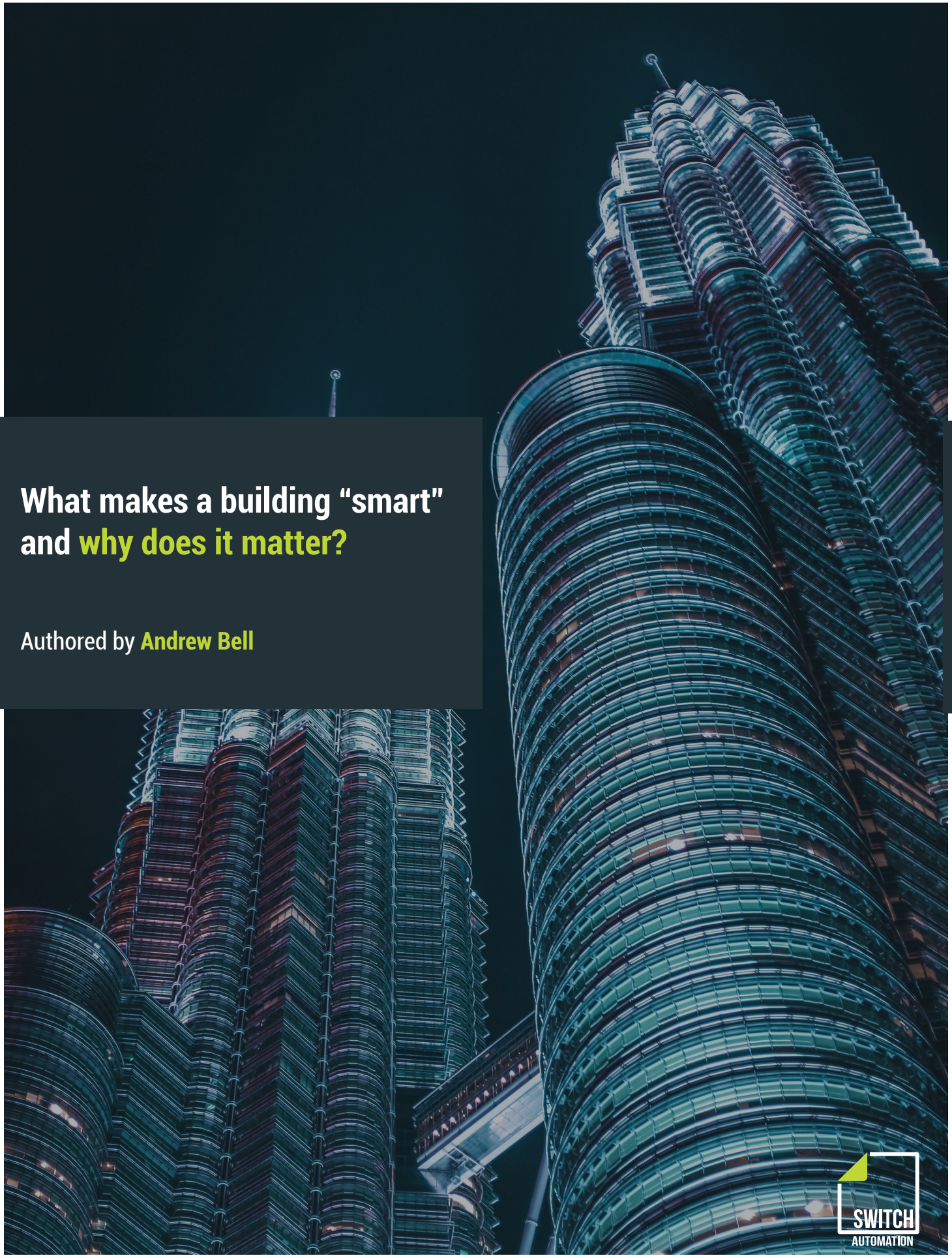


What makes a building "smart" and why does it matter?

Authored by **Andrew Bell**

SWITCH AUTOMATION

Introduction

Smart buildings are buildings which integrate and account for intelligence, enterprise, control, and materials and construction as an entire building system, with adaptability, not reactivity, at its core, in order to meet the drivers for building progression: energy and efficiency, longevity, and comfort and satisfaction.

> *"The increased amount of information available from this wider range of sources will allow these systems to become adaptable, and enable a Smart Building to prepare itself for context and change over all timescales."*
>
> **A.H. Buckman, M. Mayfield, Stephen B.M. Beck, "What is a Smart Building?" (2014)**

This white paper explores the meaning of the term "smart building," and the value associated with investing in a smart building program. It presents best practices for creating a smart building program and utilizing connected, IoT technology across a portfolio.

The guidance in this paper focuses on strategic, portfolio-wide solutions that reduce risk, are cost effective and deliver compelling ROI. These solutions are scalable from a small initial phase to enterprise-wide implementation and can be adopted at sites with a diverse range of installed technology.

Part 1
Real estate today

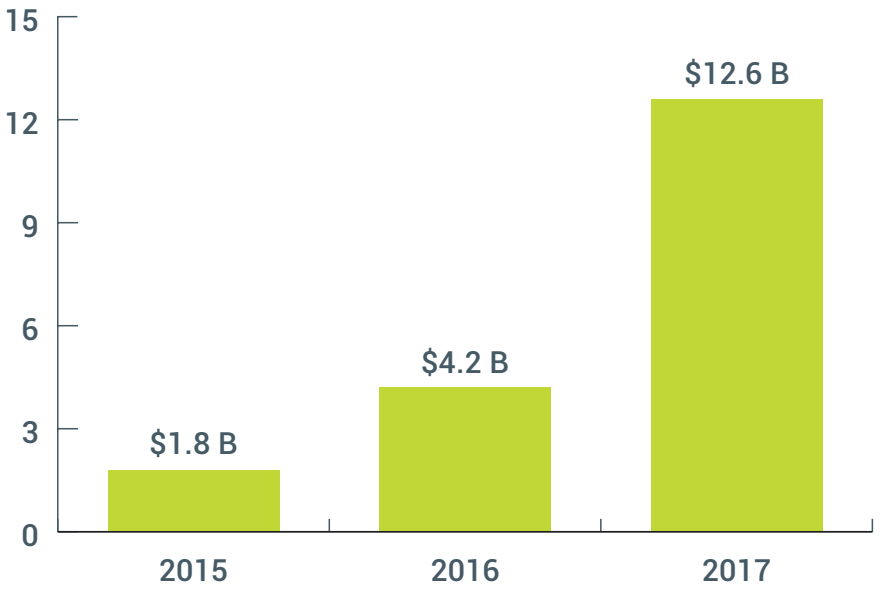
The real estate industry is in the midst of widespread disruption, with investment in Real Estate Tech rapidly increasing year-over-year. According to a report published by Re:Tech, investment in Real Estate Tech hit $12.6B USD in 2017, a huge increase from 2016 ($4.2B) and 2015 ($1.8B).

The proliferation of devices and smart sensors are driving rapid growth in innovation and investment. Excluding computers, smartphones and tablets, Gartner predicts that there will be more than **20 billion IoT devices by 2020,** a three-fold increase from 2016. Deloitte estimates that IoT technologies in commercial real estate will advance at a compound annual growth rate of **78.8% between 2015 and 2020,** adding up to 1.3B sensor units in this industry alone.

Financially, the global smart building market was valued at approximately $7B USD in 2014 and is expected to reach **approximately $36B by 2020,** growing at a compound annual growth rate of slightly more than 30% between 2015 and 2020, according to Zion Market Research. Portfolio managers are embracing smart, connected technologies because they want to manage their buildings as a unit, with similar processes, metrics and the ability to deliver similar outcomes.

Real estate tech investment by year
(in billions)

RE:Tech Real Estate Tech Annual Report 2017



Part 2
Why consider a smart building program?

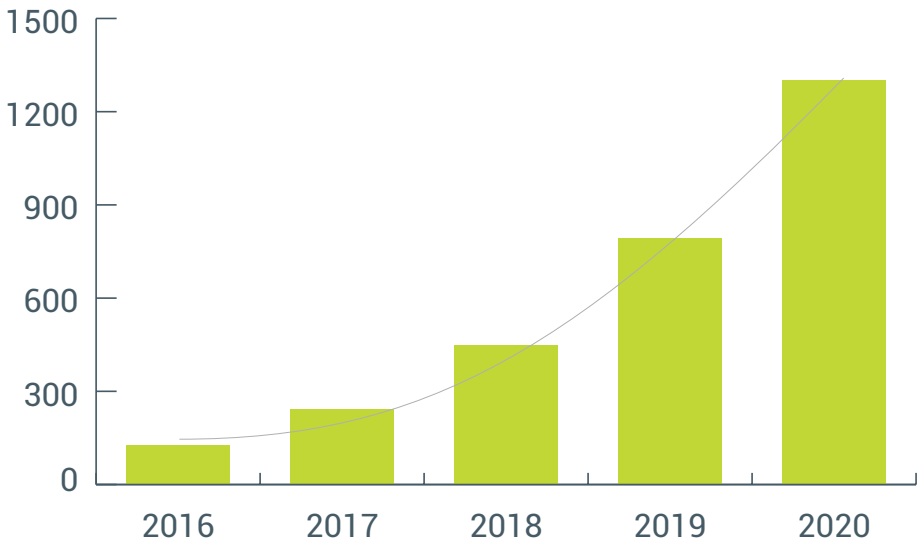
There are a series of global trends that will heavily impact the real estate industry; and CRE managers should actively consider how to accommodate them.

First, urbanization is increasing, with the United Nations reporting that "in 2030, **60% of all people will reside in cities**, proportionally twice that of 1950." This means that buildings are having to operate more efficiently to house current residents and anticipate future urban transplants alike. Second, buildings are no longer thought of as mere cost centers; there is an increased focus on making these structures function more effectively for owners, operators and occupants. To this end, companies are embracing initiatives like green building certification and the WELL building standard.

Third, distributed energy generation, noted above, will change the traditional role of utilities. The internet of things, big data processing and the cloud are enabling the smart grid and making building and energy optimization a reality.

Projected volume of IoT sensors in CRE

Smart buildings: How IoT technology aims to add value for real estate companies



COMMON PORTFOLIO INEFFICIENCIES

Deloitte's 2015 Commercial Real Estate Outlook noted that "CRE owners may be at a competitive disadvantage by relying on manual or traditional processes in building design and maintenance." The building lifecycle, from design to operations, involves a variety of stakeholders, many of whom do not interact. The handoff processes from builders to owners and occupiers usually result in knowledge gaps about how these building systems should function.

When a building is ready for tenants, often the commissioning job was either not completed or not comprehensive enough, leading to a variety of operational and maintenance issues and significant energy waste. Broadly speaking, a lack of visibility into building operations across all enterprise systems makes it difficult to identify operational issues and close the gaps left by an incomplete commissioning job. A smart building solution can address many of the technology barriers that this complex landscape creates.

Following handoff, a few examples of common portfolio inefficiencies include:

Different systems across buildings and functional areas mean that an unnecessary amount of time and money can be spent training staff and maintaining a high number of disconnected systems. These might include separate systems for metering, building automation, energy and work order management.

It's difficult to reduce high energy costs, particularly with disparate energy monitoring systems, delayed meter information and time-of-use charges making it difficult to measure cost effectiveness.

Occupants increasingly demand sustainable places to live and work, and are showing a greater interest than ever in connected technologies and healthy, productive and comfortable environments.

Building assets tend to be inspected on a regular, cyclical basis, meaning that equipment may fail some time before inspection, going uncorrected for an extended period.

Unnecessary truck rolls and service calls are often made for equipment that is found to have no faults. This is a waste of resources and labor and is usually due to a lack of reliable equipment condition data.

It's increasingly difficult to maintain visibility into third party performance due to the outsourcing of operational services. This issue only worsens as portfolios expand and these services multiply.

Assets can become stranded as increasingly efficient building equipment is purchased. 'Unsmart' legacy assets that do not connect to a central smart building platform are rendered invisible and this both makes their management more difficult and increases their lifecycle cost.

IoT technology helps properties run more efficiently, enabling facility and real estate teams to do more, faster and with less effort. In addition, asset value tends to increase by delivering a better real estate product and service. As an increasing number of new technologies enter the market, real estate professionals need to be aware of what vendors offer and how exactly to procure the right solution for their unique business and operations goals.

Part 3
The value of smart building solutions

The main goal of a smart building solution is to create one centralized, intuitive dashboard, accessible by a range of users to drive asset visibility and building optimization. Having one central system, integrating all the relevant hardware and software, supports a diverse range of stakeholders and achieves better outcomes at a lower cost.

More specifically, cost effective and sustainable smart building solutions tend to deliver the following outcomes:

ENTERPRISE-WIDE VISIBILITY FOR BETTER DECISION MAKING

Leaders and building managers don't tend to have a single system to analyze portfolio data to identify trends and opportunities for efficiency. The information facilities managers need to make certain strategic decisions is often stored in an array of spreadsheets, databases, and disconnected systems throughout the organization.
A true smart building solution combines real-time data, analytics and smart alerting capabilities on a single system so that building managers can analyze portfolio data and identify opportunities for efficiency. From here, they can make changes to reduce building load or set up automation programs to automatically curtail demand.

Oxford Properties is a global commercial real estate owner, developer and manager with a portfolio of more than 200 buildings. At their **WaterPark Place location**, this smart building solution provided the visibility needed to identify open isolation boiler valves. These were causing hot water to bypass the system, unnecessarily increasing boiler and pump energy. Oxford traced the cause to a temporary control sequence inadvertently left in place during building testing and balancing (TAB). The onsite team adjusted control sequences, which alone resulted in $41,000 annual savings in HVAC and boiler operation. With 12 opportunities to optimize total building performance, WaterPark Place achieved $65,000+ in annual savings for a 1.2 year payback.

CONTINUOUS EQUIPMENT OPTIMIZATION

A combination of fault-detection and diagnostics (FDD) and continuous commissioning can ensure that portfolio equipment is always performing optimally.

The City Energy Project defines continuous commissioning as "a process that relies on collecting and analyzing energy data via an existing building automation system or standalone metering equipment, and then making the necessary operational changes so that the systems in the building work optimally." Using the building automation system and other technologies, buildings may be tuned properly when they are first occupied, but as new tenants move in and out, as changes to the building are made, and as staff turns over, efficiency gains can be lost. Continuous commissioning specifically addresses these issues and more.

A recent report from the American Council for an Energy-Efficient Economy states "Automated fault detection and diagnostics (FDD) can include a combination of sensors and algorithms to compare the expected operating condition of the equipment or system to actual performance." FDD solutions identify building efficiency issues, presents them in a prioritized fashion and reduces the volume of maintenance calls. The report goes on to describe how one property company dramatically cut costs with FDD: "a Washington DC based energy management software and analytics company helped the Tower Company identify a relatively simple fault in one of its office building's cooling towers. After installing a wireless web-enabled water consumption submeter on the cooling tower, the engineering team began receiving regular reports on cooling tower water consumption."

"When the vice president of engineering noticed unusually high cooling tower usage on a Sunday—a day when the building is typically unoccupied - it led to the discovery of a faulty electronic float inside the cooling tower. This discovery, along with minor cooling tower maintenance, allowed the team to reduce the entire building's water consumption by 45%."

INCREASED CAPITAL EFFICIENCY

Capital planning decisions across the real estate portfolio require data on building performance. Smart building solutions can expedite new capital project analysis, automatically calculate ROI to track performance of existing ones and generate performance summary reports.

One large grocery store has 3,000+ stores throughout the U.S.. They implemented a portfolio intelligence solution at 150 stores to identify underperforming and faulty equipment. The energy team

draws 5-minute interval data from HVAC, lighting, refrigeration and dehumidification sub-metering systems, synthesized in user-configurable dashboards to see exactly which stores and sub-systems perform outside of their weather-normalized benchmarks and to what degree.

Now their team can investigate each anomaly, completing the full cycle of opportunity management from identification to resolution. As such, the organization identified $500K in annual CapEx savings opportunities in just 2 months.

IMPROVED OCCUPANT EXPERIENCE

Smart building technology often improves occupant comfort, causing staff to be more productive and happy. **A study from the University of California** observes: "A variety of building design and operational strategies affect indoor environmental quality (IEQ)."

"The potential costs of poor IEQ can be thought of as direct medical costs associated with health problems caused by the building, or indirect costs related to reduced individual performance, which could either be because of higher absenteeism, or - more often - reduced effectiveness when one is at work."

"The benefits of good IEQ are either related to minimizing these negative implications, or creating positive effects such as improved recruitment and retention of employees, and lower cost of building maintenance due to fewer complaints, and enhanced worker effectiveness."

In other words, using smart building technology to improve occupant experience through higher air quality and a more pleasant, functional working area tends to result in valuable savings through decreased absenteeism and lower staff turnover.

BOOSTED BRAND PERCEPTION

A smart building solution enables real estate professionals to easily optimize, track and convey portfolio performance to stakeholders, investors, customers and prospective customers. **WeWork uses machine learning** to observe how occupants use their facilities to gauge the effectiveness of their communal areas and how satisfied occupants are:

"We fed the neural network (referring to WeWork's machine learning algorithm) information about the layouts of our locations, including the number of offices, the size of the offices, the number of meeting rooms, and the facilities in the meeting rooms."

"Every time the network was fed a layout, it was also shown how frequently the rooms

were used in recent months. Over time, as the network saw the layouts repeatedly, it began to learn the relationship between the layout and the usage. Eventually it understood this relationship well enough that it could fairly accurately predict how a layout would be used by our members before we began construction."

This use of machine learning is a prime example of how a smart building solution can help consolidate occupant satisfaction with better data usage. In addition, better occupant satisfaction and a willingness to push the envelope on new forms of AI contributed to WeWork's already distinct brand perception as a technology company.

SYSTEM AGNOSTIC AND 'FUTURE-PROOFED'

A true smart building solution should be system-agnostic and able to serve a variety of building portfolios. It should work with many, if not all, existing building-focused solutions on the market, and needs to be more than just an energy management system or real-time database for specific information feeds.

Making technology investment decisions across a real estate portfolio has traditionally involved a risk of vendor lock-in – that is, buying a type of hardware that requires a proprietary software solution, or software solutions that cannot connect together to provide enterprise-wide visibility. This is particularly risky when the proposed technology has a high total cost of ownership.

Instead of demanding costly upgrades or alterations, smart building technology should be capable of connecting to many different hardware and software solutions that already reside in buildings. The value of current hardware and software investments should be protected and consolidated when working alongside a given smart building solution.

DRIVING VALUE WITH GREEN BUILDING CERTIFICATION

Smart building technology boosts the value of buildings and their assets with certifiable improvements to energy efficiency and sustainability. Smart building technologies make the environmental certification process less labor intensive by automatically collecting, error-checking and presenting the information necessary for submittal. Achieving green building certification positively impacts asset value and often outweighs the associated costs.

A recent study on occupational wellness from Ryerson University states "a comprehensive review of academic papers and industry surveys demonstrated both increased rental rates for sustainable and energy-efficient properties" and a willingness of a "majority (70%) of tenants to pay a premium to occupy such properties." In addition, the study also finds that sustainable buildings can deliver

additional value in the form of "a cash rebate, reduced development charges or building permitting fees, or decreased tax burden."

On the flip side, **the UK Green Building Council** observes that non-smart buildings that fail to comply with contemporary sustainability standards are losing value as a direct result. The organization finds that as "tenants and their agents understand that a good building shell is more likely to lead to better operational performance," this leads to "price chipping on poorer performing assets which are in need of substantial investment to bring them up to minimum standards."

The previous occupational wellness study echoes this trend:

"...poor energy performance has correlated with reduced rental rates, reinforcing the commercial importance of energy performance."

Part 4
The road to your smart building strategy

The internal barriers to implementing a smart building program tend to fall into one of four categories:

1. **A perceived lack of resources,** perhaps due to a lack of budget for investment in new real estate technologies or concerns about the costs associated with becoming locked into a non-agnostic technology vendor.
2. **A perceived lack of skill,** or concerns about the internal team's knowledge of smart building solutions. There may be questions around how to identify the right technologies or how to implement and properly use the solution across the management and facilities teams.
3. **Concern about return on investment (ROI);** since every site and portfolio is so unique, it can be difficult to estimate the annual financial benefits of smart building technology, let alone in the medium term and beyond.
4. **Reluctance to using cloud-based technology,** due to a lack of other enterprise-wide cloud-based technology deployments, or general concern for IT security.

Fortunately, most barriers only exist in the short-term and can be minimized with proven technology from an established provider. The opportunities offered by smart building technology are simply too numerous and compelling for organizations to ignore, particularly in the medium to long-term. Work with an established provider that can clearly help your organization navigate any barriers, via proven payback periods, penetration tests and expert training for example, is key.

The real estate professionals of tomorrow need a strategy to keep up with megatrends, increase property value, achieve sustainability certifications and meet occupant and stakeholder expectations.

Ultimately, an effective smart building solution should include:

- An IP-based technology stack, which is scalable across the portfolio and allows new assets to be added seamlessly
- A central system of record for data, plus a central control platform, creating a single version of the truth and point of access
- Cloud based technology to enable remote data processing and a variety of data sources to be accessed, such as third-party sources or other cloud-based technologies used inhouse
- A software interface that's easily accessible for employees and stakeholders
- A streamlined analytics and fault detection and diagnostics (FDD) platform

Given the pace at which other real estate organizations are adopting this technology, standing still is the highest risk option. Smart building technology can be deployed at low cost and without significant risk to the organization's core charter or existing operations. Moreover, smart building technologies can scale quickly and reliably, setting real estate professionals up for success, both in the initial deployment phase and during scaled, enterprise-wide implementation.

Andrew Bell *is currently a marketing content manager & creator at Switch Automation. Andrew's academic research was published internationally on multiple occasions. He has also edited bespoke corporate marketing videos at award-winning independent film studios. At one stage, Andrew also taught English as a foreign language in Yunnan, China, and has enjoyed study in Computer Science with Stanford University and Film Editing at Met Film London.*

What makes a building "smart" and why does it matter?

Do you want to **implement or enhance building performance** across your real estate portfolio, but need a guide to help inform your research?

Check out this Evaluation Roadmap: How to choose the right smart building solution.

Are you ready to go smart and enjoy better portfolio energy efficiency, longevity and occupant comfort?

Click here to talk to a Program Manager and find out how your buildings could benefit from going smart. Our team of experts would love to learn about your goals and help you transform your portfolio management into an IoT-inspired smart building operation.