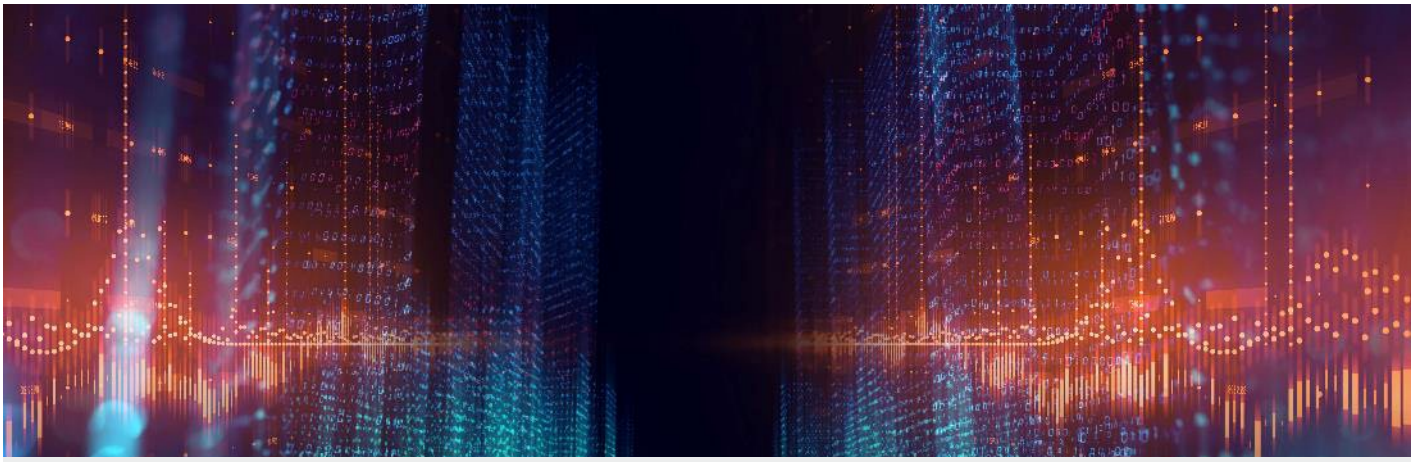
Baker McKenzie.



Digitalization of Real Estate and Construction with IoT

In recent years, the Internet of Things (IoT) has emerged as a transformative force across various industries, including real estate and construction. This technology, which connects devices to enable seamless communication and automation, is reshaping traditional practices and unlocking new possibilities. From smart buildings that adjust energy usage in real time to construction sites equipped with safety-monitoring wearables, IoT is driving innovation and efficiency while addressing some of the industry's long-standing challenges. In this article, we uncover how IoT is contributing to the digitalization of real estate and construction, paving the way for smarter, safer, cost-efficient, and more sustainable environments.

What is IoT?

IoT refers to a network of interconnected devices that communicate via the internet. These devices, often embedded in everyday objects such as televisions, cars, and appliances, are designed to perform specific functions and can be remotely controlled or programmed. For instance, IoT provides off-site security for real estate through connected

devices, such as cameras, motion sensors, and smart locks, which send real-time alerts and enable remote monitoring.

How IoT is Revolutionizing Real Estate and Construction

Real Estate:

1. **Energy and Maintenance Cost Reduction**
   - IoT technologies have proven to be highly effective in reducing operational costs. By integrating smart sensors and monitoring systems, buildings can cut energy and maintenance costs by up to 30%.
   - IoT devices can adjust lighting, HVAC and security systems based on space occupancy or usage.
   - Sensors may detect issues in plumbing, HVAC or electrical systems.
   - Smart locks enhance security and convenience by automating access control and allowing remote granting and revoking of access.

   This efficiency comes from real-time data collection and analysis, which allows property managers to optimize energy consumption, manage access, or proactively address maintenance issues.

2. **Optimizing Space Utilization**

   Developers increasingly rely on IoT-enabled sensors to analyze workspace usage patterns. For example, sensors can count the number of people in a room and provide data to design layouts that maximize efficiency and comfort. This application is particularly valuable in commercial real estate, where space optimization directly impacts profitability.

3. **Improving Building Layouts**

   In France, IoT is used to monitor customer movement in a retail setting. The data gathered helps identify congestion points and inform the strategic placement of elevators, escalators, signage, even fitting rooms, and cashiers. Such insights lead to smoother navigation for customers and increased operational efficiency.

Construction:

1. **Safety and Operational Oversight**

   IoT devices play a crucial role in enhancing safety and operational oversight on construction sites:

   - In the US, drones and IoT cameras provide real-time surveillance and monitor site conditions. Dubai's Microavia has weatherproof AI-powered drones that detect cracks, heat leaks, human movements, and other unauthorized changes.
   - Sensors may be used to ensure equipment's health and even the structural integrity of construction materials.

- Wearables like helmets or vests can monitor vitals and trigger alerts for fatigue, exposure to hazardous gases, or proximity to danger zones, ensuring worker safety in real time.
- GPS devices may also be used to track the location and usage of heavy machinery and tools.
- 360-degree cameras can be installed in key locations on the site to regularly transmit images to a cloud-based IoT platform to monitor the status of construction.

These tools provide actionable data that helps prevent accidents, reduce theft, maximize equipment usage, and optimize workflows in construction sites.

These tools can also assist with compliance with laws and regulations. As an example, sensors that detect hazardous leakages can ensure compliance with the OSHA hazardous atmosphere standards in the US.

2. **Increased Automation and Robotics**

IoT-enabled machinery (e.g., self-driving excavators, cranes, and bulldozers) can operate semi-autonomously, reducing the need for manual labor. Additionally, robotics will play an increased role in the construction industry. For example, SAM100 is a bricklaying robot developed by Construction Robotics, a company based in New York, USA. It works alongside human masons and can lay bricks at a much faster rate than humans. This technology has already been used in the United Kingdom.

Robots are also being increasingly used for tying rebars. TyBot, by Advanced Construction Robotics, can perform 1,200 ties per hour compared to 150-250 ties per hour manually. Japan's MAX Company is upgrading its Twintier technology so that it can automatically detect the tying target area, adjust to the optimal position to accurately tie rebars, detect rebar misalignment or obstacles and automatically execute adjustments or avoidance measures.

3. **Concrete Curing**

Concrete curing sensors can speed up construction schedules. These IoT-enabled sensors provide monitoring of concrete's maturity via temperature probes and then transmit real-time data. Concrete generates heat as it cures, so time and temperature are used to estimate concrete strength. By tracking concrete maturity, the optimal time for formwork removal or opening for traffic can be determined to reduce waiting periods and speed up construction schedules.

4. **ESG and Sustainability**

The use of IoT in construction is an important tool in supporting ESG and sustainability goals. For example, sensors monitor real-time energy consumption and data helps optimize HVAC systems, lighting, and machinery usage, reducing carbon emissions; smart bins and material tracking systems reduce over-ordering and improve recycling; and leak detection sensors and smart irrigation systems reduce water usage on construction sites.

Legal Issues in IoT

1. **Data Privacy**

   One of the primary concerns surrounding IoT adoption is data privacy. IoT devices collect highly granular data about individuals' habits, movements, and preferences. While this data is invaluable for optimizing processes and improving safety, it also raises questions about how it is stored, accessed, and used. Construction and real estate companies must implement robust data protection measures to safeguard sensitive information and ensure compliance with data protection laws.

2. **Cybersecurity**

   The threat of cyber-attacks and data breaches in construction has increased due to the amount of confidential and proprietary information digitally stored and shared across various projects and their chain of information technology. Cyberattacks and breaches that could affect the construction industry include ransomware, fraudulent wire transfers, business interruption, and breaches of intellectual property and bid data. To protect against these threats, regulations and guidelines have been issued in many jurisdictions, including in the United States, the European Union, Japan and Singapore.

3. **Regulatory Considerations**

   The implementation of IoT in construction is also influenced by local laws, rules, and regulations. For example, the use of drones to monitor and report construction progress to project managers, owners, and end-users may be subject to local regulations. As an example, the Federal Aviation Administration of the United States also has rules for Small Unmanned Aircraft Systems (drones under 55.0 pounds) and has a Recreational UAS Safety Test (TRUST) for recreational flyers. Some countries even prohibit the use of drones.

4. **Risk Allocation in Contracts**

   When implementing IoT, legal and contractual issues related to risk management and risk allocation must be considered. Risk allocation for liability for breaches, incident response protocols, and the minimum-security standards related to cybersecurity obligations should be considered in contract negotiations. In addition, the allocation of risk regarding the ownership and use of the data, warranties and representations, indemnities, service level agreements, and insurance requirements should be addressed.

   As an example, for IoT sensors installed on HVAC and electrical systems, the technology provider could be made contractually responsible for ensuring sensor accuracy. The main contractor could be made liable for integrating the system into the building management system (BMS). A joint risk register could be maintained, and failure to act on predictive alerts would be assigned to the party responsible for monitoring.

Interplay of IoT with Adjacent Technologies

The seamless interplay of IoT with adjacent technologies is a significant factor in its success in the construction industry. These technologies don't operate in silos and form a connected ecosystem. The integration of IoT with these technologies is not just enhancing operational efficiency, it is reshaping how buildings are designed, built, and maintained. The following is a discussion of some of these adjacent technologies.

1. **BIM (Building Information Modeling)**

   IoT sensors feed real-time data into BIM models. This enhances situational awareness, allowing dynamic updates to digital twins and enabling better decision-making during construction and facility management. For example, a building's BIM model updates automatically with temperature and humidity data from IoT sensors embedded in walls and with information collected by drones.

2. **AI**

   AI processes data from IoT devices to detect patterns, predict failures, and optimize workflows. This process enables predictive maintenance, safety alerts, and resource optimization. For example, AI analyzes vibration data from IoT sensors on scaffolding to predict structural stress and prevent collapse. AI-powered drones can use facial recognition to identify possible trespassers and send alerts to security systems.

3. **Digital Twins**

   Digital twins are virtual representations of physical objects, systems, or processes that simulate their real-world behavior in real time. IoT provides live data that powers digital twins. This live data facilitates real-time simulation, monitoring, and lifecycle management of assets. For example, a digital twin of a construction site reflects real-time progress, equipment status, and environmental conditions.

Global Policy Trends

Governments and regulatory bodies are increasingly promoting smart infrastructure investments through urban development grants, green building certifications that reward IoT-enabled monitoring, and data transparency and cybersecurity standards for connected construction systems. These policies are creating fertile ground for IoT innovation, especially in public works and large-scale infrastructure projects.

In the retrofitting and repurposing space, we can expect to see tax incentives and subsidies for retrofitting older buildings with IoT sensors. In addition, we will see lifecycle extension programs using digital twins to optimize aging assets, and circular construction models where IoT tracks material reuse and recycling.

The growth of smart cities will become an important and integral part of real estate development, and IoT is central to the vision of smart cities. Buildings will need to communicate with transportation, energy, and public safety systems. Real estate developers will need to use IoT data to design responsive, resilient spaces. Some countries, such as the

United Arab Emirates, Germany, China and Australia have adopted programs to encourage the development of smart cities.

Conclusion

The integration of IoT in real estate and construction is transforming the industry, offering innovative ways to cut costs, optimize layouts, and enhance safety. However, alongside these benefits come critical privacy, cybersecurity, and regulatory considerations that require careful management. For industry professionals, understanding and addressing these aspects will be key to unlocking IoT's full potential while maintaining compliance and trust. From sensor-rich construction sites to intelligent buildings and smart cities that evolve with their occupants, IoT is laying the foundation for a more connected, efficient, and sustainable construction environment.

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