WHY 5G WILL TRANSFORM MUCH MORE THAN TELECOMMUNICATIONS

The transition to fifth generation wireless technology will likely have deeper and broader economic implications than previous transitions.

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KEY TAKEAWAYS

- The transition from 4G to 5G will allow wireless technology to surpass three technical thresholds: 1) wireless internet speeds will surpass cable broadband and potentially also fiber optic cable; 2) the "internet of things" will have mass industrial applications for the first time; and 3) communication lag will fall to one millisecond—faster than the speed at which humans perceive touch response as instantaneous—giving rise to new, "tactile internet" applications such as remote surgery.
- As a result of these barriers being broken, the 5G transition will likely have a larger and broader economic impact than shifts between previous wireless generations.
- Consumers have the most to gain from this transition, followed by network equipment suppliers, cellular tower companies, and connected device makers.
- Telecommunications and media companies should stand to gain as well, though they will also face new challenges as content distribution changes, while cable TV companies will likely see their value proposition further erode.

In April 2017, US telecom companies spent a total of US$19.8 billion for the use of several 5G-compatible segments of electromagnetic spectrum in the latest Federal Communications Commission (FCC) spectrum auction. Though this auction was one of the FCC's largest to date, the highest spectrum spend in the US occurred just two years earlier when US companies expended a whopping US$41 billion on this limited resource. Telecom companies in countries such as Germany, India, and Canada have also heavily invested in securing spectrum rights in their respective national auctions as competition for increasingly crowded airwaves intensifies.

The huge sum of money spent in spectrum auctions around the world in recent years demonstrates the rising value of electromagnetic spectrum and its increasing centrality in economic life. In fact, wireless spectrum is now one of the increasingly more valuable intangible resources in the world. More specifically, massive investments in 5G-compatible spectrum are a telling indication of the perceived economic promise of 5G wireless technology, slated to be rolled out in developed economies in 2019 and in emerging markets shortly thereafter.

SPEEDING BEYOND THREE THRESHOLDS

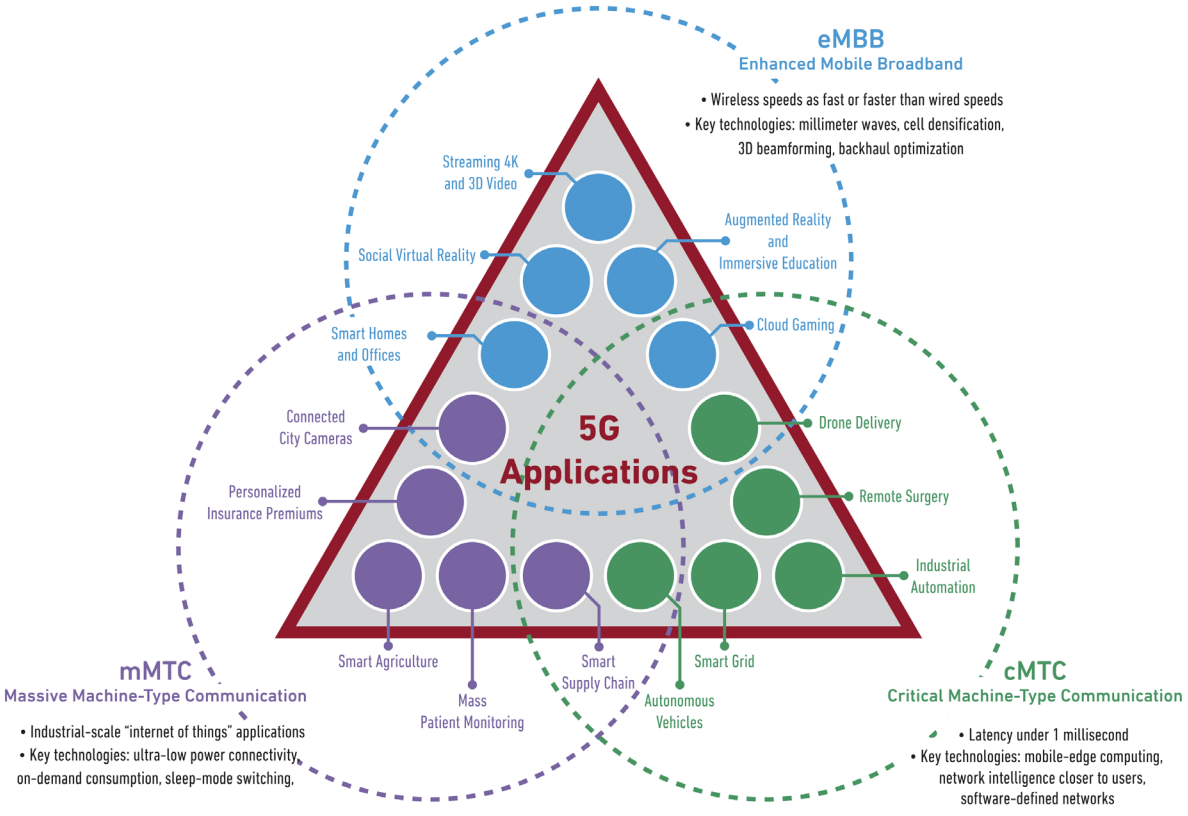
Like every new generation of wireless technology, the fifth generation, or "5G," will dramatically increase the speed and volume of data transfer through the airwaves. However, the transition from 4G to 5G will be more consequential than previous transitions as unprecedented speeds—in some cases up to 50 times faster—as well as significantly larger carrying capacity, will allow wireless technology to move past three technical thresholds, each representing a significant milestone in their own right.

The first threshold is that 5G wireless internet speeds will, for the first time, exceed that of cable broadband and potentially also fiber optic cable (think Verizon Fios and Google Fiber). This will allow users to flip through high-quality video content on mobile devices, including 4K, 3D, and virtual reality content, and have the same or better experience as watching cable television. According to Telecom Services Analyst Jafar Rizvi, CFA, "When we experience flipping through ultra-high definition video on mobile devices with virtually no buffering we will probably each have an 'a-ha' moment, in the same way as many of us did when we first checked our email on our phones. It will fundamentally change how we think about video."

Secondly, the "internet of things," or "IoT," will have broad industrial and city-wide applications for the first time. Not only will consumer products such as fridges and thermostats be increasingly connected to the internet via the "consumer IoT," large-scale and complex processes such as industrial agriculture, supply-chain coordination, fleet management, and city traffic flow will increasingly be guided by connected devices as part of the "industrial IoT." Importantly, 5G will provide the necessary bandwidth for connected vehicles to send and receive the huge amounts of data at the speed required for effective vehicle coordination, thereby representing a vital component in the development of autonomous driving. The integration of wireless communication with transportation signifies a potentially large new revenue stream for telecom companies.

The third threshold that 5G technology is predicted to surpass is the reduction of network latency, or lag, to one millisecond, faster than the speed at which humans perceive audio, visual and physical response as instantaneous. For comparison, 4G LTE latency is currently between 20 and 50 milliseconds. The perception of immediate response, especially when combined with haptic, or touch-based, feedback, will enable new wireless applications such as remote surgeries and remote driving. Additionally, truly immersive virtual reality and gaming experiences available on demand will allow users across the world to interact with each other in virtual worlds in essentially real time. This ultra-reliable and low-latency communication will underlie what is increasingly becoming known as the "tactile internet."

APPLICATIONS OF 5G TECHNOLOGY



SOURCES: QORVO, INC., EUROPEAN COMMISSION, ERICSSON

BROADER BAND, BROADER IMPACT

As the roll out of 5G will occur over a number of years and at different rates in different countries, some of the use cases will only become technically possible at scale in the early- or mid-2020s. Other use cases may be limited or otherwise shaped by government regulations. Nonetheless, the broad range of new economic opportunities—and threats—posed by 5G will significantly impact not only telecommunications, but other areas such as health care, consumer and industrial products, energy, and utilities. As such, the winners and losers at the industry and company level may be markedly different from those that resulted from previous wireless transitions.

The tables below summarize the potential impact of 5G on four industries likely to be heavily affected by the technology:

MEDIA COMPANIES

CATEGORY	FIRMS	PROS	CONS
TV NETWORKS AND MOVIE STUDIOS	▪ ABC ▪ NBC ▪ DISNEY ▪ TOEI ▪ FUJI	▪ New or substituted revenue streams as content and advertising moves to wireless networks.	▪ Increased competition from domestic and global sources as data travels more effortlessly across geographies. ▪ Substitution risk from other content categories. ▪ Have to pay more for media talent as relative bargaining power falls.
"OVER THE TOP" CONTENT CREATORS	▪ NETFLIX ▪ AMAZON ▪ GOOGLE	▪ As above	▪ Substitution risk from other content categories. ▪ Have to pay more for media talent as relative bargaining power falls.
VIDEO GAME MAKERS	▪ SONY ▪ TENCENT ▪ MICROSOFT ▪ NINTENDO	▪ As above	▪ Substitution risk from other content categories.
SOCIAL MEDIA AND USER-GENERATED CONTENT AGGREGATORS	▪ FACEBOOK ▪ WEIBO ▪ LINE	▪ As above	▪ Substitution risk from other content categories.

INDUSTRY ASSESSMENT

- "Anytime, anywhere" availability of all forms of media should result in a marginal increase in total media consumption, benefitting all media companies.
- However, relatively finite daily screen time will result in increased competition amongst media companies in all categories.
- In this environment, companies may be more tempted to enter other content categories or instigate mergers and acquisitions across categories to increase revenue streams.

CONNECTED DEVICE MAKERS

CATEGORY	FIRMS	PROS	CONS
CONSUMER INTERNET OF THINGS (IoT) HARDWARE MAKERS	▪ APPLE ▪ SAMSUNG ▪ GOOGLE ▪ AMAZON ▪ GE ▪ LG ▪ FITBIT ▪ PHILIPS ▪ HOSHIZAKI	▪ High demand growth ▪ New revenue from higher prices in the short term as products become more valuable to consumers.	▪ Increased competition as connected device makers could move into adjacent categories. ▪ Entry of new players unencumbered by old technologies. ▪ Potential substitution of hardware by software.
INDUSTRIAL IoT HARDWARE MAKERS	▪ GARMIN ▪ TOPCON ▪ TIMBLE ▪ FANUC ▪ HEXAGON	▪ High demand growth	▪ As above
IoT SOFTWARE MAKERS	▪ GOOGLE ▪ APPLE ▪ AMAZON ▪ IBM	▪ High demand growth ▪ Potential substitution of hardware by software.	▪ Competition from traditional software vendors.

INDUSTRY ASSESSMENT

- Connected device makers should enjoy new revenue streams from high demand growth, particularly in the industrial IoT space.
- Consumer IoT hardware makers should also be able to charge higher prices due to more compelling products.
- Software IoT makers could become more profitable than their hardware counterparts over time as hardware becomes increasingly commoditized.

NETWORK OPERATORS

CATEGORY	FIRMS	PROS	CONS
TELECOM COMPANIES	▪ VERIZON ▪ AT&T ▪ T-MOBILE ▪ VODAFONE ▪ CHINA MOBILE ▪ KDDI ▪ TELSTRA ▪ AMERICA MOVIL	▪ Incredibly fast wireless speeds provides a premium service to sell to subscribers, which should result in higher revenues per user. ▪ Potential new commercial and industrial customers such as auto companies (connected cars), health care companies (remote patient monitoring), city governments (smart city cameras), and food companies (smart agriculture).	▪ Need for huge capital expenditure to build out a 5G network—necessary to remain competitive—could result in lower return on capital than previous wireless transitions.
CABLE TV COMPANIES	▪ COMCAST ▪ COX ▪ DISH ▪ VERIZON ▪ AT&T ▪ LIBERTY GLOBAL ▪ MEGACABLE	▪ Possible weakening of net neutrality laws could enable a more profitable business model.	▪ Increased competition from wireless companies in the form of a powerful new pipe. ▪ Potential obsolescence as wireless video speeds surpass wired video speeds.

INDUSTRY ASSESSMENT

- New revenue opportunities from the consumer and industrial internet of things should benefit wireless telecom companies, while increased cord cutting will be an ongoing challenge for cable TV companies as their value proposition continues to erode.
- We could also see more mergers and acquisitions between network operators and content creators along the lines of the NBC-Comcast merger in 2013 as content-distribution partnerships become an increasingly lucrative proposition.

NETWORK SUPPLIERS

CATEGORY	FIRMS	PROS	CONS
CELLULAR TOWER COMPANIES	▪ CROWN CASTLE ▪ AMERICAN TOWER CORP. ▪ BHARTI INFRATEL ▪ TOWERS BERSAMA	▪ Greater demand from telecom companies due to need for denser networks.	▪ Potential increase in operating challenges such as community complaints and municipal approval as network equipment moves closer to end users. ▪ Increased bidding for new contracts will likely increase rivalry and potential loss of market share to competitors. ▪ Threat of new 5G-specific companies unencumbered by old technologies taking market share.
NETWORK-EQUIPMENT SUPPLIERS	▪ ERICSSON ▪ NOKIA ▪ HUAWEI ▪ ALCATEL-LUCENT ▪ CISCO ▪ QUALCOMM ▪ FUJITSU ▪ HITACHI	▪ Greater demand from telecom and tower companies due to need for denser networks.	▪ Increased bidding for new contracts will likely increase rivalry and potential loss of market share to competitors. ▪ Threat of new 5G-specific companies unencumbered by old technologies taking market share.

INDUSTRY ASSESSMENT

- We should see greater demand for cellular towers and networking equipment as 5G technology requires networks to become denser.
- However, there could be more competition among incumbents in securing large contracts, while new 5G-specific entrants in the space, unencumbered by old technologies, may provide an additional challenge.

INTERVIEW WITH TELECOMS ANALYST JAFAR RIZVI

Portfolio Specialist S. Clarke Moody, CFA recently spoke with Telecom Services Analyst Jafar Rizvi about the coming 5G transition and how it could affect industry players both within and outside the telecom sector. The interview transcript, lightly edited for clarity, follows.

Clarke Moody:
Jafar, each successive generation of wireless technology has been accompanied by as much hype as promised. 5G is on the horizon now. Maybe you could share some thoughts about what you see as the various pros and cons for various industries. Maybe you could start, as a telecom analyst, to talk about the telecom industry.

Jafar Rizvi:
In the telecom industry, what I've seen is that with each successive generation of wireless technology the incremental return on capital has gone down because the capex requirements are huge, so I think this might be the case this time as well. However, there will be some new revenue opportunities for the wireless companies from the industrial and consumer internet of things, a concrete example being autonomous driving potentially generating revenues for a company like Verizon. In terms of substitution risk, wireless has substituted wireline so that the cable company, the fiber company, and the copper company has been further and further removed from the revenue and profit pool in favor of the wireless companies.

CM:
You are talking about distribution. How about on the content side of things? What impacts will this have on media companies?

JR:
I think the impact on the media industry will probably be a little bit more long-term. What we've noticed so far with each successive wireless generation is that the power has shifted away from the traditional media companies—the TV networks and the studios—towards the likes of Netflix, Amazon, and now to Facebook in the US, Weibo and Tencent in China, and to Line in Japan. We expect that this shift will continue over long periods of time.

CM:
You mention there's going to be a lot of capital expenditures that the telecom companies will have to spend in order to build up these networks. Does that mean that the network-equipment manufacturers are going to be immediate beneficiaries?

JR:
In terms of the network technology companies there will be some semiconductor companies that could benefit such as Qualcomm in the US as well as Chinese companies such as Huawei and ZTE. The traditional equipment providers such as Sony, Ericsson, Nokia, and Alcatel-Lucent should also be beneficiaries. However, there could be pure-play 5G technology companies either on the software or hardware semiconductor side that may not have any legacy businesses that could come up over time and benefit and disrupt some of the older providers. Another interesting sub-segment that could benefit is the tower companies, as the need for more dense networks will necessitate more build-outs of what we call wireless cells. That would help companies like American Tower in the US, Bharti Infratel in India, and Towers Bersama in Indonesia.

CM:
What about businesses that might not immediately spring to mind that are not part of the telecom, media, and technology side of the equation?

JR:
I'm learning that in countries like Germany they want the 5G network to be an enabler of in-home patient monitoring, for example a dialysis machine in a patient's house that can be hooked up using 5G networks to the hospital. So I think the health care industry will see some interesting changes in terms of lowering health care costs. In the industrial space, companies like Fanuc in Japan are talking about smart factories, which could see smarter inventory management as well as maintenance and repair scheduling of machines.

CM:
A lot of what we've been talking about strikes me as being more impactful in developed markets. Perhaps talk about the global impact, particularly in places like emerging markets.

JR:
What we've seen is that the immediate adoption is much faster in developed markets where consumers have more spending power and emerging markets tend to follow with a lag. However, they do pick up. What's interesting in the case of emerging markets is that we're seeing a leapfrogging from no broadband to a wireless broadband network. Many of these consumers have never experienced cable or fiber, so their first experience of broadband will be a wireless network.

CONTRIBUTORS

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