

Face the Future with Confidence®

THE 5G EFFECT

Lessons learned from real-world 5G applications and the roadmap ahead

protiviti®
Global Business Consulting



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Introduction

A reality check on 5G

From massive connectivity for Internet of Things (IoT) devices to reduced latency to supersonic network speed, 5G continues to have a transformational effect on how individuals consume information, and the way businesses operate. Across various industries, organizations are deploying 5G technology to enable business processes and efficiency. Many have succeeded in spectacular ways, while others continue to press ahead on their 5G journey.

The imbalance in the state of 5G application and deployment prompts these questions: Where is 5G making the biggest difference in the real world? Why are some organizations succeeding while others lag behind? As the world advances into a more digitized and connected future, what can be learned from those who have gotten it right?

It is time for a 5G reality check.

In April 2023, Protiviti initiated research and a series of interviews with telecommunications industry leaders and business executives from multiple industries to gain a deeper understanding of current 5G use cases.



The objectives of this project were simple:

- Document successful implementations of 5G and the use cases driving them.
- Highlight transformational impacts and value realized from the adoption of 5G.
- Identify lessons learned implementing 5G.
- Assess future changes and growth potential of 5G use cases.

Methodology

The research team interviewed dozens of senior executives from the largest global wireless network operators, IoT technology and services providers, and other major telecommunications companies in the 5G ecosystem. Additionally, the team interviewed technology leaders in the manufacturing, energy and utility, and retail industries — the end users of 5G. The interviewees' insights not only reveal what's working today and what is not but also provide a roadmap to, and a better understanding of, the state of 5G adoption and real strategies that will enable greater implementation and adoption of the technology in the long term.



Key findings

Why 5G?

Mobility, Speed, Capacity and Security

5G means many things to many people. Its low latency (faster internet connections) and mobile broadband capabilities are its biggest appeal. In the commercial realm, 5G private networks, which allow businesses to deploy and operate their own in-house (nonpublic) network in a defined area, is a game changer. Network virtualization, slicing and cloudification are additional features of 5G that are revolutionizing enterprise data transmission and wireless connectivity.

Wired connections have dominated for decades, but now 5G, for the first time, introduces a comparable capability in terms of performance, reliability and

Key improvements over 4G

- **Speed** — The technology enables users to upload and download data more quickly.
- **Latency** — The 5G network is more responsive when making connections.
- **Density** — The network supports more simultaneous connections.
- **Distributed intelligence** — The network involves more nodes for processing data at the edge.
- **Mutualization** — The core network is mutualized across multiple access technologies, supporting 5G radio, 4G, narrowband IoT, and Wi-Fi.
- **Software enablement** — 5G is natively software-driven, enabling the network to adapt to real-time demand and specific application requirements.
- **Network slicing** — The same physical network can be partitioned into multiple virtual networks, each optimized for different applications, enabling guaranteed quality of service.



security to a wired connection, a senior wireless technology company executive explained.

“That’s the importance of 5G relative to its predecessors,” the executive said.

An IT executive at a retail company put it this way: “The idea that you can control your data, that you can tune the network to your particular data flow is super exciting.”

Speed is another significant element driving 5G, which can reach speeds up to 100 times faster than its predecessor. Its average latency is around 4 milliseconds, about a tenth of 4G’s latency.

5G is not replacing Wi-Fi. The two will coexist harmoniously for a long time.

“We’re trying not to turn it into a holy war between Wi-Fi and cellular because, in most cases, they’re going to coexist,” another executive said.

IoT applications are more viable today largely because of 5G’s mutualized core network, which enhances cell towers’ capacity to manage many connections concurrently.

Enhanced cybersecurity is another vital factor. 5G users say it supports increased network safety, including new security mechanisms such as end-to-end encryption of all network traffic and mutual authentication.

“It’s a really secure technology out of the box, and there are things you can do to make it even more secure,” another executive said.

“Wi-Fi is great for the carpeted areas of the world, but it has been stretched to its limits over the years and it cannot be depended on for business-critical, operationally important use cases. When you need coverage everywhere with a high level of security that enables control of your data, private cellular is the only way to go.”



ALLEN PROITHIS, CEO, GXC



Where 5G is gaining traction

FWA, IoTs, anything in motion, China and the public sector

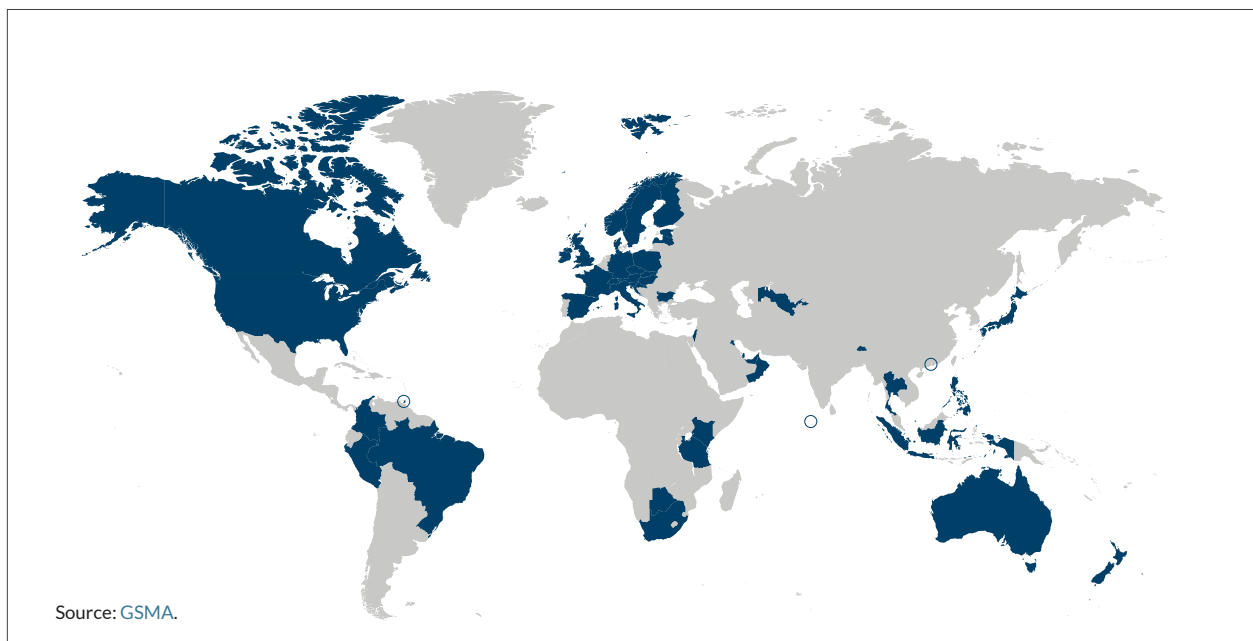
North America is the largest segment for 5G services, but the Asia-Pacific region is the fastest-growing region.

According to CTIA, the U.S. wireless industry is investing an estimated \$275 billion in network infrastructure buildout and enhancements, driven by fierce competition.¹

Significant investment is going toward 5G home broadband offerings, using fixed wireless access (FWA) or 5G radio frequency (instead of cable) to connect to the internet. In areas with mobile coverage that are either underserved by cable and fiber or stuck with expensive monthly broadband costs, FWA can deliver more capacity over greater distances at speeds as high as 1 Gbps at often lower monthly cost.²

5G FWA Services

Markets where at least one operator has commercially launched 5G FWA services



IoT device makers are intensely leveraging 5G to advance new products and solutions. 5G uses the most advanced cellular infrastructure and technologies to empower devices with reliable, high-speed data connections. Advanced IoT devices that are currently leveraging 5G include industrial cameras, high-end logistic trackers, health monitors and utility meters.



According to a senior executive with a major U.S. mobile carrier, a single cell tower can support 100 times more IoT devices when it is powered by 5G. “IoT is going from the hundreds of millions of connections today and in the next year to billions of connections in the next five to 10 years,” he said.

The public sector is another area where 5G continues to gain significant traction. The military, local governments and first responders are expanding 5G private network deployment to support mission-critical services and communication.

While the number of 5G use cases continues to expand, the technology still is only used in certain industries, with a minority of organizations having developed private 5G networks. The availability of 5G-enabled products and the cost of implementation and maintenance were consistent themes in discussions about barriers to growth and availability. The following are additional findings from our research:

- Many business leaders do not understand how to use 5G within their organization and lack awareness of how transformative the technology can be for their business.
- Private network operators see significant opportunities to deploy 5G in outdoor settings, like sporting arenas and venues, where Wi-Fi coverage is limited or not consistent.
- Managing and installing certain 5G-related infrastructure present complexities that will take time to resolve as the technology and use cases mature.
- 5G networks need a mix of low-, mid- and high-band spectrum to grow. However, to date, the mid-band spectrum is still lagging, and government intervention in making additional spectrum available is crucial to alleviate this problem.

“With 5G, we’ve got a very strong 2.5 GHz layer that is our mid-band spectrum – and one big thing we were able to do launching out of that was fixed wireless access. Without 5G and the capacity that 5G brought to the network, we wouldn’t have been able to have a significant fixed wireless access product.”

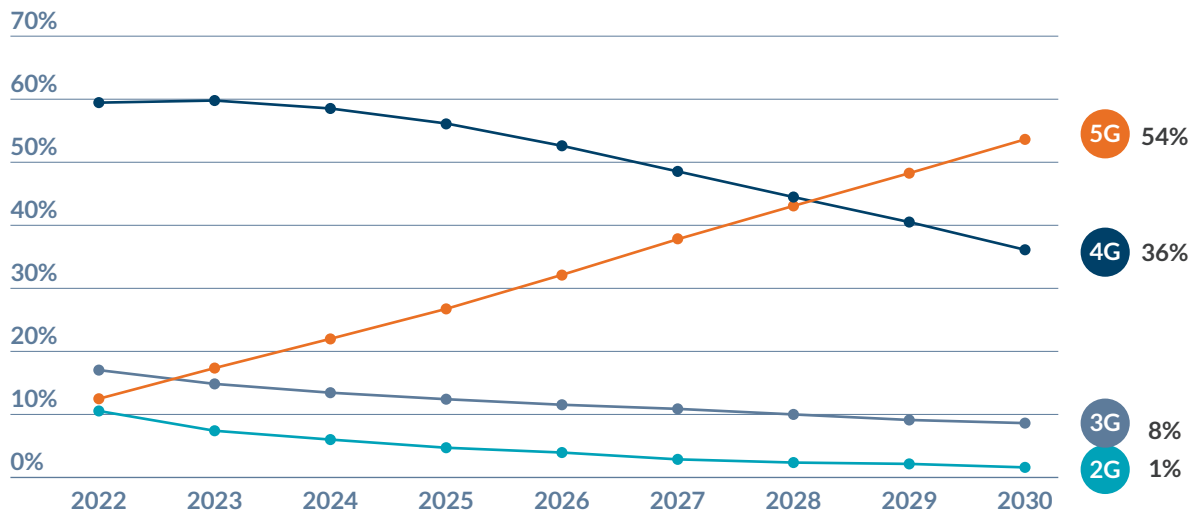


STEVE SHARKEY

VP, GOVERNMENT AFFAIRS,
ENGINEERING AND TECHNOLOGY
POLICY, T-MOBILE



According to the GSMA, there were 229 commercial 5G networks around the world and over 700 5G smartphone models had been launched, including more than 200 in 2022.



Source: GSMA.

Deployment strategies and trends

Deploying 5G effectively requires careful planning and strategic design considerations. To meet the demands of diverse 5G use cases and business objectives, today's operators and service providers incorporate high-level infrastructure, network functions and state-of-the-art technologies.

Pre-deployment strategies take into consideration critical factors such as capacity management, cyber resilience, network scalability, and maintenance (or management) capabilities. This process requires bringing different expertise to the table. "No individual company can do a rollout on their own," a 5G wireless services company executive said.

Many 5G deployments are orchestrated through system integrators and managed services providers. "They're the ones with the connections, the layouts and the thought process of putting together a schedule, project management, and quarterbacking it," the executive explained.



A lot of design nuances go into deploying a 5G network. According to an executive of a company pioneering 5G deployment in several industries, many iconic public-venue customers want installations to be aesthetically pleasing. This means finding creative ways to hide access points or antennas. The Bigbelly smart trash cans seen across many cities and airports are a perfect example. The Bigbelly looks like any curbside bin except that it isn't; it discreetly houses six radios and cables in its Telebelly.³

Functionality and features are largely dependent on the use case and cost. For example, in many cases, it is cost effective to use 5G edge boxes and gateways to collect and process data rather than embedding 5G modules in sensors or IoT devices. According to one executive, the 5G modules are still 10 times more expensive than LTE modules with spectrum slicing. Nonetheless, there are situations where embedding 5G modules make sense. Verifone's point-of-sale system is a good example of a 5G module use case.

It is worth noting that operators' capital expenditure on 5G deployment continues to rise. According to the GSMA, out of a total \$1.5 trillion that operators expect to spend on their mobile networks between 2023 and 2030, 92% will be spent on 5G deployment.

“The sheer number of IoT devices connecting to 5G networks alone will create tremendous vulnerabilities for many businesses. Preparing for these increased risks means ensuring that cybersecurity plans and mechanisms are key elements of the deployment discussion and strategy.”

MICHAEL LYONS

MANAGING DIRECTOR, PROTIVITI



Use Cases

5G state of play

The 5G revolution is occurring in big cities and smaller communities alike. Ubiquitous connectivity is becoming a necessity and will continue for the foreseeable future. The need for speed and incessant demand for streaming content are significant drivers.

On August 22, 2023, AT&T announced the rolling out of its 5G home internet after a limited and quiet spring roll out. With this, all major carriers now publicly offer 5G home internet services, which will advance consumer knowledge of the product and ultimately help continue to advance business awareness and adoption. According to CTIA, 5G home broadband now covers more than 94 million households, accounting for 90% of net broadband additions in 2022 over other options like cable, fiber, or DSL.

If you walk into an airport, hospital or hotel today, you are likely to encounter some form of 5G connectivity. The new Terminal A at Newark Liberty International Airport, for example, features a fully converged wireless network that combines 5G capabilities with cellular distributed antenna systems, LTE and Wi-Fi 6. Check out the [Aviation section](#) below for more.



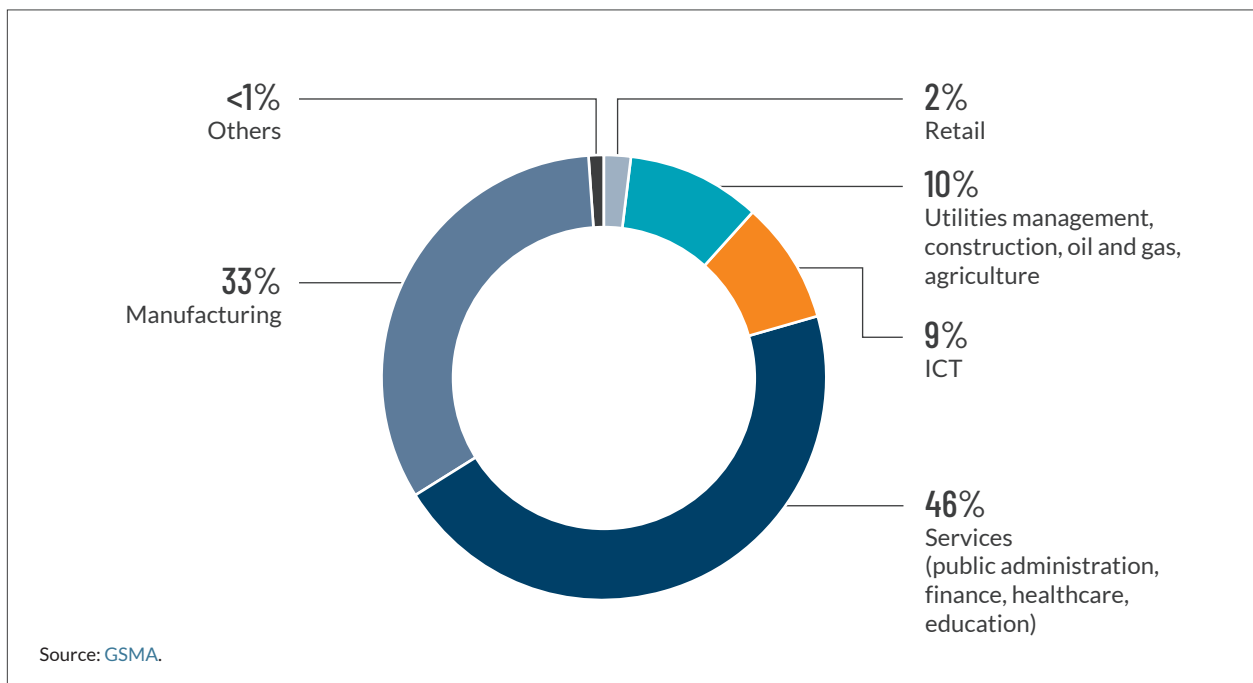
Industrial 5G use cases are expanding at a rapid pace, powering patient monitoring in medical facilities, smart energy grids in the energy and utilities industry, virtual reality learning in education, and robotics in manufacturing.

Cities are leveraging 5G jointly with edge computing for crowd control and infrastructure monitoring. And as noted earlier, the military, emergency services and first responders, are using the technology for mission-critical services. For instance, in recent years, FirstNet Core, a nationwide enhanced packet core infrastructure for first responders, upgraded its network to enable 5G connectivity.⁴

Below we detail examples of use cases where 5G is having a significant impact.

Benefits of 5G to various industries, 2030

Percentage of total benefit





5G IoT

IoT has become an increasingly integral part of various industries, from healthcare to agriculture to transportation. With 5G, industries have scaled the use and capabilities of IoTs, especially to enhance operations that rely on real-time or frequent data transmission.

In healthcare, 5G-supported medical IoTs are helping providers communicate better with patients, monitor their progress in real time, and proactively administer medicine or care based on feedback from connected devices. Several medical facilities are utilizing 5G-supported

telehealth robots and high-resolution cameras. One notable example is the newly opened Cleveland Clinic Mentor Hospital in Lake County, Ohio. The 34-bed facility is outfitted with a private 5G network and is already setup to use the technology for patient kiosks, patient monitoring and infotainment.⁵

Medical device companies that are developing high-bandwidth IoT devices used in the clinical environment (e.g., CAT scans, MRIs, X-ray machines) are incorporating 5G to improve the resilience of the devices. Experts say 5G-powered X-ray machines, for example, will be able to digitize a traditional X-ray film, and transport the film and data to an imaging database. Below are additional examples of how 5G is changing IoT in other industries.

“Everything now is driven by a device, whether that be an IoT device or a consumer mobile device. The need for connectivity is massive. It is now a utility, like electricity and water. You’ve got to have it.”



MICHAEL ZETO
CHIEF COMMERCIAL OFFICER,
BOINGO WIRELESS



A few examples of how 5G is changing IoT



Smart factories

- Modern manufacturers rely on connected equipment operations, and many industrial IoT processes will benefit from 5G.
- For example, predictive-maintenance sensors relay information about the condition of a piece of equipment to an application that analyzes the likelihood of failure.



Unmanned Aerial Vehicles (UAVs)

- Drones and various types of UAVs are leveraging 5G capabilities (speed and low latency) to reduce crashes and other mechanical errors.



Transportation

- 5G ultra-reliable low-latency communication will reduce reaction times when the vehicle detects a hazard on the roadway or an issue with its own systems.
- Because 5G connectivity works well at high speeds, one of the use cases for enhanced mobile broadband is to create more powerful wireless hotspots on public transportation.

Source: Emnify.com.

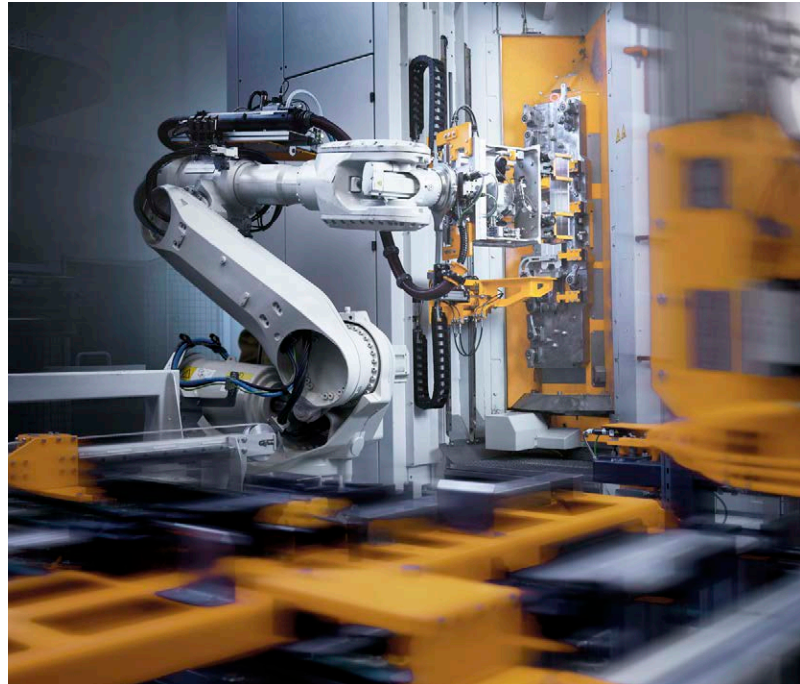


Manufacturing

The future of modern manufacturing is building a production line without human intervention, and 5G is the vehicle that will drive this change. Already, a growing number of manufacturers have built smart factories, leveraging 5G to enable robotic process automation, artificial intelligence (AI), augmented reality for troubleshooting and IoT devices.

Ericsson and Samsung are among the companies using 5G to improve operational efficiency and safety in their factories. On a recent CTIA-sponsored webinar, an executive with Ericsson's

USA 5G Smart Factory explained how the company has a goal to optimize production with autonomous and connected devices and without human interaction.



In many cases, the highly technical machines are employing 5G technology to monitor for mechanical failures in the production line. Samsung has 5G-supported sensors monitoring the thousands of fans in its facilities that are designed to push dust down and away from products on the production line. The sensors, combined with AI, are connected to an infrared camera that processes a feed in microseconds in order to detect any failure in production and potentially take a defective product off the production line. The low latency of 5G allows the connected server on site to process a large quantity of data and quickly trigger a response when needed.

This is one powerful example of how 5G is changing the manufacturing landscape. There are many others, such as manufacturing workers using 5G networks to remotely monitor and support production processes from different locations. Here are additional ways that 5G is supporting manufacturers:

- Connecting autonomous mobile robots, automated guided vehicles, video surveillance systems and other production systems.
- Supporting real-time automation
- Supporting high-speed software downloads
- Powering augmented reality/virtual reality applications



Energy & Utilities

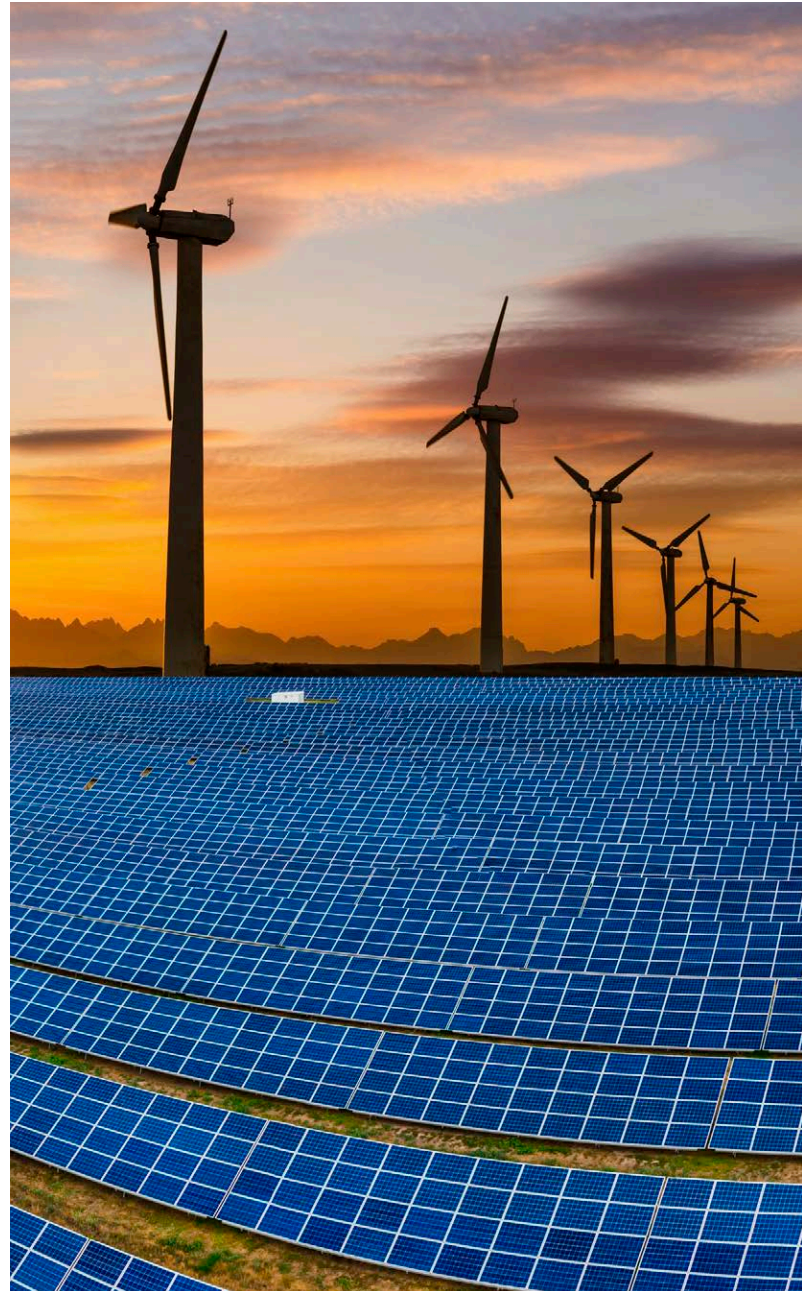
5G is being deployed across the industry to improve the health and safety of employees, generate new sources of revenue, reduce asset management costs, and facilitate remote monitoring and workforce training.

In the utilities space, 5G networks are connecting previously unconnected devices to smart grids, allowing the grids to forecast and schedule their energy requirements more precisely, reducing downtimes and costs on maintenance and repairs.

Additional 5G utility use cases include:

- Enabling end-to-end smart grid infrastructure management.
- Fully automating smart meter reading.
- Providing secure and reliable field worker communications.

In the oil and gas sector, digitized oil fields are leveraging 5G to collect real-time data from sensors, pressure and temperature meters, tank-level sensors, and other devices.





Companies providing 5G services to energy and utility companies

Ericsson SOGNO Initiative

- Ericsson partnered with industry representatives to jointly develop a **scalable, cost-efficient automation solution**, enabling data-driven monitoring and control of power infrastructure, proven as a turnkey service.
- The solution harnesses 5G to help **virtualize automation services** and locate them in the 5G edge infrastructure.
- Combined with sensors, data analysis techniques and 5G-based ICT, it **provides real-time control and decision-making in planning**.

Source: [Ericsson](#).

Nokia Microgrid Technology

- Nokia and A1 have joined forces to provide a **private wireless network** for Siemens' microgrid, which is deployed at its Austrian headquarters in Vienna.
- The A1 campus solution demonstrates the advantages of using a private wireless solution to operate **critical applications such as enterprise or utility microgrids**, and how they can be efficiently implemented with secure, reliable and fast connectivity.

Source: [Nokia](#).



Hitachi Energy

- Hitachi Energy launched **TRO600 series wireless routers with 5G capability**, which are purpose-built to help industrial and utility customers achieve high **reliability and resiliency** in mission-critical operations.
- The TRO600 series routers enable a **scalable, flexible and secure, hybrid** wireless communication architecture.
- This approach **unifies communications to all devices**, ensuring fast, secure, and reliable connectivity for each operational need.

Source: [Hitachi](#).



Retail

5G is helping retail brands implement new phygital experiences — a blend of physical and digital ecosystems to provide unique interactive experiences for customers. Also, COVID-19 propelled the rise of immersive retail, which enables the use of technologies like augmented reality and virtual reality and self-service kiosks with AI avatars to create engaging, personalized and frictionless shopping experiences for customers. Several companies are using these technologies in limited areas, but 5G promises to make it easier to deploy at scale.

Currently, retailers, particularly those with multiple store locations, are adopting 5G for basic operational purposes, including to support point-of-sale and automated checkout systems, augmented and virtual reality for an enhanced omnichannel shopping experience, and security cameras for loss control and inventory tracking. An IT executive at a major apparel store said that his organization is using a combination of Wi-Fi and fixed wireless access to supplement its broadband needs in many store locations.

Cost savings is a significant driver behind FWA 5G adoption at certain store locations. One executive described it this way: “Instead of paying \$200 a month for terrible internet at the mall, I can put a \$1,000 router in, amortize that over two or three years, and get the same or even better broadband-quality service for \$50 to \$90 a month.”

Retailers like the fact that 5G can serve as a potential alternative or replacement for DSL circuits and provide more bandwidth at a cheaper price.





“The thought there was that we can stand up stores a lot more quickly because new stores oftentimes require a buildup that can take somewhere from 90 to 180 days. The promise of 5G is, we can provision a 5G circuit probably 95 times out of 100 in a lot less time,” Michael Jacobs, chief technology officer of J Crew said.

Pop-up stores or kiosk operators generally opt for FWA 5G as a temporary measure to wired broadband. In more remote areas, this is an easy choice to make because it means they can set up or close the pop-up shop quickly in order to take advantage of changing market conditions.

According to AT&T, logistics and supply chain tracking is one of the fastest-growing 5G use cases for retailers. Combined with the IoT, 5G allows retail distribution centers to track merchandise in transit, operate forklifts in a warehouse, and monitor conditions in storage facilities where temperature-sensitive products are stored.

In recent years, several major retailers have announced significant investments in 5G. For example, Walmart outfitted certain stores with 5G data capabilities as part of an effort to ramp up the roll out of its digital health services and enable faster connections in other areas of its stores.⁶

Over the next few years, 5G will support more sophisticated use cases in the retail space, including computer vision applications to monitor inventory, payments and loss prevention, and AI-powered price optimization technology to track competitors’ price movements in real time. Other future cases include smart digital signage and billboards and facial recognition to support customer loyalty programs.

“New stores oftentimes require a buildup that can take somewhere from 90 to 180 days. So the promise of 5G is we can provision a 5G circuit probably 95 times out of 100 in a lot less time.”



MICHAEL JACOBS
CTO, J CREW



Aviation

5G has already transformed airport operations dramatically — and the journey is just beginning. In many airports around the world, 5G is supporting enhanced video security and surveillance systems, baggage tracking, autonomous traffic control, biometrics services, predictive maintenance, and utilities monitoring.

“They are using it to track carts, the escalators for usage, the people coming in and out of terminals over video,” an IT executive with a managed services company said.



The newly constructed Terminal A at Newark Liberty International Airport boasts many 5G-supported technologies. Perhaps one of the most consequential ways is using the technology to mitigate runway incursions — mishaps on the runway involving vehicles or humans that can result in fatalities, injuries or structural damage to an aircraft. According to an executive of a wireless network service provider who has worked with many airports on 5G implementation, runway-incursion detection systems are real-time systems that analyze a lot of data, and require significant bandwidth and very low latency. Low latency is critical because of the need to quickly analyze and detect foreign object debris or the presence of objects or humans in inappropriate locations via video technology.

“You are trying to identify something and alert somebody in milliseconds,” the executive said. “You don’t need that video going anywhere; it has to stay on the premise, where it can communicate with the system that’s doing the alerting, and you need 5G solutions to do that.”

The state-of-the-art, converged network at the Newark airport combines Boingo’s distributed antenna systems, Wi-Fi 6 and private LTE. An important aspect of the setup is that the network is a neutral host and is designed to bring LTE and 5G solutions from all Tier 1 carriers.



Challenges and Lessons Learned

In 2022, Protiviti conducted a survey of 183 executives, including business leaders in various industries about their timelines for 5G adoption, levels of investment, perceived benefits and barriers to implementation. Many of the same challenges that business leaders expressed last year are still true today — although nearly all of the executives interviewed for this research paper admitted to significant progress in adoption and implementation.

These are the concerns that still linger: Cost and the ability to integrate with legacy systems and networks remain significant barriers to 5G adoption, followed closely by security concerns and the availability of products and technology with 5G.

Here are other common viewpoints: 5G adoption comes with uncertainty — including a slow-but-steady rollout, LTE's expected longevity, increasing competition from Wi-Fi 6, and other wireless protocols. While cellular carriers are continually expanding 5G coverage and features, 5G is still in the **early stages of deployment**. More business leaders and enterprises will need to be educated on the technical capabilities of 5G.

According to several experts, many of the IoT and machine-to-machine benefits of 5G, such as greater power savings, are not yet included in the current 5G protocols — and, realistically, they will not be seen in products for another three to five years. Trial deployments must demonstrate cost benefits over traditional network setups.

Those who have succeeded with various uses cases provide a roadmap for success. These forward-thinking leaders say they've achieved success by working together to overcome challenges. As one executive put it, no single company can do it alone — there are many players involved in a successful deployment. In our interviews, we asked experts to share lessons learned so far in their 5G journey. Here are a few notable lessons:

- Greater bandwidth will be required as use cases further mature and the value that can be extracted from data grows
- The difference between operators that have rolled out 5G successfully and those that have not is that the successful ones prioritized security and the need for speed.
- Hire a system integrator or partner to do the implementation and rollout; don't try to manage it yourself.



- Cybersecurity efforts need to be enhanced across the ecosystem. 5G supports the transition from traditional core network boundaries toward edge computing, where computing resources are moved to wherever the infrastructure is located, rather than a central hub. The increased volume of data flowing over 5G networks and the large number of potentially unsecured devices connecting to the network will require substantial cyber security monitoring and protection.
- Prioritize aesthetics — people like the value and benefits of 5G, but they want the product or equipment to be visually appealing.
- Ensure that you are building a program that is sustainable — that you build in an allowance for the operational cost of running the networks and upgrading them when needed.

Finally, one important lesson for the companies behind 5G technologies and solutions: They need to develop products that are user-friendly and easy to incorporate into legacy systems. Allen Proithis, the CEO of GXC, said the trick is to provide a mature solution that is productized to a point where companies can extract value in a reasonable amount of time.

“Anybody can build anything with enough time and energy. But companies are busier than ever and their staff are thinner than ever. Our philosophy is that 5G will grow faster if it continues to mature as a pre-certified out-of-the-box solution so the customer can get value out of it faster.”

“We see private network demand, but the availability of devices for 5G is limited. Cost and the supply chain issue are still not sorted in this area.”



TUSHAR SACHDEV
CTO, KORE WIRELESS



Challenges in 5G Adoption



Infrastructure

5G networks are still in the **early stages of deployment**, and coverage is not yet ubiquitous. Utilities may need to **invest in additional infrastructure** to ensure that their critical systems are always connected.



Regulatory

The deployment of 5G networks in the utilities industry may **require changes to regulations and policies** to accommodate new technologies and use cases. It is essential to **ensure that the regulatory framework** is in place to support the deployment of 5G in the industry.



Cost

Cost remains high for **routers and switches** that support the higher bandwidths and densities required by 5G, as well as the **new base stations** that are needed to provide coverage.

Source: TechTarget and ISACA.



5G Growth Potential

The latest research indicates that 5G service revenues will reach **\$315 billion this year, accounting** for 35% or more of operators' overall revenue in 2023. The carriers are reporting significant growth in customers. T-Mobile, for instance, expects to have **11 million to 13 million** total FWA customers by the end of 2025.⁷

Verizon's **billion-dollar investment** in its C-band spectrum holdings to power its 5G network has already started to pay off for its fixed wireless access **push**. It now hopes that it will help jumpstart slow-to-develop **private network** and mobile edge computing (MEC) services.⁸

“The success of 5G adoption will depend on whether organizations have built a risk culture that encourages management to look out far enough, monitor what matters both internally and externally, and devote sufficient time to assess the implications of change on the business.”

GORDON TUCKER
GLOBAL TECHNOLOGY, MEDIA &
TELECOMMUNICATIONS LEADER,
PROTIVITI



Global 5G capital expenditure and research and development are up 10.8% from last year's forecast to \$265 billion annually over the next 15 years, according to new research.

Appendix B provides a few examples of carrier-specific news on 5G growth. The chart below provides additional data on how 5G is impacting the global economy.

Impact of 5G on the global economy



Source: Qualcomm.



Recommendations

Clearly, the evolution of 5G will continue, but there is still some time before 5G adoption in business becomes more mainstream. Businesses will need to consider the implications and advantages that 5G can bring to their model. As organizational awareness progresses, business leaders considering 5G must evaluate the outcomes they are looking to achieve. It is essential that they begin the process with a problem statement.

Next, they will need to leverage the communications mechanisms that many use on an individual basis with cellular connectivity and apply this to a business construct. CFOs and CEOs should be asking their CTOs and CIOs what they know about the technology, and request suggestions about how it can help achieve the business objectives.

Even if your organization is not ready today, business leaders need to understand the role 5G will play in their organization and begin planning ahead. Here are a few steps to consider when preparing for 5G deployment:

- Build your strategy with results in mind. Ask yourselves these key questions:
 - a. What are the outcomes I want to drive?
 - b. Does my strategy relate to the outcomes I am seeking?
 - c. Do I have a commitment from the board and stakeholders to allocate resources to this 5G project?

“You need to have a clear goal about how you’re going to apply 5G to your business,” one company executive who designs 5G applications for major corporations said.

“You also need to have an objective metric for success, and the time frame for achieving your goals.”

The ecosystem also needs to continue to develop; there are carriers that offer many incentives to local governments to help offset the costs of a 5G deployment. Having an understanding of subsidies available from all partners to help lower upfront investment costs is critical.



Additional recommendations for various 5G ecosystem players:

- From an IoT perspective, companies should think about the type of spectrum and device availability.
- For operators helping to deploy 5G services and applications, if it is a consumer-type application, ensure that you are driving a host-neutral outcome.
- Manufacturers must evolve their internal network architecture and governance as operational technology networks become increasingly complicated and critical to operations.
- Regulators should support 5G development by ensuring that sufficient mid- and lowband spectrum is available, that licenses are affordable and well designed, and by engaging early and often with the industry on spectrum policies.

“Governments have a major role to play in pushing for equity when it comes to 5G access. They can support the ecosystem by providing additional spectrum and also creating and implementing policies that will drive 5G penetration across areas underserved by broadband just as much as the big metropolitan areas.”



PERRY KEATING

MANAGING DIRECTOR AND PRESIDENT, PROTIVITI GOVERNMENT SERVICES



Appendix

Appendix A: A Sample of 5G Use Case Profiles

Use cases	5G project details	Value delivered
Honeywell <small>Source: Honeywell.</small>	<ul style="list-style-type: none">• VersaWave for UAS: This project was designed specifically for advanced air mobility vehicles and uncrewed aerial systems (UAS). This system combines satellite communication (satcom), cellular connectivity (including 5G, 4G, and 3G), Wi-Fi, and Bluetooth capabilities.	<ul style="list-style-type: none">• The system's cellular capability includes high-speed 5G connectivity supporting low-latency and high-data transfers at a low cost whether on public or private networks.• By adding cellular connectivity, the new satcom system provides customers with the flexibility to choose their connectivity solution based on individual needs without having to install multiple systems.
Gillette Stadium <small>Source: Verizon.</small>	<ul style="list-style-type: none">• The Verizon-provided 5G network supports more digital content and game-day interactivity for fans attending live sporting events at the stadium.	<ul style="list-style-type: none">• Fans get faster download and upload times and lower latency as they consume and share digital content such as video highlights, social media videos and interactive apps.
Atlas Copco <small>Source: Atlas Copco.</small>	<ul style="list-style-type: none">• Atlas Copco is collaborating with Ericsson and Orange Belgium to ensure intelligent manufacturing with 4G and 5G. Atlas Copco's factories in Antwerp, Belgium, and the integration lab in Sickla, Sweden, are testing 5G network technology to speed up the global shift to smart manufacturing.	<ul style="list-style-type: none">• The private 5G network at the Sickla integration lab supports 5G-ready industrial-tool solutions for customers worldwide.



Use cases	5G project details	Value delivered
<p>U.S. Government — Navy, DoD</p> <p>Source: U.S. DoD.</p>	<ul style="list-style-type: none">• The 5G Smart Warehousing project at Naval Base Coronado incorporates 5G capabilities for trans shipments between shore facilities and naval units.• The 5G Smart Warehouse Network optimizes warehouse operations via increased throughput of data, IoT support, and low latency.	<ul style="list-style-type: none">• Using 5G-enhanced technology, the program seeks to increase the efficiency and fidelity of naval logistic operations, including identification, recording, organization, storage, retrieval, and transportation of material and supplies.
<p>Halo.Car</p> <p>Source: T-Mobile.</p>	<ul style="list-style-type: none">• Las Vegas-based company provides remotely piloted electric car-sharing service, using video navigation and sensor data powered by T-Mobile 5G mobile networks to deliver cars to customers without a driver.	<ul style="list-style-type: none">• This tech-enabled car rental service is convenient option for customers who don't want to visit a physical garage.
<p>Volkswagen</p> <p>Source: TechTarget.</p>	<ul style="list-style-type: none">• Volkswagen accesses and shares data across plant locations, through an industrial cloud in a global wide area network that relies on 5G network slicing.	<ul style="list-style-type: none">• The 5G network slice allows the car maker to transfer large amounts of analytic data and optimize processes between 20 plants that are part of its ecosystem. The goal is to increase the number of plants leveraging the 5G slice to 133 by 2025.
<p>Komatsu</p> <p>Source: Boudy Technology.</p>	<ul style="list-style-type: none">• Komatsu launched a 5G network at its Awazu factory in Komatsu City, Ishikawa Prefecture, Japan, one of its main factories.	<ul style="list-style-type: none">• Given the labor shortage, Komatsu's smart factory uses a SoftBank 5G antenna to enable robots and to supplement human skills on the production floor.
<p>Caterpillar</p> <p>Source: Caterpillar.</p>	<ul style="list-style-type: none">• In 2022, Caterpillar unveiled a rugged 5G mobile internet hot spot. The Cat® Q10 5G is a robust mobile internet router for high-speed connectivity wherever it's needed.	<ul style="list-style-type: none">• Cat Q10 is completely portable and designed for use by businesses operating in the toughest of environments. Harnessing the power of broadband, it can securely connect up to 32 devices at once



Appendix B: Bibliography

- ¹ [CTIA - The State of 5G: Evaluating Progress and Charting the Path Forward July 2023](#)
- ² [Protiviti: Riding on 5G, Fixed Wireless Access Technology Continues to Make Huge Waves](#)
- ³ [IOT World Today: Smart Trash Can Provides Hidden 5G Infrastructure](#)
- ⁴ [FirstNet Gov: FirstNet & 5G: An experience unlike anything else for America's first responders](#)
- ⁵ [Becker's Health IT: Why Cleveland Clinic went with private 5G over Wi-Fi for its newest hospital](#)
- ⁶ [Brainstation: Walmart and Verizon Explore 5G Stores to Power Digital Health](#)
- ⁷ [Telecoms.com: T-Mobile buddies up with Verizon on FWA broadband mission](#)
- ⁸ [SDX Central: Verizon C-band spectrum drives 5G, FWA \(can it jumpstart private networks and MEC?\)](#)



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