Johnson Controls

The smart building of the future

Digital solutions that enable sustainability, efficiency, comfort and safety

The power behind **your mission**

Contents

> A smart building is one that uses technology to maximize efficiency and create a safe, comfortable environment for occupants.

Executive summary

Today's buildings account for nearly 40% of global greenhouse gas emissions. That's one of the many reasons why organizations are under pressure to meet net zero goals while accommodating continued growth with improved profits. When a building comes alive with smart technology, it conserves energy as well as the resources needed to fuel the organization while creating a healthier, safer, and more productive environment.

Although smart buildings have been a reality for years, advancements in connectivity, AI, IoT, cloud and cybersecurity technology, as well as innovation in the buildings domain, are driving dramatic transformation. Envision a future where these structures harmoniously intertwine with human and environmental ecosystems, fostering sustainability and enhancing experiences.

The smart buildings of the future are able to self-heal, self-manage and self-operate with little to no human intervention for day-to-day operations.

Space occupancy and usage can be tracked to deliver comfort only when and where it's needed autonomously. Smart building technology can measure energy usage and determine how to balance sustainability with the comfort and wellness of its occupants.

Flexibility replaces permanence in terms of operational efficiency, as buildings will quickly reconfigure space as needed and serve multiple purposes under one roof, for commerce, work, living or entertainment. The risks of unforeseen or unplanned disruptions such as natural disasters, or another pandemic, can be mitigated against as the building will quickly adjust to changing circumstances and environments.

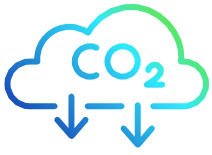
Open standards will be used to integrate heterogeneous systems to accelerate smart building implementations. Smart building technology generates valuable data that can be analyzed to improve building systems and the occupant experience. This data delivers insight

> The smart buildings of the future are able to self-heal, self-manage and self-operate

on the health of building equipment to enable predictive maintenance and avoid unplanned downtime.

The smart buildings of the future are more resilient because they operate autonomously at the edge, even in the event of a server or cloud failure. And safety is assured by integrating physical security technologies with cybersecurity to protect people, property and building data.

Getting to this future is a journey where organizations can incrementally adopt smart building technologies to improve sustainability and reduce costs. This won't happen overnight. Organizations must plan their journey today to meet the challenges and opportunities of tomorrow.



Introduction: A vision for comprehensive building autonomy

Today's buildings account for nearly 40% of global greenhouse gas emissions and 30% of final energy consumption. With increasing energy costs, an evolution in occupancy patterns and increasing focus on greenhouse gas emissions, many organizations are under pressure to meet net zero goals while accommodating continued growth with improved operating costs. With recent technological developments, smart building technology is offering new and more effective ways to boost building efficiency and meet these critical goals.

In this paper, we'll explore what smart buildings are, the market trends driving change and how innovation is meeting these challenges and creating spaces that are healthier, more efficient and more comfortable.

What is a smart building?

While the term "smart building" has been used for many years, what it means has and will continue to evolve with advances in technology and changes in the way we use spaces. In a very broad sense, a smart building is one that uses technology to maximize efficiency and create a safe, comfortable environment for occupants.

Traditionally, buildings have been made "smart" by integrating disparate and siloed systems. Data is extracted and analyzed to identify ways to drive specific outcomes such as energy efficiency, carbon reduction, air quality improvement or asset performance. While this type of approach delivers tangible benefits at the building or campus level, inherently inconsistent data, difficulty connecting equipment from multiple manufacturers and a lack of interoperability stifles the ability to scale across the enterprise.

The smart building of the future is not only integrated and connected, but possesses increasingly more intelligent capabilities that enable it to adapt to people and the organizational mission. It collects large volumes of data from inside and outside the building and uses AI to automate a range of desired outcomes, such as balancing comfort with energy efficiency, providing a personalized experience for building occupants and adapting to changing conditions. It also uses that data to keep buildings and their communities safe and secure.

Trends driving the future of smart buildings

Several critical factors are converging to accelerate the development and adoption of advanced building systems technology. Chief among these are rising energy costs and the need to manage and reduce expenses, an increased focus on achieving net-zero emissions and dramatic changes to occupancy patterns and building use brought on by new hybrid work practices. Responses to these challenges are innovations which allow the deployment of sophisticated IoT devices and the implementation of data analytics and artificial intelligence.

Together, they create a digitally enabled platform that has the data and capability to react to changing conditions and adjust systems to maintain optimal efficiency and performance.

> "Buildings account for circa 40% Global GHG emissions

The smart building trifecta

Efficiency: Upgraded hardware and energy-efficient equipment combined with data-driven recommendations can achieve energy savings in the double digits.

Electrification: Equipment replacements – like upgrading boilers to heat pumps – can add 30-40% energy savings.

Digitalization: Digital solutions help connect building equipment and systems, enabling a deeper understanding of performance and flagging critical issues for action.

Rising energy costs – With recent market instability and rising costs coupled with the sheer amount of electricity consumed within buildings, managing and reducing energy use is a key priority for every facility. Building owners are challenged with finding ways to boost energy efficiency without sacrificing occupant comfort, safety or health.

Race to net zero – Organizations are motivated to achieve net-zero emissions due to environmental concerns, economic incentives, regulatory pressures and shifting consumer and investor preferences toward sustainability. Organizations are looking to technology to reduce emissions and foster the development and integration of sustainable energy solutions, contributing to a greener, more environmentally responsible future.

Healthier buildings with flexible spaces – The recent pandemic, wildfire outbreaks and studies demonstrating the positive effect that building attributes (e.g., air quality, temperature, lighting) have on health, productivity and cognitive performance have all emphasized the need to develop healthier buildings. This trend encompasses managing flexible spaces that adapt to new work patterns and compliance with new, increasingly stringent indoor air quality regulations.

Advanced security – As buildings incorporate more digital infrastructure, they become potential targets for cyberattacks, which could disrupt operations, compromise business or personal information, or even result in physical harm. The safety and security of employees, assets and data are paramount for businesses. Ensuring robust security measures fosters trust among stakeholders and can prevent significant financial losses and reputational damage.

Operationally efficient and resilient – More operationally efficient and resilient buildings are desired to reduce operational costs and ensure uninterrupted functionality in the face of unforeseen events or changing conditions. **Smart buildings optimize resource use, adapt to various challenges and provide long-term value, making them more attractive to occupants and owners.**

Personalized customer experiences – Tailoring spaces and services to individual preferences and needs can significantly improve user comfort, well-being and productivity, creating a sense of belonging and loyalty among occupants. This focus on personalization not only serves as a competitive differentiator in the real estate market but also supports higher occupancy rates and tenant retention, which in turn positively impacts the financial performance and reputation of the building.

Digitally-enabled outcomes – The digitally-enabled building is essential for smart buildings as it integrates technologies like the Internet of Things (IoT), artificial intelligence (AI), sensors and data analytics to create a connected and intelligent building. The needs of the business and occupant are evolving and constantly changing and the adaptability offered by digital solutions enables buildings to respond to changing environmental conditions, occupancy levels and user preferences, ensuring comfort, safety and energy efficiency.

Energy efficiency and sustainability

Today's buildings offer significant opportunities for innovation and improvement, as they are responsible for approximately 40% of the world's greenhouse gas emissions. By transforming them into efficient, sustainable spaces, we can significantly reduce our environmental footprint. Optimizing energy usage presents a win-win opportunity by enhancing sustainability and boosting financial performance, without sacrificing productivity or creativity.

> "Smart buildings optimize resource use, adapt to various challenges, and provide long-term value, making them more attractive to occupants and owners.

Electrification

Electrification of buildings refers to the transition from fossil fuel-based energy systems to electricity-powered systems for essential building operations such as heating, cooling, lighting and powering equipment. The future of smart buildings is moving toward electrification to improve energy efficiency and reduce carbon emissions. Advanced electric systems integrated with sensor technology and data analytics enables real-time energy optimization, aligning with corporate sustainability goals and future-proofing against evolving regulations.

A smart building can match service delivery to building usage – for example, reducing ventilation and heating supplied to vacant or lightly used spaces, and increasing delivery to areas where people are congregated. By adjusting service delivery throughout the day, smart buildings assure that each space and occupant is properly accommodated and energy is only used where and when it's needed. When a building leverages smart technology, it also can identify opportunities to replace fossil fuel-powered equipment with electrically powered equipment, reducing scope 1 emissions. According to a recent report by Forrester Research, **"Sustainability-focused companies have seen better financial results relative to their peers, even during the COVID-19 pandemic."**[1]

More intelligent buildings also create an environment for improved experiences. For example, stadiums exist to deliver an exciting, positive fan experience. Outfitted with occupancy sensors, it costs less to fulfill its purpose by conserving energy and water. It boosts fan experiences because the same occupancy sensors telling the HVAC to cut back, for example, can also alert people to a short line for a cold beverage.

Data-driven sustainability

Data and efficient reporting is also emerging as a crucial factor in meeting sustainability goals. Organizations must be able to quantify progress on sustainability and find new opportunities to conserve, which is only realistically possible by analyzing data collected through a smart building's energy management system. Information such as the amount of energy used, the duration and timing of usage, the mix of electricity sources – the balance among traditional, self-generated and renewable energy sources – and utility costs must all be part of the picture. Gathering and analyzing this kind of data manually is extremely difficult, if not impossible, in multi-building or campus facilities, or organizations that span a geographical area such as a school district. By automating the collection of this data and using advanced logic to review it for trends, issues and opportunities, smart building systems save an incredible amount of staff time and vastly improve the timeliness and quality of information.

Facility leaders with this information at their fingertips can easily assess status, track their sustainability progress and reveal new opportunities for efficiency. The information also can help inform the transition to decarbonized fuel sources.

The importance of simplified reporting is also not to be underestimated. With organizations, regulators and investors increasingly interested in decarbonization goals, and new standards on the way, demonstrating compliance is becoming fundamental. Being able to easily generate accurate reports and trend data will help organizations meet goals and disclosure requirements – and remove a huge burden from facility staff.

Space, well-being and productivity

Smart buildings must be comfortable, safe and centered on the needs of people. They empower people to thrive and do their best to support the organization's mission. Smart building technology navigates the compromises between occupant comfort and sustainability by using advanced sensors and algorithms to optimize energy use, while prioritizing features like air quality and temperature. By using technology to adapt to the changing needs of occupants and their environment, buildings can unlock the full potential of people, as well as resources and investments. That's because a comfortable, healthy workplace supports productivity and peak performance and can help attract and retain talent as employees feel more valued.[2]

Flexibility to optimize space – comfort and wellness without compromises

Smart buildings currently adapt to occupants' needs for climate control, security and energy efficiency, all while safeguarding privacy. As technology evolves, future smart buildings will employ more advanced AI, seamless integration with personal devices and even digital twins to offer more personalized, secure and efficient experiences.

> "Sustainability -focused companies have seen better financial results relative to their peers, even during the COVID-19 pandemic.

[1] "Factors Driving the ROI of Sustainability," Forrester Research, Inc., April 22, 2021
[2] "Healthy Buildings: How Indoor Spaces Drive Performance and Productivity," Harvard Business School – Faculty & Research

These advancements also enable quick response to changes in use and spaces to be reconfigured as needed. This type of flexibility is needed to optimize real estate footprint and associated costs while accommodating organizational and occupant needs.

Smart building technology can also help employees find the resources they need to do their work, for instance, managing meeting spaces, scheduling shared workspaces or finding quiet spaces. Safety is also enhanced through tracking of occupant locations, allowing more effective responses to fire or other emergencies.

Improved air quality for health and productivity

Given that **the average person spends 80-90% of their time inside,** indoor air quality has a major impact on our health and ability to perform. The transmission of airborne pathogens and allergens are obvious considerations, since sickness, asthma attacks and allergies are major causes of absenteeism, lost productivity, and missed school days. Less obvious are the effects of other gases and particulate matter in our air, which can impact cognitive ability, attention span and ability to focus.

Smart buildings filter dust, mold and airborne infections like their traditional counterparts, and they can also root out chemicals and volatile compounds from cleaning agents and odors from personal care products. Smart filtration systems will protect occupants from particulates like pollen and dust, and pollutants such as smoke from a wildfire or diesel fumes from nearby roads.

Predictive analytics for ventilation systems can also improve building health through reduced downtime due to failures by forecasting breakdowns and anticipating maintenance needs. In addition to interfering with clean air delivery, failures are disruptive and costly because they require reactive emergency repairs. And, if there are supply chain issues in getting spare parts, systems can be down for a long time leading to major impacts. A proactive approach helps mitigate these factors and minimize both cost and disturbance.

Balancing comfort and wellness with energy efficiency

Historically, ensuring comfort and wellness for occupants has been seen as diametrically opposed to maximizing energy efficiency.

Utilizing advanced AI algorithms and sensor technologies, smart buildings will become more adept at dynamically adjusting lighting, heating and cooling systems in real time, balancing both human comfort and energy consumption. By making deliberate and intelligent decisions based on the data, smart buildings offer a harmonized environment that will allow organizations to meet both health and climate objectives.

Buildings adapt to people, providing individualized experiences

In a world where everything from movie-watching to grocery shopping is customizable, people are no longer satisfied with one-size-fits-all approaches, not even in their buildings.

AI technology can be used to analyze individuals' activities and preferences. The vision is that each employee, customer and visitor will have a streamlined experience that's optimized for them. For example, technology will anticipate a person's arrival based on a scheduled time or recognize them as they walk through the entrance.

> The average person spends 80-90% of their time inside

A key fob, mobile device, wearable or other technology will signal their arrival, prompting the building to open its doors automatically, activate lighting and adjust the thermostat. This technology reduces physical touchpoints to reduce the spread of germs. It also eliminates unproductive time at security checkpoints. In other examples, people can meet their needs in real time by using apps or kiosks. They can click on an app to report a problem with a room, order food for a meeting or even reserve a parking space before heading into the office. Hot-desking or hoteling employees can stop by a kiosk or use their phone to quickly find an available workstation or reserve a storage locker.

AI and machine learning infuse intelligence into automation so buildings can learn to fine-tune the occupant experience and anticipate the needs of individuals.

Security, safety and compliance

Today's buildings rely on manual processes for physical security which have evolved over time. Manual processes can't keep up with ever-changing threats and, as a result, can add friction to the occupant's experience. They also depend on a human element, which can be a point of failure. The smart building of the future will automate physical security for improved protection and less effort for occupants, giving them peace of mind and more freedom of movement throughout a building or campus.

For example, touchless access control will open doors for authorized individuals, but alert security personnel if a tailgater violation occurs, while preventing access to the tailgater. Peel-and-stick wireless sensors will detect audible threats such as gunshots and breaking glass and provide location details to improve situational awareness. Automation can spot metals without a line at a security checkpoint and uncover poisons like anthrax in the air. The smart building of the future will use occupancy information to help evacuate an area or building in the event of a fire, safety threat or hostile act by providing the safest directions to the closest exit.

Keep occupants safe and secure with predictive and drone-assisted security

Physical security is evolving to focus less on forensics and more on predicting and preventing incidents with real-time, actionable insights delivered through AI and analytics. The goal is to improve efficiency by cutting response times to security alerts and minimizing false alarms. AI and analytics will provide more context inside and outside the building so authorized people can flow freely – even through other buildings, facilities, or transportation systems. The smart building can also detect unauthorized intruders and restrict their access while alerting security personnel.

Automated security will extend beyond the four walls of the building by incorporating external data such as weather, traffic, social media and emergency broadcasts. An AI-equipped smart building can then adapt the building's inside conditions and notify occupants based on what is happening outside.

Autonomous drones will help security officers handle duties such as fence patrols, suspect detection and tracking. They can also detect threats such as smoke, fire and gas leaks. In the event of a wildfire, drones can provide early warning to evacuate a building.

Similarly, AI-enabled robots will manage repetitive, mundane security tasks. Robots can take over after-hours security duties to follow up on alerts, detect leaks and fires, and patrol the interior. By playing an "observe and report" role, robots enable security staff to diffuse an incident remotely or intercede directly. Because they learn as they go, robots can respond to anomalies in real time. They can deter criminals and improve evidence quality for investigations.

Physical safety and security require advanced cybersecurity

Cybersecurity is complementary to physical security and safety and is a critical component in smart building technologies. As buildings rely more on connected devices, sensors and systems, they also become more vulnerable to cyberattacks that can compromise their functionality, integrity and data. Cyberattacks can have serious consequences on occupant safety and security, such as disabling access control, tampering with alarms, triggering false emergencies or causing equipment malfunction. Smart buildings need to have robust cybersecurity measures in place to protect themselves from unauthorized access, manipulation or disruption.

Cybersecurity is also vital because it enables the connectivity that allows security staff to monitor, manage and control smart building systems remotely, improving efficiency and flexibility. As smart building technology evolves, cybersecurity will continue to be a key area of focus and AI-enabled cybersecurity technologies will be relied upon to deliver safer and more secure smart buildings.

Operational efficiency and equipment performance

As smart capabilities grow, buildings can interact with people and conditions to self-adjust, self-heal and self-notify. Organizations can also amplify automation across multiple buildings and locations. What was once a physically managed structure evolves into a dynamic, self-configuring and autonomous ecosystem. Intelligent automation will replace manual processes, such as starting chillers on a hot day to cool a large space before an event.

Operations personnel will get comprehensive, real-time visibility into system operations through unified management consoles, reducing complexity, boosting productivity and making it much easier to manage operations. Field service engineers will also have more flexibility and be able to respond more quickly using secure remote access to building systems. Maintenance personnel can move throughout the facility, or connect from off-site, while having continuous access to automated work orders, service tickets, and resources such as equipment documentation.

Predictive and prescriptive maintenance for maximum uptime

Predictive and prescriptive maintenance play a pivotal role in addressing the shortage of skilled staff and reshaping the responsibilities of facilities management teams. Data-based predictive maintenance utilizes advanced technologies such as sensors, IoT and AI to anticipate equipment failures and schedule timely interventions, thereby reducing downtime and extending asset life. Prescriptive maintenance goes a step further by not only predicting failures but also recommending optimal corrective actions. By automating routine checks and preempting system failures, these technologies alleviate the disruption caused by failures and emergency repairs. They also ease pressure on skilled staff, allowing for facilities management teams to focus on higher-value tasks, fostering a shift toward more strategic roles.

Adapt and evolve

The global pandemic underscored the need for flexibility and adaptation in how organizations use their space. They need buildings to adapt to disruptions as fast or faster than people, and serve multiple purposes under one roof, be it for commerce, work, living or entertainment.

Software-defined buildings enable dynamic buildings

A flexible building requires flexible technology. Software provides unparalleled flexibility for managing and updating facilities, often without the need for hardware changes. While traditional infrastructure is defined by physical servers, networks and storage, smart buildings break through these limitations through software-defined everything, where software does the work of configuring infrastructure. Software-defined everything enables true autonomy of building systems to adapt to environmental and business changes, and deliver outcomes for comfort, wellness, efficiency and sustainability.

> “Operations personnel will get comprehensive, real-time visibility into system operations through unified management consoles

Organizations can modify spaces within buildings as easily as they update software thanks to software-defined buildings. If a facilities manager has a great idea, it can be modeled and simulated to visualize its effectiveness. Implementation is easily accomplished using software and without changing hardware. For example, existing security cameras and door access systems can often be updated with new software that uses AI to recognize tailgating or space utilization. Software-based Building Management Systems (BMS) can be updated to better match energy usage to occupancy and weather patterns, without needing to replace HVAC systems. Upgrades to a building's services can now be quick and cost-effective, eliminating the need for lengthy, expensive projects.

Key technology enablers

As we look to the future, smart buildings will continue to evolve and leaders will continue to innovate, leveraging increasingly more technology to achieve more advanced outcomes. The smart building of the future will benefit from advancements in technology, engineering, and intelligent design. **AI will play a critical role in the future of the smart building,** especially given its recent and fast pace of advancements. Key technology enablers include advanced data analytics, cybersecurity, robust connectivity and intelligent edge devices. Advancements in these technologies are paving the way for a new era of autonomous buildings.

Ubiquitous connectivity is a fundamental capability of the smart building

Smart buildings are, and will be, much more connected than today's buildings. A new world of possibilities opens when devices and systems can communicate with one another and with cloud-based services. In addition, connectivity enables the flow of information that business leaders can analyze for insights.

A smart building's management system must be able to connect to many different devices from many manufacturers, including some older models of devices, and consistently manage their data flow. The smart building of the future will consistently use open standards to break barriers between siloed and integrated devices, making the implementation of new capabilities much faster and easier.

Broad connectivity forms the basis for a "system of systems" approach to building technology, where diverse systems operate under common operating principles. Connectivity between devices, sensors and systems is essential to enable digital twins – a computer model of a physical asset that simulates its composition and operation – which draw on a continuous influx of data to improve accuracy.

Unified data and analytics from edge to cloud

Unified data and analytics from edge to cloud is necessary to enable smart buildings, providing the foundation for insights and intelligence. The smart buildings of the future will generate exponentially more data as buildings are instrumented with more sensors and devices, making it increasingly more important to store and analyze at the edge in collaboration with the cloud. By aggregating data from various sources and analyzing it both at the edge, where immediate real-time processing occurs, and in the cloud, where more complex computations can be executed, smart buildings can achieve increased levels of efficiency and responsiveness. The analysis of data across cloud and edge enables a more cost-effective, dynamic environment that can anticipate and respond to the needs of occupants and operational demands.

To orchestrate outcomes across an entire building, campus or global locations, the smart building uses the cloud, where data can be standardized, mined for insights, and used to measure KPIs (Key Performance Indicators). The cloud also enables organizations to combine data they already create and own with third-party data, such as weather history and forecasts.

AI-enabled autonomous smart buildings

AI will be at the core of the next generation of smart autonomous buildings, driving efficiencies, enhancing the user experience and enabling advancements in sustainability.

> "AI will play a critical role in the future of the smart building

It will be heavily leveraged in nearly every aspect of the smart building of the future and will be pervasive across the cloud to the edge, inside and near the building and devices. Recent advancements in AI, including generative AI, is revolutionizing how we create, innovate and solve complex problems.

Edge intelligence will be fundamental to smart buildings, enhancing speed, processing power and autonomy by bringing AI inside the building and devices. Intelligent edge devices enable immediate feedback for real-time decisions, offering faster and more responsive solutions for energy optimization and cybersecurity. These devices communicate with each other, ensuring that buildings remain operational even if there's a problem with the cloud, network, or internet, thereby reducing dependence on cloud computing.

Furthermore, edge technology simplifies privacy compliance and reduces cyber concerns by keeping control of sensitive building data within a building operator's firewall.

The crucial role of cybersecurity in smart buildings

The smart building of the future will require advanced cybersecurity. The successful smart building is secure by design and by default, making it resilient to cyberattack. Everything is protected.

Smart buildings will become increasingly more connected, and every new sensor and edge device added to a network can introduce a potential vulnerability that can impact smart building outcomes. Cyber threats continue to become more advanced; adversaries are keenly aware of these gaps and use AI-powered automation to find and exploit them.

The cornerstone of smart building cybersecurity is the zero-trust security framework with granular access control based on person, system, device, role, location, time or other factors. In a zero-trust environment, all network communications are continuously authenticated and monitored across the entire technology ecosystem.

This protection extends to all building technology, including critical systems such as chillers, devices such as surveillance cameras, and every sensor in the building. Edge devices, from HVAC controllers to surveillance cameras, are becoming more interoperable and equipped with cybersecurity features to protect and realize the outcomes of a smart building.

Open standards and APIs for extensibility and interoperability

Smart buildings bring together many different systems that need to work together to deliver intelligent outcomes. Open APIs (Application Programming Interfaces) and standards are key to the future development of smart buildings. The advancements and the adoption of open standards will reduce integration work and drive down costs, making advanced smart building technologies more accessible. In addition to the need to integrate systems in the building, the smart building of the future will integrate with smart things, like robots and drones, to deliver new intelligent outcomes. Open standards and APIs will make it easier to integrate with smart things.

Digital twins and their role in smart buildings

A digital twin is a virtual representation of a physical asset, system, or process that can be used to simulate, monitor and optimize its performance. The digital twin of a smart building provides a holistic view of the building's structure, systems, operations and occupants, as well as the interactions and relationships among them.

The role of digital twins in smart buildings is to enable a continuous feedback loop between the physical and the virtual, and to facilitate the integration of AI, IoT and cloud technologies. By creating a digital twin of the building, the smart building can learn from its past and present data, as well as from external data sources, and use AI to generate predictions, insights and recommendations for improving the building's performance and user experience. The digital twin can also act as a platform for collaboration and innovation, allowing different stakeholders to access, share and co-create data and solutions for the building.

Through open standards and APIs, organizations will be able to create their innovations on top of existing services to make their buildings even more personalized. For example, developers can integrate the smart building's touchless, frictionless access control technology with a visitor management system to streamline the visitor experience.

While system integration has its benefits, it doesn't make a building smart. In the future, buildings will truly become smart with end-to-end automation.

What you can do now

Some of the technical foundations of the smart building are already in place, and getting to the future driven by innovation won't happen overnight. **Organizations must properly plan their journey today to meet the challenges and opportunities of tomorrow.** For example, building operators who are installing devices that will be connected to the internet should ensure that new equipment and upgrades conform to established connectivity and tagging standards. This will help future-proof today's investments.

Depending on stakeholder needs and the situation, there are several actions building owners can take today to prepare for an efficient, sustainable and secure future.

1. **Develop a smart building strategy that includes the user experience** – Define and adopt a long-term strategy for how technology and tools will be used to improve their buildings rather than simply adopting the latest technologies. This should include specific goals such as reducing energy or improving occupant experience. Develop a plan, identify systems and technologies that will provide the greatest benefit, and develop a roadmap for implementation. While technology is important, don't overlook the human side of a smart building. Understand occupant needs and how technologies can meet them. Look at how technology will impact the people who use the building, and ensure systems are user-friendly and enhance the overall experience.

2. **Establish KPIs** – To justify investments in smart building technologies, establish KPIs that can be tracked over time to prove success. For instance, you can follow changes in the total cost of ownership, see improvements in uptime or report on reduced energy consumption.

3. **Conduct a performance assessment** – Conduct a thorough baseline assessment of your buildings' performance to identify areas of improvement, such as energy, security, maintenance and occupant comfort. In addition, conduct an audit of the building's existing systems and infrastructure.

4. **Partner with IT and prioritize cybersecurity** – As buildings become smarter, the lines between facilities managers and IT will blur. Work closely with IT teams to ensure smooth integration and operations of smart buildings. This alliance is also key in addressing cybersecurity concerns. With increasing interconnectivity, cybersecurity becomes even more crucial. Working with your IT team to ensure strong cybersecurity measures are in place and that building systems are secure will be critical to success.

5. **Establish partnerships** – Given the complexity of smart buildings and the fact that they generate a massive amount of data that facility managers will need to understand and analyze, facility managers should plan to partner with technology experts. This could include an internal IT department, external consultants, or a technology vendor that can provide guidance and support for implementing and managing smart building technologies.

6. **Run pilot projects** – Consider starting with smaller pilot projects to get a feel for smart

> Organizations must properly plan their journey today to meet the challenges and opportunities of tomorrow.

technologies and the benefits they can offer. This can involve setting up a lab or identifying spaces in the building to pilot new smart building technologies before deploying them more broadly.

7. Invest in education and training – As buildings become smarter, facility managers will spend less time on routine maintenance tasks and more time managing relationships with users and stakeholders. Improving communication, negotiation, and problem-solving skills will be beneficial. Invest in continuous learning and developing a culture of innovation. Staying informed about technology and regulatory trends and participating in industry events and forums should also be key areas of focus.

8. Understand legal and ethical implications – Smart buildings often involve technologies that track and analyze occupant behavior, raising issues related to privacy and consent. Facility managers must be aware of these issues and ensure they are addressed, establishing core ethics principles to guide daily practices.

9. Invest in infrastructure – Digital infrastructure is the backbone of any smart building. Begin investing in the infrastructure necessary for smart building technology, such as networking, sensors, devices, and software. Consider investing in modern, scalable and secure infrastructure that can support the needs of a smart building and be easily upgraded. It's also essential to ensure systems are open and can work together seamlessly. Consider interoperability and support for standards when selecting new technologies, including standards such as ASHRE 223P, Brick and Haystack.

10. Understand sustainability – Facility managers will need to be able to engage stakeholders about sustainability initiatives and be prepared to educate them on these initiatives. Become familiar with sustainability basics and develop an awareness of renewable energy options. In addition, building managers should be aware of several industry sustainability certifications and corporate reporting standards – such as LEED, BREEAM, WELL Building Standard, Green Star, GRESB, Energy Star, GRI and SASB – and how smart building technology can be used to achieve these sustainability goals.

Let's take a step into the future

Building managers have long dreamed of a smart building. Now, the technology to realize this vision is finally mature enough to make a truly smart building possible. Innovation will continue to drive performance and this journey to smart.

It's good timing. It's never been more important to reduce carbon emissions to help reduce the stress on our planet. Through the careful implementation of new technology, organizations can make buildings more efficient, more comfortable, healthier and safer for occupants. In the process, organizations can reduce the total cost of ownership of their buildings through improved energy efficiency and automation.

Take the next step in the journey to complete building autonomy. If organizations continue to operate buildings in the traditional way, the costs will only get higher, along with the carbon and environmental impact. And if your competition is modernizing for the smart building of the future, you risk being left behind. Whether you have just started adding a few sensors to your building or are years into the process, Johnson Controls can give you a personalized evaluation of your building and partner with you to create a blueprint for complete building autonomy. The smart building of the future is your building.

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