THE IMPACT OF INDUSTRY 5.0 ON SMART BUILDING TECHNOLOGIES

Whitepaper

SUSTAINABILITY & SMART CITIES

JUNIPER RESEARCH

1.1 Market Overview

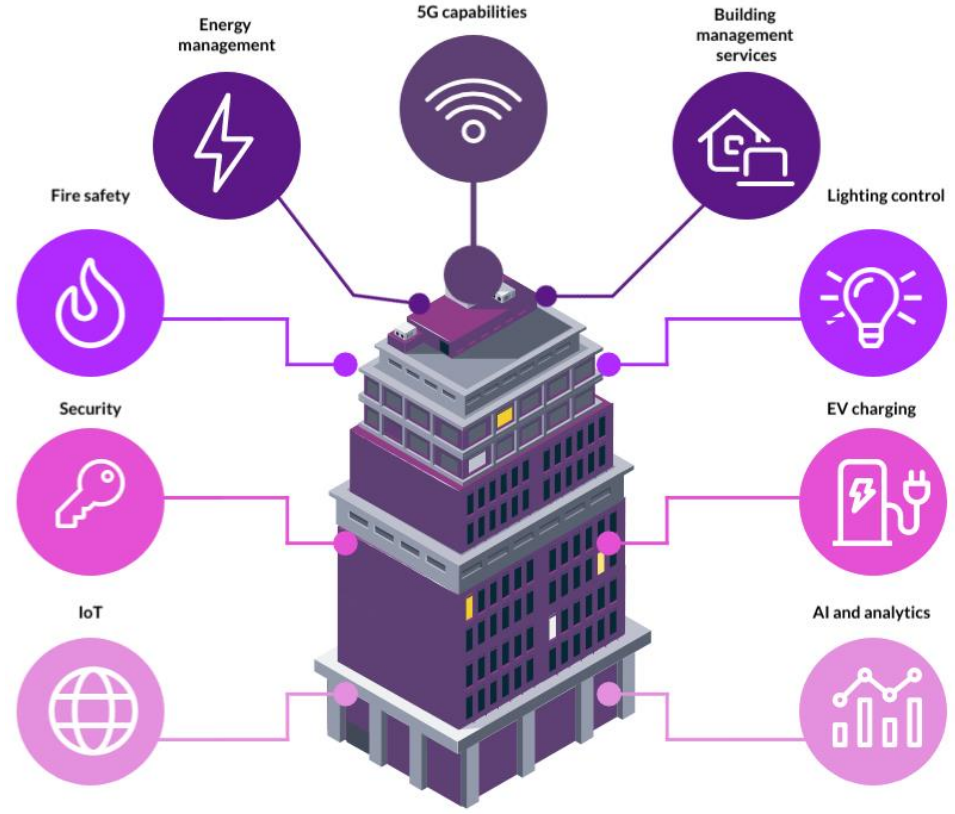
The first ever smart building is credited to City Place in Hartford, Connecticut, completed in 1983. It was the first building in which building services were carried out by a computer. Services such as heating, ventilation, lighting, security, fire protection and telecommunications were integrated to provide cost-effective management and construction.

At the time, it was unclear whether computational building services would become mainstream. However, integrated, smart buildings have gained momentum over the decades and, as technology has progressed, the technology available and applied to smart buildings has changed too. Technology such as building management systems, EV (Electric Vehicle) charging stations, 5G, AI and IoT have changed the way that buildings operate, allowing them to offer fully automated services, including fire safety monitoring and maintenance, energy management, lighting control and security, including access control and cybersecurity.

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.'

Figure 1: Smart Building Technology



Source: Juniper Research

In the wake of COVID-19, the current cost-of-living crisis and global warming, smart buildings have been at the forefront of innovation, as companies find ways to adapt buildings to the current climate.

The need to make buildings as energy efficient as possible has driven industrial and technology companies, such as ABB and Bosch, to offer solutions such as renewable energy and smart grid power distribution.

Smart buildings can now run off of entirely renewable energy, such as solar and wind. They can also be fitted with photovoltaics that capture sunlight and act as an energy store. Buildings can also draw power from smart grids, intelligent grids that provide two-way information and energy monitoring, which optimises energy use and eliminates wastage.

Smart grids can provide power to buildings through the use of sensors and software, reducing costs while still maintaining reliability. Net zero tracking is now also available for smart buildings, allowing companies to track and use energy savings toward their net zero initiatives. This, in conjunction with energy management software, can reduce operational costs while also cutting down CO_2 emissions of the building, through the use of HVAC (Heating, Ventilation and Air Con) control, lighting control and occupancy monitoring. Service providers must leverage this opportunity to secure their position as leaders in the market. This could be done through the creation of dedicated teams that focus on developing the technology, or through strategic partnerships with service providers such as ABB, Siemens or Schneider Electric. This will help them achieve a more attractive and holistic offering compared to competitors.

COVID-19 has driven more development in the smart buildings market, as automatic sanitation, hotdesking and smart parking for building parking lots have become new features offered by companies to provide employees with a seamless transition from home to work. IoT and building management and automation services have also been core focuses of the market, resulting in completely automated buildings, from smart parking and lighting, to security and energy management. These systems connect all sensors to one main managing service, allowing building owners and managers to take control of all operations within the building.

Currently, the market is looking to not only transition existing buildings into smart buildings, but also to build smart buildings from scratch, with energy efficiency and technological innovation as the main drivers. Technology like 5G, AI and edge computing can enhance the experience of a smart building and not only save building owners, managers, and tenants money, but also give them a unique experience that allows for greater productivity within the workplace.

1.1.1 Traditional versus Smart Buildings Today: The Advantages

While the technology available to transform buildings is extensive, building owners and managers often feel overwhelmed at the prospect of such a system. In order to fully comprehend the advantages and impacts technology can have on a building, the differences between a traditional and a smart building must be examined.

The first major difference is automation. Smart buildings are typically enabled with IoT sensors, which interconnect to a building management service or building automation service. This service can monitor usage and adjust devices according to appropriate patterns. In a traditional system, most services such as HVAC control and lighting are isolated and require manual control.

The automated control available in smart buildings leads to the first major advantage of smart buildings: a user-oriented experience. The ability of the building to automate controls allows for a personalised and enhanced user experience. Traditional buildings may have temperature and lighting controls, but will not have the ability to automate them.

The second major difference between smart and traditional buildings is remote monitoring. Building managers and owners can keep watch on their property and IoT devices through the use of application-based mobile monitoring. The major advantage of this ability is enhanced security. Traditional buildings do not offer this service, and thus may be more vulnerable to theft and other security threats.

The last major difference of smart buildings to traditional buildings offers a two-fold advantage in the form of increased energy efficiency, which in turn leads to cost reductions. With the ability to automate services like HVAC, temperature and lighting, smart buildings will reduce both the business' carbon footprint and costs associated with energy usage. Smart buildings can also be enabled to preform predictive maintenance, detect anomalies and schedule repairs before failures occur, also resulting in cost reductions.

In summary, smart buildings provide easier and smarter control for building owners and managers, a better user experience, enhanced security, cost reductions and an energy-efficient system which will help companies reach their net zero goals. Due to pressures such as the cost-of-living crisis, energy crisis and industry 5.0 drivers,

particularly that of providing an enhanced experience for workers in the workplace, the choice to move over to smart building technology may seem more appealing to building owners and managers, despite the amount of money and time that it requires. The continued development of AI will also be a driver to adopt this technology, as enterprises look to not only offer an enhanced experience to their workers but also aim to keep up with technological innovations.

1.1.2 Industry 4.0 and 5.0

Industry 4.0 is considered the fourth industrial revolution and revolves around the concept of smart manufacturing and business, and using technology to enhance productivity and efficiency in the manufacturing and commercial sector.

Industry 4.0 is a driver behind smart technology and energy efficiency in smart buildings and aims to advance the market until it becomes the new normal, making smart building technology more accessible and changing the way buildings are used. Hardware, software and connectivity are the three key technologies driving this revolution, with sensors and AI considered the building blocks.

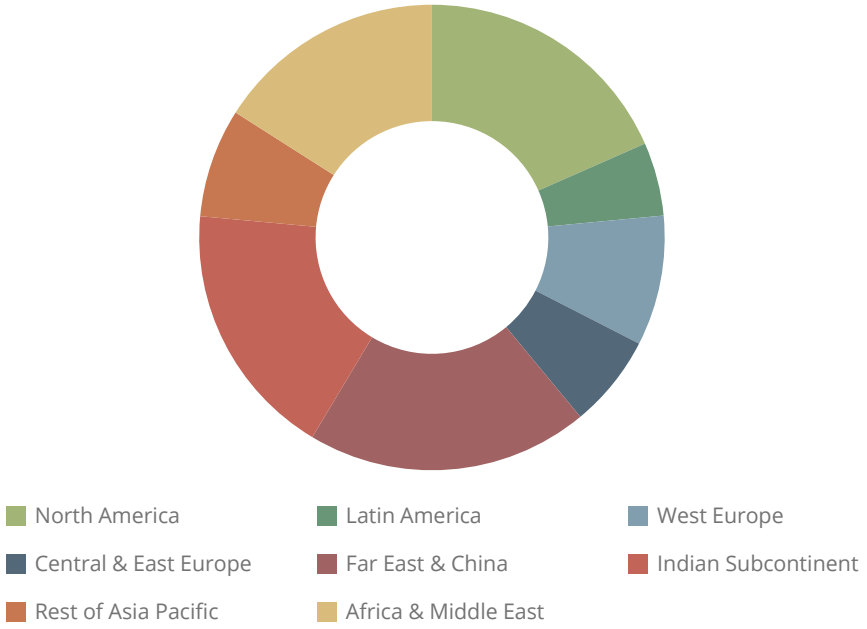
While industry 4.0 is currently underway, industry 5.0 is next industrial revolution that aims to build on what industry 4.0 has done. Industry 5.0's main focus is people and workers, with the aim to bring focus to the well-being of employees in the workplace. It also aims to support the collaboration of AI and workers to optimise workspaces. Smart buildings and factories being built upon the premise of industry 4.0 are already paving the way for industry 5.0, as AI in smart buildings, combined with an enhanced user experience, means that the goals of AI-Human collaboration and wellbeing in the workplace are beginning to be met.

However, industry 5.0 will cause more concern surrounding privacy issues. AI-human collaboration may cause fear and distrust among workers, as job displacement will be a concern. AI misuse is also a serious concern, with the potential that the AI could be corrupted and used for malicious purposes. Service providers need to remain vigilant when developing and offering these services. Strict privacy policies, along with the best and latest cybersecurity practices, can combat these issues. Cybersecurity must be the key priority for service vendors in the smart buildings market going forward.

1.2 Market Forecast Summary: Total Industrial Smart Building Market Spend

Juniper Research predicts that the market value of industrial smart building deployments will grow by 95% to $14 billion by 2026 globally. This growth, from only $7 billion in 2024, will be driven by sustainability initiatives and the need for cost reductions in building management. AI-based building management solutions will be key to securing a return on investment in smart building platforms whilst accomplishing sustainability and energy goals.

Figure 2: Global Industrial Smart Building Spend in 2026, Split by 8 Key Regions: $14 Billion



Source: Juniper Research

- To reap the maximum benefits of industrial smart building solutions, service providers must implement AI at the core of their portfolios. AI detects operative anomalies through the use of in-depth data analytics, resulting in increased safety and decreased operational costs, whilst reducing the extent of required human intervention.
- Buildings such as warehouses, factories and agricultural buildings are those that will benefit the most from AI-based smart building technology. As these industries have particularly high operational costs, AI can be used to detect potentially expensive issues, such as high-value equipment malfunction, before they occur, thus providing savings in the long term. The benefits that AI brings to smart buildings platforms will enable global spend to exceed $42 billion by 2028.
- Additionally, smart building solutions will enable operations managers to meet sustainability goals. By integrating IoT (Internet of Things) networks and sensors with AI systems that automate building functionality in real-time, significant savings and emissions reductions can be achieved.

Order the Full Research

Discover an invaluable analysis of how hardware and software service providers are reimagining smart building solutions as living ecosystems through the use of IoT and AI in this latest report. Featuring an extensive forecast split out by residential, industrial, and commercial buildings, with data across 60 countries, the research also features a Competitor Leaderboard; revealing 17 key vendors in the market. The research is an essential tool for understanding this rapidly emerging market; enabling building automation, IoT, energy consumption management and smart building vendors to shape their future strategy.

Key Features

- **Market Dynamics:** Insights into key trends and market expansion challenges within the market; addressing challenges posed by the highly technical nature of smart building systems and ongoing consumer and building manager fears regarding security and privacy, the future impacts of industry 5.0, and analysing economical (energy costs from energy consumption and carbon emission tracking and net-zero goals driving energy efficiency) and technological drivers (smart technology such as IoT technologies and digital transformation) within the market.
- **Key Takeaways & Strategic Recommendations:** In-depth analysis of key development opportunities and findings within the smart buildings market; accompanied by key strategic recommendations for stakeholders.
- **Benchmark Industry Forecasts:** The business overview into smart building service providers includes forecasts for total revenue for smart building technologies, split by industrial, commercial and residential sectors.
- **Juniper Research Competitor Leaderboard**: Key player capability and capacity assessment for 17 Smart Building technology vendors including:
    - Bosch
    - Hitachi
    - Johnson Controls International PLC
    - Siemens AG
    - Telit Cinterion
    - Verdigris Technologies, Inc

What's in this Research?

1. **Market Trends & Strategies:** Top-level report evaluating key market challenges and the addressable user base in the smart buildings industry, along with strategic recommendations for maximising revenue.
2. **Future Market Outlook:** A deep dive evaluation of the future of the market; outlining future value-added services, such as 5G coverage, AI and machine learning capabilities, and the benefits of digital twins.
3. **Five-year Forecasts:** Extensive forecasts on the total market value of smart buildings, including the number of deployments, and total revenue. It also forecasts three different sectors for deployment and revenue.
4. **Interactive Forecast Excel:** Highly granular dataset comprising of 19,600 datapoints; allied to an interactive scenario tool; giving users the ability to manipulate Juniper Research's data (Interactive XL).
5. ***harvest* Digital Markets Intelligence Centre:** 12 months' access to all the data in our online data platform, including continuous data updates and exportable charts, tables, and graphs (ONLINE).

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