



SMART BUILDINGS & THE BATTLE FOR SUSTAINABILITY

Whitepaper



1.1 Introduction

Given the overall business environment, with rising costs for energy and an enhanced focus on reducing emissions, increasing the level of automation and monitoring that happens in buildings will be a major priority going forward. This is where smart buildings come in.

Juniper Research defines a smart building as:

'A building that uses technology to enable efficient and economical use of resources, while creating a safe and comfortable environment for the occupants. Typically, this involves a monitoring function and the ability to intelligently respond using automation to changes in the environment.'

1.1.1 Traditional Buildings & the Smart Building Transition

At present, many older building systems operate independently, and many are inherently inefficient as they lack the monitoring capability that would enable them to adapt effectively to different conditions or modes of operation.

Older buildings can be adapted to become smart buildings. Any new building concept at this stage will have smart technology as the core requirement.

The air-conditioning system will be able to recycle air at the lowest cost, and with the least damage to the environment. In the past, used air was being spread from one room to the next, rather than being expelled outside, with fresh air being pumped back into the building.

Critically, in the current environment, the system must use renewable energy. Not only is this good for the environment, it can also substantially cut running costs. Some new buildings now have reduced or even reached zero energy costs because of the intelligent design and integration of solar panels, wind energy and even thermal warmth garnered from beneath the ground.

Large technology companies initially led the world with smart buildings. Consider the Apple buildings, Google buildings and Bloomberg building in Central London. Corporates who have bought land to create their own bespoke buildings want nothing but the best and have led deployment as early adopters.

The claim that a building is a smart building has to be demonstrated by evidence. If a landlord or building manager has a third-party audit to test this claim, then this can attract new tenants, because those companies will know that they will have reduced costs, and can measure sustainability. They may even be able to attract and retain employees.

Increasingly, remote working and the use of mobile technology have to be considered when planning buildings. Can staff log into the company's system in a seamless and secure fashion? The COVID-19 pandemic caused millions of office workers to have to work from home across the world. It brought displacement and cultural change to the workplace. It sped up the technology revolution by five years. Innovation had to become the lifeblood of the business and old approaches had to be discarded.

As the world begins to plan life post-pandemic, smart buildings are an attraction to help get staff away from home working. The core of smart buildings is an integrated smart technology system which allows greater control over the buildings' environment and operations; fostering productivity, improved performance and overall wellbeing of occupants. Smart buildings deliver energy cost savings, space optimisation and minimising the environmental impact of buildings.

Smart building certifications are being used now by landlords. The certification provides a way to promote the workplace and communicate unique benefits. They typically measure aspects on connectivity, efficiency, cost reduction and sustainability.

1.1.2 Measuring the Real Advantages of Smart Buildings

The advantages that every company wants are reduced costs, long-term future-proofing and whole-life costs. However, other more ergonomic benefits will include improved wellbeing and productivity of staff. This suggests that truly 'smart'



buildings are those that deliver better environmental, social and economic conditions.

1.1.3 Concerns about Smart Buildings

There are some concerns regarding the roll-out of smart technologies. It has been suggested that poorly implemented technologies can disempower occupants; taking away their control of the environment, and that a lack of suitable instructions or education may lead to the incorrect use of technology and the inefficient operation of buildings.

There are also concerns about the lack of privacy. There would typically be a cascade of security cameras at the entrance of the building, at the entrance of the lift, and at each exit point of the lift on each floor. These cameras are invaluable in the event of a security breach or theft of large items, but questions arise on whether employees would be happy with appearing on multiple cameras every day, with movement potentially being recorded and stored for months.

A person can be tracked from the car park to their office desk, to the toilet, to the canteen. A person's computer and emails can be monitored. Which websites have been visited and for how long can also be tracked, as well as purchases made during work time. There can be so much data collected on one employee that their life is no longer a private confidential entity. This will be a major concern and must be handled with care to ensure staff remain happy, as automation levels increase.

In addition, rapidly changing technologies can have a lifecycle of just two to five years. This raises environmental issues, such as how to dispose of old equipment. Is sending old equipment to developing markets getting rid of the problem or transferring the problem somewhere else?

One potential solution to the continual retrofitting of technologies suggests that building systems should be separated from the building fabric in a modular way, so they can be upgraded without the need for changes to the building itself.

1.2 The Smart Building Ecosystem

The smart building ecosystem comprises of:

- Building Infrastructure Management
- Security & Access Management
- Energy Management

1.2.1 Building Infrastructure Management

Building infrastructure management refers to the set of structures that are required for the operation of a location, physical facility or business operation.

In a physical facility like an office building, physical infrastructure consists of lighting, electricity, plumbing, alarm systems, electronic access, and other features. The commonality here is that both physical and virtual infrastructure components are used by the people who manage them to deliver services that are crucial to the overall function and operations that characterise each location.

Infrastructure solves problems – for example, plumbing infrastructure solves the problem of needing to get rid of human waste, and electrical systems solve the problem of needing to power machines, electronics or appliances. A bridge solves the problem of needing to cross quickly between two high-rise buildings. The purpose of infrastructure management is to maintain infrastructure elements in acceptable working conditions so they can be leveraged to solve the problem for which they were designed and implemented.

1.2.2 Security & Access Management

This sector covers systems that monitor and restrict people's activities within the building.

i. Access Control System

Security is of primary importance in the design of a smart building. Buildings should not be able to be accessed by just any person. Intelligent planning would have been



examined before use – especially where there are valuable products or sensitive information inside the building.

Below, we look at examples of how smart buildings will incorporate access permissions.

- Door access control restricts who can enter an area or room in a building or who can use a particular resource. Basic access control usually comes in the form of mechanical digital locks.
- More comprehensive access control solutions include products, such as electronic keypads and proximity readers. Once a system is installed access is easily structured and supervised by use of credentials which can be cards or fobs. These physical access tools can be managed by online or offline software.

ii. Video Surveillance System

All smart buildings will have an integrated network of cameras. A video surveillance system is a critical component of a comprehensive security strategy. An effective video surveillance system can serve as a crime deterrent, as well as providing key insights on the business.

iii. Safety Systems

Smart buildings occupants are likely to make use of Safety Management Software in order to manage the organisation's EHS (Environment Health and Safety) programme. It is important to capture, track and report risks and health and safety data. With smart buildings, users can leverage software to ensure they are meeting workplace compliance requirements and reducing repetitive administrative work.

1.2.3 Energy Management

This sector covers systems that are intended to optimise the building's energy consumption in order to minimise costs. Energy management is the process of tracking and optimising energy consumption to conserve usage in a building.

These are the steps for the process of energy management:

- Collecting and analysing continuous data.
- Identifying optimisations in equipment schedules, setting points and flow rates to improve energy efficiency.
- Calculating return on investment. Units of energy saved can be metered and calculated just like units of energy delivered.
- Executing energy optimisation solutions.

Where smart building technology is used, owners and operators can:

- Reduce costs.
- Reduce carbon emissions in order to meet internal sustainability goals and regulatory requirements.
- Reduce risk – the more energy businesses consume, the greater the risk that energy price increases or supply shortages could seriously affect their profitability. With energy management solutions, they can reduce this risk by reducing demand for energy and by controlling it so as to make it more predictable.
- Monitoring, controlling and conserving energy use whilst keeping up to date with environmental compliance can be a time-consuming and often complicated task for any business.

Energy management's main aim is to help reduce energy expenditure and to move towards net-zero status. Energy management includes the need for helpful capacity allowance and smart meter management, legislation and compliance, and technical advice.

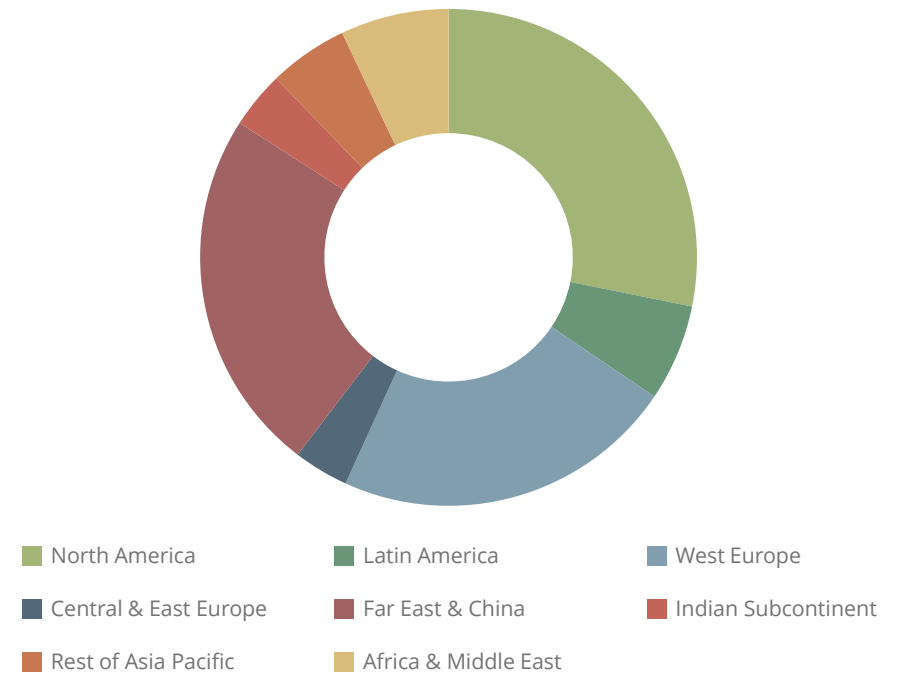


1.3 Forecast Summary

The number of buildings globally deploying smart building technologies will reach 115 million in 2026, from 45 million in 2022. This growth of over 150% reflects increasing demands for energy efficiency from businesses and residents alike, as energy costs spike.

- By enabling buildings to monitor and automate common functions, significant efficiency gains can be made, while improving the environment for workers and residents. Vendors must focus on building out analytics platforms to enable the most value to be driven from deployments.
- Non-residential smart buildings will account for 90% of smart building spend globally in 2026, at a similar level to 2022. This disparity is due to the larger economies of scale in commercial premises driving this spend, as well as the commercial focus of most smart building technologies.
- Global shipments of sensors used in smart buildings will exceed 1 billion annually in 2026, from 360 million in 2022; representing a growth of 204%. Sensors, when combined with intelligent management platforms, will allow smart buildings to adapt to conditions; matching elements such as lighting, heating and ventilation to live requirements. Smart building vendors should partner with AI vendors to maximise the benefits of automation, such as reduced energy costs and improved working environments.

Figure 1: Number of Buildings Deploying Smart Building Technologies (m): 115 Million



Source: Juniper Research



Order the Full Research

Featuring 15 smart building vendors in the Juniper Research Competitor Leaderboard, in addition to extensive forecasts, this brand-new report delivers invaluable insights and resources. For stakeholders seeking to understand the competitive landscape of the market, discover detailed coverage of market dynamics, challenges and a future outlook of the evolution of this essential market.

Key Features

- **Market Dynamics:** Detailed assessment of how smart building technologies are being deployed, and the future trends that will influence this highly dynamic area.
- **Segment Analysis:** Future outlook for the development of different smart building areas, including:
 - Building Infrastructure Management
 - Security & Access Management
 - Energy Management
- **Juniper Research Competitor Leaderboard:** Key player capability and capacity assessment for 15 smart buildings vendors including:
 - Bosch
 - Cisco
 - Huawei
 - IBM
 - Intel
 - Siemens

- **Benchmark Industry Forecasts:** Forecasts for smart buildings, including buildings deploying smart technologies, sensors in use, sensor shipments, hardware revenue, platform revenue and total revenue, split by residential versus non-residential. Data is also split by our 8 key regions and 25 countries.

What's in this Research?

1. **Market Trends & Opportunities:** Detailed analysis and strategic recommendations for the expansion of the smart buildings market, including prospects for growth and the trends shaping deployments.
2. **Strategic Analysis:** Examines the future outlook for the different segments in the smart buildings ecosystem and provides comprehensive analysis of the key trends and market disruptions. The report also delivers an assessment of 15 major players within the smart buildings market and their positioning on our Competitor Leaderboard.
3. **Interactive Forecast Excel:** Highly granular dataset comprising over 7,700 datapoints; allied to regional and sector analysis tools. Includes regional and country-level analysis, together with 5-year forecasts for the smart buildings market, including revenue, sensor shipments and buildings deploying smart technologies.
4. **harvest Digital Markets Intelligence Centre:** Visualises all the data in easy to use and exportable graphs, tables and charts, and features continuous data updates for 12 months.



Publication Details

Publication Date: March 2022

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