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From 5G to 6G: Patent and Legal Challenges in the New Tech Era

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The global momentum behind 5G continues to build up as its adoption accelerates. At the 2024 Mobile World Congress (MWC) in Barcelona, GSMA Intelligence reported that, as of early 2024, “261 operators across 101 countries have launched commercial 5G services. The number of 5G connections worldwide reached 1.6 billion by the end of 2023, with projections indicating a rise to 5.5 billion by 2030.”[1]

The development and deployment of 5G have been remarkably transformative, driven by several key factors. First, the expansion of network coverage in both urban and rural areas has significantly broadened accessibility. Second, 5G offers enhanced connectivity with notably faster speeds, low latency, advanced IoT capabilities, and integrated artificial intelligence (AI), all underpinned by new standards that have established a robust infrastructure. This infrastructure has revolutionized mobile broadband communications, even in areas with high device density. As a result, 5G has unlocked a wide range of innovative applications and services, from smart cities and autonomous vehicles to remote healthcare and immersive entertainment experiences.

As revolutionary as 5G has been, 6G is set to bring even more groundbreaking changes. The technological advances in 6G involve the use of terahertz frequencies, allowing data rates up to 1 terabit per second—a leap from the gigabit speeds of 5G. The latest tests demonstrate speeds thousands of times faster than current 5G.[2] Moreover, 6G promises lower latency and more reliable connections, enabling immersive augmented reality (AR) and virtual reality (VR) experiences, advanced robotics, and AI-driven automation across various sectors.

On that note, 6G technology will integrate AI even more deeply into the network, creating highly intelligent, adaptive systems. AI is already enhancing several solutions and influencing standards adoption, and 6G will support much higher device densities, ensuring seamless connectivity for a vast array of devices simultaneously.

Another notable feature of 6G will be its ability to create digital twins: precise digital replicas of physical objects. This capability will revolutionize industries by enabling real-time monitoring, diagnostics, and simulations.

Sustainability is also a priority in 6G development. The focus is on creating energy-efficient

networks through optimized architectures, renewable energy, and materials that reduce energy consumption. Security and privacy are being emphasized, as well, with advanced encryption and AI-driven threat detection, especially as we transition into the AI era.

In response to those technological shifts, several jurisdictions have started to adapt their regulations. The USPTO, for instance, has updated its guidelines on patent subject matter eligibility to include explicitly artificial intelligence. The EU AI Act, enacted this year, also sets comprehensive standards for AI deployment, with a strong emphasis on risk management and ethical considerations.

Brazil is making strides in AI regulation, as well. Bills 146/2024 and 2338/2023 aim to balance innovation with safeguards against AI misuse, including punitive measures for AI-related digital crimes. This proactive approach mirrors global trends in anticipating the challenges of AI and advanced technology.

The journey from 5G to 6G, expected to unfold around 2030, will undoubtedly be marked by the emergence of groundbreaking technologies. Innovations in AI, machine learning, and edge computing will be crucial in realizing the full potential of 6G. As with 5G and other previous generations, standards will be crucial to ensure interoperability, security, and efficient spectrum use.

Underscoring the race to secure intellectual property for emerging technologies, a recent analysis shows that 6G patent filings are increasing worldwide, with a 46% growth in recent years.[3] China leads with around 40% of filings, followed by the United States (35%), Japan (10%), Europe (9%), and South Korea (5%). However, these numbers vary when examining specific technological areas. For instance, in reconfigurable intelligent surface (RIS) technologies, South Korea leads with around 35% of patent-related filings, followed by China and the U.S.[4] In terahertz technologies, China holds 45% of the filings, trailed by the U.S. with 30% and South Korea with 11%.[5]

In Brazil, 6G initiatives are emerging, driven by primarily by government and national research institutions initiatives. The federal government recently allocated over R$180 million (approx. USD 33 million) to support the development of 5G, 6G, and Open RAN technologies, aiming to enhance Brazil’s competitiveness in telecom innovations. Meanwhile, research institutions have expanded support for 6G research at various universities.[6] Reinforcing these initiatives, in October 2024, Brazil formalized a strategic partnership with India for joint innovation in 6G research and standardization and speed up implementation.[7]

As Brazil navigates the journey from 5G to 6G, it stands at a pivotal moment in the global telecom race. While those investments and partnerships underscore the country’s commitment to technological advancement, the country will face critical challenges to become more appealing for investors. Brazil will have not only to foster a robust domestic patent ecosystem but also ensure that its legal frameworks are agile enough to adapt to new technological complexities, including those posed by AI-driven advancements and data privacy issues inherent to 6G networks. By strategically addressing these patent and regulatory obstacles, Brazil can position itself as a competitive force in the next wave of connectivity, driving technological growth and safeguarding its investments in a globally competitive landscape.

[1] https://www.mwcbarcelona.com/news/5g-momentum and

https://www.qualcomm.com/news/onq/2024/02/mwc-2024-wireless-innovations-enabling-intelligent-computing-everywhere

[2] https://guardian.ng/technology/telecoms/new-6g-speed-5000-times-faster-than-5g/

[3] https://www.globaldata.com/media/disruptor/globaldata-highlights-6g-evolution-via-patent-and-fdi-activities/

[4] https://www.questel.com/resourcehub/6g-technology-patent-dynamics-ris/

[5] https://www.maxval.com/blog/patents-and-pitfalls-examining-the-6g-landscape/

[6] https://ieeexplore.ieee.org/abstract/document/9083775 (Brazil 6G Project – An Approach to Build a National-wise Framework for 6G Networks)

[7] https://telesintese.com.br/6g-brasil-e-india-assinam-acordo-para-desenvolver-tecnologia/

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