and 1990s with the possible development of intelligent tutoring systems. The initial enthusiasm for these systems has waned somewhat, mainly because they worked for only very limited, tightly specified domains. A user needed to predict the types of errors people would make in order to provide advice on how to rectify those errors. And in many subjects (the humanities in particular), people are very creative in the errors they make, and more significantly, what constitutes the right answer is less well defined.

Interest in AI faded as interest in the web and related technologies increased, but it has resurfaced in the past five years or so. What has changed over this intervening period is the power of computation. This helps address some of the complexity because multiple possibilities and probabilities can be accommodated. Here we see a recurring theme in edtech: nothing changes while, simultaneously, everything changes. AI has definitely improved since the 1990s, but some of its fundamental problems remain. It

2014 2015 2016

LEARNING ANALYTICS
Interest in analytics is driven by the increased amount of time that students spend in online learning environments, particularly LMSs and MOOCs.

DIGITAL BADGES
Providing digital badges for achievements had an initial flurry of interest but represents a combination of key challenges for educational technology.

THE RETURN OF AI
The concern about AI is not that it won't deliver on the promise held forth by its advocates but, rather, that someday it will.

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UNCOMMON THINKING
FOR THE COMMON GOOD

always seems to be a technology that is just about to break out of the box.

More significant than the technological issues are the ethical ones. As Audrey Watters contends, AI is ideological.[25] The concern about AI is not that it won't deliver on the promise held forth by its advocates but, rather, that someday it will. And then the assumptions embedded in code will shape how education is realized, and if learners don't fit that conceptual model, they will find themselves outside of the area in which compassion will allow a human to alter or intervene. Perhaps the greatest contribution of AI will be to make us realize how important people truly are in the education system.

2017: Blockchain

Of all the technologies listed here, blockchain is perhaps the most perplexing, both in how it works and in why it is even in this list. In 2016 several people independently approached me about blockchain—the distributed, secure ledger for keeping the records that underpin Bitcoin. The question was always the same: "Could we apply this in education somehow?" The imperative seemed to be that blockchain was a cool technology, and therefore there must be an educational application. It could provide a means of recording achievements and bringing together large and small, formal and informal, outputs and recognition.[26]

Viewed in this way, blockchain is attempting to bring together several issues and technologies: e-portfolios, with the aim to provide an individual, portable record of educational achievement; digital badges, with the intention to recognize informal learning; MOOCs and OER, with the desire to offer varied informal learning opportunities; PLEs and personalized learning, with the idea to focus more on the individual than on an institution. A personal, secure, permanent, and portable ledger may well be the ring to bind all these together. However, the history of these technologies should also be a warning for blockchain enthusiasts. With e-portfolios, for instance, even when there is a clear connection to educational practice, adoption can be slow, requiring many other components to fall into place. In 2018 even the relatively conservative and familiar edtech of open textbooks is far from being broadly accepted. Attempting to convince educators that a complex technology might solve a problem they don't think they have is therefore unlikely to meet with widespread support.

If blockchain is to realize any success, it will need to work almost unnoticed; it will succeed only if people don't know they're using blockchain. Nevertheless, many who propose blockchain display a definite evangelist's zeal. They desire its adoption as an end goal in itself, rather than as an appropriate solution to a specific problem.

2018: TBD

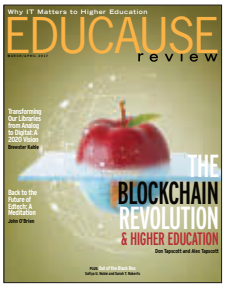
We're only halfway through 2018, so it would be premature to select a technology, theory, or concept for the year. But one aspect worth considering is what might be termed the dark side of edtech. Given the use of social media for extremism, data scares such as the Facebook breach by Cambridge Analytica, anxieties about Russian bots, concerted online abuse, and increased data surveillance, the unbridled optimism that technology will create an educational utopia now seems naïve. It is not just informed critics such as Michael Caulfield[27] who are warning of the dangers of overreliance on and trust in edtech; the implicit problems are now apparent to most everyone in the field. In 2018, edtech stands on the brink of a new era, one that has a substantial underpinning of technology but that needs to build on the ethical, practical, and conceptual frameworks that combat the nefarious applications of technology.

Conclusion

Obviously, one or two paragraphs cannot do justice to technologies that require several books each, and my list has undoubtedly omitted several important developments (e.g., gaming, edupunk, automatic assessment, virtual reality, and Google might all be contenders). However, from this brief overview, a number of themes can be extracted to help inform the next twenty years.

2017

BLOCKCHAIN
Blockchain could provide a means of recording educational achievements and bringing together large and small, formal and informal, outputs and recognition.



2018

TBD
Edtech needs to build on the ethical, practical, and conceptual frameworks that combat the nefarious applications of technology.

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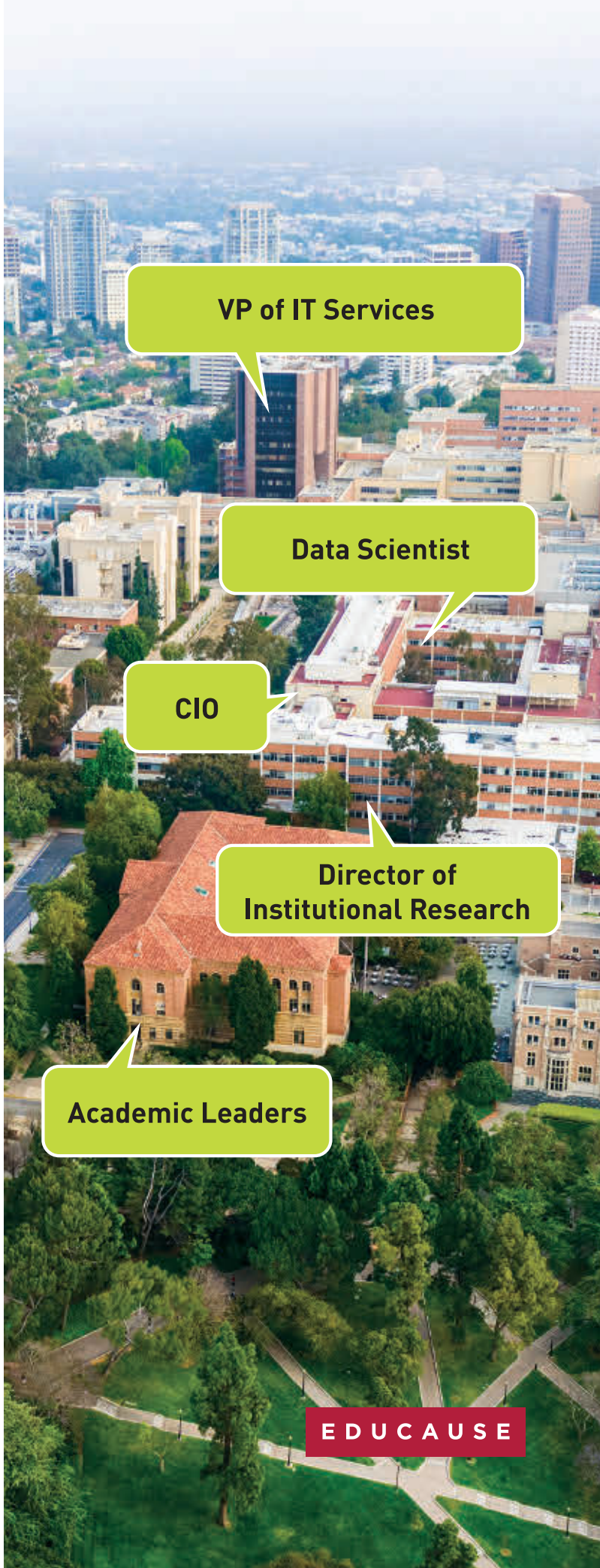

The first of these is that in edtech, the *tech* part of the phrase walks taller. In my list, most of the innovations are technologies. Sometimes these come with strong accompanying educational frameworks, but other times they are a technology seeking an application. This is undoubtedly a function of my having lived through the first flush of the digital revolution. A future list may be better balanced with conceptual frameworks, pedagogies, and social movements.

Second, several ideas recur, with increasing success in their adoption. Learning objects were the first attempt at making teaching content reusable, and even though they weren't successful, the ideas they generated led to OER, which begat open textbooks. So, those who have been in the edtech field for a while should be wary of dismissing an idea by saying: "We tried that; it didn't work." Similarly, those proposing a new idea need to understand why previous attempts failed.

Third, technology outside of education has consistently been co-opted for educational purposes. This has met with varying degrees of success. Blogs, for instance, are an ideal educational technology, whereas Second Life didn't reach a sustainable adoption. The popularity of—or the number of *Wired* headlines about—a technology does not automatically make it a contender as a useful technology for education.

This leads into the last point: education is a complex, highly interdependent system. It is not like the banking, record, or media industries. The simple transfer of technology from other sectors often fails to appreciate the sociocultural context in which education operates. Generally, only those technologies that directly offer an improved, or alternative, means of addressing the core functions of education get adopted. These core functions can be summarized as content, delivery and recognition.[28] OER, LMS, and online assessment all directly map onto these functions. Yet even when there is a clear link, such as between e-portfolios and recognition, the required cultural shifts can be more significant. Equally, edtech has frequently failed to address the social impact of advocating for or implementing a technology beyond the higher education sector. MOOCs, learning analytics, AI, social media—the widespread adoption of these technologies leads to social implications that higher education has been guilty of ignoring. The next phase of edtech should be framed more as a conversation about the specific needs of higher education and the responsibilities of technology adoption.

When we look back twenty years, the picture is mixed. Clearly, a rapid and fundamental shift in higher education practice has taken place, driven by technology adoption. Yet at the same time, nothing much has changed, and many edtech developments have failed to have significant impact. Perhaps the overall conclusion, then, is that edtech is not a game for the impatient. ■

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Reading Signals from the Future: EDUCAUSE in 2038

By Paul LeBlanc

In 1992, I was in a meeting at Apple Computer and was asked if I wanted to see the next "killer technology" the company would soon release. My Apple colleague left the conference room and came back to unveil the Apple Newton, a handheld device (sort of) that Apple was calling a "Personal Digital Assistant" (PDA) and that featured handwriting recognition. I flipped back the gray metal lid and tried the stylus, writing to my wife, "Dear Pat." My writing, converted to text on the fly, came back as "Deal Pot." The Apple team reassured me that the software was getting better, but problems in the Newton's handwriting recognition continued to plague the device, as did its high price, and Steve Jobs killed the product in 1998. The Newton was widely considered a failure.[1]

The Institute for the Future in Palo Alto, California, uses the phrase "signal from the future" to describe a technology like the Newton. The notion is that we are surrounded by signals from the future—artifacts in current use that presage a future trend or development, even if they are commercial flops in the present and are eventually abandoned, as was the Newton twenty years ago. Yet although the Newton was deemed a failure at the time, it foreshadowed the PalmPilot, which dropped the handwriting recognition for other functions such as scheduling and contact management and became the first widely successful PDA. The Blackberry came later, adding phone capabilities, and we all know what happened next. In 2007, Apple released the first iPhone. Twenty years after the Newton, the newest iPads (an offspring of the iPhone breakthrough technology) have excellent handwriting recognition.

The Newton, circa 1993, and the iPhone, circa 2007

Credit: Blake Patterson (Alexandria, VA). CC BY 2.0.

As EDUCAUSE contemplates its next twenty years, what signals from our future exist today?[2] Current trends are fairly well established, even if still in their relative infancy in some cases. Online learning is a mainstay of higher education. Data analytics, common in so many industries, is starting to take hold in higher education. Supplied with that data, machine learning is being applied to a variety of areas such as persistence,[3] assessment, personalized learning, and improved workforce pipelines.[4] But these are not signals from the future—they are technologies that are already reshaping our work.

What are our present-day signals from the future? Although we may flounder and perhaps fail in our current attempts to use them (à la the Newton), I suggest paying attention to four: game play and immersive learning; virtual and augmented reality; connected learners; and artificial intelligence.

Game Play and Immersive Learning

The idea of game play is hardly novel. Kevin Bell, for example, has discussed "gamification" and how we might harness the engagement strategies of game design in designing learning experiences.[5] But in addition, I'm thinking about the power of games as *immersive learning environments,* which do the following:

- Put the user into a world that requires exploration and increasing mastery
- Make this world so engaging that the user can engage for hours, in the "flow," not noticing the passage of time
- Utilize their built-in intelligence to alter the environment to calibrate to the user's level of mastery and to present the next challenges at just the right pitch
- Place users into that environment with others, and in many cases, require them to work collaboratively to be successful
- Yield "wow" moments of satisfaction and accomplishment

This may be a good description of the ideal learning experience. In 1993, when I was leading a technology team at Houghton Mifflin Company, I kept showing anyone who would watch a new, captivating computer game called *Myst*, which I played for hours at a time (don't tell Houghton). I remember thinking that it would be the future of learning. As it turns out, of course, this early game was a Model T compared with today's computer games and their startling realism, artistry, and technology. Costing tens of millions of dollars to create, they are a signal of what is to come in learning.

Virtual and Augmented Reality

Virtual reality (VR), an extension of the immersive learning/gaming environment, is already being used in entertainment: movies, games, and pornography.[6] VR is also being deployed in industrial settings. For example, ThyssenKrupp is using VR to enable elevator technicians to "go into" a repair before entering the physical site; wearing a "HoloLens" (a VR headset), they are able to understand the problem, the fix required, and the parts and tools needed before ever climbing into an elevator shaft.[7] We can expect VR to transport students into immersive

worlds so that they are able not only to understand ancient Rome, for example, but also to feel what it was like to be there. VR has the power to create empathy in ways largely unavailable to most students, as they "live" the experience of a modern-day refugee, of a Mississippi slave in 1835, or of a disabled person navigating the workplace today.

Augmented reality (AR) is sometimes posited as an incremental step toward VR, but I think it is actually more powerful. Rather than providing an alternative reality, as VR does, AR offers a *hybrid* reality. Most of us are online *or* off-line. Members of Generation Z, by contrast, are never off-line or online; they reside simultaneously in both. They live in a hybrid world. We had a dorm fire at SNHU last year, and although everyone escaped unharmed, many residents lost all of their possessions. When our team gathered and made a list of the things we could quickly replace (computers and clothing and phones and so on), what was the only thing students had with them as they left their smoky rooms? Their phones. They live in a blended world already.

AR is powerful because it takes the ultimate immersive learning environment—physical life—and overlays it with information. It melds physical information, what we ascertain with our senses, with digital information. Immersive and visual experiences are powerful, but they lack the distance—and thus the insight—that writing allows. For example, breaking-news footage of a bombing can be vivid and make us feel the immediacy of what is going on, but it is only later, when we read about the details, that we gain an understanding. As Jay David Bolter described in 1984, we have in the modern world moved from a world of written literacy to visual literacy, in which the textual is subservient to the visual.[8] AR has the ability to bring both together. While the devices we use to combine the two remain clumsy, such as holding up my phone to harness its camera to yield an AR trigger—for example, pointing it at the Eiffel Tower and getting historical and other information about the landmark—a much-maligned and failed product probably signals how we will someday access AR: Google Glass. That heralded 2013 product had a short life (pulled from the market in 2015), but its next iteration is in use in industrial settings and has been used to help autistic children learn.[9] With the iPhone, Apple got the last laugh regarding the Newton. Keep an eye on smart glasses and AR.

We are surrounded by **signals from the future**—artifacts in current use that presage a future trend or development, even if they are commercial flops in the present and are eventually abandoned.

Connected Learners

When you read "connected learners," do you think about networks, Wi-Fi, and online learning? Instead, I am talking about learners who are connecting by producing and sending data. In a world with sensors everywhere, look for humans to be laden with sensors that provide feedback first to them and then to others. Do you wear a Fitbit? It's a sensor. We are increasingly accustomed to the Internet of Things, like those ThyssenKrupp VR headsets that enable elevator repairs and the Samsung refrigerators that can order more milk when needed, but the Internet of Humans is the hot innovation space right now.[10] This is happening first in areas of fitness and health, with amazing potential for good. It is not an enormous leap to think about connected learners, especially as we discover more about the intersection of learning with physical and cognitive dynamics.

Connected learners are likely to send data on simpler things: Are they getting enough sleep? Are they anxious? Are they getting enough exercise? But what if you could take a drug that allowed you to learn Chinese 50 percent faster? Assuming no side effects, would you take the drug? Research is yielding startling results in this area.[11] Imagine, then, that a body sensor indicates a learner needs a dose of valproate to prepare for finals. We think of the use of performance-enhancing drugs in sports as cheating. What about in learning? In all events, the Fitbit may be a signal from the future.

Artificial Intelligence

Artificial intelligence (AI) is here now (as is machine learning, noted above), so technically it is not a signal from the future. However, it is not yet a strong force in higher education and thus bears mention. AI will radically alter the way we do our work. This will probably happen first in administrative functions, such as guiding students through processes for financial aid, course registration, and career pathways. It will increasingly be deployed as an aide, from help desk to tutoring. It will make possible individualized learning pathways and adaptive learning and will erase the difference

between formative and summative evaluation. AI will be the engine behind immersive learning and will be inextricably linked to the use of data. It is likely to be preferred over human interactions in many instances, since those in Generation Z will grow up completely comfortable with human-machine collaboration. Siri and Alexa will join a circle of friends and professionals, there whenever needed.

Conclusion

In 2038, EDUCAUSE will be making sense of a world dramatically different from the one in which we live today. Like dog years, technology years go by faster than human years. In other words, the velocity of change is increasing. The tablet computer reached 50 percent adoption in just five years, whereas the telephone took 100 years to reach saturation.[12] New technologies influence our world in exponential ways that outpace our ability to understand and manage them well. Take a look at the impact of hackers who recently weaponized social media in elections around the globe and our ongoing inability to respond with the right mixture of technology, security, public policy, and practice.[13]

As we look at this challenge through a higher education lens, EDUCAUSE will need to not only explain the emerging technologies but also broaden its view to take up issues of policy, regulation, and management (which it does now) as well as ethics, morality,

and philosophy. The technologies of the next twenty years offer enormous opportunity for great good—but also for great harm. EDUCAUSE has an important role to play as a translator and as a bridge between disparate fields. We will need as many ethicists and sociologists at EDUCAUSE gatherings as IT staff and edtech vendors.

Every field and every industry is grappling with a version of this problem, trying to stay ahead of the technology to yield its greatest good while offering protection from its potential for harm. In that sense, the signal that must receive most of our attention is not one from the future after all. Rather, it is a signal from the past: that is, every life has value and dignity and a right to self-determination. What that means in an increasingly technological world may be the most important question of the next twenty years. EDUCAUSE can help us find the answer. ■

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Dear Vendors

Dear Vendors: Like most other higher education Chief Information Officers (CIOs), I spend a lot of time talking to and working with you. Sometimes I am determining if your product(s) meet our need(s), and sometimes I have a suggestion for, or a problem with, one of your products that we already own. But frequently I am talking to you about the price of your product. Whether I need to acquire one of your products for the first time or renegotiate a contract that is about to expire, we spend a good deal of our time on the phone and in emails discussing price. Yet here's the odd thing: the pricing conversation hasn't changed over the years, despite the fact that both the institutions where I have worked and the technology I am using have indeed changed.

I have been fortunate to have worked in higher education information technology for many years, and I have been privileged to work at a variety of types of educational institutions. Yet despite currently working for a community college, the pricing discussions with you are exactly the same as when I was working at a large private university or at national and regional liberal arts colleges. Some of you have a fixed price that you charge all institutions. More commonly, you have a single formula that will determine price based on a specific criterion, such as the number of students or employees at an institution. Sometimes you are willing to get into detailed negotiations leading to "special" or "one-time" fees. But in my experience, such pricing is typically less about the institution and more about the abilities and tenacity of the person negotiating on behalf of the institution.

While virtually no educational institution takes a one-size-fits-all approach to what it charges students for an education, the technology we procure often comes with a one-size-fits-all price.

Institutions differ. I believe the time has come for you to rethink your pricing model to reflect those differences. Perhaps you would consider a model that looks at clients in the same way that higher education looks at students: by using pricing as a means (1) to attract a diversity of institutions and/or (2) to help those institutions that might not have the financial means to take advantage of your solutions.

Higher education institutions use merit-based financial aid to defray some of the costs of an education in order to recruit students with specific skills or backgrounds that we believe will help enrich our educational environment. A college or university may be looking for students with specific academic, leadership, musical, or athletic skills and abilities. It may be looking for students from a particular part of the country or from a particular background. That diversity strengthens our institutions—our students, faculty, and staff—in immeasurable ways. Yet while virtually no educational institution takes a one-size-fits-all approach to what it charges students for an education, the technology we procure often comes with a one-size-fits-all price.

The vast majority of higher education institutions are nonprofits. But even within that realm there are the haves, the have-lessers, and the have-nots. Community colleges, for example, are frequently in the have-not or have-lesser categories. While private colleges and universities have the flexibility to increase their income by raising tuition, most community colleges have no such luxury. Instead, their tuition is often set by the state legislature. In addition, while private institutions and, often, large public institutions can enroll students from afar who are able to pay their tuition, community colleges exist to attract the students next door and must price themselves to be affordable to the local community.

Your companies may find value in having a community college as a client who wants to use your product in a unique way or apply it to meet a unique need. Community colleges serve particular demographics and meet particular demands and would undoubtedly enrich your client base and, thus, your product and your company. We serve a broad range of educational requirements that can make the use of technology at our institutions notable. We use your IT solutions not only for meeting the traditional educational needs common to all undergraduate institutions but also for meeting very distinct needs: adult learners coming back to school to learn new skills; corporate training for local employers; or programs specifically for local markets (e.g., first responders, aquaculture, nursing).

You could benefit from having the community college perspective to guide your roadmap and future development. Or maybe you know that your product could be useful to community colleges, and you want to help make a difference. Whatever the reason, perhaps you could price your products in a way that intentionally seeks to offer discounts to community colleges—and they, in turn, can assist in enhancing your product, your company, and your clients.

Connections Editor: **Bret Ingerman**

By BRET INGERMAN

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Secondly, need-based aid is often offered to potential students who do not have the financial means to afford the cost of higher education. In many ways, your customers are on a similar continuum of economic ability. There are institutions, such as community colleges, that have less means than do others to pay for your product. That doesn't make us less needy for the solution that you can provide or less able to effectively use it; it simply makes us less able to buy that solution. Perhaps your companies can intentionally price your products in a way that reflects the economic disparity existing within your potential client base.

For example, many traditional pricing models penalize community colleges. I have had vendors tell me that they charge based on the total number of users. That presents a financial challenge to community colleges. Unlike other types of institutions, we serve a large number of part-time students, many who come to us to take a single class. Thus, whereas my college may have 9,000 full-time equivalents (FTE), that number may actually reflect a total of 13,000 different part- and full-time students taking credit-bearing courses. On top of that, we have an additional 8,000 students taking noncredit classes. This brings the total number of unique users to 21,000. So even though my institutional revenue comes from what amounts to 9,000–11,000 FTE, we would be charged as though we derived revenue from 21,000 potential users. Clearly, the total users model does not work for community colleges. Some form of financial discount would not only help us acquire your solution but also allow you to recognize our unique type of institution.

The ability to offer alternative pricing to community colleges should be even easier for those of you who offer software as a service (SaaS) and other cloud-based solutions. Your salespeople rightfully point out to us the tremendous value and economies of scale that exist in SaaS and cloud-based solutions. Yet your SaaS and cloud pricing models almost always mimic the pricing structure of your on-premises solutions. If SaaS and cloud-based solutions provide your company with the economies of scale touted by salespeople, you should have a much lower marginal cost to add and support a new client, such as a community college. You should then be in a better position to assist institutions with limited financial means in finding ways to take advantage of your solutions.

The purpose of this open letter is simply to ask you, the vendor community, to be more intentional in your pricing models so as to allow community college (and other) customers to use and gain from your products. Lowering fees can provide you with a broader and more diverse set of customers. And we, in turn, can help you offer even better products. I do not propose a particular rubric for pricing your products. Rather, I only ask that you consider whether your company can create such a rubric that will, in the end, benefit all. ■

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ETDs in the 21st Century

Twenty years ago, the first electronic thesis/dissertation (ETD) was required to earn a master's or doctoral degree, so this seems an appropriate time to look at the ETD's past and future. We have come a long way from considering ETDs to be a new form of online scholarship and from the early days of "Oh my gosh, the files will be too large to download" or "File formats become obsolete so quickly." Many of the early goals of ETDs have been realized, including graduate students saving money and libraries saving shelf space. We have seen institutional repositories use ETDs as exemplars of public access to information, and we're no longer surprised about the number of "visitors" and "sessions" (in Google Analytics terms) received by an ETD. However, we still haven't seen the majority of ETDs transformed into new media with sophisticated interactive graphics and/or embedded sound and video demonstrating research findings.

Innovative ETDs

On the other hand, some standouts have been recognized through the annual (since 2004) NDLTD (Networked Digital Library of Theses and Dissertations) Awards. "Innovative" ETDs have largely been PDF files accompanied by multimedia (and not just in STEM fields). In the recordings of the NDLTD Awards, the authors point out that voices and visuals often say more than text and that they want to entertain as well as educate. They explain how they want to reach an audience beyond academia and, for instance, show the way a garment moves and the fabric flows. They add that multimodal ETDs can "change learning." Award-winning ETDs have been accompanied by full-length documentary videos demonstrating health care and human rights and showing parents voicing concerns about their sons' and daughters' educational opportunities. Some ETDs have even evolved into enhanced "books."

Developing Technologies

These outliers had no best practices to follow. The Educopia Institute has helped to remedy that with funding from the Institute of Museum and Library Services (IMLS). For example, the ETDplus Project, a multi-university endeavor, developed guidelines and built tools for graduate students who are creating and submitting works beyond the PDF file, including data sets, videos, websites, and other results that cannot be captured in writing alone.[1]

Various activities involve ETD systems development. Since ETD-db, Vireo, and ProQuest ETD Administrator, we haven't seen ETD-specific systems developed. However, librarians at Texas Tech designed SAVE (Streaming Audio and Video Experience), a tool specifically for handling music ETDs. The IMLS-funded Educopia project ETD Lifecycle Management Tools developed openly licensed micro-services software that can be used independently or incorporated into existing repository workflows.

Digital library service developments led by computer scientists and researchers see ETDs as a vast resource for experimentation in artificial intelligence, information extraction, information retrieval, machine learning, natural language processing, and more. An exemplar is ETDseer, based on CiteSeerX.

Access

From the earliest days, ETDs have also been recognized as a way to advance other agendas, particularly public access to information. Today the many interests of the ETD community are shared through conference programs, publications, and the ETD Forum. Periodically the community hosts discussions and presentations about whether ETDs should have immediate public access or limited embargoes. Restricting access during patent applications is a no-brainer, but many faculty advisors continue to be concerned that allowing online, publicly accessible dissertations will make it more difficult for authors to get published and join the academic ranks of traditionally published faculty. Naysayers deny the studies that show,[2] as well as the editors who have stated in public venues,[3] that an ETD requires an extensive transformation and rigorous peer review before it will be published as a journal article or a book.

In the ETD Forum archives, no topic comes close (in terms of both posts and views) to the discussion of access to ETDs, with almost 100 posts and nearly 900 views in the last four years. The debate continues about how long the embargo should be for an ETD that contains creative writing. There was much buzz when the American History Association recommended six-year embargoes. However, a study by Midge Coates showed that this may have increased the publication of history books based on ETDs by only 4 percent.[4]

Articles

An increasing number of graduate students are publishing articles prior to completing their dissertations and are

E-Content Editor: **Joan K. Lippincott**

By GAIL McMILLAN

including those articles in their ETDs. Some colleges and universities have what is often referred to as "manuscript style" ETDs. The ETD chapters are articles that have been published, are under consideration by a journal, or have been prepared for submission. These require that graduate students have a greater understanding of copyright law, as well as a willingness to read, and not just sign, publishers' author contracts.

This format raises concerns when an article has more than one author. Graduate school policies at universities such as Southern Illinois and Virginia Tech require that the ETD author's contribution be clearly described. Of course, policies vary. At the University of British Columbia, multi-authored ETDs are not allowed, but the near-same chapter can appear in more than one thesis if this is clearly explained and each student's contribution is described. Universities such as Loyola (Chicago) and Central Florida allow multi-authored ETDs from their Schools of Education with EdD programs, which have group doctoral research projects.

Data

Data is trending—not only data accompanying or within ETDs but also their metadata. The peer-reviewed literature about ETDs focuses heavily on ETDs in institutional repositories and on ETD metadata (including cataloging). While good metadata improves the discoverability of ETDs, it is also a significant body of data itself, as Lucas Mak and his colleagues at Michigan State University Library have pointed out.[5] ETD metadata can be used to measure academic activity within and outside the administrative structure (e.g., departments), and it can reveal related communities beyond the college/university. ETDs can expose disciplinary trends and networks of academic activity, as well as potential research advisor genealogy.

Text and data mining is beginning to appear as a topic in many venues, including those outside the ETD community. For example, at the February 2018 International Digital Curation Conference in Barcelona, my colleague Zhiwu Xie presented "Advancing Policy and Changes for Graduate Data Management" and recommended that graduate students prepare data-management plans so that from the early stage of their research, there will be periodic review-and-revise with their advisors and submission of the data along with the ETD for review before the defense, all as integral components of the students' plan of study and final exam procedure.

Another change for graduate students is the move of many colleges and universities away from requiring ETD authors to give nonexclusive copyright licenses to ProQuest.[6] There are now many online and searchable ETD databases, including Global ETD Search from the NDLTD, OADT (Open Access Theses and Dissertations), and EBSCO Open Dissertations.

Preservation

Another scholarly communication issue that ETDs have exemplified is long-term preservation. Many who are concerned about digital libraries (including Clifford Lynch and Henry M. Gladney) have pointed out that the difficulty with preservation issues are largely organizational, economic, and institutional.[7] The mechanics are relatively easy, as evidenced by, among others, the MetaArchive Cooperative. Since 2004, when the Cooperative received initial funding from the Library of Congress's National Digital Information Infrastructure and Preservation Program (NDIIPP), there has been a practical and affordable strategy for ETD preservation available. The NDLTD lists this and many other preservation strategies.

■ ■ ■

While I celebrate the anniversary of the ETD requirement at Virginia Tech, I know that other colleges and universities are still wondering when, not if, they will require ETDs. Unfortunately, the issues surrounding ETDs continue to be more about an institution's political climate than about its technical expertise. I'm still longing for the "innovative" ETDs to evolve into the "typical" ETDs, though I do enjoy referring to Timur Oral's 1997 ETD, in which he incorporated digital video (accessible, though primitive) and lovely color illustrations.[8] Although progress is slow, I'm anticipating a time when the norm for a graduate student's legacy will be a *demonstration* of the research, not just words describing it. ■

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A Professional Life Defined in EDUCAUSE Years

Twenty years of EDUCAUSE—and I missed the first seven! My professional life divides into B.E. (Before EDUCAUSE) and S.E. (Since EDUCAUSE). Despite an IT career of thirty-plus years, I was not privileged to have EDUCAUSE experiences for all of its twenty years. In my administrative systems IT department B.E., there were neither the resources nor the intention for professional development for early-to-mid-career staff—other than specific training to develop technical skills. Adding to the challenge was geographical isolation. B.E., the use of research at my institution occurred primarily among the academic technology staff and the growing and fast-moving network technology fields. Transitioning into managing a team was learned, at best, through modeling good managers (if we were lucky enough to have had them) and, at worst, through inflicting a big experiment on the team with a new leader.

In 2004, a promotion took me from managing a small team of three to leading a team of forty. The next year, when EDUCAUSE was seven years old and a gem I did not yet know about, my world changed. IT at my institution was reorganized, a CIO position was established, and that position was filled by a great man, Ralph Caruso. Ralph taught me more about leadership and management in one year than I had learned in the prior seventeen, but more important, he gave me the gift of EDUCAUSE as he encouraged me to engage with and take advantage of all EDUCAUSE had to offer.

From my very first EDUCAUSE conference, Ralph inspired me to take pre-conference seminars focused on leadership, and in those seminars I began developing relationships that changed me, challenged me, enriched me, and expanded my world. I attended compelling sessions, and the connections I developed as a result of asking presenters numerous questions added to my growing network. I read articles, which took me down trails of further reading. I was mentored and coached. I learned that leading a team well isn't due to luck or personality. It's intentional and thoughtful, and EDUCAUSE has great research, materials, and training to guide our success and impact. Sometimes I wonder how I stumbled through my B.E. life and went from managing three people to leading forty without the network and tools I found and everything I learned S.E. I am sure those forty people wish I had connected with EDUCAUSE *before* I took over that team. I'm sorry, folks. If only I had known then what I know now!

Within a couple of years, I knew that I wanted to attend the Frye Leadership Institute (now the Leading Change Institute), but I felt too "far behind" given my years of experience compared with my professional development experiences. Every year when the application deadline rolled around, I found another reason to not put myself through the process, which terrifyingly included getting a recommendation letter from the chancellor! The idea of spending two weeks with all those amazingly smart people, who clearly had way more going on than I did, was daunting. An additional barrier was that I would have to leave my children for two weeks. When Frye changed to a week-long event in 2012, that seemed manageable. My network had expanded to include people who had attended Frye and who now encouraged me to apply.

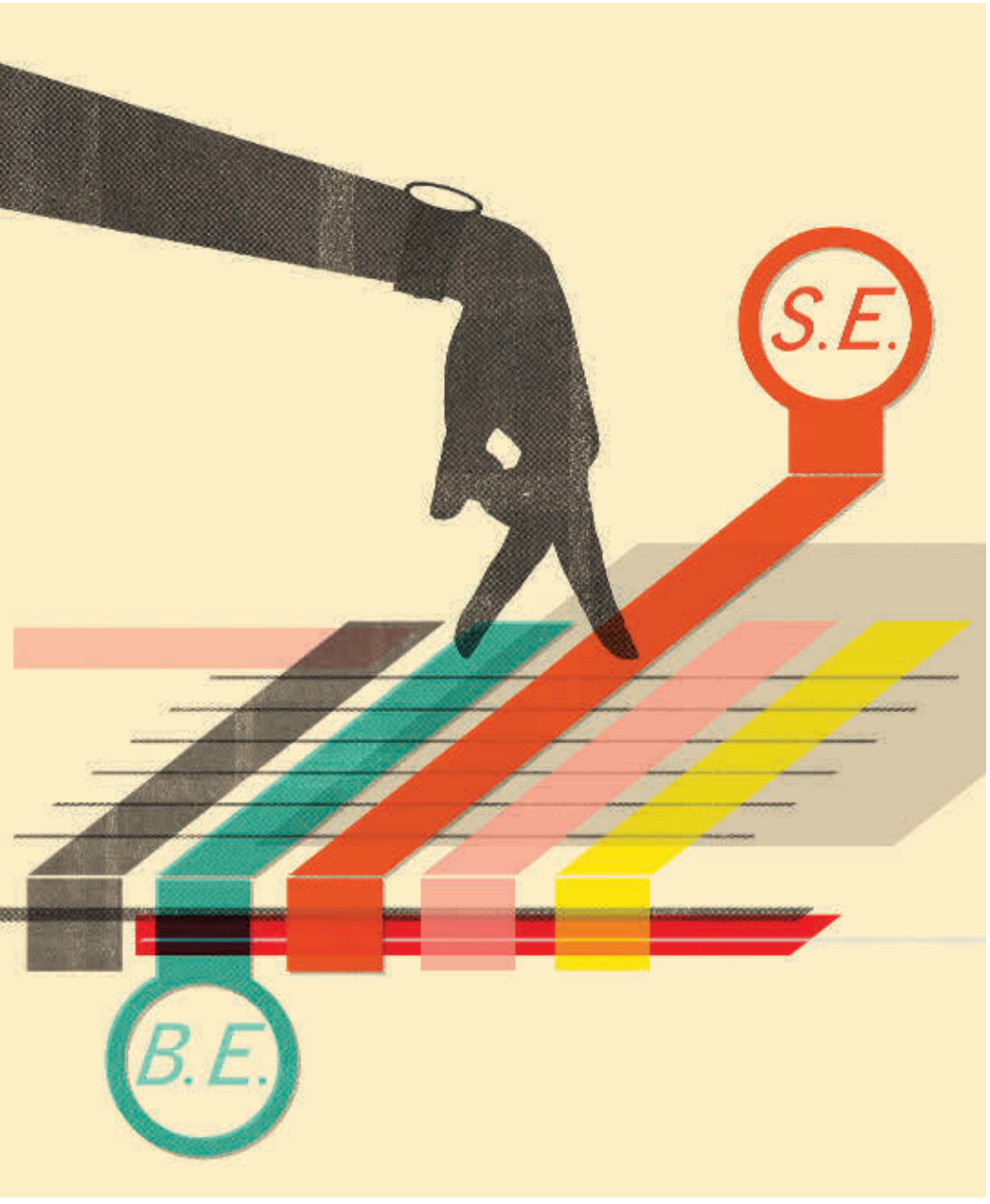
> **Because of EDUCAUSE, I had the courage, knowledge, experience, and supportive colleagues encouraging me to seize the opportunities and to take on the challenges the years have brought.**

I really should create another timeline—A.F. (After Frye)—because the institute was a pivotal point for me. Even with all that EDUCAUSE had given me so far, I had no reference point to guess, imagine, or dream how I would grow from that experience. The week itself was powerful, but just as important were the relationships I formed there. They are the heart and soul of my professional and personal life, and because of them, my career has taken directions I never imagined. All of us have coached, mentored, texted, talked, cajoled, challenged, and supported each other in considering different positions, starting new positions, and surviving major organizational changes, divorces, empty nests, births/parenthood, and deaths.

A.F., the pace and change of my professional life created nearly annual "big events" as I was promoted and took on challenging work for which I regularly sought out EDUCAUSE resources. In that time, I have learned, presented, contributed, and yes, further expanded my network through ELI, the Core Data Service Advisory group, ECAR working groups, and the Enterprise IT Advisory Group. A week doesn't go by without an interaction with someone I have met through EDUCAUSE or someone I am referring to

New Horizons Editor: **Jennifer Sparrow**

By CINDY MITCHELL



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EDUCAUSE resources, connections, or development opportunities. I became engaged in NERCOMP and now serve on the NERCOMP Board. I took a major leap and am now privileged to be CIO at Colby College, which landed me in the incredible CLAC (Consortium of Liberal Arts Colleges) network.

Because of EDUCAUSE, I had the courage, knowledge, experience, and supportive colleagues encouraging me to seize the opportunities and to take on the challenges the years have brought. Do I wish I hadn't missed those first seven years? You bet. But I am thankful for all the support I received during the following thirteen years with EDUCAUSE and am excited about what is to come. ■

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Facebook's Teachable Moment: What Higher Education Knows about Improving User Behavior

I changed my privacy settings. Did you? Who among us did *not* review our Facebook privacy settings this past March? Were you spurred to do so by the Cambridge Analytica news? By Facebook's full-page apology in the *New York Times*?[1] Perhaps you are naturally cautious and just happen to always review your social media privacy settings on the second-to-last Sunday in March?

The fact that Facebook was sharing more data than it stated really shouldn't come as much of a surprise. The fact that another organization didn't delete data when it promised to do so and used it for other purposes shouldn't be a surprise either. Yet it continues to be a bitter pill to swallow that the best defense against these vendor "oversharing" violations is a fundamental change in *user* behavior—especially for people who just want to share photos of their latest family celebration or what they ate for dinner at the fancy restaurant last night or to circulate the social and political views closest to their heart.

Higher education information security and privacy professionals have long recognized that changing user behavior is at the core of any successful information security awareness strategy. When the higher education information security community first started to organize in the early 2000s, it recognized the importance of convening people to develop and share effective cybersecurity practices and of promoting cybersecurity awareness to the wider higher education community. Cybersecurity awareness is just as important today. In fact, the opening keynote by Dr. Jessica Barker at the 2018 EDUCAUSE Security Professionals Conference stressed the importance of cybersecurity awareness and suggested that approaching this type of awareness training from a positive viewpoint (emphasizing good cybersecurity hygiene practices instead of highlighting the poor practices one must avoid) might lead to a more informed and security-savvy user.[2] Thus, higher education practitioners continue to evolve and refine their approaches to information security awareness education.

Effective awareness and education activities are crucial to the success of information security program. We share practices and awareness tips in an environment that says that information security is the number one issue facing higher education IT organizations today.[3] We promote user awareness in an environment where the complexity of security threats continues to grow and influence institutional IT strategies. And, we advance data security and privacy literacy in an environment where resource constraints[4] may mean that the most exciting up-and-coming security technologies are beyond the reach of even the best-funded IT organizations.

So, what does higher education do that might scale for other industry sectors?

- *Community.* First, we have an identifiable community whose members work together to share tips and techniques for changing user behavior. We create awareness campaigns that any higher education institution can use to supplement its own information security awareness program. Higher education understands that changing one user's behavior may be all that is needed to provide a good security outcome for our entire higher education community. Building a global network of practitioners that understands this is crucial.
- *Collaboration.* While there are certain subject areas in which institutions may want to be self-sufficient and even competitive, information security awareness is not one of those areas. There are opportunities for mutual and sector improvement only when those in the higher education information security and privacy community collaborate to create and share tips, techniques, practices, policies, procedures, technologies, and tools related to information security activities.
- *Conviction.* Finally, higher education leaders and information security and privacy practitioners have a true passion for protecting the data that community members entrust to their institutions. Students, faculty, staff, vendors, and other third parties entrust many different types of data (e.g., business, financial, and research data, as well as personnel information) to institutions every day. Failing to protect this data may not necessarily impact an earnings report, but it can negatively affect an institution in many other ways (e.g., data breaches or inadvertent disclosures that result in remediation costs, regulatory fines, and reputational loss). While there is no silver bullet to prevent data breaches,[5] a sense of conviction in protecting institutional data persists in the higher education community.

Viewpoints Editor: **Theresa Rowe**

By JOANNA LYN GRAMA

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Many users may have been caught off-guard earlier this year with the news about Facebook and Cambridge Analytica. Teaching users how to protect themselves is an essential step toward protecting the data of a larger enterprise, from ongoing business concerns to higher education institutions. And the results are reflexive: any security hygiene practices learned and employed at work to secure organizational resources can be used to help secure a user's personal data as well. Higher education information security and privacy professionals offer some quick tips to help users protect data both at work and at home:

- Use different passwords for every single account, and use a good password manager tool to help keep track of all the different passwords.[6] In most applications, passwords are coupled with an email address to grant you access to the application. When you reuse an email/password combination, you run the risk of having multiple resources compromised if a single password is exposed. At the very least, make sure that sensitive accounts (e.g., bank accounts, credit card accounts, work accounts) all have different passwords.
- Be very suspicious of unsolicited requests received via electronic communications.[7] Sometimes these types of communications are used to steal data or spread malware. Today's phishing scams are far more sophisticated than the "prince in a far-off land" schemes of ten years ago. Any unsolicited request that asks you to follow an embedded link, open an attachment, share your user credentials, enter banking information, or provide additional personal information should be reviewed with a critical eye. Wherever you can, use another communication mechanism to verify that the first communication was authentic before navigating to a website, providing data, or opening an attachment.
- Limit the types of personal data that you share via apps and other online services whenever possible. Often organizations and applications ask to use or access far more data than they need in order to offer you goods and services. They do this so that they can build a profile of you as a user and offer you even more goods and services. Be a discerning service user and read the user agreements before you download a new game or use a new service. You may decide that using the new service is more important to you than sharing your Facebook friends list, or you may decide to forgo the new service because it asks for too much data. In order to make an informed decision, you must know and understand what you are sharing.

Improving data security and privacy literacy is something that transcends and can unite every industry sector. The higher education approach to creating effective awareness and education programs—focusing on community, collaboration, and conviction—is something that any industry sector can emulate to improve user behavior. ■

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A condensed version of this article was published in *EdSurge*, June 3, 2018.

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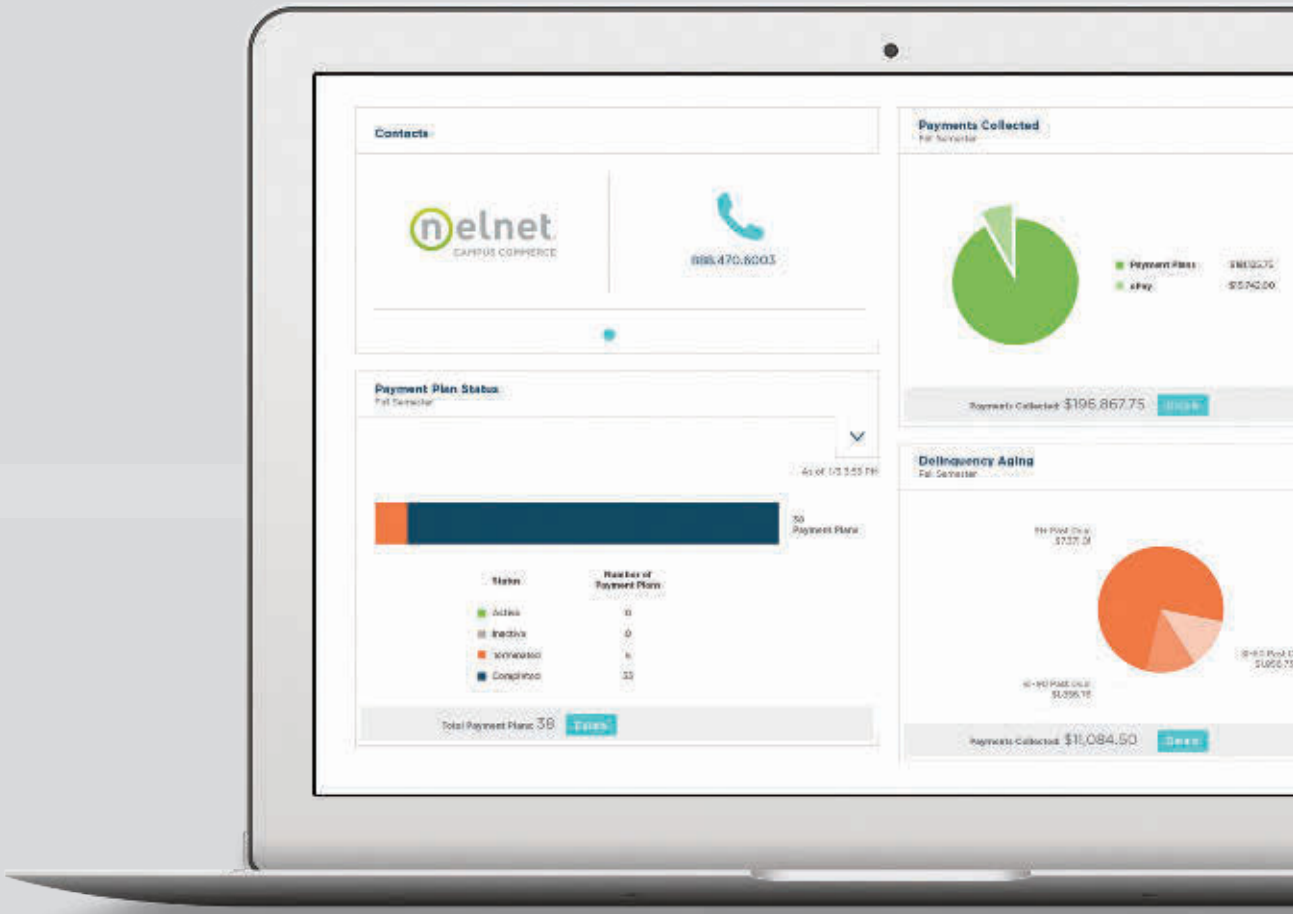

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