The Internet of Things (IoT) is exploding in size and impact as the number of smart devices continue to grow in almost every industry. It has taken rapid hold in corporate real estate, and it will enable owners to extract vital information from their real estate assets, thereby allowing them to aggregate data, monitor performance and make more intelligent business decisions. The expansion of these connected devices will allow building owners and operators to turn workplaces into environments that are personalised, efficient, functional and profitable.

UNLEASHING THE POWER OF CONNECTIVITY IN BUILDINGS

By integrating and analysing data from connected furniture, lighting and conference rooms, IoT makes it possible to rethink the utilisation of space in the office. With a shift in the use of physical space, less space is required per person, which translates to substantial reductions in real estate operating costs. Increased connectivity also helps to optimise asset utilisation, and improves performance and productivity of both physical and human assets, enabling the workforce to be productive at any time and in any place. Whether the emphasis is on collaboration or individual work, it can be executed in a more flexible manner that best suits the schedule and habits of employees.

DEMAND FOR IOT-POWERED LIGHTING TODAY

With steady growth in the commercial building stock and net square footage expected to increase for years to come in countries like Singapore and the United States, reducing the energy intensity (energy consumption per square foot) of
building operations is the best means to achieve a net energy reduction in commercial buildings.

Until recently, these kinds of significant improvements in building energy consumption were out of reach due to technological barriers. However, with the advance of new intelligent sensor technology and IoT, huge gains in energy efficiency have become possible.

Because the IoT for commercial buildings always begins with advanced sensor installation at the lighting fixtures in a building, IoT-powered lighting systems become a more integrated and central component of every building project. The demand for this type of technology is growing worldwide as governments especially in developed nations encourage the adoption of IoT technologies in buildings.

For example, the Building and Construction Authority (BCA) of Singapore has allocated 10 points under Section 4 ‘Smart and Healthy Building’ in its latest Green Mark 2015 for non-residential new construction, which includes technology to facilitate analytics, demand response and continuous energy monitoring. Furthermore, with the recent updates to the Title 24 Building Energy Efficiency standards in the United States, advanced lighting control systems have more or less become a legal requirement.

LIGHTING IS THE GATEWAY TO ADVANCED BUILDING CONTROL

The lighting layout in commercial buildings represents a large untapped opportunity to learn how a business’ real estate is used by its stakeholders. Smart controls today are capable of transforming this lighting infrastructure into a dense network of real-time data collection points and truly bring commercial real estate into IoT.

While networked lighting systems most obviously provide data on light levels and energy usage, this is only the beginning. Intelligent systems can collect information on temperature, space usage and more, and communicate with other building management systems such as Heating, Ventilation, and Air-Conditioning (HVAC) and security protocols to create a facility that is smart and responsive.

There are a number of sensor-based systems on the market today—systems that combine lighting, smart controls and data analysis. But the features and functionality vary, and customers have a number of factors to consider. Topping this list are space utilisation, energy savings and employee comfort. With smart technology making great strides to unlock the potential of IoT for commercial real estate, these factors are being tackled in innovative ways as explained below:
LIGHTING

Personalised controls, increase energy savings
Lighting and employee comfort: Incorporating advanced lighting sensors can be helpful in securing additional Green Mark points on a construction project. From the data collected by smart sensors, it can be determined how to optimally light a space while taking advantage of natural light. Occupancy and vacancy sensors monitor when an area is unoccupied, helping to ensure that lighting is only present when necessary. Daylight harvesting sensors determine the amount of natural sunlight entering a space and adjust artificial light levels accordingly. Finally, task tuning allows employees to adjust the lighting in a space to meet their needs. Thus, with IoT-enabled lighting control systems, building owners can gain control over how light:

(i) Is received on an as-needed basis
(ii) Is customised to the activities of individuals within the space
(iii) Is provided at the exact intensity required within each separate area
(iv) Is adjusted as work activities or human traffic change anywhere in the environment.

This new responsiveness will improve our experience of the world in both tangible and eventually transformative ways. Ensuring that light and heat levels are optimised can help reduce eye strain and headaches, while also promoting comfort and relaxation, and therefore increasing focus and improving productivity. Furthermore, this also means huge gains in terms of energy savings because lighting is only used when needed and to the extent it is needed. That is obviously an attractive sustainability goal for any organisation, but the savings can be huge for large companies. American multinational telecommunications corporation AT&T, for example, recently upgraded lighting systems in 1,000 of its largest energy-consuming sites and 500 retail stores. The result was a savings of $8 million in annual lighting energy costs.

The key here is integrated sensors that also include occupancy and vacancy sensors along with ambient light and temperature sensing. After all, sensors should not be fooled by heat-producing fax machines and space heaters, or by motion created by machines and not humans.

Space utilisation: Space utilisation data can help update the facility based on its current and future needs. The advanced sensors in a networked lighting system track occupancy and motion for valuable insights on how space
Capturing workplace productivity in real time...

Maximise your comfort, reduce HVAC costs.
can be optimised. Large campuses and organisations with multiple buildings can determine when to expand based on how space is being utilised. So much is possible now—from identifying traffic patterns in a space to creating heat maps of motion, motion trails, tracking when employees arrive and leave, and more.

Cloud-based application software can provide insights into building usage and occupancy patterns using data from sensor networks within buildings. This allows customers to visualise and measure workplace use in real time and make decisions on how to better use their space.

For example, a powerful space utilisation application can provide estimates of occupied square footage and costs by department and function; vacancy reports detailing the percentage of unoccupied space; and utilisation reports showing low, medium and high workspace utilisation. Graphs display average and peak utilisation in each area of a workspace over time. This data can inform better space design, expansion and consolidation decisions. Furthermore, it can also help monitor janitorial activities, security sweeps and other such maintenance-related activities.

**HVAC and plug loads:** Centralised HVAC systems in commercial office buildings are routinely overbuilt and waste massive amounts of energy. Temperature controls integrated in networked lighting systems can provide information on hot and cool spots in a building to optimise HVAC usage. Occupancy and vacancy sensors can also determine spaces that are used infrequently so that they are not unnecessarily heated or cooled.

Recently, engineers and architects have begun to look at plug loads in building energy. When plug-load studies are undertaken by the design team as part of a whole system design approach (especially in equipment-intensive building types like laboratories and other critical facilities), significant energy savings are frequently discovered.
Working with right-size power supplies, reducing heat output and eliminating phantom loads can yield important energy savings. Smart data collection solutions now provide plug load management as a key efficiency capability.

- **Safety and security:** IoT technology can be used to detect intruders after hours and help locate occupants within a building during a disaster situation. Additional features of occupancy sensors can provide added benefits. For example, dim and linger controls warn occupants prior to lighting being turned off, which gives them ample time to exit the facility or override the control system. Sequential and pathway lighting controls anticipate and illuminate the pathway in front of pedestrians, customers and employees for increased visibility and security.

Without knowing exactly how the IoT-powered future will manifest, the fact remains that in the next 10 years, the amount of data generated by the human race is expected to increase by at least tenfold—largely due to IoT sensors coming online everywhere from outer space and underground pipes to vehicles, buildings and human body in the form of wearable technology. What is done with this data—the problems that can be solved and how lives and livelihoods can be improved—might become an act of imagination unparalleled in human history. However in buildings, it starts with smart lighting.

“The intelligence and connectivity among key building systems can enable better monitoring, control, optimisation, personalisation and autonomy to produce a truly Green and healthy building,” said Edmond Looi, Director of Business Development at Enlighted Sales and Service Pte Ltd. “Enlighted is poised to grow exponentially and accelerate the adoption of decision-making data solutions for intelligent real estate. Our emphasis on engineering IoT apps means we can provide our customers with more ways to make the data collected by our advanced sensors actionable and help improve efficiencies for commercial real estate.”