



# Top 12 IoT Applications and Examples in Business

# Top 12 IoT applications and examples in business

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The number of connected devices now dwarfs the number of humans on earth.

Researchers at Frost & Sullivan put the number of active IoT-connected devices at 41.76 billion in 2023. IoT Analytics researchers estimate the number at 16.7 billion active endpoints in 2023, while Statista estimates 15.14 billion.

Despite variations in the actual figures and what's included in the count, one thing is clear: There's a mind-blowing number of IoT devices in the world.

That might not be surprising, though, considering the multiple areas where IoT is being used. Those IoT connections span the globe and permeate nearly all places: homes, offices, factories, farms, vehicles and even space.

Here's a detailed look at the top 12 use cases of IoT.

## 1. SELF-DRIVING AND CONNECTED VEHICLES

Autonomous vehicles are one of the most notable examples of IoT in action, with longtime automotive companies such as BMW Group, Ford Motor Company and

General Motors along with newer entries such as Tesla, all working on self-driving vehicles.

Self-driving cars and trucks use a slew of connected devices to safely navigate roadways in all sorts of traffic and weather conditions. The technologies in use include AI-enabled cameras, motion sensors and onboard computers.

Although regulatory, safety and technical concerns over the use of self-driving vehicles exist, the market for self-driving vehicles is expected to grow rapidly in upcoming years. An Allied Market Research report predicted that the global autonomous vehicle market will hit nearly \$2.2 trillion by 2030, up from \$76.13 billion in 2020.

Meanwhile, IoT connections also exist on conventional vehicles, with manufacturers installing connected devices to monitor performance and manage computerized systems.

Commercial fleets such as municipal buses and corporate delivery trucks are often fitted with additional IoT technologies, such as connected systems to monitor for safety issues. Personal cars and trucks can be fitted with similar technology, which frequently comes from insurance companies, that collects and transmits telemetry data to verify good driving habits.

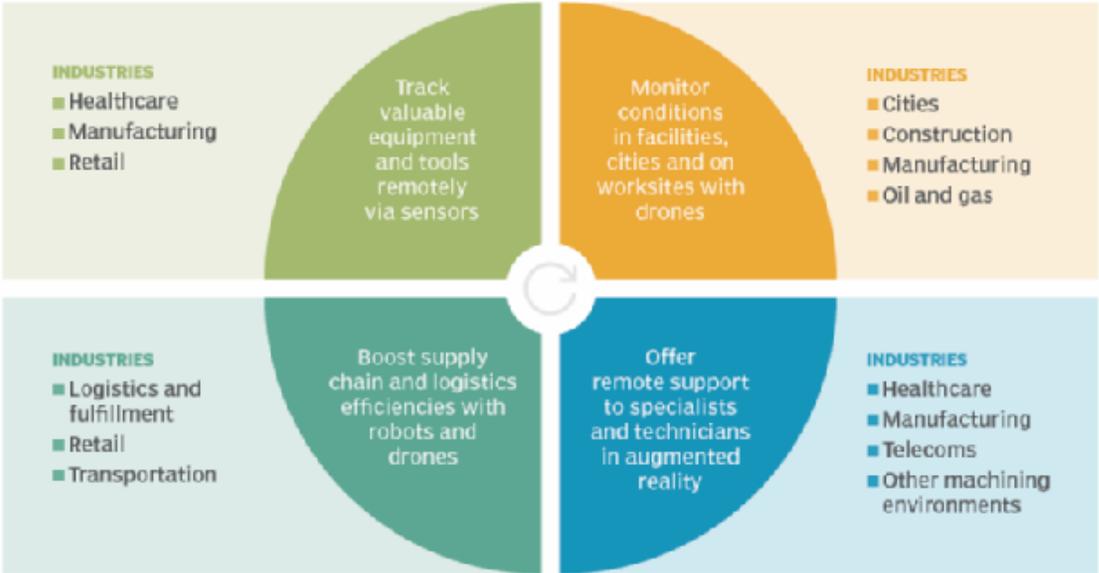
## 2. LOGISTICS AND FLEET MANAGEMENT

Companies are using sensors, telematics, GPS and analytics to see where their vehicles are at any given moment, estimate when they'll arrive at their destination and whether external conditions warrant updating routes or expected arrival times.

This technology ecosystem also enables companies to identify ways to improve operations through predictive maintenance, more driver training and route optimization.

Although logistics companies are among the primary users of such technologies, others also use IoT to track their fleets. For example, bike and scooter rental companies -- sometimes known as the micromobility industry -- use IoT to know where their wares are at any point in time.

# Industry IoT use cases for workforce distribution and automation



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### 3. TRAFFIC MANAGEMENT

Part of what enables self-driving cars is smart traffic management, which is also powered by IoT.

Like the vehicles themselves, roadway infrastructure has become more connected during the past decade, with cameras, sensors, traffic light controls, parking meters and even smartphone traffic apps transmitting data that's used to help avert traffic jams, prevent accidents and ensure smooth travel.

For example, cameras detect and transmit data about traffic volume to central management groups that analyze the information to determine whether, what and when mitigation steps must be taken.

Sensors on traffic signals can detect varying levels of light in the sky and adjust the brightness of the signals, helping ensure they're always visible to drivers.

Connected devices can be used to detect open parking spaces and transmit that information to kiosks or apps to alert drivers.

Monitors on bridges collect and transmit data for analysis about their structural health, alerting authorities to maintenance needs before there's any sort of issue or failure.

#### 4. SMART GRIDS, INCLUDING SMART METERS

Utilities are also using IoT to bring efficiency and resiliency to their energy grids.

Historically, energy flowed one way along the grid: from the generation site to the customer. However, connected devices now enable two-way communication along the entire energy supply chain: from generation through distribution to use, thereby improving the utilities' ability to move and manage it.

Utilities can analyze real-time data transmitted by connected devices to detect blackouts and redirect distribution and respond to changes in energy demand and load.

Meanwhile, smart meters installed at individual homes and businesses provide information about both real-time use and historical usage patterns that customers and the utilities can analyze to identify ways to improve efficiency.

Experts see the development of a fully smart grid as critical to key sustainability goals but note significant work is required to get to that point. A 2022 report from the International Energy Agency, for example, said that "investments in smart grids need to more than double through to 2030 to get on track with the Net Zero Emissions by 2050 Scenario, especially in emerging markets and developing economies."

## 5. ENVIRONMENTAL MONITORING

Connected devices can collect data that indicates the health and quality of air, water and soil, as well as fisheries, forests and other natural habitats. They can also collect weather and other environmental data.

As such, IoT delivers the ability to not only access more real-time data about the environment at any given time and place, but it also enables a range of organizations in various industries to use that data to glean actionable insights.

Such information can help government agencies better monitor and even predict natural disasters, such as tornados, as well as better manage and protect land and wildlife populations. Companies can use this data to better limit their carbon footprint, more effectively document compliance with environmental regulations and more efficiently plan around weather conditions that affect their business.

The market for environment-related IoT systems is seeing strong growth. A spring 2023 report from Global Industry Analysts valued the worldwide market for environmental sensing and monitoring tech at \$14 billion in 2022 but expects it to grow to \$19.3 billion by 2030.

## 6. CONNECTED BUILDINGS AND BUILDING SECURITY

Property owners are using the power of IoT to make buildings smarter, meaning they're more energy-efficient, comfortable, convenient, healthier and possibly safer.

An IoT ecosystem in a commercial building could include monitoring of the HVAC infrastructure that uses real-time data and automation technologies to constantly measure and adjust the temperature for optimum energy efficiency and comfort. Meanwhile, cameras using AI could aid in crowd management to ensure smooth flow of foot traffic or support public safety at large-scale events such as sold-out concerts.

On the home front, consumers can install smart technologies, such as door locks, appliances, thermostats and smoke detectors, which help them with their everyday needs by, for example, coordinating temperature controls to the owners' schedules.

Additionally, IoT capabilities power modern security systems both in commercial and residential buildings with connected cameras and sensors detecting and registering movement or activity -- i.e., a doorbell ringing. Those cameras and sensors then transmit that information to other systems, which can be programmed to analyze the data and automated to take specific actions based on that data, or to actual humans, such as homeowners who can determine what course of action to take.

This IoT market segment is also seeing remarkable growth: According to a 2023 report, the global smart building market stood at \$72.8 billion in 2022 and is predicted to hit \$304.3 billion by 2032, with a compound annual growth rate of 15.8% over the 10-year span.

## **7. SMART CITIES**

Smart cities are consolidating IoT deployments across many facets to give them a holistic view of what's happening in their jurisdictions.

As such, smart cities incorporate connected traffic management systems and their own smart buildings. They might incorporate private smart buildings, too. Smart cities might also tie into smart grids and use environmental monitoring to create an even larger IoT ecosystem that provides real-time views of the various elements that affect life in their municipalities.

Similar to smaller, more confined IoT deployments, the objective with smart cities is to collect real-time data for analysis that provides insights that municipal officials can then use for better decision-making and automated controls to yield more efficient, effective, resilient and safer communities. Case in point: Copenhagen, the capital of Denmark, is using IoT technologies to reach its goal of being a carbon-neutral city by 2025.

## **8. SUPPLY CHAIN MANAGEMENT**

Supply chain management has been undergoing modernization, thanks to low-power sensors, GPS and other tracking technologies that pinpoint assets as they move along a supply chain. Such information lets managers both more effectively plan and more confidently reassure stakeholders about the location of items shipped or received.

That visibility is beneficial, but it's only the start of the value proposition that IoT brings to this discipline. IoT technologies can also monitor and manage delivery requirements, for example, measuring and maintaining a specified temperature throughout transport to ensure quality and safety controls. Additionally, back-end analytics capabilities can use IoT-generated data to determine supply chain improvements, such as more efficient routes or shipping times.

## **9. DIGITAL PAYMENTS**

IoT also has a role to play in digital payments, which will continue to expand, according to researchers at Frost & Sullivan. The firm's post "The Top Growth Opportunities for IoT in 2023," states that as "cities become more digitally integrated, the use of payments will increase, and IoT will play a critical role."

## **10. HEALTHCARE AND CONSUMER HEALTH AND WELLNESS**

The healthcare industry as well as the consumer health and wellness market have numerous examples of IoT in action.

Medical institutions use connected devices throughout their care delivery processes, with many of those devices specifically designed to monitor patient vital signs and health conditions. Connected monitors, for example, can monitor, record and transmit a patient's heart rate, glucose levels or blood pressure; some also can determine if readings are within or outside a predetermined acceptable range and alert the patient or healthcare provider if that happens.

Consumers also have access to such devices and more, with smartwatches and other wearables capable of tracking, transmitting and analyzing different wellness markers, from daily steps taken to the amount of quality sleep received.

## **11. PREDICTIVE MAINTENANCE**

Another prominent use of IoT, as well as one of the most widespread examples of it, is in understanding machine health and identifying in advance when they'll need service.

Sensors are placed in a plethora of different mechanical systems, from airplanes and mining equipment to manufacturing assembly lines and household appliances. These sensors collect, store and transmit data about performance, which when analyzed can pinpoint maintenance needs and potential problems before they're required -- enabling owners to take preventative action thereby avoiding degraded performance and equipment failures.

## **12. AGRICULTURAL, COMMERCIAL, INDUSTRIAL AND RETAIL MANAGEMENT AND OPERATIONS**

IoT has numerous applications in nearly every sector, from agriculture to space exploration.

- For example, manufacturing uses IoT to monitor factory production and provide predictive maintenance on equipment. A manufacturer might use machine-to-machine connected devices as part of an industrial IoT deployment to more accurately map workloads. A factory could track wear and tear on equipment to schedule preventive maintenance at an optimal time. Companies can use employee badges or wearable devices embedded with RFID chips to manage and control physical access to facilities.
- Farmers can opt for location technologies integrated with environmental monitors and their field equipment to both automate and maximize their seed allocations.
- Transportation and logistics companies, including international shipping companies, use IoT technologies to track their fleets and track and monitor goods as they're

transported. Some also track the conditions in which goods are stored; a transportation company, for example, can track, monitor and adjust the temperature in a refrigerated truck to ensure it's kept within an optimal temperature range for the items being transported.

- Retailers are using IoT systems to support automation and robotics capabilities in their warehouses. They're also using IoT for inventory control and, increasingly, for in-store customer experience and personalized experience.

## **ENTERPRISE BENEFITS**

Although there are some industry-specific IoT use cases, many of the most common deployments involving connected technologies transcend any particular vertical and can be found across a wide range of organizations.

The benefits that come with those deployments similarly cross industries. Typical ROI includes the following:

- Lower operational costs.
- Enhanced productivity.
- Optimized output.
- Increased security.
- Improved safety.
- Personalized service.
- Better quality control.
- Heightened understanding and visibility into real-world activities.