Over the horizon technologies and legal innovation: emerging use cases for India Inc

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In the movie *The Terminator*, a sentient artificial intelligence (AI) called Skynet becomes self-aware and triggers a chain of events that nearly wipes out humanity. What seemed like a dystopian fantasy in 1984, is now part of serious policy and legal discussions around the world.

India stands at the edge of an era that will be defined by technologies that, until recently, belonged to the realm of science fiction. These 'over the horizon' technologies, such as cyborgs, ambient intelligence, digital twins, etc, are culminating from the convergence of breakthrough foundational technologies (such as AI, robotics, quantum computing, genetic engineering, synthetic biology, the Internet of Things (IoT), Augmented Reality/Virtual Reality (AR/VR), etc) are no longer future aspirations. They are fast becoming tangible realities with serious implications for the society at large. As they make their way into corporate boardrooms, research and development (R&D) labs and government missions, they will be reshaping the way businesses operate and how legal systems respond.

The Indian legal system has historically played a catalytic role in supporting and enabling technological and business innovation across sectors, ranging from **Aadhaar** to q-commerce (quick commerce) to the Chandrayaan and Mangalyaan space missions. As use cases around over-the-horizon technologies come about, the Indian legal community will play a pivotal role, not only in shaping forward-looking regulations to govern these innovations, but also in interpreting them within the contours of existing legal frameworks. Mere regulatory compliance will no longer suffice.

The future of legal services will demand a multidisciplinary approach, one that integrates core laws and regulations with a nuanced understanding of technological advancements. Clients are increasingly expected to seek counsel that goes beyond traditional legal questions, requiring lawyers to be conversant not only with regulatory frameworks but also with emerging technologies and their strategic implications. In this context, legal professionals must proactively engage with technological trends, develop techno-legal literacy and adapt to a landscape where law, policy and science intersect with increasing frequency and urgency.

Quantum computing, for instance, is poised to upend conventional computing by solving problems previously considered unsolvable. In 2023, India launched its **National Quantum Mission** with an ambitious budget allocation of INR60bn (approximately USD 697m), signalling not just intent, but urgency. The goal is clear, to develop quantum technologies in areas such as secure communication, simulation, and advanced sensing. Startups like **Qulabs.ai** are at the forefront of this movement, experimenting with quantum machine learning and encryption protocols tailored for sectors like finance and defence.

At the same time, spatial computing, an intersection of physical and digital spaces using AR, VR and sensor networks, is quietly transforming Indian industries. From **Lenskart's virtual try-on** features to **Tata Elxsi's immersive design simulations**, Indian enterprises are embracing the metaverse and digital twins, making their processes more interactive and data-driven. While this shift is still in its infancy, its potential impact on real estate, logistics, healthcare and education is undeniable.

Neurotechnology, which enables direct interaction between the human nervous system and machines, is starting to emerge from clinical environments and into consumer tech. Take **Neuphony**, for example, a Gurgaon-based startup offering electroencephalography-enabled wearable devices designed to monitor cognitive states. In an era where mental health is taking center stage, such tech is revolutionising how we approach productivity, mindfulness and even education.

Then there's synthetic biology – arguably the most interdisciplinary of them all. Combining biology, engineering and computing, synthetic biology allows us to program cells like we program computers. Indian firms like **Sea6 Energy** are developing biofuels and agricultural inputs through genetically engineered algae. Others are working on designer microbes to accelerate drug discovery or eliminate environmental toxins. As climate concerns mount and global food security becomes a priority, synthetic biology offers new hope – though not without significant ethical and regulatory dilemmas.

As India experiments with and adopts these technologies, the ripple effects will be felt in courtrooms and law offices across the country. Legal practitioners may initially grapple with questions like the legality of products based on over-the-horizon technologies, because we don't have any precedents at the moment. What happens when quantum computing renders today's encryption model obsolete? How do we legislate against the misuse of neurodata collected from consumer-grade brainwave monitors? Is a synthetic organism created by an AI patentable under current Indian intellectual property laws? These are not hypothetical musings, they are real questions being asked by clients and regulators alike.

From now onwards, the legal profession, which has historically been reactive, will be forced into a proactive role. It will have to fundamentally reimagine how law is practiced. It will have to be realigned with new verticals dedicated to tech advisory, often populated by lawyers with dual degrees in STEM (science, technology, engineering and maths) and law. Top-tier law firms are already hiring data scientists, neuroscientists and engineers not just as consultants, but as integral parts of their legal teams. The Economic Times recently **reported** on this trend, highlighting how multidisciplinary talent is now considered essential rather than optional.

An equally robust level of engagement is expected from the legislative and regulatory side. The government cannot afford to remain a passive observer as these technologies take hold. Instead, it must proactively establish expert committees and inter-ministerial task forces comprising of legal experts, bureaucrats, scientists, ethicists, technologists, civil society representatives and industry stakeholders. Their mandates would be to study global best practices, anticipate legal and ethical challenges, and prepare socially responsible frameworks for technically sound laws of the future. Building regulatory sandboxes, inviting public consultations and engaging with international standard-setting bodies will be crucial steps for India.

Policy engagement is another area witnessing a transformation. Some Indian law firms are not just interpreting law, they are shaping it. Through whitepapers, case studies, consultation with government bodies and foreign law firm collaborations, lawyers are contributing to the policy discourse on quantum regulation, AI governance and data ethics. For instance, with the recent rollout of India's **Digital Personal Data Protection Act 2023**, law firms had to quickly align their counsel with emerging expectations around privacy and neurodata, especially in health tech and wearables.

There are also competitive reasons why law firms cannot afford to be bystanders. For one, regulatory landscapes are becoming as much of a market differentiator as innovation itself. Businesses want to know not just what the law is today, but what the law will be tomorrow. On that basis, they want to decide return on investment on their business endeavours. Anticipatory legal frameworks, those that account for emerging tech scenarios, are fast becoming a core client expectation.

In conclusion, over-the-horizon technologies are not on the horizon anymore, they are already among us and spreading at a rapid rate. Their disruptive potential is immense, but so is their promise. For India Inc, these technologies open up unprecedented avenues for growth and leadership in the global innovation race. For legal professionals, they offer a chance to move beyond compliance and become true enablers of innovation.

The next decade will be defined not just by what we build with these technologies, but how we regulate, govern and evolve with them. Law, when practiced with a foresight and flexibility, can become the compass that steers India's innovation economy through uncharted waters. And in that journey, the legal profession must not lag, it must lead.