5×5: Five Emerging Technologies that will Reshape the Campus in Five Years

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"The future ain't what it used to be."—Yogi Berra
"Don't look back. Something might be gaining on you."—Satchel Paige

As two of baseball's preeminent philosophers once noted, change is inevitable, and sometimes a little scary. However, adapting to change is always strategic, and never more so than when planning for emerging technologies. As 2020 begins, we examine five technologies that are changing the perspectives of campus technology designers and will likely be routine practices on your campus within five years.

5G & WIFI 6: INCREASED BANDWIDTH, FASTER EVERYTHING—RIGHT NOW

Within the next 12 months, virtually all phone/data service providers will offer 5G, the next generation of cellular service. And many WiFi vendors are already offering WiFi6, the next generation of wireless networking.

Both technologies will offer significantly improved service and performance over their existing counterparts,

spurring development of a new wave of applications and services. For example, the new systems will support connecting "everything to everything" (X2X), enabling a massive deployment of Internet of Things (IoT)-based self-monitoring, self-reporting, and self-responding systems, and guiding the efforts of staff tasked with maintaining and managing your campus.

5G and WiFi6 will rock the campus in several areas. And of course, all students, faculty, and staff will expect to get full benefit from them as soon as possible, so you can expect very little patience from campus end users.

AVOIP: DISTRIBUTING AUDIO/VIDEO OVER THE CAMPUS NETWORK

Historically, audiovisual (AV) systems have used specialized cabling proprietary to AV. Until recently, AV systems were an island, lacking connectivity with other systems and not leveraging the strengths of the campus network or the developments of the IT industry.

With AVoIP (AV over IP [Internet Protocol]) networks, audiovisual systems use the campus network to distribute signals. For example, a faculty member's demonstration of a procedure in a small specialty lab can be broadcast to a lecture hall in the same building or across campus, using the campus network.

Advantages of AVoIP include:

- **More flexibility in signal routing and distribution**
- **Improved management and scalability**
- **Costs savings in many applications**
- **Provides leverage for the campus investment in networking**

LIFI: LIGHT-BASED WIRELESS NETWORKING

LiFi (short for "light fidelity") is wireless communication technology that is poised to replace or supplement traditional WiFi by utilizing modulated light from LED lamps to transmit data. This approach gives LiFi several advantages over traditional WiFi, including wider bandwidth, more functionality in areas with high electromagnetic interference (such as research labs), and higher transmission speeds than comparable WiFi systems. It can also be integrated into the existing lighting infrastructure.

The key benefits are:

- **High peak data rates**
- **Improved location-based services**
- **Improved performance of IoT sensors**
- **Enhanced secure wireless communication**
- **Enhanced energy-efficiency**

As with most of these emerging technologies, acceptance and implementation of LiFi versus WiFi will likely take several years, as the older "proven" technology gives way to the new and improved, "but-we've-never-done-that-before" technology.

BUILDING IOT: SMARTER BUILDINGS = SMARTER PEOPLE

The now popular (but little understood phrase) "Internet of Things" refers to networks of sensors and other electronic devices that can communicate with one another. The underlying principle behind building IoT is that through continuously monitoring the various components that make up building systems (e.g., building management systems [BMS] or energy management systems [EMS]), and rapidly analyzing that data, it is possible to 1) gain deep insight into the behavior of those systems, insights that can then be used to optimize results (e.g., energy efficiency); and 2) adjust system performance and operational parameters real-time to react to changes in user needs, requirements, and behaviors.

Building IoT systems provide building managers and staff with relevant real-time information about the operation and performance of building systems, such as when a system is trending toward an out-of-variance condition.

While the primary benefit of building IoT is reduced energy consumption, the automation, monitoring, and control it offers extends to other building systems, such as lighting, access/ingress, audiovisual systems, signage, room scheduling, and so on. This may lead to improved occupant health and productivity through IoT feedback-driven optimization of interior environmental conditions, optimized resource use and management, improved building security and safety, reduced water consumption, and other benefits.

AI: MACHINE LEARNING IN THE CLOUD

Artificial intelligence (AI) is the term for describing a machine that mimics humanistic functions (e.g., problem-solving, pattern recognition, and learning). Machine learning—a subset of AI—uses statistical techniques to enable computer systems to "learn" from data without being explicitly programmed. A machine becomes better at "understanding" and providing insights as it is exposed to more data.

Intelligent buildings have the potential to benefit from AI applications through increased operational efficiency, improved occupant experience, and optimized space and asset use. To increase operational efficiency in a meaningful way, AI

systems can monitor and optimize all aspects of facilities management, including:

- **Water**: Sensors and smart meters manage water use and flow
- **Fire**: Automated functionality checks and smart detectors protect buildings from fire
- **Energy**: Smart meters and demand response sensors prevent waste and drive down costs
- **Elevators**: Operational and fault-detection sensors remotely monitor performance and automatically schedule maintenance
- **HVAC**: Automated fans, air availability, and variable-air-volume units respond to occupancy data
- **Parking**: Sensors monitor available spaces and enable 24/7 parking-lot utilization
- **Access and Security**: Connected cameras, instrumented perimeter doors, and floor occupancy data help keep building secure

Once information is collected, it can be cross-referenced with benchmark data and analyzed to identify operational improvements. When sensor data from the building itself is combined with external data sources, the potential for increased efficiency grows even more.

NOT 2020 VISION, BUT 2025 VISION: ADAPTING TO THE NEW NEW THING

The future of technology-enhanced cognitive buildings is all about creating positive experiences for the people who use them. Looking forward to the mid-2020s, these five technologies (which have been maturing for the last decade) will have real-world applications and provide new features and benefits, with a positive impact on student, faculty, staff, and visitor experiences.

Institutional planning teams will likely find the ROI for all these new technologies is worth exploring for both new and renovation projects that have program goals for improving communication, connection, and collaboration. Most importantly, as we head into 2020, let's do so with 2025 vision.

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