DIGITAL LIGHTING SYSTEMS ARE MORE THAN ILLUMINATION

Solid-state lamps and LEDs (or light-emitting diodes) have already revolutionized lighting — yet the revolution has barely begun.

LED energy efficiency, dimming capabilities and long service life have long been proven. Combined with advanced lighting controls, LED performance continues to reach higher levels. But for building owners there is another sphere of LED capabilities with enormous value — and it has nothing to do with illumination.

LEDs are *digital devices*, and thus able to carry out a host of other functions. It is this digital trait that enables the second sphere. With inherent intelligence and connectivity, LEDs can support non-lighting building solutions.

GSA research found that advanced LED lighting controls with daylight harvesting capability produced large energy savings, even in buildings with limited daylight.

Cell phones began as nothing more than phones but now run hundreds of other apps. Similarly, LEDs began as illumination but can also serve as the platform for other building systems and building management applications. These additional apps can engage building occupants, enhance their experience of building spaces, and boost building owners' bottom lines.

ADVANCED ILLUMINATION CONTROLS

Advanced lighting controls designed to complement the digital nature of LEDs offer new levels of performance and savings. The Public Building Service of the General Services Administration (GSA) investigated such controls in a 2018 research report, *Advanced Lighting Controls and LED*.[1]

Among GSA's findings are that dimming and occupancy control are more precise with LEDs than with fluorescent lighting. Using a 76,000-square-foot federal office building in Fort Worth, TX, as its test site, GSA reports that just three LED control strategies — light-level tuning, occupancy sensing and daylight harvesting — yielded a cost savings of 43% over the LED baseline. One-half of the 43% savings came from occupancy control and one-half from adjusting the light levels, even though only a small percentage of the building's square footage had access to daylight for harvesting purposes.

Wireless operation is another benefit of advanced LED controls. Although GSA has cybersecurity requirements for wireless controls, the system installed in the Fort Worth building met the agency's protocols. By eliminating hardwiring, wireless controls can also lower installation costs. The GSA report notes that advanced controls are more cost effective when they are integrated with lighting fixtures by the supplier rather than installed later in the field.

Other benefits of advanced LED controls include personal lighting control through occupants' cell phones and light tuning that goes much further than adjusting light levels. Tuning the color of lighting throughout the day can complement human circadian rhythms, increasing the wellbeing and productivity of building occupants. Color tuning can also customize illumination for particular occupant tasks.

BEYOND ILLUMINATION

LED lighting systems go beyond illumination when they take on building automation tasks. For two reasons, they are a natural fit for these tasks.

First, lighting in buildings is located everywhere that building occupants are. That physical proximity is an asset for apps that manage the indoor environment.

Second, LED fixtures can provide a local power source to connect compact sensors and thus greatly reduce or eliminate field-installed hardware.

Smart sensors piggybacked onto LED fixtures collect granular data on the indoor environment for lighting as well as other building systems and enterprise-scale workplace solutions. Utilizing an Internet of Things (IoT) platform, the building can stream data to the cloud for additional analytics and processing. (For more on Sensoring and IoT, see **Smart Sensors: The Roots of Building System Connectivity and Intelligence**).

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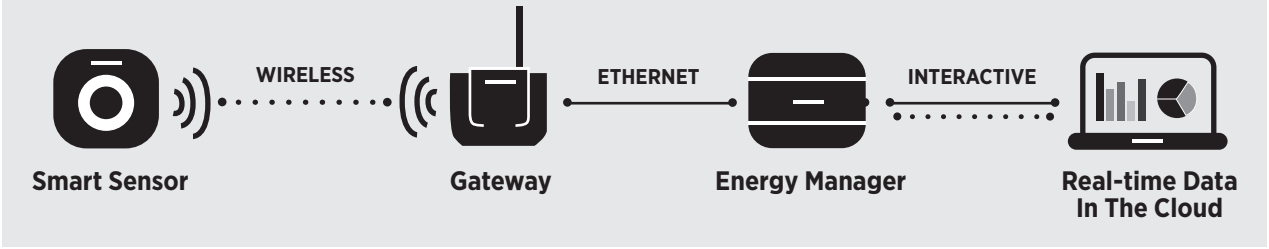
[1] *Advanced Lighting Controls and LED*, The Public Buildings Service, General Services Administration. **https://www.gsa.gov/cdnstatic/GPG_037-Findings-Advanced-Lighting-Controls-and-LED.pdf**

The Connectivity of LEDs with Smart Sensors



In the Enlighted system, a smart sensor containing the controls and all functional information is hardwired to each lighting fixture. The sensor transmits data wirelessly to a gateway connected to an advanced energy management module and to the cloud for analytics and processing.

The data from fixture-mounted sensors and networks helps to make lighting more efficient and human-centric. It also supports space utilization, HVAC, conference room management, desk hoteling, asset tracking and fire/life safety. The result is a more functional indoor environment, which in turn enhances occupant wellbeing *and* occupant productivity. More productive workforces deliver enormous impact to the bottom line for building owners and tenants. (For more on increasing market values of buildings through better occupant experience, see **How to Quantify the Bottom-Line Value of Occupant Experience**.)

HOW TO UPGRADE IN EASY STEPS FROM ILLUMINATION TO AUTOMATION

Given the many apps and functions available through digital lighting systems, how does a building owner develop a strategy that fits a particular building?

Because smart sensors contain a microprocessor and local memory, they can accommodate new control and IoT functions whenever needed. With sensors hardwired to fixtures, the digital lighting system becomes a wireless network whose software can be unlocked to add new functions at any point in the future. Such software upgrades help to keep a facility up to date with new developments for security and other building systems. They also help buildings stay up to date with energy and building codes.

For example, digital lighting from Enlighted (**www.enlightedinc.com**) consists of multi-function sensors that provide wireless, room-based lighting control with four preconfigured lighting profiles. When needed, the network's software can be upgraded to create wireless, networked lighting control with customizable lighting profiles, energy analysis from data collected for each fixture, and BMS (building management system) integration.

At the highest level, Enlighted's network software is upgraded to create an IoT platform offering even more functionality and software applications, including space analytics, real-time location services and application programming interfaces (APIs) to third-party services.

For more information on embedding automation apps into lighting systems, see **www.enlightedinc.com**.

For more information on the occupant experience in IoT-enabled buildings, click on other articles in this series.

1. Smart Buildings and the Internet of Things: A New Concept of Operations and Occupancy Experience
2. Smart Sensors: The Roots of Building Connectivity and Intelligence
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