

The Future of Telecommunications: Inspiring the Next Generation of Entrepreneurs, CEOs, and Investors for the Next 30 years.

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The Digital Economy via 5G is currently on track to become the dominate mobile technology worldwide from 2025 and beyond. The future of Mobile will be an all immersive, high definition, user experience, taking us seamlessly from Gigabytes GB = 10^9 of data to Zettabytes ZB = 10^{21} . 5G offers an efficient mobile network which delivers a higher performance in terms of throughput at a reduced investment cost, increased energy efficiency, with the capability of supporting 10 – 100x connected devices and 1000x bandwidth per unit area simultaneously. 5G provides a superfast network comprised of next generation Wi-Fi like Small Cells, offering contiguous wide-area coverage.

From the customer's perspective, 5G offers a truly converged fiber-wireless user experience, accessing sub 1GHz, 3.3GHz – 4.2GHz and prime (26GHz & 40GHz) mmWave bands, with spectral efficiency significantly enhanced to that of 4G, that can support nomadic data access speeds of up to 10Gbps. 5G Wireless consists of a myriad of wireless links connected to a Fiber Optic Cable and/or connected to a mix of application dependent LEO/MEO/GEO Satellites, providing latency of 1 - 10ms on the air interface, limited only by the speed of light.

The Continuously Connected Consumer (CCC)

The underlying drivers for all future Network Operators, both Wired and Wireless, will be the seamless delivery of services from device to device that will truly support the Continuously Connected Consumer (CCC). In order to enable on-demand services anytime, anywhere, with ubiquitous connectivity, there will be a quantum leap in technology advancements and investment opportunities in the following sectors; Cloud Services, Cyber Security, Connected and

Autonomous Vehicles, Battery Design, Software Defined Networks (SDN), Network Function Virtualization (NFV), Artificial Intelligence (AI) and Machine to Machine (M2M), Smart Homes & Cities, Wind/Solar Power Solutions, Green Data Centers, and LEO Satellites for Climate & Space Situational Awareness (SSA) related applications and Mobile backhaul interoperability. These technology subsectors will be required to effectively deliver, manage, store, and parse our personal and professional, high bandwidth content across multiple devices.

Digital tech essential to pandemic management and recovery

As we have seen throughout the pandemic, the internet has become an essential part of our daily lives. According to the Pew Research Organization, www.pewresearch.org, 90% of Americans polled stated that the internet became an essential lifeline, and that 40% used the internet for new and different purposes related to social and economic activities. The Pandemic has and will continue to foster an explosion of Business to Business (BtB) and Business to Consumer (BtC) applications in the areas of eHealth, eAgriculture, eEducation, eUtilities, eMfg, eGov't, eCommerce, Fintech and future IoT scenarios, where network services or applications will be dynamically defined and managed by the client interface.

Since the start of the pandemic in March of 2020, it has been the Mobile and Communication Networks across all technologies that have kept the world connected; all of which continue to operate astonishingly well under extremely adverse conditions, which are well beyond their initial network design. The Covid Pandemic has brought to the forefront the critical importance of 5G and the role that leading-edge telecommunication technologies play in keeping societies, economies, and governments functioning during a global crisis.

Governments worldwide have now placed digital technologies at the center of their recovery plans to rebuild their economies in a post pandemic world. As an example, the EU has established a 750B Euro recovery fund to improve economic resiliency and deliver green, digital advancements. Additionally, the USA has recently allocated \$65B USD of its new Infrastructure Bill to funding the deployment of internet access services to unserved and underserved areas in the US and its territories. The issues hindering private sector investment in 4G and 5G Mobile have now become of mutual concern to governments, fostering a dialog regarding Public – Private Partnerships, where it makes economic sense, in both developed and developing markets which include topics such as network redundancy, artificial competition, spectrum fees, cost efficient spectrum allocations, and revenue generation through excessive fees and taxes. Governments and the private sector are now jointly working together on a global basis in order to remove the barriers to 4G and 5G network deployment by harmonizing regulatory issues involving planning procedures, site acquisition, site co-location and the upgrade of base stations.

Positive outlook for mobile in developing markets

In 2025 there will be 5.7B or 70% worldwide penetration rate of Unique Mobile Subscribers (UMS), representing +5M more UMS's than the 5.2B or 67% of those using mobile in 2020, with two thirds of the growth coming from under penetrated markets in Asia and Sub-Saharan Africa.

Sim Card Connections will grow from 8.1B or 103% in 2020 to 8.8B or 107% penetration in 2025. Mobile Broadband Penetration will grow from 4.0B or 51% in 2020 to 5.0B or 60% worldwide in 2025, according to the GSMA. Additionally, the ITU estimates that approximately 4.9 billion people or 63% of the world's population are using the Internet in 2021, leaving 2.9B people offline worldwide. Of the roughly half billion subscriber adds by 2025, there will be a rebalancing of consumer purchasing power, technology, and innovation towards the developing world as Asia adds (188M subs), Sub-Saharan Africa (120M), MENA (54M), Latin America (47M), and Greater China (43M) become the dominant engines of subscriber growth, far outpacing North America adds (15M), Europe (8M) and the CIS (6m).

Developing Markets will foster the rise of entrepreneurship and the engineering required to create new business models and opportunities in these countries. Many of these technology solutions will be developed out of necessity and will then be exported to Developed Markets worldwide. (A classic example is the advent of the Mobile Money industry in Africa, which has now been implemented in most Developed Markets.) This allows for enterprise innovation, increased earnings, improved education, health, and welfare to families in the developing world.

The drivers of a cultural shift in the TMT sector

It has been estimated by the TMT industry that the pandemic has fast forwarded consumer acceptance worldwide of online innovative technology-based solutions by 10 years, as seen with mass adoption of applications such as Teledoc, Zoom and DocuSign. The demand for connected technology solutions across a plethora of devices and enterprise verticals equates to an increased demand for a skilled & technically oriented labor force, regardless of race, gender, or sexual orientation. The Telecoms, Media, Technology and Satellite (TMTS) industries offers unbridled Science, Technology, Engineering, & Math (STEM) opportunities for young entrepreneurs, especially women, which were not available 30 years ago primarily due to the advent of the internet, and prevailing social and cultural norms.

While new opportunities exist within TMTS, there is still a long road ahead to achieve parity for women and minorities in the executive tech workplace. The Institutional Share Holders Services (ISS) produced a study of the 2019 boards of directors of 2175 of the Russell 3000 companies and found that 45% of all new board seats were awarded to women that year, yet women only occupied a total of 19% of all board seats. The study also found that only 15% of new directors were ethnically diverse, while 39.9% of all Americans are non-white. The Carlyle Group conducted a study of their portfolio companies and found that boards with 2 or more directors that identified as Black, Hispanic, Asian, or Female, experienced average earnings of 12.3% over the previous 3-year period, while portfolio companies with no diverse directors experienced an average of 0.5% earnings growth over the same period. MSCI, a leading investment research firm, conducted an Environment, Social, and Governance (ESG) study, which determined that boards with a higher percentage of women had fewer instances of fraud, accounting controversy, bribery, and corruption. Studies from McKinsey, Citi, and Deloitte all reported comparable results when analyzing the profitability, work culture and competitive strength of their clients who have

ethnically diverse boards. These findings all allude to the same conclusion, that gender diverse boards may equate to stronger financial performance of their respective firms.

Diversity means good business

Increased profitability is something that all TMTS Industry Leaders strive to achieve, in this highly competitive and capital-intensive industry. It is up to us as the Investors, Board Members and C level leaders of this fast-paced industry to consciously embrace the positive economic impact that women and minorities bring to leadership roles. To do so, tech companies need to embrace the multi-cultural perspectives in our shifting global mobile workplace and remain focused on the target market for specific industry verticals. Telecoms, Media, Technology and Satellite (TMTS) companies of today must embrace diversity and be cognizant of the ESG issues impacting their sectors if they wish to raise funding from Venture Capital, Private Equity or Commercial Markets in the future and become or remain industry icons in the next 30 years to come.



Laureen is an Alumna of the IFC (World Bank), where she was the Principal TMT Adviser, in the Global Telecoms, Media & Technology Investment Sector. Currently she is the Founder & CEO of Extelcon, LLC, providing technical and commercial oversight to the Investment Banking Community, Regulators, and TMT & Satellite industry sectors as Lender's Technical Adviser for multi-billion USD telecoms & technology companies. Prior to joining the IFC, Laureen was with Alcatel-Lucent (now Nokia), as Vice President 4G/LTE Strategy & Innovation. She is a founding Director and International Board Member of Global Telecommunications Woman's Network (GTWN), and is an Investment Committee member of Rising Tides, a European based Angel Investment Fund, providing

financing to female led IoT start-up companies. Additionally, she is a member of the STEM Committee at Rochester Institute of Technology and recipient of the 2021 Distinguished Alumni Award from the College of Engineering Technology. Laureen holds an MSc in Telecommunications Engineering from Rochester Institute of Technology, and an MBA from Long Island University in New York.