WHITE PAPER

What a smart college campus looks like

The Smart Campus era has arrived and higher education institutions must adapt to attract and retain top students and faculty.

Technology is transforming all aspects of college campus operations, from teaching and research to managing facilities and enhancing safety. New IT innovations are boosting operational efficiencies and improving the college experience for everyone involved.

To stand out, keeping up with technology changes is essential as colleges and universities compete to recruit top faculty and students. How faculty and students perceive their campus experience can have a huge impact on an institution's reputation, enrollment and bottom line.

According to a survey from CBORD Insights, campus decision makers believe the smart campus concept is attractive to staff and students and more than eight in 10 say they're "very interested" in building a more connected campus.[1] They see this as a way to remain competitive as an institution. "Better connectivity can help schools grow more vigorously, improving a school's brand image and attracting more students," says a chief financial officer at a Midwestern university.[2]

As you plan your own IT strategy, understanding how technology will be used across the entire college campus environment is critical. To inspire your vision for the future, here's an overview of how technology is creating the smart campus of tomorrow.

Classrooms and learning spaces

New innovations in the college classroom are connecting students with their peers and with subject-matter experts from around the world. They're enabling world-class opportunities for collaboration and driving deeper student engagement with the content and each other, turning classrooms into more active learning spaces.

Hybrid and HyFlex environments

With the growing demand for flexibility among students, educational delivery formats are no longer just online or face-to-face. Instead, an increasing number of classes combine these modalities to give students choices in how they'll participate. In a hybrid or HyFlex classroom (a combination of hybrid and flexible learning), the instructor addresses both in-person and online learners at the same time using cameras that track the instructor's movements and microphones placed strategically around the room.

"With a cross-modality approach, it's possible to design learning environments that engage students in multiple ways, speak to the needs of diverse groups of students, align with a range of instructional goals and remove geographic boundaries between learners and experts," EDUCAUSE says.[3]

Telepresence robots

The MBA program at Case Western Reserve University's Weatherhead School of Management uses a telepresence robot to create more intimate connections between in-person students and a remote instructor than can be done using an online platform alone. The robot looks like an iPad sitting on top of a long

pole attached to wheels. The tablet screen shows the instructor's face and the instructor controls where the robot goes. The instructor can easily move the robot from left to right, and forward or backward, by clicking on directional arrows on their screen.

To Reesa Rotman, an instructor in the school's Master of Science in Positive Organization Development and Change (MPOD) program, the experience was as close to being in person as she could imagine. "With the robot, I could go chat with someone individually in the room — and when we had group work, I would sit there and huddle with the group in this robot body," she said. "I felt like I had a presence in the classroom."[4]

Virtual and mixed reality

Layering virtual environments on top of physical spaces enables students to explore content in powerful ways, helping them construct new understanding by interacting with virtual objects that bring abstract concepts to life.

For instance, Los Angeles City Community College's MetaCity program uses augmented and virtual reality in teaching a range of subjects, from English to chemistry and anatomy/physiology. Faculty members report improved student engagement, with 79% of faculty saying the technology has led to better learning outcomes.[5]

And Rensselaer Polytechnic Institute has created a revolutionary way to teach Mandarin, with students learning this Chinese dialect within a virtual street scene by conversing with avatars. As one student says: "It's definitely more engaging, because you're actively involved with what's going on."[6]

Questions to ask during technology planning include:

- How will we use technology to improve instruction within classrooms and other learning spaces?
- Will students be using devices to access the internet during class? If so, how many students will be online at once?
- What types of applications will instructors and students use during class? Will these involve HD video streaming? Online collaboration? Downloading large data sets?
- What kind of strain will these activities put on our network? How can we make sure our wired and wireless networks can handle this load?

"Spectrum Enterprise has been so reliable and very responsive to us if something ever does come up. The biggest thing for us right now is that downtime is almost non-existent."

Nat Keebler, Assistant Director of Infrastructure and Technology, Laurus College

Residence halls

Technology isn't just transforming instruction. It's also changing how college students spend their time outside the classroom — and their expectations for their living spaces. Students expect to have reliable WiFi connectivity from the classroom to the dorm room and everywhere in between.

However, ubiquitous, reliable WiFi isn't the only hallmark of a smart campus residence hall. As the competition for students continues to rise, many colleges and universities are offering additional tech-enabled services designed to make students' lives easier. These include:

Smart thermostats

Due to the popularity of the smart home thermostat market, students are looking for digital thermostats in their dorm rooms, too. Using a smartphone app, students can easily set their temperature, turn off the thermostat while they're away from their dorm and turn it on remotely so their room is comfortable when they return. As a bonus, they tend to save on energy as well.

Smart laundry systems

Internet-connected laundry machines eliminate much of the hassle involved in doing laundry. These smart devices allow students to see which washers and dryers are currently available through an online app — and they automatically notify students when their laundry is done.

Smart lockers

A smart locker system allows students to pick up their packages any time that's convenient for them. Students receive a notification via text or email that their package is ready. Once a student receives the alert, they can retrieve their package from a smart locker with a secure PIN or barcode scan. Providing secure, on-demand package service in student residence halls eliminates long waits in residence life offices or campus mail centers.

Streaming video service

Institutions such as UCLA and UC San Diego offer students free video streaming through the SpectrumU TV service from Spectrum Enterprise®. The service delivers a variety of entertainment, news and sports programming directly to students' mobile devices, including live and on-demand TV shows and movies. A key advantage is that students can consume this content live or on demand from wherever they are.

Questions to ask during technology planning include:

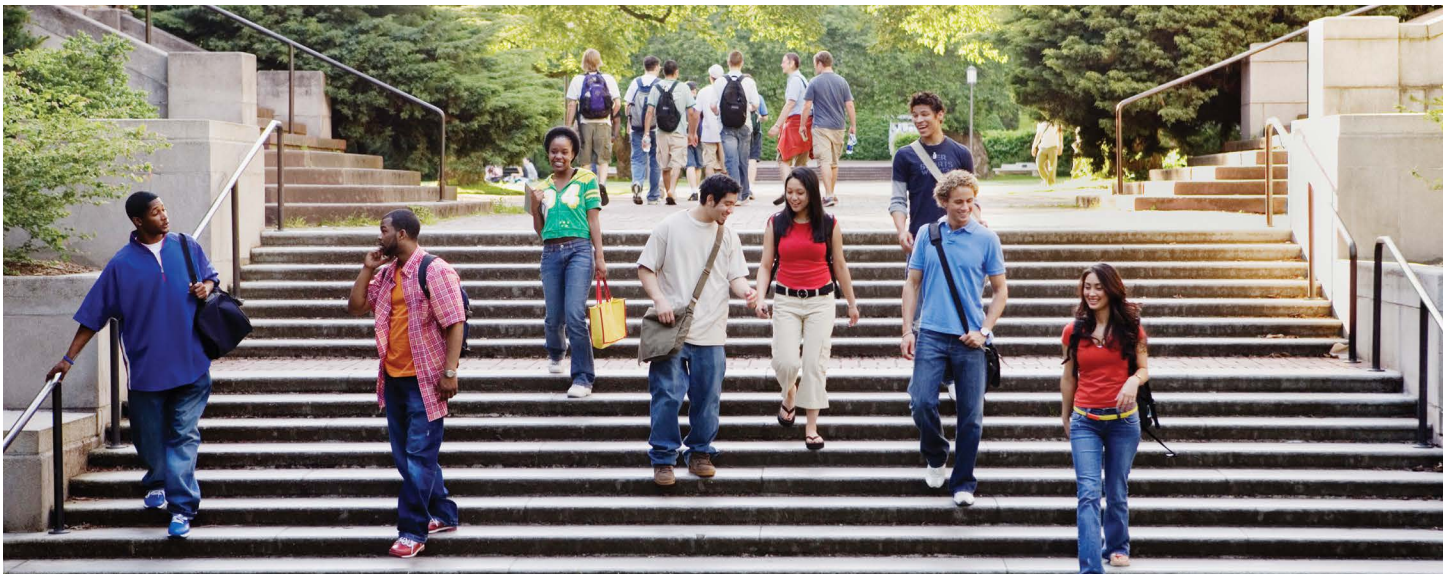
- How can we create additional value for students inside and outside of academics? Do we want to offer streaming video services? What about voice-activated assistance in student dorms?
- How many internet-connected devices will students bring with them to college?
- How will students expect to use technology within dorm rooms? How will they connect?
- How much bandwidth will we need to meet all of these demands?

Food service

On smart campuses, technology gives students access to nutritional data and other information about campus meals. It empowers students to order remotely through an app or self-service portal, which speeds up food service lines. It even facilitates the delivery of snacks and meals to students across campus at all hours of the day. Advancing food service technology also empowers the food service operations staff to track preferences and supplies, timing orders and more to gain efficiencies.

Self-serve kiosks

Many institutions have installed self-serve kiosks in their dining halls. These devices allow students to interact with a touchscreen display to view menu options and nutritional information, including photos and descriptions of each item — and then place their order online. Because multiple students can place orders at once, the devices are speeding up food service lines, which is critical for students who are pressed for time.



Grab-and-go options

As restaurants have introduced online ordering so that customers can simply grab their food and go, college and university dining halls have followed suit. In fact, Lehigh University and the University of Arizona are among the institutions using smart food pickup lockers to ensure that students aren't picking up the wrong food orders.[7] These food lockers work like the smart lockers used to deliver packages into the hands of students.

Questions to ask during technology planning include:

- How can we use technology to enhance the dining experience for students and faculty? How can we compete with online food ordering and delivery companies?
- How can technology improve the efficiency of our food service operations? How can we do more with less?
- What type of technology infrastructure will we need to support these innovations?

Athletic stadiums

For today's college students, attending a sporting event is as much about sharing the experience with others as the game itself. To enhance the fan experience, colleges and universities are installing interactive screens and high-performance WiFi throughout their athletic stadiums and other venues, allowing students to share the fun they're having through social media platforms, engage with real-time stats, order food from their seats and more.

Infotainment

Robust WiFi in athletic stadiums allows colleges and universities to take their fan experience to the next level, with apps that give fans opportunities to interact by answering trivia questions, accessing live in-game stats, sharing photos that can be displayed on the giant video board and even voting in polls to determine which song will be played next. Connectivity also helps fans miss less game action with mobile food ordering and cashless payment options at concession stands.[8]

"Students want to have a number of streaming options at their disposal. More than that, they want the ability to consume video on any device and in any location on campus: in their rooms, in their friends' rooms, in the student lounge or even in the middle of the main campus. They want the ability to be watching whenever they want. Partnering with Spectrum Enterprise is really all about enabling our digital transformation."

Anne Rocco Pacione, Chief Information Officer, St. John's University

Crowd management

Fans connecting to in-stadium WiFi networks and smart cameras also enable colleges and universities to track and understand their behavior. If long lines are forming at one concession stand and not another, for example, stadium operations staff can promote areas with shorter wait times or adjust their staffing levels as needed.[9]

Questions to ask during technology planning include:

- How can technology enrich the fan experience during games?
- How can we make attending games more convenient?
- How do we build reliable outdoor networks that can support tens of thousands of wireless users at once?
- Where should we place cameras to optimize traffic flow patterns?

Facilities management

As networked sensors and controllers become embedded into more devices, facilities managers on smart campuses are seeing added value from systems that can detect environmental changes and either alert an administrator or automatically adjust their settings. Here are some examples:

Energy efficiency

Networked sensors are being used to optimize energy usage, reduce carbon emissions and manage utility systems. For instance, smart lighting adjusts brightness and smart HVAC systems automatically control temperature based on building occupancy, helping institutions like Stanford University and the University of California, Irvine reduce operating costs and encourage sustainably.[10]

Parking availability

Aside from helping colleges become more energy-efficient, networked sensors and cameras can identify when resources such as parking spaces become available to students, faculty and staff. For instance, Bridgewater State University in Massachusetts offers a smart parking feature for its students who commute. University parking stickers have embedded RFID chips that tell sensors at parking lot entrances and exits when a car enters or leaves. This information is transmitted to a smart parking app, which shows students where there are spaces available.[11]

Questions to ask during technology planning include:

- How can we use smart sensors, controllers and other Internet of Things (IoT) devices to save energy and improve operations?
- How many of these devices do we expect to deploy in campus buildings and outdoor spaces within the next 3 to 5 years? How much network capacity will this require?
- What additional security measures will we need to keep these smart devices secure?

Campus security

Technology is helping to make colleges safer in a variety of ways. For instance, networked security cameras give administrators better visibility into all parts of campus and communications apps make it easy for students to report suspicious activity. What's more, sensors embedded in smart beacons located around campus can help emergency personnel quickly find students in distress.

Location sensors

Networked beacons help safety personnel quickly and accurately dispatch assistance in the event of an emergency. These Bluetooth®-connected beacons send out data in frequent bursts. They can help campus officials immediately identify the location of an emergency situation. For instance, a beacon equipped with environmental sensors can send an alert in the event of a fire.[12]

Mobile access credentials

Physical room keys, key cards and badges can easily be lost or misplaced and aren't the most secure means of access into buildings. Mobile access credentials increase campus security by allowing students to access their residence hall and other secure locations using their smartphones with fingerprint and facial identification. It's also easier to manage permissions remotely using mobile credentials; administrators can grant or revoke access to specific individuals without having to distribute or collect physical keys.[13]

AI-enabled networked cameras

Advanced cameras use artificial intelligence algorithms to analyze videos and detect potential threats. For instance, they can recognize weapons, forbidden objects, abandoned packages or vehicles. They can also analyze human behavior patterns and detect abnormal activities like fighting, trespassing or loitering. When a camera recognizes any of these things, it sends an alert to security personnel.[14]

Questions to ask during technology planning include:

- How can we use technology to keep our campus more secure?
- How can we balance the need for security with respect for stakeholders' privacy?
- What demands will new and emerging security technologies place on campus networks?

Libraries

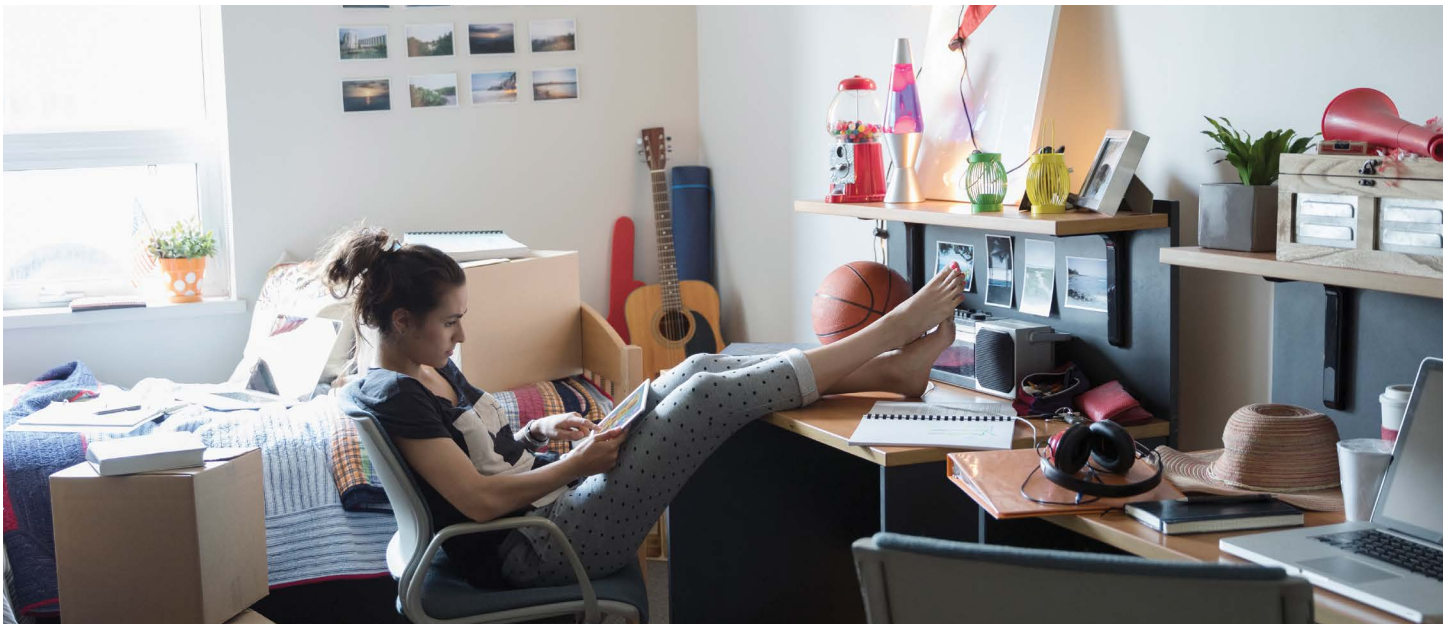
On the smart college campuses of tomorrow, libraries are evolving from repositories of information to learning commons that meet a variety of stakeholder needs. They are spaces for quiet study and reflection, but also dynamic creativity and collaboration. And while students are still turning to libraries for access to academic resources, technology is making it easier for users to find what they need.

Automated lending systems

Automated book checkout systems powered by RFID technology streamline the borrowing process, reducing waiting times and improving user satisfaction. A growing number of institutions also allow students to check out laptops, mobile chargers and even VR headsets through automated kiosks. The kiosks give students access to mobile computing devices and other learning technologies at all hours of the day, without placing any additional burden on administrative staff. When a device is returned to an empty bay, it's connected to a power source so that it recharges automatically.

Inventory management

Georgia State University and University of Texas at Arlington are among those using smart sensors for library management. RFID tags and sensors track books, manage inventory and enhance resource use. Predictive maintenance based on sensor data ensures that equipment is functioning properly, while smart asset tracking systems are helping universities manage valuable equipment and prevent loss.[15]



Questions to ask during technology planning include:

- How will campus libraries evolve to meet digital-age demands? What new roles will they play in supporting digital teaching and scholarship?
- How can technology improve the delivery of essential library services?
- What infrastructure will we need to empower these changes?

Admissions office

Colleges and universities face stiff competition for students. Operating under tight budgets, admissions offices must seek to engage prospects and recruit students using limited resources. Technology helps the admissions offices on smart campuses do more with less, while understanding how to focus their time and effort on the students who are most likely to enroll.

"Spectrum Enterprise supports our students, our faculty and our staff. And the uptime alone in our connectivity has been nothing but spectacular."

Joseph Gunnells, Chief Information Officer, D'Youville University

Chatbots

Many institutions use chatbots powered by machine learning technology to engage students from the time they first express an interest in the school all the way through enrollment. The chatbots answer prospective students' questions, drawing upon a knowledge base with answers to thousands of anticipated questions. The technology is helping to personalize support for incoming students, while reducing the number of students who are accepted but fail to enroll.

AI-based data tools

AI is transforming college admissions workflows as well. "AI tools are being used in many parts of the admission process," says Professor and Higher Education Advisor, Diane Gayeski. "Most colleges are using 'chatbots' to answer common questions of applicants when they access the admissions website; this allows for 24/7 quick and consistent answers without tying up staff resources."[16]

Questions to ask during technology planning include:

- How can technology help us become more efficient in recruiting top students?
- What role can AI play in engaging more prospects and improving enrollment?
- What requirements will these new developments impose on campus networks?

Student services

As consumers in a digital world, students are used to having personalized, high-quality services just a finger swipe away. Smart campuses are matching these expectations with improved services of their own, with the goal of making students' busy lives easier — including mobile apps that let them register and pay for courses, receive tutoring and complete other transactions.

Self-service apps

To improve the student experience, colleges have created customized apps and portals that provide much of the information students need to navigate the institution, from account balances and exam schedules to email and course websites. These tools also empower students to complete most tasks online.

Location-based sensors

A growing number of universities are using smart sensors to inform students of the availability of campus resources in real time, such as how many computers are available in campus labs or how many minutes it will take for a bus to arrive.

Telehealth support

With student mental health a growing concern, Montgomery College Community College (MCCC) is among the schools that provide both in-person mental health support and 24/7 virtual counseling and care. More than 2,000 MCCC students have registered for virtual mental health services since 2020.[17]

Questions to ask during technology planning include:

- How can we deliver a more personalized, student-centric campus experience with the help of technology?
- How can we make essential campus services more easily navigable, so there are fewer friction points where students might drop out?
- How can technology make campus life more convenient, so students can spend more time on their studies?
- What impact will these innovations have on our network?

Student success center

Smart campuses are also using technology to boost retention and completion rates by combing through mountains of data to identify the students who are most at risk and delivering targeted interventions designed to help them succeed.

Early warning systems

Colleges are using machine learning algorithms to provide early intervention by identifying the warning signs when students might be struggling and connecting those students with targeted support. For instance, Amazon Web Services (AWS) Machine Learning University is launching a free machine learning program to help community colleges, minority-serving institutions and historically black colleges and universities in this area.[18]

AI tutors

AI chatbots, tutors and coaches are helping universities extend the reach of their instructors by delivering more widespread (and personalized) support for students. For instance, Purdue University has developed "Charlie," an AI assistant for providing instant, "preflight" feedback to students submitting essays for writing-intensive courses. Trained on large, instructor-graded groups of essays, Charlie provides instant feedback, predicting outcomes according to an assignment's rubric criteria. Students can revise and resubmit their essays repeatedly, giving them an opportunity to reflect and get assistance as needed before the assignment deadline. Charlie also points them to helpful resources.[19]

Questions to ask during technology planning include:

- How can technology bolster our student success initiatives?
- How can we use technology to identify students' needs more quickly? What about delivering highly personalized support?
- What new infrastructure will we need to enable these developments?

What a smart campus means for your network

Technology innovations have important implications for college and university networks, which must be powerful enough to support the vision for a smart campus.

What worked for campus networks in the past will not be enough to meet users' needs going forward. Without seamless, high-speed connectivity that includes ubiquitous WiFi coverage, fiber connections between buildings and reliable security, the quality of students' campus experience will suffer and could negatively impact an institution's reputation.

To power these new developments, campus networks must be flexible and adaptable. They must be capable of expanding easily to accommodate new demands. They must be built with intelligent technologies that can respond dynamically to users' needs, such as wireless infrastructure that can automatically transfer users to access points with lighter loads.

Partnering with the right connectivity provider to support these modern technology trends is essential. Designing, deploying and managing wired and wireless networks requires extensive expertise. Colleges and universities need a skilled provider with proven experience in the education space, as well as scalable and responsive services and support. The education IT experts at Spectrum Enterprise are here to help you design and create solutions to support your own vision for a smart campus.

Learn more

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About Spectrum Enterprise

Spectrum Enterprise, a part of Charter Communications, Inc., is a national provider of scalable, fiber technology solutions serving many of America's largest businesses and communications service providers. The broad Spectrum Enterprise portfolio includes networking and managed services solutions: Internet access, Ethernet access and networks, Voice and TV solutions. The Spectrum Enterprise team of experts works closely with clients to achieve greater business success by providing solutions designed to meet their evolving needs. For more information, visit enterprise.spectrum.com.

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