

BUILDING BLOCKS FOR THE CONNECTED CAMPUS

Wireless networks, collaboration tools and other solutions position colleges to facilitate learning inside and outside the classroom.

EXECUTIVE SUMMARY

For today's college students, constant connectivity isn't just an expectation. It's a requirement.

Students arrive on campus with carloads of connected devices: tablets, smartphones and laptops; fitness trackers, smartwatches and other wearables; gaming consoles, smart assistants and wireless speakers. When institutions lack robust wireless networks that can accommodate these devices, it's only a slight exaggeration to say students might pack their devices back into their cars and drive off to another college.

While students certainly rely on mobile connectivity to facilitate their social lives, they also view dependable wireless service as essential to their learning and academic success. Several years ago, institutions might have been able to get away with supporting high-end solutions primarily in classrooms and libraries, but students now view their entire campuses — including residence halls, common areas and even outdoor areas — as learning spaces that ought to be connected.

To create truly connected campuses, institutions must invest not only in wireless networking, but also in back-end supporting technologies, security tools and collaboration solutions that help students make the most of network upgrades.

Elements of the Connected Campus

Look at a group of teenagers on a college campus tour, and you'll see more than one set of eyes turned down, looking at the screen of a smartphone. But these prospective students aren't all checking their Instagram feeds or texting friends back home. Many are simply testing the on-campus wireless connectivity. For some of these students, the lack of a good connection is enough to take a potential college off their list.

To adults who graduated from college a decade or more ago, the idea of picking an institution based on its Wi-Fi connection may seem silly. But in fact, these students are making a strategic decision about their educations. Students today don't just live online; they also learn online. Consequently, a college that makes it difficult for students to use mobile devices to connect with peers and online resources isn't just putting its enrollment numbers at risk. It is also doing a disservice to its current and future students.

Fortunately, administrative and IT leaders at most institutions recognize that connectivity is a priority for student life and student learning, and they're racing to upgrade their infrastructures to accommodate growing demand. But on many campuses, work remains to be done.

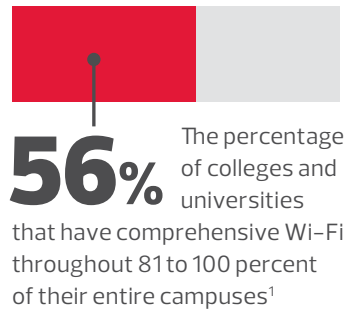
The following IT solutions are critical for colleges that want to turn their entire campus into a connected learning environment:

Robust Wi-Fi: At many universities, IT networks have sprawled over time, with individual departments adopting their own solutions, often without a cohesive strategy to guide investments. As a result, disparate legacy hardware can limit the performance of the wireless network and make it difficult to perform upgrades without massive rip-and-replace efforts. By centralizing their networking strategies and investing in state-of-the-art solutions such as 802.11ac Wave 2 access points, colleges can give students and faculty the robust, reliable connectivity they want and need.

Network optimization tools: As networking investments grow, so do monitoring and troubleshooting tasks. Network optimization tools can aggregate data from across the network to alert IT professionals when problems arise. Often, such tools help IT staff diagnose and correct potential problems before students and faculty even notice them, thereby increasing user satisfaction and reducing the maintenance backlog for IT shops.

Digital signage: Increasingly, higher education institutions are adopting digital signage solutions to share information across campus, enhance classroom learning experiences, provide wayfinding services and facilitate emergency announcements. According to [Digital Signage Today](#), up to seven out of 10 colleges have already implemented digital signage, for reasons ranging from saving money on printing to needing a convenient way to encourage students to fill out course evaluations. Digital Signage Today notes that 97 percent of students now prefer to receive information digitally.

Collaboration tools: Through video, voice, instant messaging



and file-sharing tools, colleges can empower students to seamlessly share work and ideas inside and outside the classroom. Such tools also let faculty and students facilitate virtual visits from experts in the field and access files from any machine on campus. Familiarity with tools like these also prepares students for the collaborative nature of many top jobs. According to a study from [the Institute for Corporate Productivity and Babson College professor](#)

[Rob Cross](#), companies that promote a collaborative environment are five times more likely to be high performing than peer organizations. Finally, collaboration tools make it possible to deliver the distance-learning programs that have become such an important component of many students' education.

Learning management systems: These systems have been a staple of the IT environment at most colleges for a decade or more. However, as the capabilities of consumer technology have expanded, some LMS tools have stagnated by comparison. In the higher education edition of its 2017 "[Horizon Report](#)," the New Media Consortium suggests that next-generation LMS solutions, designed to support more flexible online learning spaces, are poised to make a splash in the higher education market. For now, the report notes, many students and faculty must augment existing online learning systems by incorporating outside tools such as Google Apps, WordPress, Slack and iTunes U.

Audiovisual tools: Audiovisual solutions help professors share information in a visual format, incorporate video and music into lectures, and display student work. Wireless AV tools that seamlessly pair with faculty members' and students' mobile devices can encourage adoption and reduce wasted instructional time.

Back-end support: Connected campus solutions require data center support, including appropriate networking, processing and storage. For some colleges, the public cloud will be a good fit for some of these infrastructure needs. Others are incorporating hyperconverged infrastructure — which combines compute, storage and networking into a single, on-premises solution — to power hybrid cloud models.

Security: In EDUCAUSE's list of "[Top 10 IT Issues](#)" facing higher education institutions in 2018, information security ranks at the top. The more connected that campuses become, the more they must be mindful of security — for example, ensuring that Internet of Things devices don't compromise the network. In a 2017 survey from the [Center for Digital Education](#), 36 percent of colleges say they will need to beef up cybersecurity to facilitate their connected campus plans.

The Big 'Why': Drivers and Benefits

Investments in networking upgrades and other connected campus solutions don't just make colleges and universities more attractive to prospective students. They also help faculty and staff improve learning outcomes, drive revenue, cut costs and prepare their campuses for future technologies.

Here are some of the top drivers and benefits of connected campus initiatives:

Student demand: Although virtually every institution has invested considerable resources in recent years in both wired and wireless networks, it's nearly impossible to keep up with the growing demands that students place on IT resources. The situation is improving rapidly, but work remains. According to the "[2017 State of ResNet Report](#)" from ACUTA and ACUHO-I, 87 percent of campuses offer robust wireless coverage in the vast majority of academic spaces, such as classrooms and study areas.

Similarly, more than four in five institutions now offer robust Wi-Fi in the vast majority of dining facilities and residence halls (including student rooms, community spaces and administrative areas), with each area seeing a bump of at least 10 percentage points over a three-year span, according to the report. In outdoor spaces adjacent to residence halls, such as courtyards and parks, however, adoption has *decreased*, with the percentage of campuses offering robust Wi-Fi in the vast majority of such spaces dropping from 20 percent to 12 percent between 2014 and 2017.

Among institutions adopting or expanding connected campus technologies, 43 percent say that student retention is a top driver of their investments, according to a 2017 study by the [Center for Digital Education](#). That ranks second among overall drivers of connected campus technologies.

Revenues and expenses: In the Center for Digital Education study, the top spot on the list of connected campus technology drivers goes to the "potential for cost savings," a priority for 48 percent of institutions. Another 21 percent are motivated by reduced facilities costs and better resource utilization, and 15 percent see potential for increased revenue in such investments.

Some of that potential is still theoretical. For example, while 43 percent of higher education IT leaders expect the Internet of Things to reduce costs, fewer than half (21 percent) have yet to realize these savings.

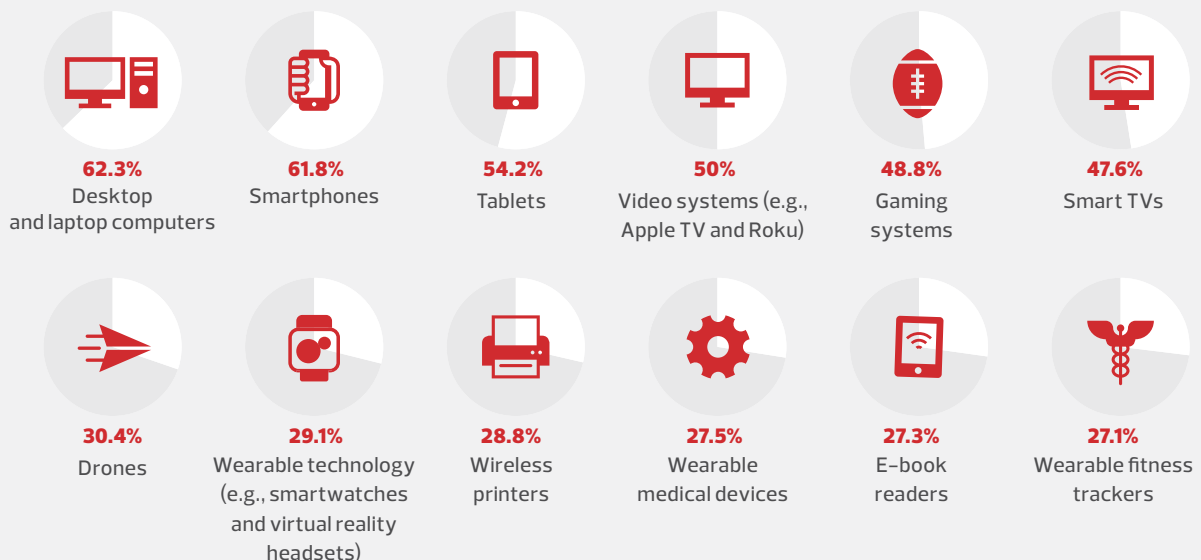
Still, the fact that money is at the forefront of so many administrators' minds when it comes to the connected campus illustrates the extent to which organizational thinking around IT has evolved. IT shops were once seen primarily as a cost center at many colleges and universities, but administrators are now taking a more strategic approach to technology.

One example of this shift in thinking is the rise of LMS. In addition to supporting students in traditional, on-campus classes, these tools help educators offer high-quality classes online – which, in turn, makes it possible to increase enrollment capacity and diversify revenue streams without dramatically increasing overhead. Internet classes were once considered largely the purview of for-profit, online-only colleges, but that's no longer the case. For both students and institutions, online degree programs now play a major role in expanded educational options. And some traditional university systems, such as the [University of Massachusetts](#), have amassed more than \$100 million in annual revenue from online enrollment.

Improved learning outcomes: The day-to-day management tasks of an IT shop can feel disconnected from student learning, but in fact, the entire point of campus technology is to support students' academic success. In fact, EDUCAUSE named "student success" the No. 2 IT issue facing institutions in 2018. In the Center for Digital Education study, 38 percent of institutions listed improved student

BYOE: Bring Your Own Everything

The variety of connected devices on campus keeps growing, and that leads to a more complex networking environment. A survey of 450 IT pros shows how many are concerned about the bandwidth demands in each category:

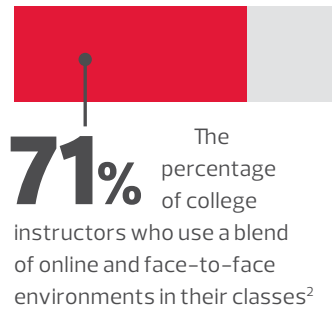


learning outcomes among their top drivers of connected campus technologies. And in the higher education edition of its 2017 "Horizon Report," the New Media Consortium calls out a number of learning-focused goals among the key trends accelerating IT adoption at colleges and universities over the next five years.

Simply giving students fast and reliable internet access — across campus and on any device — is an important step toward enabling student success. More than ever, students are taking charge of their own learning by seeking out reputable resources on the web. But collaboration tools that help students share information and work together are also important. These can include cloud-based services and apps that let students and educators access and contribute to shared workspaces. The New Media Consortium also emphasizes the importance of tools that make it possible for educators to redesign learning spaces, promote blended learning and improve measurements of student learning.

Preparation for the future: While students are responsible for much of the demand on IT networks today, much of tomorrow's demands will stem from the growth of the Internet of Things (IoT). Institutions that don't work to build out network capacity now may find themselves lagging. Already, according to the Center for Digital Education study, fewer than a quarter (23 percent) of IT administrators say their current computing infrastructure can sustain connected campus activities for the next five years. More than one-third (36 percent) say the existing infrastructure will accommodate needs for the next year, but not much longer than that. And 22 percent say their infrastructure is inadequate even for today's requirements.

Early IoT use cases, such as smart buildings initiatives, have largely centered around tracking data in the physical environment



to arrive at insights that help organizations optimize operations. However, the New Media Consortium report also points to emerging research on student-focused IoT use cases. Future applications may include wearables that monitor biological factors corresponding to students' emotional states and sensors that track students' skeletal positions to identify correlations between different postures and learner engagement.

Best Practices to Support the Connected Campus

While the benefits of creating a more connected college campus are readily apparent to most administrators, the transition is easier said than done. To truly turn living, dining, outdoor and common areas into connected learning spaces, most campuses must undergo a significant transformation, with obstacles ranging from funding to institutional inertia.

In the Center for Digital Education study, IT administrators listed several technologies that are necessary to implement planned connected campus initiatives. Thirty-nine percent said their colleges will need bandwidth improvements to carry out their plans; 36 percent will require network modifications, data analytics and improved cybersecurity; and 33 percent will need to beef up cloud infrastructure. Perhaps most alarmingly, nearly one-third (28 percent) of respondents said they don't even know what technology improvements will be necessary to support connected campus solutions.

IT leaders at colleges and universities should consider taking the following steps to help realize their vision for a fully connected campus:

Eliminate (or mitigate) silos: By their very nature, higher

A Student's-Eye View of Campus IT

In its 2017 "[Study of Undergraduate Students and Information Technology](#)," the EDUCAUSE Center for Analysis and Research found that, overall, students rated their campus technology experiences favorably. But they also see opportunities for improvement.

- Seventy-six percent of students reported good to excellent Wi-Fi experiences in campus libraries, the highest marks of any campus learning space. Classroom Wi-Fi received positive marks from 68 percent of students, and "general indoor public spaces" scored 61 percent. Only 51 percent of students gave positive marks to Wi-Fi in student housing, however.
- Sixty-three percent of students say they typically try to figure out tech problems on their own. Just 25 percent say they contact university IT services for help.

- Ninety-seven percent of students own a smartphone, and 78 percent see these devices as at least moderately important to their academic success. Still, 70 percent say faculty members ban or discourage the use of phones in class.

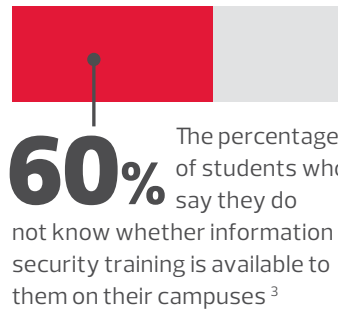


- The vast majority (79 percent) of students prefer course designs that incorporate online learning in some way.
- Most students are satisfied with the basics of their college's learning management system, but satisfaction drops for more complex functions. Seventy-seven percent of students say they're satisfied with the mechanism to submit course assignments, for example, but satisfaction rates for tools that let them collaborate on projects (43 percent) and participate in study groups (40 percent) are much lower.

education institutions may be fragmented, with business schools, graduate programs, humanities departments, fine arts centers, athletic departments and other suborganizations all pursuing their own goals. Historically, this has often meant that individual departments have considerable control over their own funding, including money for IT initiatives.

It makes sense for programs to be able to invest in the tools that leaders consider most helpful for their individual aims, but this scenario can lead to a hodgepodge of solutions that IT staff must support. This is especially worrying when ad hoc IT implementation extends to networking solutions and other systems that should be centralized. To the extent possible, IT administrators should work to bring the connected campus systems of various departments under the umbrella of a single, cohesive strategy.

Modernize the data center: Whether institutions are thinking about investments in IoT, data analytics, wireless connectivity or all of the above, they're likely to need three things to power their plans: more networking capacity, processing power and storage. As IT staff work to replace legacy infrastructure with modern tools, leaders must take the time to strategically evaluate options. In just the past few years, the options open to data center administrators have changed dramatically. For instance, public cloud adoption has grown, and the price of high-end, on-premises solutions such as flash arrays has dropped. Officials should consider these changes and future needs as they map out data center modernization efforts. By upgrading the data center, institutions can drive operational efficiency and cut costs,



enhance security and reliability, improve the student experience and future proof their campuses.

Collaborate with other colleges:

Technology vendors, consultants and resellers tend to focus their efforts on the largest institutions, which have bigger budgets and larger IT staffs. As a result, some smaller colleges, especially those in remote or rural markets, may not be early targets for tech companies rolling out

new and innovative technologies. This is not to suggest that IT administrators at small colleges are not informing themselves about changes in the industry, but even when these leaders want cutting-edge solutions, financial constraints often force them to scale back their ambitions. One way to address this gap is for neighboring institutions to partner on large-scale IT initiatives. By collaborating with peer institutions, colleges can leverage the expertise of IT colleagues and share the costs associated with connected campus projects.

Rethink learning spaces: At the K-12 level, educators are working to create modern learning environments in their classrooms. In practical terms, this means providing students with connected devices, deploying audiovisual tools and installing flexible furniture that can accommodate multiple learning styles. The trend hasn't made as much headway in higher education, in part because of differences in education models (at most colleges and universities, for example, students provide their own computing devices).

However, colleges absolutely should re-examine the ways in which classrooms and learning spaces affect teaching and

Campuses of the (Near) Future

In its 2017 "[Horizon Report](#)" for higher education, the New Media Consortium predicts that these technologies will have a significant impact on college campuses within the next five years.

ONE YEAR OR LESS

Adaptive learning: Technologies that use machine learning to monitor student progress and use data to modify instruction over time are emerging as a way to promote active, personalized learning.

Mobile learning: As smartphones, tablets and other mobile devices continue to become more powerful, mobile learning solutions will give learners anytime, anywhere access to course materials across multiple devices.

TWO TO THREE YEARS

Internet of Things: IoT solutions will increasingly generate data on student learning and campus activity, helping

to inform the direction of content delivery and institutional planning.

Next-generation learning

management systems: Emerging systems will evolve into more flexible online spaces that support personalization, meet universal design standards and play a larger role in formative learning assessment.



FOUR TO FIVE YEARS

Artificial intelligence: AI has the potential to enhance online learning, adaptive learning software and research processes in ways that better respond to and engage with students.

Natural user interfaces: Over time, learning devices and systems will be able to understand natural movements, such as gestures and facial expressions, and provide tactile feedback to users.

learning, together with how IT upgrades and other changes might improve student outcomes and opportunities. Some institutions are already doing so, creating active learning classrooms that emphasize tech-supported collaboration and support pedagogical trends such as flipped learning. For starters, institutions should work to expand and improve connectivity across their organizations, helping to turn virtually all corners of their campuses into potential learning spaces. But educators can

also enhance or redesign existing classrooms by incorporating technologies such as augmented reality and telepresence solutions. Some colleges are even creating makerspaces featuring cutting-edge tools such as virtual reality equipment, digital editing software and 3D printers. Such initiatives help take the connected campus to the next level by giving students hands-on experience in technical fields and truly revolutionizing the learning environment.

CDW: A Security Partner That Gets IT

With decades of experience working with higher education institutions across the country, CDW's solution architects understand the specific IT challenges facing colleges and universities. Especially for institutions tackling new and innovative projects, CDW can provide an expert perspective to help institutions design and implement solutions that promote connectivity and learning.

Cloud: Cloud client executives at CDW can help institutions navigate the ever-changing public cloud environment and work with IT professionals to decide which workloads to place in the cloud and which to run in-house.

Mobility: From mobile devices for staff to campuswide wireless networking, CDW's solution architects help organizations meet their end-to-end mobility needs.

Networking: Legacy environments can hamstring the performance of modern applications. CDW's solution architects can help staff design solutions that ensure optimal performance and uptime for networks.

Disaster recovery and operation continuity: Many organizations delay disaster recovery and operation continuity initiatives until after disaster strikes. Engagements with CDW can help leaders prepare their institutions for worst-case scenarios.

The CDW Approach



ASSESS

Evaluate business objectives, technology environments and processes; identify opportunities for performance improvements and cost savings.



DESIGN

Recommend relevant technologies and services, document technical architecture, deployment plans, "measures of success," budgets and timelines.



DEPLOY

Assist with product fulfillment, configuration, broad-scale implementation, integration and training.



MANAGE

Proactively monitor systems to ensure technology is running as intended and provide support when and how you need it.

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