

How 5G Will Change So Much More Than Your Phone

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The current generation of wireless technology ushered in a host of new smartphone applications that helped put the mobile phone at the center of e-commerce, socializing and navigation.

The next wave of wireless—5G—will supercharge cellphones, but its real strength lies in its potential to power the “Internet of Things,” a byword for everything electronic other than the smartphone.

That includes factory production lines that get instructions over the air instead of through wires; driverless cars that receive incredibly detailed information about road conditions in real time; sports broadcasts that let viewers see the game from a dizzying number of angles, and get a host of new statistics superimposed on the screen to reflect the action; and wearable devices that monitor a patient’s physical condition and beam the information to doctors.

These are just some of the developments that may be in store as 5G networks evolve and as carriers look for growth opportunities outside of the mature cellphone market in developed countries. Here’s a rundown of how this new telecom technology could transform six industries, how long those changes might take and what obstacles stand in the way.

Flexibility in the factory

Factories have relied on physical wires for more than a century—for good reason. A spotty wireless connection can cause machinery to move too slowly or misfire, with expensive and potentially dangerous consequences.

Deutsche Telekom AG is testing what kinds of machines in factories benefit from enhanced wireless service. Photo: Deutsche Telekom

Wireless engineers say 5G's emphasis on slashing latency—the amount of time that machines take to respond to each other—could challenge that status quo. The network's responsiveness would allow robotic assembly lines to take instructions over the air or grab the latest specifications for a product without lagging, so they could remain on the job all the time. Mobile robots could also be on the move constantly without having to plug in.

“This is sort of the Holy Grail of factory automation,” says Gerhard Fettweis, a professor of mobile communications at Germany's TU Dresden. “There's nothing nailed to the floor.”

In Germany, cellphone carrier [Deutsche Telekom](#) AG [launched](#) in 2018 a pilot factory program designed to test what kinds of machines benefit from enhanced wireless service. The program's specially designed 4G networks will get a 5G upgrade once new wireless spectrum is available for use, a spokesman says.

Telecom companies in Germany and China have so far shown the most interest in fostering 5G manufacturing, according to Chetan Sharma, industry analyst for his eponymous consulting firm. He predicts growing

interest from manufacturers that might face sudden orders that their existing workforce can't fulfill.

Still, he doesn't expect wireless networks to touch every part of the production process right away. A slower-growing company that makes metal goods or paper products, for instance, isn't likely to spend precious capital on wireless technology. And he doesn't think that factory owners are likely to start cutting the cord on robotics soon.

Mr. Sharma says computer-chip makers must first develop specialized hardware for the sector before factories will be willing to risk installing wireless 5G machinery, a process that will take several years. "Redoing the manufacturing workflow demands certainty," he says.

Cars get fueled up with data

Experts expect to see vehicles equipped with 5G modems in the coming years. Still, what the next generation of connected cars will look like is an often-contentious question.

Some telecom-industry leaders paint a futuristic picture of driverless vehicles getting real-time information about traffic and hazards as they move, and then reacting to them. It is a vision that takes advantage of the strength of 5G networks—their ability to juggle swarms of simultaneous connections, allowing sensors in cars and on streets to provide uninterrupted streams of precise data.

But skeptics say telecom companies are overselling the capabilities of 5G when it comes to vehicles. The next generation of wireless networks, like its

predecessors, will sometimes fail. And it might take years for even urban areas to get 5G signals everywhere.

See how watching videos, loading Fortnite and downloading music will get a lot faster

“Nobody in their right mind would make a driverless car dependent on the wireless network for critical functions like braking and steering,” says Craig Moffett, analyst at research firm MoffettNathanson. Any reliance on a 5G connection, he says, “would require ubiquitous networks, which we won’t have in our lifetimes.”

Some companies are pitching more-limited uses for 5G transportation, at least to start. [AT&T](#) Inc. executives have said that small, neighborhood-size 5G zones could be a good place for public-transit riders and car passengers to keep themselves amused by downloading video and games as they pass through the area.

“We think it’s going to pop up in zones centered around campuses” early on, John Donovan, chief of AT&T’s telecom business, said in an interview last year.

An AT&T spokesman says the company is also developing technology with partners to allow cars to share information with each other and roadside service stations when they fall outside the range of a cell tower. That could mean sharing information about things like road hazards, or getting in touch with emergency services.

A new angle on sports

When South Korea's [KT Corp.](#) offered a version of its 5G technology at the Winter Olympics in Pyeongchang last year, the telecom giant allowed visitors to fiddle with the angle from which they viewed an event—such as seeing a game from the perspective of athletes.

That was a preview of how professional sports leagues are planning to reshape their content using 5G connectivity. For instance, viewers can expect to have regular sports enhanced with the same 5G boost as the Korean games. Technology under development will use a host of cameras and sensors installed throughout sports venues to let fans choose among numerous angles for viewing athletic contests.

“You can literally run around like LeBron James, ” says Roger Entner, chief of wireless-industry research firm Recon Analytics Inc.

Other technology wouldn't just offer new angles on the field of play, it would offer viewers more information about the action.

[Intel Corp.](#) experimented with attaching sensors to players and pucks at the 2019 National Hockey League All-Star game in January. Viewers could pull up a host of new statistics on their phones to see how fast shots went into the goal and how fast skaters moved down the ice. The steps were a precursor to providing fans more real-time statistics on their phones or customized on their television screens during games, once 5G is deployed.

More immersive movies and games

Hollywood studios and videogame companies are looking to leverage 5G's speed and ultralow latency to give viewers a much more immersive

experience—whether they’re watching on a TV or with a headset.

“More so than sitting back and watching TV, you’re going to be living life in a virtual world. People could be anywhere, including imaginary worlds,” says Ron Yekutieli, chief executive of video-platform provider Kaltura.

Studios have tested applications that give a taste of what the 5G future might bring. But they’re still trying to figure out just what content and pricing will get the best response from viewers.

A \$20 virtual-reality experience in 2016 tied to the release of Twentieth Century Fox’s film “The Martian,” for example, received mixed reviews from audiences. The VR content allowed people to move through a Mars-like environment like the movie’s hero, played by Matt Damon.

Robert Powers, executive director, global technology and business development for Fox Innovation Lab, says \$8 to \$15 is a more palatable price range for consumers for VR experiences. Fox is also working on augmented and mixed-reality experiences—where computer-generated graphics are overlaid over real-world images—that 5G will help facilitate.

For example, last summer the lab worked on a mixed-reality experience in which a person moved through a story using their mobile phone or wearable device in a public space like a theme park. While walking, the player followed prompts and saw superimposed figures that could move around and interact with the user.

A new doctor-patient relationship

In the coming years, 5G will make it possible for doctors to have more interactions with their patients through new telemedicine avenues, such as high-quality videoconferencing and virtual reality, says Sandra Rivera, general manager of Intel's network-platforms group.

Boosters say the upgraded networks will make even bigger changes possible, such as having a doctor in one corner of the world operating on a patient in another with remote-controlled surgical machines. Less grand, but coming sooner, is a wave of changes bringing more-personalized care.

A therapist remotely treating a child with autism, for example, could use a VR headset to see the child's facial and body cues more clearly than is possible on today's video calls via mobile phones. Columbia University researchers, meanwhile, are working on virtual physical therapy helped by 5G's low latency. A patient wears a virtual-reality headset and moves controllers to manipulate digital versions of physical objects like a ball, mimicking motions in a traditional therapy session.

The FCC recently announced a plan to encourage a blazing fast wireless service called 5G. But what is 5G? And how far is the U.S. from rolling it out? Photo: Reuters

New sensors and wearable devices connected to 5G networks that generate data will also help flag abnormalities or adjust the dosage of medicine or therapeutic activities without in-person visits. Patients could wear sensors that monitor their activity, stress levels and blood sugar, with that data flowing to their physician, Ms. Rivera adds.

Later on, 5G's faster speed, lower latency and higher bandwidth could facilitate larger changes such as paramedics getting real-time instructions in an ambulance from a trained physician using high-definition cameras and virtual reality.

Making surveillance more precise

Cameras and sensors already blanket the busier corners of the world without the help of 5G technology. But an experiment that [Verizon Communications](#) Inc. recently ran at a Houston testing center offered a peek at what the world could look like when faster wireless service becomes commonplace.

Early experiments suggest cameras and sensors with 5G enhancements could allow police departments to scan public places more quickly for suspects in their databases. It could also allow stores to track their customers' movements with more precision, perhaps allowing them to tailor marketing to them based on their behavior.

Engineers at the wireless carrier developed customized software that allows computers to process images near a cell tower rather than in a data center hundreds of miles away.

The test took advantage of two 5G benefits. Enhanced bandwidth allows cameras to pass data-heavy images over the air without degrading their quality. Lower latency also lets computers process images close to where they are captured, allowing them to quickly identify people and objects. Verizon says the on-site processing led its systems to find matching images twice as fast as they could using conventional methods.

Adam Koeppe, Verizon's senior vice president for network planning, says public-safety groups often ask for the ability to make better use of surveillance data. Similar technology could also be used by retailers to track foot traffic.

"This type of technology is not new," he says. "The question is, how do you deploy it in a mobile environment?"


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