21, rue d'Artois, F-75008 PARIS
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Smart Cities and the Ideas that Light Them

S. A. REESE, L. S. ESCALANTE
Burns & McDonnell
USA

SUMMARY

Civilization has harnessed the power of light for safety, convenience and commerce, but as mankind has developed and grown, lighting has been overlooked as a means for advancement and growth. What if city planners and designers were to look at lighting as a sustainable commodity, a beautiful bioluminescent installation, or even a hub for citizen convenience? Could lighting play a role in citizen safety, crime reduction, or aiding emergency workers during natural disasters? In "Smart Cities and The Ideas That Light Them", authors Seanmichael Reese and Lazaro Escalante will imagine a smart city that utilizes existing technology in order to advance civilization forward into a more efficient, more sustainable and, maybe most importantly for the citizens of the smart city, a more convenient smart city. In a way, this imaginary trounce through the future of lighting and its effect on the city of tomorrow is nothing new. These materials and this technology already exist in the world and also in the industry of today but for some reason, lighting is still used as though it is a background character. A background character only adding to the story when the protagonist needs it but never becoming the star. How does lighting become the star or at least takes an active role in perpetuating the star's agenda? Lighting output that can be adjusted real time, motion sensors to activate and deactivate illumination, and energy efficient luminaires already exist, but a case can be made that utilizing all of these technologies into a single connected system could help lower utility costs and in turn reduce the burden on the electrical grid as a whole. This would actively take a role in the perpetuating the agenda of a more sustainable tomorrow. But how about reimagining the light pole itself? A background character to the background character could evolve into an electrical convenience hub. Creating a mount for solar panels that could back feed a grid, provide charging ports for electric vehicles or possibly house Wi-Fi routers in order to provide citizens with on the go internet are all obtainable options as technology becomes more integrated, compact and efficient. Utilizing the multi-coloured light emitting diodes (LED), a city planner or business owner could help direct traffic to a point of interest by utilizing colours that are more pleasing to the eye and inspire different feelings like hunger, calmness or happiness. Burns and McDonnell is at the forefront in imagining how a typically over looked technology can be one of the most valuable for a municipality. Trail blazing a path into integrating existing, relatively low cost, and efficient technologies into a more user friendly and sustainable future that the citizens of smart cities can enjoy in the coming years. So much of this world's most successful technological breakthroughs come from reimagining existing technologies and materials. There are so many opportunities for lighting to become the next big break through that it will take a visionary and a municipality to implement the world's most advanced smart city.

KEYWORDS

Smart city; technology; luminaire; light; lighting; convenience; Wi-Fi; solar; sustainability; utility

SReese@BurnsMcD.com

At the heart of civilization, you have a city — a place to gather, work, engage and play. A city is a hub that connects people and lighting, a critical element that provides safety, supports convenience and empowers commerce. Lighting is a regular part of days and nights, but in a connected world, can lighting provide more than illumination? In the city of tomorrow, a smart city, how will lighting improve lives and environment?

The modern city has been designed with vehicle ingress and egress as a driving force for its layout. Over time, pedestrians have slowly begun marching back that idea. By seizing land once reserved for vehicles, cities are creating more areas for pedestrians to use exclusively. Will cities of the future have street lamps, spaced in uniform lines, shining at their full capacity until a timer tells them to shut off, their orange glow basking cones of light onto the asphalt? What new applications for lighting will the future hold?

Imagine lighting that can adapt to the presence of its occupants in real time. In some areas, it could be used to detect gun fire, breaking glass or cries for help, but more importantly, to alert authorities. Smart lighting could be among the first technologies to lead the march toward smarter cities of the future. How? By turning the burden of lights on an electrical grid into a Wi-Fi hot spot rented out to networks, a source of solar electricity that feeds power back into the grid, or even a data collection tool.

A more efficient, sustainable and connected lighting system presents many benefits a community. A lighting system can help provide connectivity, boost sustainability and support future growth. Three network technologies support smart lighting applications: narrowband, mediumband, and broadband. Utilities currently have very robust communications systems that utilize a minimum of networking technologies to monitor assets, high-priority equipment and, in some cases, their physical security platforms.

Utilities already utilize narrowband networks and these networks can be further developed into smart remote-controlled systems. Mediumband network technology also can work with a diverse set of potential applications for smart lighting, while maintaining a reasonable cost and better rate of return for its initial investment compared to broadband technology.

However, one of the challenges utility and municipal officials face when retrofitting existing light poles with smart technologies is the lack of documentation about where the lights already exist. Capturing this information can be done by deploying vehicles with cameras on them (think Goggle Earth vehicles), then using the information to procure retrofits where needed.

Research shows that lighting also can boost feelings of security — and more. According to a study conducted by Philips Lighting, at the same light level, 80 percent of people felt safer with a whiter light produced by LEDs as opposed to yellow or orange lights typically produced by high-pressure sodium bulbs.

The study goes on to show that residents who feel safer are more likely to participate in the culture of that city. Ways to increase engagement throughout the city include having block parties, festivals, parades and music festivals. With LED luminaires you could increase the lumen output to illuminate these areas, and give the people attending a safer feeling.

Some community decision-makers are evaluating and deploying sensors that can detect gunfire. Most of these systems are mounted on distribution poles and street lamps. Utilizing sensors used on a connected lighting system could mean more of these gunfire detectors. Sensors could activate an increase in lumen output to better illuminate the area, warning citizens and supporting law enforcement.

Reduced emergency response times and increased safety are added benefits of the implementation of smart lighting systems. Lights can be controlled remotely to provide adequate brightness for emergency response teams during events like fires, traffic accidents and various crimes.

Weather emergencies, like hurricanes, foods, tornadoes, blizzards or conditions spurring ozone alerts can affect a significant number of people. These weather conditions can be indicated with various colour outputs on lamps. Smart technology can communicate alerts quickly, allowing people to take shelter, evacuate or stay indoors. Information regarding man-made events — like smog, Amber Alerts and other threats — can be instantly communicated and done so remotely. Alerting the public to dangerous events could prevent injury and possibly even save lives.

In the event of a power outage, optional integrated battery systems may be utilized to keep the lights on and give the emergency response teams extra time that could save a life or help with rescue efforts.

Other research by Philips concludes that coloured lighting can have a subconscious effect on the way people feel. It's why warm colour schemes like red and yellow are prevalent in restaurants to increase appetites or why painting prison walls pink can make inmates less aggressive. Smart cities could use this principle, too. Providing certain lighting can help entice shoppers into a retail store or encourage people to crave a burger.

Lighting and colours can affect our psyche at a subconscious level and making people more comfortable in an area is well within its power. New bioluminescent lights can be implemented in low-light areas to preserve the night sky or create an aesthetic a designer would wish to achieve.

Lighting can change our communities in imaginative and practical ways, and smart cities will be able to take advantage of this. For example, lamp posts could send audible beeps or clicks to headsets worn by hearing- or visually impaired people. Microsoft has been developing this technology since 2014 and is having success in the United Kingdom.

Beyond using light poles for data collection and as a monitoring source, utilities also can view them as passive energy hubs. Solar panel film can be installed around the lighting pole to collect electricity and charge a storage battery system. This collected energy then can go back into the grid with optimized automated distribution systems. Depending on the location and size of the lighting poles, these public energy hubs could charge small electronics like cell phones, laptops and tablets.

Who knows what designers, inventors or visionaries can think of in the future? Connected structures that can generate their own electricity, bring a Wi-Fi signal to the streets and help people who are visually impaired navigate a bustling city are just the tip of the iceberg. The one thing that is undeniable, is engineers and urban planners will be on the forefront of discovering new and exciting ways that lighting and smart cities can coalesce into an efficient and sustainable network of the future. The smart city of tomorrow will be illuminated not only with lighting but also with the imagination of its citizens.

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