INNOVATION THROUGH DISRUPTION

The Energy Efficient Lighting Industry Adapts to Technological Forces of Change

This white paper examines the changing landscape for energy efficient lighting systems brought on by new LED lighting technologies and advanced lighting controls with their role in the Internet-of-Things movement. The author provides key insights on how the industry can and will adapt to the disruption and offers practical advice on building a plan for successful implementation of the new technology.

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The legacy lighting industry is undergoing a revolution. Driven by an unprecedented pace of technological change shaped by widespread energy efficiency and sustainability initiatives, the lighting industry has joined the ranks of those faced with new disruptive forces. At the heart of the disruption are the lighting products themselves - LEDs, advanced lighting controls, embedded sensor technologies and networked systems, all proven to reduce the energy costs associated with operating a large facility. As product innovation has advanced, product costs have declined, thus accelerating deployment of new lighting systems in facilities that provide not only cost savings but also much more.

"Smart" Lighting Market Snapshot

The global market for smart lighting and connected lighting controls is currently valued at $6 billion, forecasted to more than double in size by 2020,[i] and reach nearly $19.5 billion by 2022.[ii] While energy cost reductions and maintenance savings historically have been the key drivers for adoption of new lighting technology, emerging capabilities from intelligent control technology are creating much interest in smart lighting platforms. What was once viewed as a functional stand-alone building system, lighting in the new realm is quickly evolving to address broader business strategies. Controlling lights based on occupancy, available natural daylight, and motion detection to conserve electricity is becoming commonplace. The new focus is to leverage these smart lighting systems to address facility workspace planning, asset tracking, temperature control, retail store shopping traffic, and similar business issues. In this era of big data, AI, and the internet-of-things (IoT), smart lighting systems play a role and prove to deliver more than marketing buzzwords.

Beyond the Buzz

IoT is not a new phenomenon, as the phrase was first coined by Kevin Ashton in 1999 and added to the Oxford Dictionary in September 2013. The concept has gained traction with the expansion of Wi-Fi and cloud-based computing platforms which enable the harnessing of vast amounts of data fed by connected systems.

As a simple definition, IoT requires a device that has capabilities to "sense" its surroundings and to collect and transmit data to a central receiver. The receiver stores and interprets the data, often from multiple sources. In some cases, the analyzed data can trigger actions which are executed in a programmatic fashion, without human intervention. Today, the number of devices connected to the Internet is 8.4 billion, up 31% vs. 2016. A recent study by Gartner estimates there will be 26 billion IoT devices by 2020.[iii] Networking giant Cisco is more bullish, estimating that 50 billion devices will be connected through the Internet by 2020.[iv]

Beyond the buzz, figuring out the path for future developments in IoT is difficult. The task of connecting as many as 50 billion devices, appliances, vehicles, smartphones and more means that no industry, product vertical or consumer demographic will be immune from the disruptive effects of an exhaustive and inter connected data driven network. The key will be applying an IoT strategy that can solve business problems and yields positive financial outcomes for the enterprise.

What is the Role of Lighting in the IoT Movement?

Smart lighting systems are poised to turn building automation on its ear by becoming a sought after IoT platform. How can this be? In the US alone there are an estimated 7 billion light fixtures (compared to 327 million smart phones)[v] and these fixtures are widely prevalent within and outside of our facility infrastructure. Thus, lighting is a common foundation upon which advanced controls can be incorporated using proven energy savings as the source of funding for the advanced IoT capabilities. The lighting platform already has power, is accessible, and is easy and affordable to connect intelligent sensors that allow a given fixture to have the core characteristics of an IoT ready device. Much in the same way that the smart phone became the indispensable platform device for consumers, LED lighting technology with intelligent sensors will become the backbone for many commercial, industrial and institutional environments, both indoor and outdoor.

Beyond ubiquity, the cost of smart lighting systems continues to drop, while efficacy and ease-of-use improves. Luminaires, devices, sensors, controls and all associated networking costs are less than they were a few years ago and are predicted to continue to decline. Through an approach that optimizes energy savings and leverages implementation efficiencies, financial metrics that were once impossible to model are now attainable. IoT enabled LED renovations are no longer limited to the conceptual and abstract.

The lighting industry sees the promise and is responding. Several lighting and LED driver manufacturers, IoT technology companies, and industry groups have established the IoT Ready Alliance, which is dedicated to making installation of IoT technology in luminaires easier both now and in the future. The alliance is setting industry standards that will enable LED light fixtures to be IoT-ready, facilitating quicker and easier installation of advanced IoT sensors.[vi]

Managing the Change

Since its inception, the energy efficient lighting industry has operated using a straightforward approach. Projects are typically examined based upon a one-for-one model with new lighting technology replacing older, less-efficient technology. Justification for capital investment hinges on simple payback criteria derived through the projected energy and MRO savings. Upgrades and retrofits, with or without basic controls, have dominated the landscape, often included as part of a larger multi-system energy conservation initiatives and Energy Savings Performance Contracts (ESPC) in the ESCO sector of the marketplace.

This approach is changing as more complex smart lighting systems enter the marketplace. One-for-one project scopes are being swapped for those requiring engineering grade designs to maximize the energy reduction and operational cost savings potential.

Methods of justifying decisions to deploy these smart lighting systems are also evolving. Organizations are factoring other business metrics provided by the new systems into the decision-making process versus relying on simple payback calculations.

To move from concept to interest to action, users and service providers need to rethink the legacy lighting system decision-making paradigm. No longer viewed as a stand-alone project, smart lighting system deployment is playing an increasingly integral role in the broader business strategy as a change management initiative that addresses enterprise-wide issues through the enabled system.

Deploying a smart lighting system rollout is a complex process with multiple stakeholders from different functional areas such as facilities, operations, EHS, sustainability, marketing, finance and IT. All have a role in the strategy, planning, funding and implementation of the IoT enabled system. It is critical to understand who will own the process? Who will drive the decision to break the status quo and innovate? Does the C-suite endorse the project and see value in the initiatives? IoT initiatives affect the entire organization and require in depth exploration and dialogue with key stakeholders to develop the best approach for the organization. Some exploratory questions to consider include:

- What are the organization objectives, goals, challenges and/or issues?

- How can the facility lighting infrastructure address these issues?

- How can an IoT capable smart lighting system be deployed in a manner that enables flexibility to scale IoT applications atop the lighting platform over time as business needs dictate.

- How does access to real-time data translate to business impact?

- How will results be measured and quantified?

Lastly, smart lighting systems introduce a new set of challenges with respect to security, privacy and compliance. Who can access the information? How and what new standards or policies need to be developed? What would happen if a piece of equipment (sensor, beacon, etc.) is stolen or stops operating properly? How secure is the connected network? What would happen if the networked lighting system is accessed by an unauthorized user?

Working with Lighting System Providers

Given the added complexity, aligning with the right provider to design, build and commission an IoT enabled smart lighting system will become paramount. The provider must carry demonstrated expertise in specifying, designing and commissioning advanced lighting control systems and have proven ability to manage a partner's ecosystem with multiple players. This is not a one-size-fits-all approach. There will be inherent advantages in working with a full-service, turn-key provider that offers a centralized approach, especially for enterprise solutions involving multiple facilities, with different indoor and outdoor needs, spread across many different US communities.

In addition to the design expertise, the provider needs to deliver a consultative, unbiased evaluation of the different lighting systems and their technological capabilities. If you Google "top-rated advanced lighting control systems," you will get more than 9.3 million results; for "top-rated wireless advanced lighting control systems," your list narrows to more than 2.2 million results. A provider who already knows the technology landscape and delivers unbiased recommendations will be worth their weight in gold.

Experience of the provider can be ascertained by examining the amount and diversity of successfully installed connected lighting. During this evaluation, the provider's business acumen and strategic planning support should be revealed. It is critical that the provider understands the user's short and long-term business objectives to maximize system capabilities and results.

From front-end strategy, design, and integration with existing assets to post-implementation and commissioning, a variety of functions will need considerable input and support from an experienced IoT lighting provider. Engagement will also require a clear understanding of how employees, customers, etc. will interact with the system and how the lighting control capabilities will be managed. Given a likely range of skill levels and experiences among those who will engage with the system, a provider who can provide training and support for end-users will be essential.

The last mile of the IoT enabled system may be the most critical -- implementation. Without successful installation by an experienced team of professionals, the entire project will suffer and may even fail. A pre-determined timeframe should be carefully managed with key milestones for design, implementation, commissioning and roll-out of the system. Sampling, testing and fine-tuning demonstrations prior to roll out are critical. A multi-phased approach starting with the upgrade to LED technology will provide immediate energy savings and create the infrastructure for advanced controls. Additional applications such as customization of zones, tunability, localized data and reporting and scalability can all be added to the existing system over time.

Funding Hurdles

A smart lighting system is an enterprise-wide technology pursuit that lives on the facility lighting infrastructure. To that point, a change management paradigm recognizes that conventional lighting project payback targets of less than 3 years do not apply to strategic IoT enabled LED solutions. While energy savings, MRO savings and utility rebate incentives may help underwrite the cost, the traditional CapEx funding process may present barriers to gaining approvals. A few forward-thinking Fortune 1000 companies are leading the way with different innovative funding solutions to accomplish their enterprise-wide energy conservation goals. From Green Bonds and sustainability funds, to programs such as PACE and Lighting-as-a-Service (LAAS), alternative funding models are forging new paths to bring IoT enterprise-wide projects to fruition.

Summary

One thing is certain, technological advances in the world of IoT and connected lighting platforms will accelerate. Disruption across the lighting industry is igniting passion to adopt new models, products, methods and innovations that will reshape how business operates across a broad spectrum. The legacy lighting system is positioned for a technology makeover with upgrades that enable far more capabilities. As funding alternatives proliferate, further adoption of smart lighting systems by large scale commercial and industrial enterprises, schools, hospitals, municipalities and government operated facilities will occur via an ever-changing technological landscape. Lastly, reliable providers will distance themselves as being fully capable in this exciting new phase of the lighting industry.

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