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Smart Buildings and the Internet of Things: Unlocking Value



Life Is On



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Introduction

Building management is getting easier, more powerful, and more innovated – thanks to the Internet of Things (IoT). Over the next decade or so, billions of devices will be installed and connected, generating trillions of dollars in revenue in buildings and other applications. Data generated by sensors will be combined with new control capabilities to make buildings smarter, more efficient and comfortable, allowing occupants to be more productive.

To make smart buildings and the IoT a reality you need to:

1. Understand the size and nature of the opportunity
2. Comprehend the value of integrated building management software and systems
3. Realize what is implied for hardware
4. Take advantage of applications, analytics and services

In general, the opportunity is immense, as buildings will soon have massive sensor and actuator arrays installed. But, this also means that software must be designed and built to put these capabilities to use. Hardware, for its part, must deliver as well as facilitate innovative features. Finally, applications, analytics and services that exploit new functionalities must be implemented and deployed.

The following Smart Building eGuide outlines and explores these aspects in more detail. Armed with this information, you'll be better prepared to unlock building value.



Data generated by sensors will be combined with new control capabilities to make buildings more efficient and comfortable.



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Smart Buildings and the Internet of Things

The Internet of Things (IoT) is getting a lot of attention these days. There are some eye-popping reasons for that – billions and trillions of them. The first is how many devices are going to be connected – [50 billion](#) by 2020. The second reason is the size of the economic activity generated – as much as [\\$11.1 trillion by 2025](#) in an analysis from the McKinsey Global Institute.

OK, now that we have your attention, what does this mean? Let's focus on something a lot nearer and more concrete – the building you're sitting in and perhaps responsible for.

According to McKinsey Global, the IoT economic impact on factories, retail settings, work sites, offices and homes could total as much as \$6.3 trillion by 2025. Some of that impact will be in the form of sensors and other hardware that goes into buildings. Some of it will be building management software, applications and services. This makes buildings more efficient, which in turn [makes people more productive](#).

IoT helps make enterprises smarter. Think of it as today's building management system, a BMS, made more intelligent and more powerful. Some of those billions and billions of connected devices in the IoT will show up as advanced sensors and meters in:

- Networked lighting
- Heating, ventilation and air conditioning (HVAC)
- Security and access control, and
- Electric meters



The arrival of IoT means that the old way of doing things won't work. BMS will have to evolve.

But beyond the smart building itself, there will also be data available from weather monitors and financial information – like the price of electricity, other utilities, and even commodities. That data can factor into how buildings are managed.

So buildings will be more intelligent and systems will be able to make adjustments on-the-fly. For example, if an office is empty because somebody's out on assignment or leave, then don't heat or cool it. Setback the temperature to [save energy](#) and make sure the lights stay off. Such steps help reduce the [waste that today represents about a third of the energy](#) used in commercial buildings.



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Smart Buildings and the Internet of Things (cont.)



One impact of the IoT is that people expect smarter buildings.

Now for something else for you to consider. According to the 2016 Navigant Research report [“Data Integration for Intelligent Buildings.”](#) one impact of the IoT is that people are going to expect buildings to be smart. They’re going to demand “data-driven solutions that improve energy and operational efficiencies, facility planning, preventative maintenance, fault detection, occupant comfort, and safety in buildings.”

But this requires more than sensors. You need data integration. The data may be in various formats, with different naming conventions and syntaxes coming from a variety of devices, sensors and systems. As a result, gathering, processing and analyzing the information may not always be easy.

According to McKinsey Global, the IoT economic impact on factories, retail settings, work sites, offices and homes could total as much as \$6.3 trillion by 2025.

However, two drivers will make this data integration happen despite these difficulties:

1. Utilities are expanding energy demand response programs that offer varying energy pricing based on time of day.
2. Energy mandates to increase efficiency by adjusting consumption are becoming more standard.

Responding to either of these requires collecting and reacting to information, often lots of it and sometimes very quickly. Consequently, there’ll be a strong incentive to harness the power of IoT.

So, the arrival of IoT means that the old way of doing things won’t work. Overall building technology will have to evolve.



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Building Management Software and the IoT

The IoT is getting attention because billions of devices and trillions of dollars are at stake. Anybody involved or concerned with managing a building needs to anticipate and plan for changes brought about by the IoT.

Let's look at software for example. In ["Data Integration for Intelligent Buildings."](#) Navigant Research reports that end users are going to be conditioned by their experience with intelligent devices to expect smart buildings. Building owners/managers will want solutions that enable optimization by:

- Visualizing and reporting on such things as utility bills while offering interactive dashboards
- Detecting and diagnosing faults through benchmarking and performance analysis
- Providing predictive maintenance through asset monitoring

While disparate software solutions have been available, innovative building management software will integrate and automate these functions. The way this will be done will have an impact on today's buildings and the capabilities they must offer.

The first part of the IoT – the Internet – means that sensors gather data for analysis and help facilitate system communication with the outside world.

For instance, this could mean that the building management software is talking to a local utility. Maybe the utility has implemented a demand response pricing program, which could cut a building's energy costs by allowing energy usage to be adjusted according to the price of power at off peak hours during the day. In order to do that, the software managing the building will have to have up-to-date information from the utility. While this capability is already available with some utilities, IoT-enabled smart buildings will need more capabilities like this in the near future.

With the added data and intelligence IoT brings buildings, facility owners/managers should not underestimate the potential risk of security breaches. Cyberattacks are rampant and [recent news items from law enforcement](#) show the problem is widespread.



Building management software can no longer assume isolation as a barrier against cybercriminals and cyberattacks.

All of the protections and best practices of a standard office network will have to be part of the software package. That's only the beginning, though, because the software also faces threats from being connected to an array of sensors, actuators, control devices, and meters. So, there are potentially more points of entry.



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Building Management Software and the IoT (cont.)

Anybody involved or concerned with managing a building needs to anticipate and plan for changes brought about by the IoT.

While being robust enough to ward off attackers, building management software should be able to collaborate with multiple- and third-party systems and devices. A not-so-obvious aspect of IoT and the experience with smart devices is that users expect to be able to take any device, get it on the network, and then have it work.

In the building management world, that means that effective solutions need to adhere to standards and open protocols such as: [BACnet](#), [LonWorks](#), [Modbus](#), and [KNX](#).

Support for industry standards and protocols provides seamless interoperability across the following systems and devices to provide an integrated view of building operations:

- Networked lighting
- Heating, ventilating and air conditioning (HVAC)
- Fire, security and access control
- Workplace management



A not-so-obvious aspect of IoT and the experience with smart devices is that users expect to be able to take any device, get on the network, and then have it work.

In summary, it is essential that the building management software is able to handle cybersecurity and standardization, while still taking advantage of what the IoT offers. If your software isn't equipped to do that, then it may need to be upgraded or changed.



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Building Hardware and the IoT

To make the IoT a reality, buildings need to be more efficient, comfortable and easier to manage. Changes in software and its integration into hardware devices will make this possible.

Let's look at building hardware and the IoT.

IoT-ready products, such as sensors, actuators and controllers, that are connected to a building management system, need to deliver efficiency and optimization impact at every level of smart building operations. When software and hardware systems connect and communicate via a central Internet Protocol (IP) backbone, buildings become a hub or network that enables "connected things" to come into the building from the outside and vice versa.



To make the most of the Internet of Things, you need data available so that you can make informed decisions and take action.

Let's take something at the simplest level, for example, an occupancy sensor that checks CO₂ levels to see if people are currently occupying a room. When occupied, the sensor communicates via the BMS to turn on the ventilation systems to bring in more fresh air. Furthermore, the sensor has the ability to inform the BMS if more lights should be turned on; then it can adjust the temperature, turning it out of a [power conserving deep setback](#). When the occupants leave the room, everything goes back to its original energy-saving settings.

Sensors are a very large component of the IoT; eventually they will be connected to everything everywhere! To make the most of the IoT, you need data available so that you can make informed decisions and take action. For example, is that compressor about to fail, are those blinds closed to keep those rooms cool, are access control systems on and working at every possible entry point in the building? Sensors will help provide answers we need.

IoT-ready products connected to a BMS will deliver efficiency and optimization impact across building operations.



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Building Hardware and the IoT (cont.)

As noted in the Navigant Research report [“Data Integration for Intelligent Buildings.”](#) the cost of sensors and actuators is dropping. However, you can't go by price alone. Reliability and ease of integration are key factors when choosing the right IoT-ready products to go with your BMS.

As mentioned, part of what the IoT can enable is system health and [preventive](#), or better yet, [predictive](#) maintenance. In other words, a facility manager will receive fewer calls in the middle of the night to repair something that has broken unexpectedly. Instead, fixes can be scheduled at a time when there's less disruption, less downtime and most likely less expense.

The BMS is key; the hardware and software needs to be robust and scalable. The IoT is evolving quickly, new technologies are arriving in the market faster than ever. A BMS should be future-ready and have the ability to grow and adapt as the technology advances.

Fortunately, as noted in the Navigant Research report, the

A BMS should be future-ready and have the ability to grow and adapt as technology advances.



IoT enables system health and preventive or better yet predictive maintenance. Repairs can be scheduled when there's less disruption and less expense.

cost of computing has fallen and continues to drop. Again, hardware with the right characteristics is increasingly affordable.

It's important, though, to get IoT-capable hardware for a new build or when doing a retrofit. That applies to everything from the control devices up to the BMS. Do that and you'll be on the way to getting the most out of the IoT.



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Building Services and the IoT

What does the IoT mean for building service offerings?

With the goal of creating smart buildings that are more efficient and comfortable while being easier to manage, the IoT equates to the networking of systems and devices in buildings. These include:

- Lighting
- Heating, ventilating and air conditioning (HVAC)
- Security and access control, and
- Control devices – valves, actuators, sensors and meters

When these end points are connected, systems and devices can be adjusted on the fly to respond to varying outside conditions for optimal comfort and productivity. Also, connected systems provide the necessary information to enable preventive and predictive maintenance, which can now be scheduled to cause the least disruption.

By connecting everything, the potential exists for remote management of a building in ways that were not possible before.

Most current managed service offers focus on platforms for predictive energy optimization. They use algorithms and predictive analytics to automatically reduce operations in commercial buildings. The benefit comes from managing and monetizing all the data gathered from the plethora of sensors we talked about earlier. For managed services to be of value, they must ensure the sensor data is gathered, stored, managed, optimized, safeguarded and monetized in the cloud.



Management services will become more vital partly because government regulations call for increased energy efficiency.

Take, for example, if you wanted to put a room, a wing, or a building in a [deep setback](#) to save energy. In the past, this would have been done on a piecemeal basis with a lot of manual intervention to change set-points. With connectivity via sensors and smart devices, it can now be done remotely. It's also possible to do the opposite, making it easier to bring facilities out of a deep setback when the time comes to do so. In that way, you can save as much energy as possible while still allowing people to be comfortable and productive.

More importantly though, the IoT offers the ability to coordinate the response in different areas. When moving from an old location to a new one, the new site can be brought online, the move made, and the old location shut down in a synchronized way. Again, you minimize energy use while still enabling people to be productive.



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Building Services and the IoT (cont.)

Take for example the service of [demand response pricing](#), which is defined as a change in the power consumption of an electric utility customer to better match the demand for power supply. In many respects, demand response can be put simply as a technology-enabled economic rationing system for electric power supply.

It's important to keep in mind what the IoT really means: everything is connected.

Utilities may signal demand requests to their customers in a variety of ways, including simple off-peak metering, in which power is cheaper at certain times of the day, and [smart metering](#), in which explicit requests or changes in price can be communicated to customers. Having a building management system in place that is connected to smart meters makes demand response an easier service to leverage for energy and operational efficiency.

As noted in the Navigant Research report, "[Data Integration for Intelligent Buildings](#)," the cost of sensors and computing is decreasing while the challenges on the software side are growing, which means the software side of management will become increasingly important.

The report also notes that building services will become more vital. Part of the reason for this is that government regulations call for increased energy efficiency. The U.S.,

for instance, is pushing for a nearly [30 percent reduction](#) in greenhouse gas emissions within 10 years. Getting there will mean that buildings will have to do much better at energy management. As a taste of what may be coming, some jurisdictions are requiring energy code compliance certification to obtain certificates of occupancy for new buildings. Companies will therefore increasingly turn to sophisticated and optimized building energy management systems to meet these requirements, according to Navigant Research.

Those building services will help produce significant energy savings. They will also deliver better running smart buildings that make IoT a reality.

Additional Resources

For more information about how to navigate the smart building IoT landscape, please visit these resources:

- [Schneider Electric EcoStruxure Building Applications, Analytics & Services](#)
- [Edge Control: Building Management](#)
- [Connected Products: Valves, Actuators & Sensors](#)
- [Connected Products: Circuit Breakers](#)

