

6G: A Quantum Leap or a Quagmire for Global Connectivity?

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Navigating the 6G Horizon: Between Boundless Potential and Grounded Pragmatism

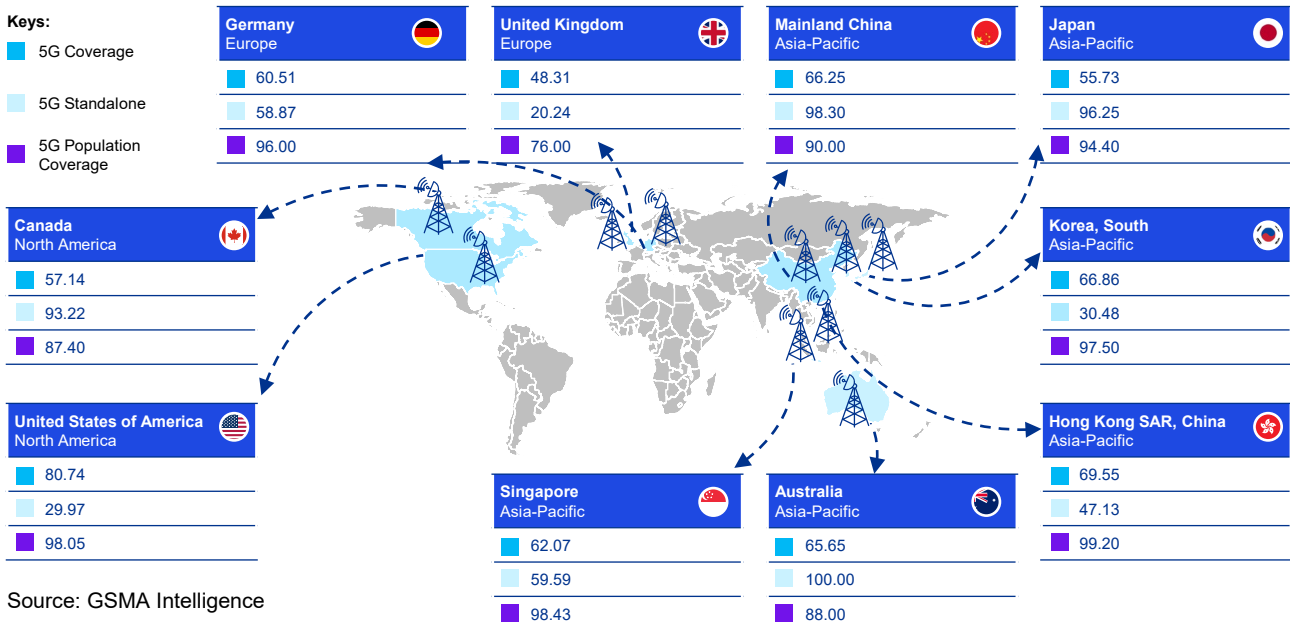
As the digital landscape evolves with the advent of 6G, the UK is at a strategic crossroads: Should we follow the siren call of new technology for its own sake, or should we focus on consolidating our digital infrastructure for lasting innovation? The forthcoming 6G revolution offers more than a mere increase in connectivity speed; it heralds a new age where technology is deeply integrated into our societal fabric and economic framework.

The UK must take the helm in bolstering the essential underpinnings of our digital realm. It is critical to not simply acknowledge, but to actively catalyse investment in fundamental areas: enhancing telecom towers to meet rising data demands, evolving data centres into robust hubs of computation, extending fibre networks for steadfast connectivity, deploying satellites to achieve universal access, and empowering the ICT industry to support the growth of digital economy. Elevating these sectors to a place of strategic prominence is vital for the UK to secure a leadership position in the imminent 6G era, thereby enabling an infrastructure that can ignite ground breaking innovation, economic enrichment, and societal benefit.



A Patchwork of Progress: The uneven strides of 5G

The deployment of 5G has unfolded in a manner akin to a quilt work – vibrant patches here, gaping holes there. In the UK, a nation grappling with infrastructural and regulatory constraints, the dream of ubiquitous coverage remains elusive. “Despite the UK’s early ambitions, the full bloom of 5G has been stymied, bottlenecked by investment shortfalls and policy quagmires,” notes an industry analyst from a **global major telco**, illustrating the missed economic windfall, particularly for SMEs. Contrastingly, nations like USA, China and South Korea are sprinting ahead, leveraging aggressive government support and robust investments. This uneven rollout paints a stark backdrop for 6G, spotlighting the need for shrewd planning and solid investment.











Industry sentiments

With the ink barely dry on 5G blueprints, the global telecom industry is setting its sights on 6G. This next-gen technology, still in its embryonic stage, promises speeds and capacities that could dwarf those of its predecessor, facilitating innovations such as holographic communications and AI-driven networks. Yet, beneath this shimmering promise lies a web of apprehension among telecom operators. The specter of another financial burden – without the promise of tangible returns – casts a long shadow.

At the recent 6G Symposium, the atmosphere was tinged not with the electrifying charge of innovation but with an air of apprehension. Telecom players, usually at the forefront of cheerleading technological leaps, voiced a unified concern: the financial albatross of yet another generational upgrade. Vodafone UK's chief networks officer's plea for a pivot towards software-centric advancements underscores a broader industry yearning for sustainability over spectacle.

In facing the dual challenges of technological uncertainty and financial constraints, a phased approach to 6G adoption – prioritizing software-driven upgrades and leveraging existing 5G assets – can reduce risks. Furthermore, fostering an ecosystem of innovation through collaborative R&D projects, both domestically and globally, can distribute costs and amplify benefits. Emphasizing regulatory reforms that encourage experimentation and early deployments can also provide clarity and reduce hesitancy among stakeholders.

	5G	6G
 Speed/ Peak data rate	Theoretical speeds of up to 10 Gbps (over 30 times faster than 4G).	Reports of 206.25 Gbps achieved in a lab environment in China.
 Frequency bands	Uses higher frequency bands than previous generations (low-band, mid-band, high-band).	Expected to operate in the 30 to 300 GHz waves, providing better coverage and reliability.
 Technology	Multiple access platforms and multi-layer network.	Enabling cyber-physical continuum.
 Energy efficiency	Achieved more energy efficiency over 4G.	Expected to be much more energy efficient.
 Satellite integration	Not capable.	Added capability.
 Technical differences	eMBB, URLLC, mMTC, eMBB+, URLLC+, mMTC+.	Immersive communication, global broadband, omnipresent IoT, special-temporal services, compute-AI services, critical services.



Global perspective

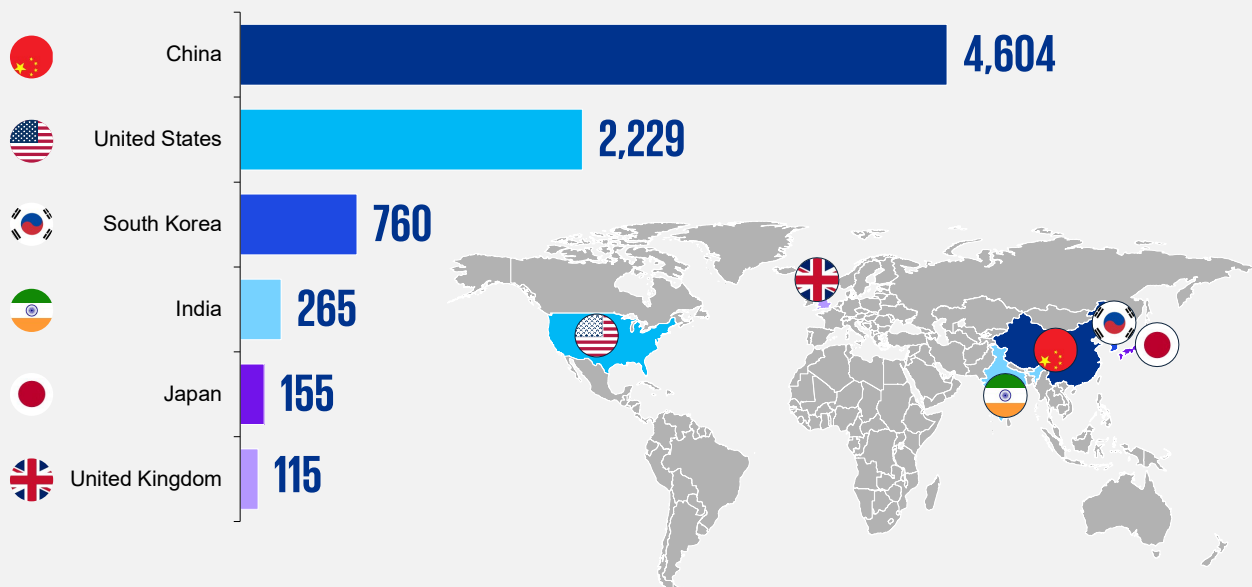
The chessboard of global telecom is being reset with the advent of 6G. In this intricate game of strategic foresight and technological prowess, should the UK's role not just to participate, but to lead – navigating through the mist of uncertainty with innovation, policy acumen, and collaborative spirit?

China's aggressive push into 6G research and development, supported by substantial state backing, positions it as a formidable contender. "China's early investment in 6G is a clear signal of its intention to lead the next technological era," asserts a researcher from GSMA Intelligence. In February 2024, China allegedly launched the first satellite to test 6G architecture¹.

Conversely, Western nations, spearheaded by the US and including the UK, are forging alliances, emphasizing collaboration over confrontation. In October 2023, UK, US, Japan, Australia and Canada entered The Global Coalition on Telecommunications (GCOT) to support investment in 6G technology, information sharing and international outreach along with setting the 6G benchmarks. Through this, UKRI announced a £70 million investment towards these new technologies.

To reach the 6G goal, countries are investing heavily in R&D. The R&D spread has China at 40.5% of total global patent fillings for 6G followed by USA at 35.2%, Japan at 9%, and Europe at 8.9%.² The patent race underscores a burgeoning geo-technological rivalry. Will the UK be able to leverage its research and innovation ecosystem to bridge gaps and foster international partnerships?

The Global Race for 6G Dominance: Patent Landscapes



Source: Uswitch, April, 2023

(1) <https://dig.watch/updates/us-and-allies-back-shared-principles-for-6g>.

(2) <https://asia.nikkei.com/Business/Telecommunication/China-accounts-for-40-of-6G-patent-applications-survey>



The UK's Ambitions in the 6G arena

The UK's vision for 6G, as outlined in its Wireless Infrastructure Strategy, seeks to leverage the nation's strengths in research, policy, and international collaboration. With a commitment of £100 million towards future telecom technologies, the strategy underscores the imperative of global partnerships and homegrown innovation. A spokesperson from the Department for Science, Innovation, and Technology highlights, "Our investment in 6G underscores the UK's ambition to be at the forefront of telecom innovation, ensuring our competitive edge in the digital age."

DSIT (Department for Science, Innovation and Technology) has also invested in future telecoms research via the government's 5G Supply Chain Diversification Strategy, supported by a £250 million Open Networks R&D Fund. This includes £28 million for the Future Open Networks Research Challenge (FONRC), with winning bids from Bristol, Surrey, and York universities collaborating with major telecoms companies to develop future networks like 6G.

Governments and universities aren't the only ones taking steps to invest in research and development (R&D) to advance 6G technology. There are also a number of tech-based companies working on developing the technology, standards and protocols to enable 6G to operate at greater speeds than 5G. Ericsson3 is charging into the UK's 6G race with multifaceted commitments through major investments with a £1 billion R&D centre in Sweden, launched in June 2022 and £15 million for the 'West Midlands 5G Living Lab' in March 2023. It is also a founding member of the 'UK5G Innovation Programme' and actively collaborates with BT, Vodafone, universities, and the '6GUK' consortium, propelling the UK towards 6G evolution.



The future implications of 6G

As 6G begins to take shape, its implications are vast and varied. Beyond the technological marvels it promises, 6G stands to influence global economic patterns, security architectures, and societal norms. The integration of terrestrial and satellite networks, for instance, could close the pervasive digital divide, while also posing new challenges in terms of privacy and cyber-security.



Infrastructure investment:

The development of 6G will require significant investment in infrastructure. Building a denser network of base stations and increased fiber optic connectivity will be a monumental task demanding collaboration between stakeholders.



Spectrum acquisition:

6G will require a portfolio of spectrum bands to achieve the coverage and capacity needed for its use cases. This will necessitate understanding the physics of high-frequency signals and efficiently managing the spatial needs within devices to accommodate multiple wireless chips and hardware components.



Digital access:

6G aims to address the "cell edge" problem, where users in challenging radio conditions experience poor service despite being in nominally covered areas. By utilising emerging technologies such as cell-free networks and reconfigurable surfaces, 6G intends to minimize service level disparities, ensuring consistent connectivity across various environments and locations.



Innovation:

6G will drive limitless technological innovations, fostering the creation and adoption of applications we don't even know about yet. Engineers and researchers will have to tackle a multitude of challenges, one of which includes developing software essential for automating the management of distributed and programmable networks.



Cross-sector collaboration:

Developing 6G networks will require consensus among operator, carriers and technology providers. This necessary industry collaboration will spark exciting cross-disciplinary innovation, setting the stage for 6G through extensive research, development and innovation.

Moreover, 6G's environmental impact, particularly in terms of energy consumption and electronic waste, warrants careful consideration. As such, the journey towards 6G is not just about harnessing technological innovation but also about navigating the ethical, economic, and environmental quandaries that accompany such advancements.



Looking ahead

As we chart a course towards the 6G frontier, the UK stands at a pivotal juncture: the choice is ours to either chase transient technological trends or to lay a solid digital groundwork that underpins enduring innovation. The advent of 6G offers more than high-speed connectivity; it heralds a new era where technology is intricately woven into the fabric of society and economy.



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To carve out a competitive advantage, the UK must spearhead initiatives to fortify the fundamental infrastructure of our digital landscape. It is imperative to not only recognize but also to vigorously drive investments in key areas: telecom towers for escalating data capacity, data centres as nexuses of computing power, expansive fibre networks for robust connectivity, satellites to ensure comprehensive coverage, and ICT sector that undergird the digital economy. Elevating these subsectors from mere considerations to strategic priorities is crucial for the UK to emerge as a global frontrunner in the 6G epoch, leveraging a strong infrastructure as a catalyst for breakthrough innovation, economic prosperity, and societal progress.

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