

5G Is Unleashing the Fourth Industrial Revolution—Here’s What It Means for Legal Systems

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We are only now beginning to experience what 5G can do, and the need for legal services in data protection, health, security, and cyber-security, among others, will continue to increase exponentially. The authors of this article discuss how 5G will impact law and policy at all levels of government.

5G technology delivers wireless communication speeds exponentially faster than any previous generation—speeds comparable to delivery via fiber-optic cables. Companies are racing to make it commercially available everywhere. 5G is the first-ever mobile technology capable of extending the reach of broadband wireless services to connected devices. According to the Global System for Mobile Communications Association (“GSMA”), there will be 25 billion connected Internet of Things (“IoT”) devices by 2025. Ubiquitous 5G service will drive radical changes in the way we communicate and live.

5G promises to supercharge the IoT, autonomous vehicles, augmented reality, smart cities, mission-critical manufacturing, 3D videos, remote healthcare, and regenerative medicine. Each of these and other 5G-enabled applications could change the shape of legal, risk, and regulatory environments, and collectively, they will usher in the Fourth Industrial Revolution. While previous industrial revolutions used water and steam power to mechanize production, electricity to create mass production, and electronics and IT to automate production, this revolution, powered by 5G wireless technology, will fuse them all and blur the lines between physical, digital, and biological spheres. Indeed, according to a recent Harris Williams report, the average number of devices and connections per capita in North America alone is expected to grow by 63 percent, up from 8.2 to 13.4 by 2023. The Fourth Industrial Revolution promises to create velocity, enable unlimited scope, and

manifest a profound impact on our systems, transforming how we produce, manage, and govern our world and ourselves.

As societies around the world struggle to cope with the global COVID-19 pandemic, the rush to rework and study remotely put massive pressure on the capacity of existing telecommunications networks, whether broadband, fiber-optic, 4G LTE or legacy 3G or even 2G wireless networks. According to Verizon, between March 12 and March 19 alone, voice usage was up 25 percent on its network, and total web activity was up 22 percent over the same period. According to Harris Williams, during the same period, Verizon's usage patterns showed a 12 percent increase in demand for bandwidth-intensive streaming video services.

5G Will Accelerate the Fourth Industrial Revolution

Beyond addressing the pressing need for additional bandwidth, 5G should support and engender new consumer and business applications with its near real-time connectivity. Its lower latency and more reliable speeds will allow for faster transmission of massive data streams, even in extreme conditions. With speed expected to be 10x faster (or more) than 4G, 5G will support a broader range of sensors, wearables, and devices.

As 5G is rolled out, artificial intelligence ("AI") will be supercharged, hastening the transformation of applications. Instead of AI living in the cloud (think, slow), AI will become distributed, living on the edge or on IoT devices themselves. When quantum computing is added to the mix, AI on the edge will become a whole new thing.

In the healthcare industry, for example, 5G will support tremendous expansion of preventative and monitoring practices via connected devices, whether wearable or not. While devices are already used to track everything from steps to sleep as well as blood glucose and oxygenation levels, faster 5G speed and greater network reliability will allow for more complex devices, including implanted devices, to provide real-time streaming in and out of patients' bodies. The streamed data will support remote diagnoses, robotic surgery, and telehealth. According to C.B. Insights, the telemedicine market alone is projected to grow to an estimated \$86B by 2025.

Similarly, manufacturing is set to be reinvented with AI and IoT tools to increase efficiency, collect data, and predict outcomes. Augmented reality tools enabled by 5G will allow technicians to maintain and repair smart factories remotely. Slicing techniques (running multiple networks on the same infrastructure) will permit manufacturers to tailor processes, improve adaptability, and accommodate increased volumes of production. Additional manufacturing applications fostered by 5G include continuous monitoring of equipment performance, robotic and autonomous production, and predictive analytics.

Self-driving vehicles provide another example. Automotive manufacturers are racing to develop the first commercially viable autonomous vehicle. 5G and edge computing are requisites for scanning the environment surrounding a vehicle and making safe decisions based on the information scanned. According to telecoms consultancy Analysys Mason, the number of automotive 5G connections is expected to reach 86M by 2027.

Additional applications of 5G in retail, energy, entertainment, agriculture, financial services, and supply chain management abound. The possibilities brought about by a 5G-enabled world will herald the Fourth Industrial Revolution and nurture the Internet of Everything (“IoE”).

Investment Trends

According to a recent PitchBook-NVCA Venture Monitor¹ report, venture capital (“VC”) firms invested \$34.2B globally across 2,298 deals in Q1 2020. Corporate VCs participated in nearly 30 percent of all deals, the highest rate to date. Meanwhile, venture funds raised \$21B across 62 investment vehicles. “There is ample dry powder in the market ready to be put to work in promising startups,” according to PitchBook and NVCA. Late-stage median deal sizes are dropping, but early-stage valuations are still growing. While the IPO market fizzled through the pandemic, and the M&A market suffered as well, reopening is engendering a reinvigoration of those markets. This should drive a whole new wave of investment in businesses powered by 5G.

While the past decade has seen minimal telecommunication infrastructure investment (dominated by Ericsson in Sweden, Nokia in Finland, and Huawei in China), we expect this to change radically

in the decade to come. According to Harris Williams, the telecom services landscape should see significant investment supported by strong tailwinds for long-term buildout and infrastructure maintenance across the value chain, centered around wireless, wireline, and fulfillment. The range of services spans design, engineering, installation, testing, inspection, repair, and maintenance.

As the markets remain highly fragmented, opportunities for vertical integration via mergers and acquisitions should be plentiful. There are relatively few independent platforms of scale, and there is talk that the U.S. government is encouraging the creation of U.S.- and European-based champions.

Meanwhile, institutional venture capitalists and corporate venturing groups scour the planet for new business models that support the rollout of 5G networks. On the 5G start-up investment front in the past year alone, we have seen Mavenir Networks raise \$105.3M, Affirmed Networks raise \$155M, and Altiostar raise \$357.5M, among others.

What It Means for Our Legal Systems

As the world continues to integrate 5G technology into the IoE, the Fourth Industrial Revolution will trigger a plethora of legal questions:

- How will we implement and roll out 5G service?
- Who gets access, when and where?
- How will we pay for it?
- Where will the data go?
- How will we protect the privacy of citizens?
- How will civil society be protected from authoritarianism?
- How will we secure networks from cyber-criminals or state-sponsored cyber-attacks?

5G technology and the Fourth Industrial Revolution that ensues will require our legal, risk, and regulatory environments to evolve and adapt.

Limitless Potential, But Limited Means of Implementation

For 5G to ramp up and become an effective tool for people, significant investments must be made soon, and until 5G becomes omnipresent, legal structures must protect network sharing and infrastructure use, and foster growth. According to the GSMA's annual global capex index, the cost of mobile telecom infrastructures is currently about \$160B annually, and some predict that a 5G infrastructure will require a yearly global spend of \$200B for a period of time. However, 5G's global deployment will not be immediate or streamlined. According to the GSMA, by 2025, only 14 percent of mobile communications will use 5G globally, with 53 percent and 29 percent still relying on 4G and 3G, respectively. The topologies of 5G networks require increased spectrum and greater use of small cells, as well as creating greater dependence on fiber networks. Legal challenges are likely to arise in the face of network sharing and infrastructure requirements.

Moreover, building the infrastructure needed to place 5G in cities will take a significant amount of time. 5G has been touted as the future of technology for years. However, only recently have we seen major progress in creating 5G-enabled cities. This is because 5G frequencies travel far shorter distances than current wireless technologies, thus requiring more cell towers to truly be effective. Telecommunications companies will need to be increasingly inventive in locating 5G towers in cities.

Only when 5G has been fully integrated will we reap the benefits of smart homes, AI, virtual reality devices, drones, and autonomous vehicles. In one scenario, you are away from home and would like to make dinner upon returning, but you have no groceries. You tell your voice-activated assistant to order ingredients. Within seconds, the assistant orders the food from your local supermarket. A drone picks up your order and delivers it safely to your home before you arrive. 5G not only makes this possible, but it makes the process extraordinarily streamlined and efficient.

While the immense potential of 5G can fundamentally change the way we interact with each other and the world, our laws will have to adapt to these rapid changes.

Regulatory Implications of 5G

Since every single part of the global economy will be affected, 5G will not be a niche regulatory issue. From telcos to connected health solution start-ups to retailers deploying machine learning, business models and operations will be reinvented. Investors are currently looking to capitalize on the benefits of a connected future while navigating a complex global trade and security landscape. And governments want to begin deployment, while also reviewing regulatory solutions to privacy, security, and safety concerns.

5G may be the first technology to gain widespread consumer adoption at the same time as businesses uncover the benefits. This means that consumer demand will press regulators and lawyers to enable equality of 5G access for everyone. In addition to legal issues relating to accessing 5G, other legal issues will need to be addressed, such as the reconciliation of the vast distribution of sensitive consumer data (and not just photos and videos) across multiple jurisdictions with different consumer protection laws.

5G is a highly localized system, requiring a high-density network and an array of local cells. This has led to consumer concerns about health risks associated with 5G radio wave frequencies. These concerns could shape the attitudes of local authorities vested with control over planning permissions.

In the past two years, regulators have facilitated negotiations between telcos and landowners concerning siting telco equipment. This has made it economically feasible for telcos to improve coverage, especially in rural areas. In the meantime, larger landowners with legal experience are challenging regulations and encouraging telcos to seek alternative properties. In urban areas, the customer base easily justifies laying fiber, but in rural, less densely populated areas, the cost is harder to recoup. Unless we want continued data inequality, regulation may be needed.

Corporate data has already moved to the cloud. While there are exceptions, the guiding philosophy is that specialists in the movement and storage of data can secure information more effectively than individual companies. The cloud storage market is necessarily stratified, with services like AWS, Azure, and Google delivering off-the-shelf, commoditized data security to a higher standard than most private organizations can achieve internally. Because 5G will unlock entirely new classes of data and new business models, there will likely be further stratification.

5G technology will soon affect several other issues, and companies and investors would do well to remain cognizant of them.

Privacy

5G presents numerous privacy issues that accompany increased connectivity. One arena where privacy issues and 5G technology intersect is in the smart home. As personal voice-activated assistants become prevalent, smart homes will scrape terabytes of data that track our smallest movements, analyze them, and provide outputs based on external factors:

- Who will get access to the data?
- What can they do with the data?
- How can it remain private?
- How can it stay secure?
- Can anonymized data be reverse engineered to allow governments or corporations to spy on citizens?
- Will these technologies destroy civil society?
- Will we become increasingly vulnerable to hacker attacks and loss of privacy?

Because of these challenges, companies developing the platforms must ensure that they are using the most sophisticated data security and privacy protection methods.

Device Regulation

As with most groundbreaking technology, 5G will likely foster and encourage new, innovative devices. Once companies and inventors create new technologies enabled by 5G speeds, they will almost certainly be subject to government regulation. Not only will inventors be faced with the challenges of ensuring that new products conform to existing regulations, but lawmakers will also be required to ensure that regulations stay up to date and relevant. For example, all devices that emit radio frequency (“RF”) radiation are subject to equipment authorization procedures under the Federal Communications Commission’s (“FCC”) rules. Usually, this authorization must be obtained before any RF device may be marketed. To be authorized, a device must go through a rigorous

certification process with its own complications. To a company or inventor with no experience in dealing with the FCC, all of the requirements that go into developing a device or product can be overwhelming and quite confusing. The advice of a lawyer with FCC experience may help in navigating the process.

Law Enforcement

The interaction of law enforcement with 5G also presents implications, and those are likely to increase. For the moment, companies like Apple have opted to side with consumer protection over the priorities of law enforcement. This could change, however, as more situations develop. Companies like Google and Facebook have been more than willing to cooperate with law enforcement when an official request is made. This means that there is an increased likelihood that law enforcement will have access to more data, including personal data, as 5G becomes prevalent. We can expect companies to continually update their policies on data collection and cooperation with law enforcement. Similarly, there will likely be new laws on the rights of law enforcement officers to an individual's data when they are the subject of a criminal investigation. As our world continues to develop through 5G and other devices, companies must anticipate that their relationships with consumers, the public at large, and law enforcement agencies will become increasingly complicated.

Conclusion

5G is here, and it will power a Fourth Industrial Revolution. Investors will deploy vast amounts of dry powder into businesses that leverage the growth of 5G networks to disrupt entire industries, changing the way we interact with each other. 5G will **impact law** and policy at all levels of government and across agencies around the world. We are only now beginning to experience what 5G can do, and the need for legal services in data protection, health, security, and cyber-security, among others, will continue to increase exponentially.

Notes

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1. https://nvca.org/research/pitchbook-nvca-venture-monitor/?utm_source=morning_brew.

