## What if biomimicry made cybersecurity more resilient?

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# Nature Shield

Within Reach | **Transitional** | Visionary

A biomimetic cybersecurity framework enhances digital ecosystems' ability to detect, respond to, and evolve against cyberthreats.

**UNCERTAINTIES**

Systems, Technology

**MEGATREND** (Most significant)

Technological Vulnerabilities

**TRENDS**

Biomimicry
Cybersecurity
Government Agility
International Collaboration
Mobilising Innovation

**TECHNOLOGIES**

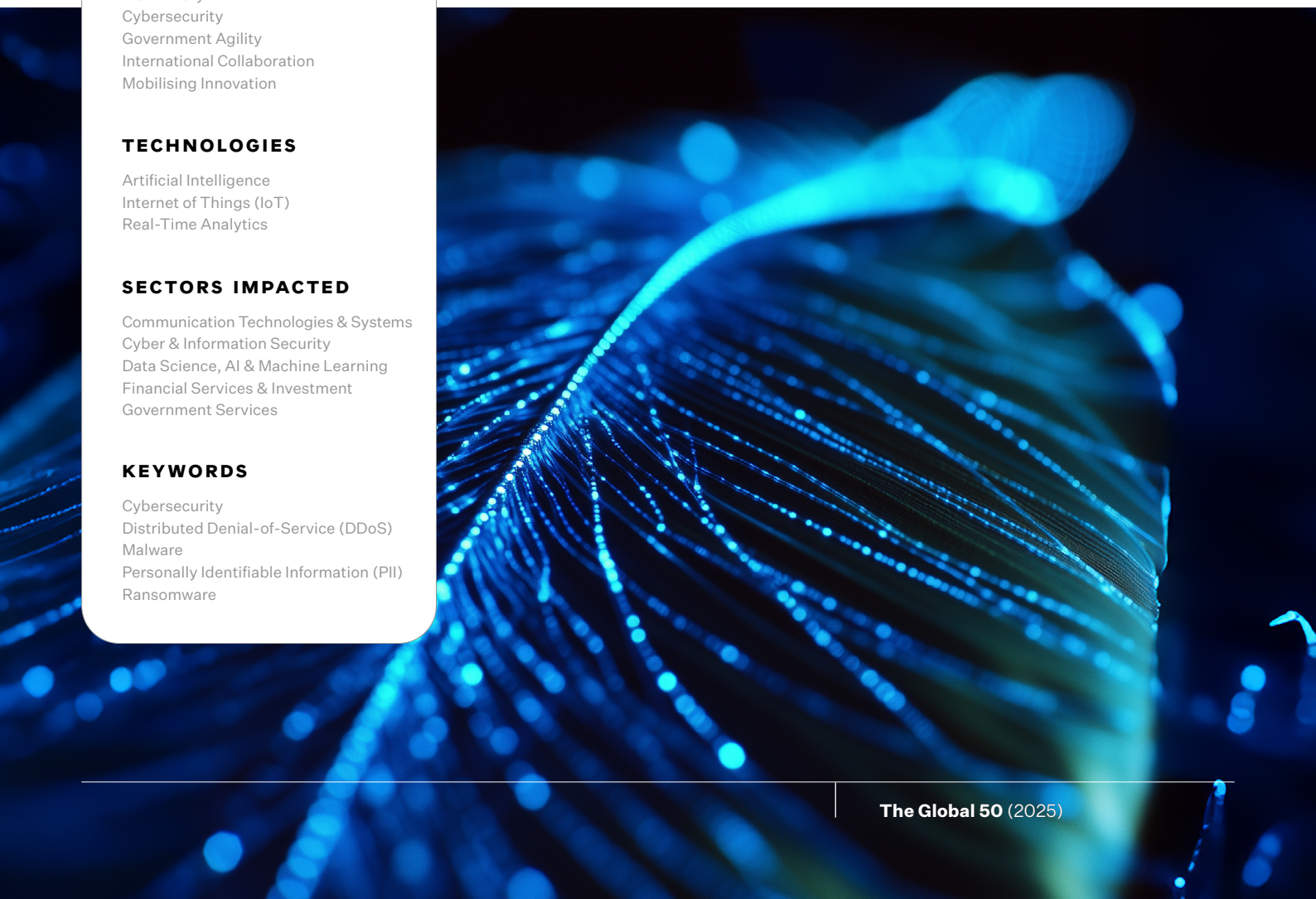
Artificial Intelligence
Internet of Things (IoT)
Real-Time Analytics

**SECTORS IMPACTED**

Communication Technologies & Systems
Cyber & Information Security
Data Science, AI & Machine Learning
Financial Services & Investment
Government Services

**KEYWORDS**

Cybersecurity
Distributed Denial-of-Service (DDoS)
Malware
Personally Identifiable Information (PII)
Ransomware



## WHY IT MATTERS TODAY

**The United States** reported the highest average breach cost, at

**$9.36 million**

followed by the **Middle East**

**$8.75 million**

Seventy-two percent of those surveyed in the Global Cybersecurity Outlook (GCO) confirm that there was a rise in cyber risks.[1104] AI is increasingly used in cyberattacks, which are also becoming more large scale, automated, and intelligent. In a survey of more than 800 IT and security leaders around the globe, 95% agreed that cyberattacks are more sophisticated, with 51% having experienced AI-powered attacks, 36% deepfake and supply chain attacks, 35% cloud-jacking, and 34% Internet of Things (IoT) and 5G attacks.[1105]

Cybercrime costs and needs continue to rise. Globally, the average cost of a data breach increased by 10% in 2024, reaching $4.88 million.[1106] This increase is the largest since the COVID-19 pandemic, driven by business disruption and post-breach expenses, with nearly 46% of breaches involving personally identifiable information.[1107] The United States reported the highest average breach cost, at $9.36 million, followed by the Middle East ($8.75 million),[1108] while healthcare remains the costliest industry at $9.77 million per breach.[1109] Beyond the financial impact, cybercrime erodes trust, damages reputations,[1110] causes stress for victims, and polarises communities.[1111]

**Globally,**
**the average cost of**
**a data breach** increased by

# ↑10%

in 2023, reaching

# $4.88 million

The average in the Middle East is nearly twice as high, $8.75 million, while healthcare is the costliest industry at $9.77 million per breach

## THE OPPORTUNITY

A biomimetic cybersecurity framework mirrors nature's strategies to create resilient, adaptive systems capable of learning and evolving against cybersecurity threats. By leveraging principles such as self-organisation, decentralisation and rapid information sharing, it enhances detection and response using techniques such as particle swarm optimisation.[1112]

Integrating interdisciplinary insights from biology and environmental science, the framework sets global standards for dynamic, efficient cybersecurity,[1113] replacing static measures with evolving protocols that optimise resources and improve adaptability to an ever-changing threat landscape.

**BENEFITS**

Enhanced digital security; autonomous optimisation and adaptation to novel threats; interdisciplinary application.

**RISKS**

Unforeseen vulnerabilities; outpacing of human oversight by rapid adaptation; increased complexity and ambiguity.

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