5G Advances Strategic Priorities in Higher Education

October 2021

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5G’s Potential to Transform Higher Education

As COVID-19 hit, higher education institutions were forced to make a rapid shift to enable remote and hybrid teaching and learning as well as enhance digital operations across their organizations. In a complete transformation from traditional higher education, where most students experience their learning journeys on campus and in a physical classroom, colleges and universities currently do not look, feel, and operate the way they used to prior to the pandemic.

Despite significant challenges early on, a year and a half of sustained online and hybrid learning has led to advancements in education technology and online pedagogy as well as innovations in education service delivery that are likely to remain permanent. However, university and college campuses are not going away; they hold fundamental roles as community and social centers, and students still have a desire for the college campus experience. However, what’s considered essential for onsite interactions and services today will fundamentally change as student expectations evolve and technology features and functionality advance. In short, the future of higher education will be a blend of physical and digital, with technology at the center of these experiences.

As institutions of higher education (IHEs) learned during the pandemic, effectively delivering high-quality digital experiences is challenging. Around the world, millions of students still lack access to high-speed broadband or internet-connected devices. Without proper connectivity, students find that participating in classes online or attempting to access digital services is nearly impossible, putting many at risk of falling behind academically.

WHAT’S IMPORTANT

The COVID-19 pandemic and broader workforce and macroeconomic shifts are putting pressure on higher education institutions to evolve. As a result, education leaders are developing new strategies and capabilities to transform their campuses, classrooms, services, and programs.

As part of this transformation, many institutions are exploring 5G for individual use cases such as immersive learning. However, without a holistic strategy, higher education institutions will fail to realize all of the benefits that 5G provides.

KEY TAKEAWAYS

The top priorities of higher education leaders in the next few years are bolstering innovation, enhancing the student experience, increasing productivity/efficiency, and improving the bottom line.

By mapping 5G capabilities to these broader institutional goals, higher education leaders can tap the full potential of 5G connectivity.
Faculty and staff may not have access to high-speed broadband either, making it hard to teach students effectively through digital channels. As technology proliferates in physical and digital classrooms, there will be an increased demand for more bandwidth and faster broadband speeds, further separating students and faculty with poor broadband access from their peers and worsening the digital divide. 5G connectivity has the potential to reverse this trend and make it possible for these institutions to create the digital and physical experiences students, faculty, and staff need to succeed in the new normal. Realizing the true potential of 5G requires higher education to think strategically about how this technology can support the advancement of broader institutional goals.

**Industry Definition and Core Attributes**

The higher education industry encompasses private and public as well as nonprofit and for-profit institutions of all sizes. They include four-year colleges and universities, junior and community colleges, career colleges, graduate schools, schools with religious affiliations, technical institutes and professional schools, distance learning and online colleges, and military academies. These organizations provide formal learning toward the award of diplomas, accreditations, and/or industry-recognized credentials such as executive education and professional certificates as well as associate, bachelor’s, or graduate degrees. Many IHES also conduct research and develop products and services for eventual commercial use.

Colleges and universities are influential members of their communities. IHEs have both a social impact and a financial impact on surrounding communities, not only via students as consumers but also through partnerships and work with local businesses, government organizations, and volunteer and/or community groups.

5G is the fifth generation of cellular network technology currently being rolled out in the United States and many parts of the world. It is designed to deliver faster speeds, lower latency, and greater connection density that will enhance traditional mobile phone service and enable new services when combined with other technologies such as augmented reality, robotics, edge compute, and artificial intelligence. In addition to more bandwidth and lower-latency operations, 5G brings the ability to support a larger number of simultaneous connections (mMTC) than ever before. The expansion of massive Internet of Things (IoT) support will allow IHES to expand and integrate more "smart campus" IoT use cases to drive education quality and operational efficiency. It is important to remember that 5G is not just this "one thing" and that there are nuances in spectrum, network infrastructure, and advanced features that will vary and evolve depending on the intended use.

**Key Business Priorities for Higher Education**

Prior to COVID-19, higher education institutions were facing declining enrollments and increasing operating costs, challenging traditional business models. As the pandemic forced a shift to digital operations, institutions struggled to transition courses and student services online, damaging the student experience, which exacerbated enrollment declines, lowered retention rates, and ultimately hurt the bottom line. Today, higher education is dealing with a rise in competition from massive open online course (MOOC) providers, which offer programs that are self-paced and flexible and teach in-demand skills at a lower cost than traditional higher education programs. This in turn is leading to increased demand from students for better digital learning experiences from their schools, forcing higher education institutions to continuously reinvent themselves.

Navigating these challenges over the past few years has shaped the way higher education leaders are currently thinking about their broader business goals in the year ahead. The leading business priorities of higher education institutions, according to IDC’s August 2021 *Future Enterprise Resiliency and Spending Survey*, are centered around bolstering...
innovation, enhancing the student experience, increasing organizational productivity and efficiency, and improving the bottom line (see Figure 1).

**FIGURE 1: Top 3 Business Priorities for Higher Education**

What are your organization’s top 3 business priorities?

<table>
<thead>
<tr>
<th>Priority</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Innovation</td>
<td>53%</td>
</tr>
<tr>
<td>Student Satisfaction</td>
<td>47%</td>
</tr>
<tr>
<td>Operational Efficiency</td>
<td>45%</td>
</tr>
<tr>
<td>Employee Productivity</td>
<td>39%</td>
</tr>
<tr>
<td>Profits</td>
<td>28%</td>
</tr>
<tr>
<td>Revenues</td>
<td>24%</td>
</tr>
<tr>
<td>Cost Savings</td>
<td>23%</td>
</tr>
</tbody>
</table>

n = 53

*Source: IDC’s Future Enterprise Resiliency and Spending Survey, Wave 7, August 2021*

**Mapping 5G Use Cases to Higher Education’s Strategic Goals**

Higher education leaders need to frame their technology investments through the lens of the four overarching strategic priorities shown in Figure 1, and 5G, deployed strategically and tactically, can deliver tangible business outcomes that are critical in driving meaningful gains in each of these areas.

**Bolstering Innovation**

5G is very much a nascent technology, which means there is a lot of interest in how it evolves and drives applications across a variety of industry verticals, including education. While mobile network operators (MNOs) have established their own 5G labs to manage the initial forays into use case development, there is a recognition that 5G’s impact ranges far and wide and there is a need to tap into a broader talent pool for 5G innovation. U.S. MNOs have started collaborative ventures with a number of universities to fuel 5G use case development. These partnerships are often aligned with the specific IHE’s academic strengths or strategic plan. Participating in cooperative 5G research programs with the private sector often delivers key benefits for the IHE. Partnering with an operator benefits the IHE by providing early access to 5G technology. Being at the forefront of 5G innovation can drive reputational benefits that lead to greater enrollment prospects, federal research funding, and alumni donations. Of course, many 5G applications developed in-house may have utility for the IHE’s own operations.

These research labs can be MNO specific, such as the relationships between AT&T and UConn, T-Mobile and the University of Kansas, and Verizon and the University of Illinois. Or they can be vendor agnostic and open to a wide range
of technology partners, such as the Mcity program at the University of Michigan. In addition, many MNOs are seeking real-world test beds to demonstrate the value of specific 5G use cases. The diversity of the student body, campus infrastructure, and geographic spread of many IHEs make them an ideal proving ground for innovative 5G use cases.

**Enhancing the Student Experience**

As previously noted, the higher education experience is shifting toward a blend of physical and digital learning, experiences, and tools. A positive student experience in the hybrid learning world is contingent on having access to a seamless, high-performing, reliable connection to all resources, whether students are in the classroom or in their dorms or studying on the quad. Most IHEs have deployed Wi-Fi to varying degrees for in-building and some public space coverage, but the performance of Wi-Fi, particularly in the latter settings, is variable and can result in an inconsistent digital experience. Leveraging 5G connectivity can improve the quality and performance of the baseline connection while better driving the ability to engage students wherever and whenever they choose to learn. As IHEs consider their overall digital transformation (DX) journey, they must ensure that there is high-speed, on-campus broadband as a foundational platform.

A high-performing 5G connection can also bring innovations around the types of experiences for students to better engage with the material they are consuming. Virtual reality (VR) can allow archeology students to explore distant digs. Augmented reality (AR) can enhance medical training through the use of digital overlays that allow procedures to be practiced ahead of the first cut. Consider Fisk University, which is deploying VR for a virtual cadaver lab that allows students to examine the human body systems in detail and even allows instructors to remove organs and "pass" them around in a virtual environment. Such a program greatly reduces the costs associated with purchasing and maintaining physical cadavers while expanding the reach of Fisk’s medical education programs to premed and biology students who might not otherwise be able to participate in traditional cadaver examination.

And it is not just about the A to Z of learning new material. 5G can be an integral part of deploying next-generation security solutions — HD video security analytics, biometric identity validation, autonomous emergency response — that make the campus experience safer. Students can leverage 5G-enabled virtual services to engage in academic, career, or even mental health counseling in a more "on-demand" format that eliminates the stigma of going to an office or scheduling issues around office hours.

A robust digital experience can also expose an IHE to a wider pool of potential students. Instead of coordinating road/air trips to visit colleges in person, which may be beyond the means of some applicants, IHEs can offer VR-enabled or live-streamed video campus tours. 5G facilitates the ability to stream the experience in real time while enabling the mobility of presenters as they move throughout the campus. These tools can help students make more informed decisions about their higher educational choices, and two-way communications can improve the ability of IHEs to engage and assess potential students.

**Increasing Productivity/Efficiency**

5G’s earliest impacts on the IHE are in providing opportunities for operational efficiencies. One of the most important benefits that 5G’s high-bandwidth, low-latency, dense connectivity provides is the ability to scale IoT usage throughout the university experience. An increased number of integrated wireless connections, even if, individually, they don’t generate large amounts of data traffic that necessitate 5G, mean that the campus can evolve from a series of disparate, disconnected operations to an intelligent campus where video analytics of student traffic patterns can better inform smart lighting systems to improve safety and save energy. 5G’s higher capacity can drive the use of digital twins of key...
campus infrastructure, proactively informing facilities staff of impending issues so as to avoid service outages. While many of these systems are available today, they exist on disparate connectivity bands (wired, Wi-Fi, LTE) that cap their performance or limit their ability to be integrated and deployed seamlessly throughout the campus at scale.

In addition, 5G connectivity can enhance the operation of on-campus autonomous transportation, with the low-latency interconnect between vehicle and campus operations allowing for rerouting based on student traffic or route disruptions. Separate from the over-the-air signal itself, 5G also brings a number of back-end network enhancements that can improve the IHE's overall network operation. Cellular connectivity has been shown to be a more secure conduit for data traffic, and the slicing and network virtualization offered by 5G can enhance the routing of network traffic to the optimal connectivity band.

As alluded to previously, 5G's role in facilitating the hybrid learning/work-from-anywhere model enables IHEs to adapt to changing conditions, such as weather conditions, that would require the suspension of classes, place students and staff at risk during travel to physical classrooms, or exclude students who might be facing transportation issues.

Additionally, 5G allows the IHE to tap into a broader pool of potential staff who might otherwise be unable or unwilling to relocate to a new campus. Much like any business in the new working paradigm, an IHE that can attract high-caliber staff to teach in a hybrid setting reaps the reputational and quality of education benefits that drive enrollment and retention.

**Improving the Bottom Line**

In addition to driving enrollment gains and tuition and enabling efficiency improvements that result in operational savings, 5G can drive some indirect revenues for IHEs. Two ways that 5G can drive revenues and margins for IHEs:

» **Technology transfer revenue.** An IHE that establishes a 5G research lab, either independently or in partnership with a private sector partner, will be at the forefront of developing intellectual capital and new use cases for 5G. As this 5G R&D advances, those new use cases can be monetized through patent/technology licensing. According to AUTM, in 2020, U.S. IHEs were issued more than 8,700 patents and spun off more than 1,100 start-ups. IHE technology licensing revenue totaled nearly $3 billion in 2020. Given the potential for 5G to affect the technology landscape in nearly every industry vertical, there is sufficient reason to believe that it can spur growth in the technology transfer prospects of IHEs.

» **Ability to maximize data value.** As previously noted, higher education institutions are demographically, socioeconomically, and geographically diverse entities that contain and create a lot of data. At the same time, deploying 5G use cases throughout the campus, whether they are focused on baseline connectivity, autonomous transport, or video analytics, exponentially increases that data creation. Analysis of student, staff, and operational data created and transported by 5G will drive actionable insights that enhance the efficiency of campus operations and improve operating margins (e.g., smart campus buildings and environmental controls). Some forward-looking prognosticators even posit that institutions that strategically address that data environment will have opportunities to monetize both the structured data and the unstructured data created in-house for advertising, research, and other commercial uses. But however conceptually appealing the idea may be, there are significant operational, governance, and legal hurdles to generating revenue from in-house data. IDC is not currently aware of any institutions that are pursuing student/staff data monetization at scale. Given the current data privacy landscape in the United States — a recent AP poll found that more than 50% of Americans lack trust in the security of personal information — this is likely a much more distant prospect.
Preparation Higher Education for a 5G Future

Although 5G has a tremendous amount of potential to evolve and impact the student experience as well as improve IHE operations, higher education institutions shouldn't look at 5G as a magic elixir that will automatically generate these benefits simply by being deployed. Sufficient strategic thought must be put into the 5G partnerships and use cases that will most benefit the IHE. All too often, the headlines highlight individual use cases or siloed benefits that 5G can bring to the IHE. While these benefits are important to consider, the possibilities of 5G become limited when institutions fail to evaluate the technology’s potential holistically. Given that innovation, student experience, productivity/efficiency, and bottom-line improvements are the top strategic priorities for higher education leaders, there are a number of key issues they should keep in mind as they deliberate on the role of 5G in their institutions.

Consider 5G Coverage Layers

5G is not just a singular technology, and educational institutions looking at 5G need to take into account how 5G coverage needs permeate the campus for different uses. mmWave 5G signals provide those blazing 1Gbps speeds but will not penetrate the low-emissivity (low-e) glass of the campus physics building. Low-frequency 5G can be accessed from off-campus radio tower but will show only modest improvements over existing cellular and Wi-Fi. Midband spectrum is the sweet spot that blends speed and coverage. The reality is most institutions will consider uses that run the gamut of connectivity performance requirements, and access to all different “flavors” of 5G will be critical to successful adoption.

Think Beyond Siloed Use Cases and Benefits of 5G

5G has tremendous potential to accelerate DX and ultimately reimagine how higher education institutions operate. However, realizing the true potential of 5G requires a more holistic approach than simply focusing on a single use case (e.g., immersive learning through AR/VR) or outcome (e.g., revenue generation). IHEs should consider broader institutional goals such as innovation or improving the student experience and outline how 5G solutions and use cases can help support those goals.

Focus on the 5G Journey, Not the Destination

Institutions need to think of 5G deployment not as something to accomplish but as a tool that can be used to advance DX and achieve broader business and strategic goals. For most educational institutions, 5G — both today and over the next two to three years — will simply be a tool for supplementing and expanding base connectivity. And there will be significant variation among operators covering various campuses. But looking at 5G as an innovation platform, whether via multiple integrated use cases or establishing a private 5G network, can drive the DX agenda for an institution.

Determine How 5G Can Complement and Enhance Existing Networks

Most institutions have spent years hardwiring buildings and deploying Wi-Fi for campus-wide connectivity. No organization likes to think about "sunk costs," and 5G is not here to replace those prior investments. Use of 5G, either through the macro network or through potential private 5G networks, will ultimately need to integrate with, complement, and enhance existing connectivity, extending to serve students wherever the learning takes place.
**Takeaways**

As higher education continues its digital transformation journey, institutions that utilize the bandwidth, latency, and connection density provided by 5G will be able to accelerate innovation around the student experience, provide agility and resiliency to campus operations, and diversify the revenue base. Leveraging 5G for increased connectedness enhances the digital and physical learning environments and enables more immersive, real-world knowledge transfer. Seamlessly providing education, wherever and whenever students are, allows IHEs to tap into a broader pool of students both near and far without adding significant operational costs. And establishing a leadership role in both the deployment and the use case development for 5G will enhance institutions' research reputations and help institutions differentiate themselves to better compete for students, research funding, and private sector partnerships.

**About the Analysts**

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Jason Leigh is a Research Manager for IDC’s Mobility team responsible for 5G and mobile operator research. Jason’s research focuses on the strategic implications and market opportunities presented by the emerging 5G ecosystem, including commercial availability, installed base forecasts, regional adoption trends, content and services enablement, device impacts, 5G’s role in the Internet of Things (IoT), and innovative use cases leveraging 5G.
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