Measuring the Impact of IoT on Real Estate Operations

The fundamental truth that the value of commercial real estate (CRE) is mostly based on location is becoming undermined by a new factor – information.

While the fundamentals of real estate still matter, information on day-to-day building operations have the potential to add new ways for the CRE sector to improve net operating income (NOI), create value and differentiate from competitors.

Specifically, the Internet of Things (IoT) is already having a significant impact on the CRE industry by helping properties use data to drive decision making. IoT applications are enabling dramatically more efficient building operations, which is enhancing tenant comfort and satisfaction.

While consumer IoT devices have drawn most press attention, it is enterprise-level adoption of the technology that will likely have the bigger impact on industry. The CRE industry is uniquely positioned to implement this technology, using sensor-generated data to gain real visibility into management and operations.

What is the IoT?

The IoT is a suite of technologies and applications that enable physical objects to generate data, and to connect that data to an analysis and reporting engine. Conceptually, the IoT lets equipment or spaces within a building utilize the Internet backbone to communicate data about their condition, consumption or other attributes. The IoT sensors particularly relevant for CRE companies are ones that track features such as moisture, indoor air quality, weather, space temperature, and occupancy. With this data continuously streaming to the Internet, the IoT can enable real-time analysis and visualization of operating performance.

With the cost of sensors, data storage, and connectivity all falling, more CRE firms are moving forward with IoT technology. A recent study suggests that IoT technology has huge potential in CRE: In fact, sensor deployment in the sector is likely to grow at a compound annual growth rate of 78.8 percent between 2015 and 2020 to nearly 1.3 billion sensors.

Realizing the IoT’s full potential empowers building owners to implement a proactive operations & maintenance (O&M) approach that directly improves the asset value of properties. The value created from the information generated by IoT-enabled buildings has the potential to distinguish buildings within a marketplace from a desirability and profitability standpoint.

By offering services their competitors lack, CRE companies using IoT applications in this way could charge premium prices and improve margins. In fact, tenants will likely soon come to expect IoT features, meaning that a building lacking them may trade at a discount.
The Optimization Process

In the CRE context, sensors that track inputs such as energy usage, temperature, moisture, weather, and water/gas flow create a vast amount of data around property operations and the environmental conditions of a building. This data, transferred over network connections, can be aggregated on a real-time basis at a building and portfolio level.

The aggregated information can be analyzed continuously to provide descriptive, prescriptive, and predictive insights for building operations teams. Advances in computing power in the cloud have enabled more flexible programs that can aggregate both structured and unstructured data, which is important when pulling from hundreds of disparate data streams per building.

For CRE executives who have already adopted some level of automation technology in their buildings, all the IoT hype may sound inflated. However, evidence has shown that CRE owners and operators have typically installed technology on a piecemeal basis to solve specific problems. Not surprisingly, holistic insights have been difficult to garner, as siloed data must be collected and aggregated from various places.

In sharp contrast, systems that can be fully integrated with existing physical and digital infrastructure allow for higher-order cost, productivity, and asset value benefits. The IoT can leverage one infrastructure to enhance all building operations and require no manual involvement in the data collection, fault detection or delivery of strategic insights.

In creating value through information generated by connected systems, IoT applications can not only improve efficiency, but provide insights for better decision making. Examples include making equipment capital expenditure decisions with supportive analytics, proactively addressing tenant comfort issues, or even enhanced revenue-generating services such as tenant submetering with consumption premiums.

Enhanced tracking and monitoring at the equipment, tenant space and building level can result in lower asset risk, more granular insights, and enhanced portfolio management capabilities.

With the amount of connectivity and data generated by IoT-enabled buildings, CRE owners have an opportunity to differentiate themselves by using the information to identify unmet tenant expectations, provide more sophisticated services, and transform occupant experience.
Examples of Value Derived from IoT Sensors

Electricity

Electricity has been monitored at the building level for many years. More recently however, advances in metering technology have enabled electricity consumption to be measured at the equipment level in real time. In addition to discovering inefficiencies related to equipment being on when it could be off, monitoring the electricity profiles of equipment provides a host of data that can help predict malfunctions and identify exactly what the issue is likely to be.

One common example is with ventilation fans on roof spaces that are not usually monitored. If a fan fails or a fan belt breaks, there is normally no indication that the unit has failed until a resident complains about smells in a kitchen or bathroom. Locating the fan and identifying the issue is a time-consuming process for staff and building management.

In one case, the fan motor on a roof-mounted ventilation fan began to short, drawing more power, overheating the motor casing and finally shutting off due to thermal cutout. After the fan motor cooled down, it restarted, drew electricity for one minute, shorted again and then cycled on for one minute and off for four minutes before finally failing.

With this level of insight, a notification system can send an immediate alert when a fan motor fails or a fan belt breaks, identifying the issue, the specific fan and its location, and the steps to bring the fan back online in the shortest possible time, thus minimizing complaints from residents and saving energy costs.

Water & Gas

Like electricity, many building operators have only been able to see their water and/or gas consumption monthly when the utility bill arrives. The IoT and advances in digital meters are enabling managers to gain visibility into their water and gas usage between billing periods.

One example of the costs that can be saved with this real-time gas consumption tracking is for buildings that participate in interruptible programs with the local utility. In New York, Con Edison administers an interruptible gas program to help it manage the grid in the heating season. This program offers incentives for buildings that switch to fuel oil instead of gas when requested, but also penalizes if the switch does not occur. For participants in the ConEd program, noncompliance can cost nine times the market rate of gas used during interruption and includes a two-strike removal clause.

Tracking the gas consumption in real time can help ensure that the switch has occurred and save the organization tens of thousands of dollars.

Steam

Some buildings also get billed on their steam consumption. Beyond pulling in data from steam condensate meters to gather valuable insights into usage and opportunities to be more efficient, sensors can also be placed on steam traps.

Tracking steam traps in real time ensures that there are no issues when releasing steam. While the actual costs of inefficient steam use are generally marginal, the real concern is collateral damage to adjacent systems. When a steam trap is not functioning properly, the systems around it are susceptible to serious damage, which can occur very quickly. If an operator can be notified immediately when a steam trap stops working, thousands of dollars in capital expenditures on equipment replacements can be avoided.
BTU Meters
Heating and cooling water takes a lot of energy and costs a lot of money. Generally, it is not an option to have tenants use less hot water, but the processes of heating and cooling water can be made significantly more efficient if insights into BTU inputs are monitored.

For example, efficiencies can be found in dual-boiler systems in a lead-lag configuration. In one case tracked by Enertiv’s platform, a top-up water tank pump was inadvertently turned off and the boilers ran out of water needed to create steam — causing a safety switch cutoff at 4:15 a.m. Although the boiler demand is variable (based on the outside temperature and the demand for heating and hot water during the day), the sensors identified that both boilers were off and an alert to the building operator was sent.

Moisture & Branch Water Sensors
Water leaks are one of the most dreaded scenarios for a building operator. Now, low-cost moisture & waterflow sensors can immediately detect when a leak has occurred. Transmitting this information immediately to an alerting system, staff can be mobilized before major damages occur.

Leaks are especially troublesome because the root cause of damages is often unclear. IoT-enabled buildings can not only identify when leaks occur, but exactly where the leak is, thus saving thousands of dollars in damages.

Local Weather Data
The performance of a building depends largely on the local weather. Spikes in electricity consumption during hot summer days and gas usage during cold winter nights can make significant dents in a property’s net operating income.

Rainfall also affects operations in unpredictable, but measurable ways. For example, flooding due to heavy rainfall can damage equipment and cause indoor air quality issues from mold. Monitoring the interplay between precipitation data, moisture and the performance of pumping equipment can be used to identify flooding before it becomes a major issue.

By layering local weather data onto other IoT sensor data, analyses can be normalized to account for fluctuations and predict resource needs. Temperature and humidity sensors, coupled with data at the zip code level helps the analysis engines behind IoT applications deliver more accurate insights into performance.

Indoor Air Quality
Low-cost indoor air quality sensors can track humidity, volatile organic compounds (VOCs), carbon dioxide and more to help ensure that tenants stay healthy. Poor indoor air quality has been shown to affect a range of health factors in occupants and discovery of bad conditions can cause vacancies or even lawsuits.

Particulate sensors can also be used to detect air quality constituents which may act as triggers for occupants suffering from asthma or allergies. Low-cost sensors can detect dust, pollen, mold spores, airborne dust mite allergens and chemicals or toxins in the air that serve as these adverse triggers.

The first step in addressing indoor air quality issues is knowing that there is a problem. While many issues in buildings get brought to management’s attention through tenant calls, VOCs, and other indoor air quality issues are odorless and imperceptible to humans, making IoT sensors even more important.

Space Temperature
Hot/cold calls from tenants are some of the most common complaints and take up a lot of time for property managers and building operators. By tracking the temperature of tenant spaces, managers can ensure that any deviance from the norm can be addressed quickly allowing root causes to be identified immediately.

This is especially important in regions that have regulations like New York’s Local Law 86. This law states that property owners must maintain an indoor temperature of 62 degrees inside all apartments at all times. Penalties for non-compliance can be levied if enough complaints are filed by tenants. In addition, these regulations add costs for additional fuel and wear and tear on the boiler systems. By having sensors in place, the required temperature can be maintained in the most efficient way possible.

Occupancy
Equipment should be scheduled around real occupancy rates and usage. Even in buildings with building automation systems that can automatically control equipment systems around a schedule, there is no guarantee that this schedule is optimal without real-time tracking of equipment usage and occupancy rates.

Motion sensors are a low-cost way to refine equipment scheduling and maintenance strategies. Automatic alerts can notify operators when an equipment system is running when it could be off, and thus save thousands of dollars in energy costs over a year.
Technology Interconnection

To achieve a fully integrated operations performance system with all of its promises for increased operating efficiency, IoT applications must bring together many diverse types of data from many different sources.

The dynamic and continuously evolving IoT technology presents ongoing challenges. For instance, a lack of industry standards and benchmarks hampers communication among different competing and legacy IT systems. Many building management systems (BMS) use their own standards leading to multiple protocols; in a 2014 survey, for almost half of respondents, 50 percent of their building retrofit projects involve multiple protocols that do not communicate with each other.

Also, many times, system integration is a low priority, as companies often emphasize lowering initial costs over collaboration. Owners of existing buildings should be wary of specialist software solutions that silo disparate building systems and hinder interoperability.

Open protocols have been developed that facilitate full use of IoT technology. OASIS Open Building Information Exchange is one global industry-wide effort aiming to define standard web protocols for communication between various building systems.

Another protocol is the LoRa specification for wireless IoT sensors. This provides seamless interoperability among sensors without the need of complex local installations and gives back the freedom to the user, developer, businesses enabling the roll out of Internet of Things.

Leveraging IoT Data

If a CRE company wishes to use IoT applications to improve operating efficiency and tenant comfort, it must overcome an additional hurdle: analyzing the vast volumes of data that applications generate and finding insights there.

The volume and types of data make this analysis difficult. Most CRE legacy systems can handle structured data, but increasingly, IoT data are unstructured. In addition, data collected from multiple devices come in different formats and at different sampling rates.

How can CRE companies leverage the data created by IoT-equipped buildings?

When determining a submetering solutions vendor, CRE companies should ensure that the company uses advanced, “Big Data” tools to aggregate large data sets—both structured and unstructured—and process them in multiple ways.

CRE companies should also seek vendors with built-in flexibility in their platform that will collect and analyze various types of building data, as the continuous evolution of IoT sensors create more potential data streams each year.

As companies adopt big data tools, their existing talent pool may lack the requisite skills to use them, so they are likely to benefit from retooling existing employees or hiring new specialized talent to aggregate, analyze, and manage the data.

Location, information, analytics?

CRE owners should acknowledge that IoT technology is not just another fad. Over time, there is potential for the information generated by IoT-enabled buildings to be as valuable as the location of the physical asset.

However, it is not a question of chasing the technology but, rather, using an existing strategy to determine what a portfolio needs.

Beyond that, firms could start with the assumption that every single object in the day-to-day lives of both tenants and staff will be able to capture and share data. From that starting point, take an "art of the possible" approach by identifying the potential opportunities these new data streams could create for them.

To sum it up, IoT initiatives will likely be tremendously disruptive and it would be wise not to ignore the Internet of Things. Location is never going away, but with the IoT, the future of CRE just may be in location, information, analytics.
Sources

Gartner, Gartner Says Smart Cities Will Use 1.6 Billion Connected Things In 2016, December 7, 2015, www.gartner.com/newsroom/id/3175418


