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What if the world agreed on a charter for brain-computer interfaces (BCIs)?

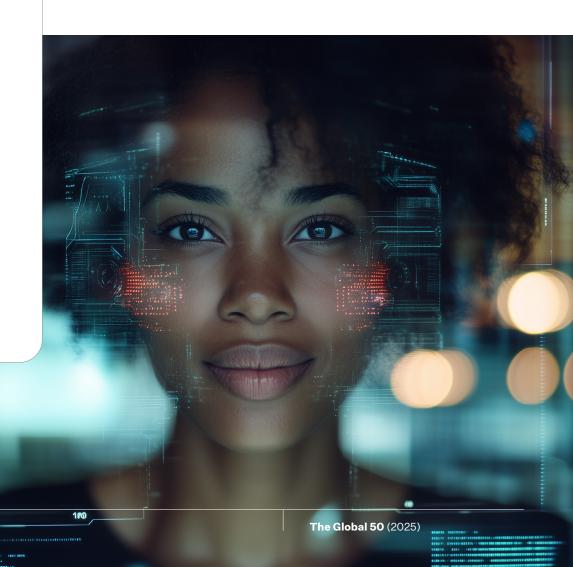
Neural Charter

Within Reach

Transitional

Visionary

A global brain-computer interface (BCI) charter and framework ensure global alignment through openness, safety standards, and responsible deployment, enabling ethical implementation and equitable access worldwide.



UNCERTAINTIES

Collaboration, Values

MEGATREND (Most significant)

Future Humanity

TRENDS

Cross-Sectoral Partnerships Data Protection & Privacy International Collaboration Neuroscience Open Data

TECHNOLOGIES

Advanced Connectivity Brain–Computer Interfaces (BCI) Human–Machine Interfaces

SECTORS IMPACTED

All Sectors

KEYWORDS

Cognitive Divide Cybersecurity Global Charters/MOUs Neural Data Privacy Regulations/Governance The global BCI market is projected to grow from

\$1.74 billion 10 2022 to \$6.2 billion

by 2030, **with a compound** annual growth rate of **17.5%**

WHY IT MATTERS TODAY

There is increased interest in BCIs. The global BCI market is projected to grow from \$1.74 billion in 2022 to \$6.2 billion by 2030, with a compound annual growth rate of 17.5%.¹²⁰³ Applications of BCIs are growing¹²⁰⁴ and include gaming,¹²⁰⁵ integration with Al¹²⁰⁶ and the metaverse,¹²⁰⁷ and treatment of strokes,¹²⁰⁸ spinal cord injuries,¹²⁰⁹ brain injuries,¹²¹⁰ and ALS (amyotrophic lateral sclerosis).¹²¹¹ The United States is leading advances in BCIs due to significant R&D funding, followed by Europe and emerging economies such as Brazil, India and South Africa.¹²¹²

With BCIs come critical challenges, including clarity in classification. While BCIs offer transformative benefits for healthcare and human enhancement, they present unique vulnerabilities in data security, with neural data requiring stringent privacy safeguards.¹²¹³ At the same time, more organisations are facing shortages of critical cybersecurity professionals (42% of organisations in 2022 versus 53% in 2023).¹²¹⁴ In terms of classification, while non-invasive (external) BCIs are currently more common, invasive (implanted) BCIs raise more concerns for society about their psychological and neurophysiological impacts.¹²¹⁵ An alternative classification divides BCIs into those used for therapeutic purposes and those designed to augment humans' capabilities.¹²¹⁶

BCIs risk creating a new cognitive divide between the world's rich and poor. With just over a third of the global population – approximately 2.85 billion people¹²¹⁷ – still lacking basic internet access, the introduction of sophisticated BCIs threatens to exacerbate existing digital divides. As these devices promise revolutionary medical treatments and cognitive enhancements, there is a real risk of creating an unprecedented gap between those who can access and pay for these technologies and those who cannot.¹²¹⁸

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The Global 50 (2025)

BENEFITS

awareness.

RISKS

adoption.

Clear regulatory guidelines for

BCI; is supporting of equitable access; protection of individuals'

rights; reduced risk of societal

exploitation; increased public

Privacy breaches exposing

reject BCIs; uneven global

neural data; global regulatory framework incompatibility; unintended harm of those who

harm; minimised risk of

THE OPPORTUNITY

Anticipating breakthroughs in BCI technology, a global charter and framework aligns implementation of BCIs across nations, focusing on three pillars: open research, safety standards, and responsible deployment.

The open research pillar includes a commitment to open access publications on BCI research and clinical trials, along with knowledge sharing and the registration of individuals equipped with BCIs. Algorithms, paired with robust privacy protocols for sensitive data, are shared solely with the signatories to ensure tamper-proof and fail-safe designs.

The safety standards pillar establishes rigorous hardware certification, software security, and ethical safeguards. It emphasises privacy protection, anti-discrimination measures, and cybersecurity to minimise risks such as brain tapping (uncovering confidential brain data), feedback manipulation, and adversarial attacks (manipulating the machine learning model in BCIs).¹²¹⁹

The responsible deployment pillar addresses diverse global contexts with guidelines for assessing risk, aligning local regulations, and monitoring societal impact. A global BCI governance body coordinates these efforts through regional committees, national regulatory bodies, and a technical advisory board comprising experts in neuroscience, ethics and cybersecurity.

The framework focuses on three key pillars: openness, safety standards, and responsible deployment

