

HCLTech Trends 2024

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Enterprise Technology Office (ETO)



Contents

- 02** Foreword
- 03** Executive Summary
- 04** Top 10 Strategic Trends for 2024 and Beyond
- 46** What's Next?
- 52** Tech Trends 2024: An Overview
- 52** Tech Trends 2024: The Methodology
- 54** Our Approach to Identifying the Top 10 Trends for 2024
- 56** About Enterprise Technology Office
- 57** References

Foreword



Kalyan Kumar

Global CTO and Head,
Ecosystems, HCLTech
and CPO, HCLSoftware

“Organizations must champion continuous learning in order to empower their teams with the skills required to navigate ever-evolving customer demands.”

In a rapidly evolving digital age, the significance of emerging technologies and the boundless opportunities they present cannot be overstated. To capitalize on opportunities and leverage these innovations, organizations must adopt a more proactive stance that enables them to not only react faster but also spot opportunities and drive change.

As we navigate another year of digital evolution, myriad technologies are poised to reshape the business environment: Generative AI is revolutionizing industries by automating tasks and enabling swift decision-making, quantum computing is solving complex problems with unprecedented speed, sustainability technologies are promoting environmental conservation, fifth-generation wireless technology is promising high-speed connectivity and more.

This underscores the need to urgently upskill the workforce. Organizations must champion continuous learning in order to empower their teams with the skills required to navigate ever-evolving customer demands. The commitment to upskill, rather preskill, is now pivotal amid the disruption that accompanies progress, fostering agility, boosting productivity and ensuring sustainable business growth.

Yet, this technology journey demands not only innovation but also ethical stewardship. As we march into a new era, responsible and ethical deployment should become our guiding force. A steadfast commitment to these principles will ensure that when enterprises embrace emerging technologies, they do so with a conscious dedication to societal and environmental considerations.

The future, as it unfolds, will be not merely a yardstick of technological growth but also a testament to our collective progress. Together we can navigate toward a more connected, efficient and sustainable world – a future where the fusion of technology and ethical governance paves the way for unparalleled industry leadership and enduring business prosperity.

With that in mind, here are the top 10 technology trends to watch out for in 2024. These insights can assist your organization in prioritizing future technology adoption, ensuring your organization is well-prepared for the year and actively engaged with your competitors in the race to stay ahead.

Executive Summary

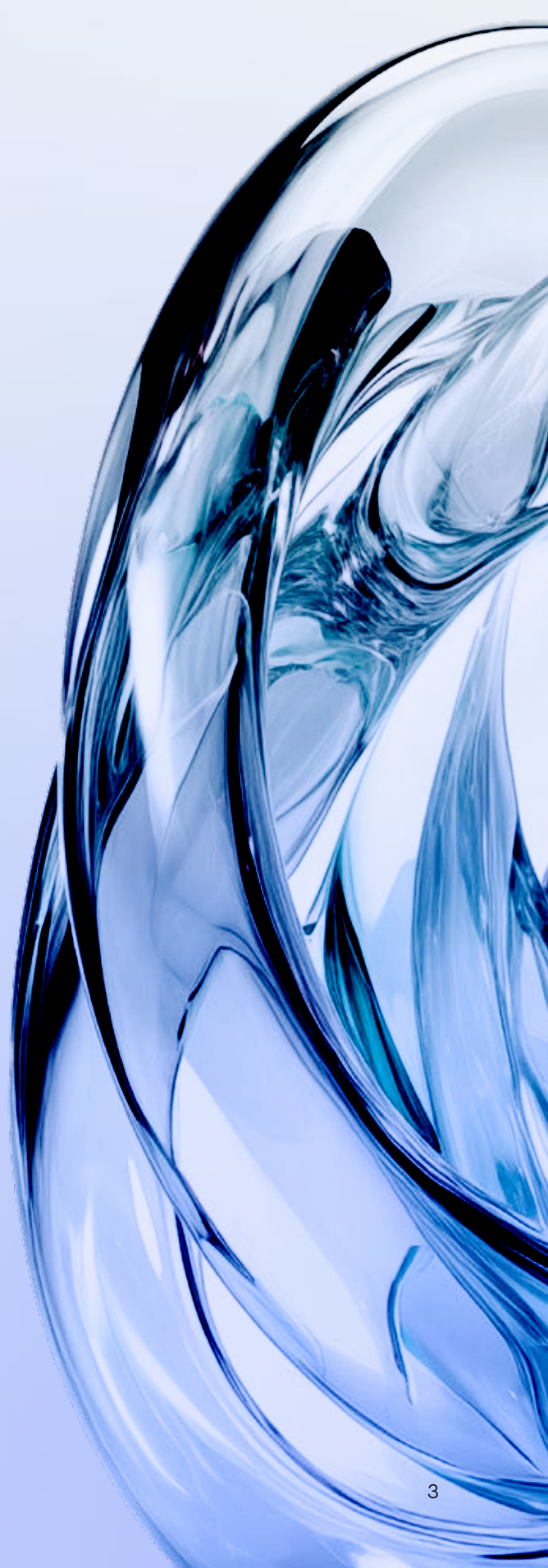
We find ourselves in an era of rapid technological evolution, where each passing moment heralds new innovations and transformative changes. The momentum of this innovation is poised to intensify in the years to come, emphasizing the need for enterprises to cultivate resilience. In times of uncertainty, the key lies in acquiring the knowledge to adopt, adapt and be adept.

For almost a decade, HCLTech's Enterprise Technology Office (ETO) has remained steadfast in its commitment to uncovering emerging technologies across various sectors, highlighting the factors that influence innovation and its adoption. We are proud to present yet another installment of our annual exploration, a dedicated effort to delve into the world's top tech trends that will not only define the upcoming year but also lay the foundation for business transformation.

This collaborative report sheds light on trends that enhance adaptability, speed and scalability in the dynamic tech environment. More than 70 experts, comprising academics, global forums, industry leaders and futurists in the Open Innovation ecosystem, have played a pivotal role in shaping this comprehensive perspective. Their industry insights contribute to a better understanding of technology's evolving landscape, equipping decision-makers with the information they need to navigate the year with confidence.

In our pursuit of business growth, we go beyond just listing trends. Our approach involves the quantitative and qualitative assessments of each technology in five crucial elements: profitability, adoptability, agility, community and macrocosmic impact. We first introduce 'The ETO Mesh of Possibilities,' a tool that measures how each technology performs across these parameters.

This report serves as a compass for businesses navigating the ever-evolving tech landscape. It provides actionable insights that allow organizations to recalibrate their priorities and strategies, ultimately steering them toward successful ventures.



Top 10 Strategic Trends for 2024 and Beyond

Technology Deep Dive





01

Mega Trend: AI

Stage: Disruption

A trifecta of rapid advancements, widespread adoption and limitless opportunities in artificial intelligence

Overview

The global artificial intelligence landscape within organizations has attained- a near-equilibrium where disruptions are embraced, existing tech is harnessed and emerging trends are eagerly pursued. The attainment of this dynamic shift is largely accorded to the emergence of enterprise generative AI which has further propelled the need and advancements in ethical AI.

28%

Respondents believe GenAI will be transformational for enterprises

48%

Respondents believe GenAI will be most useful in content generation

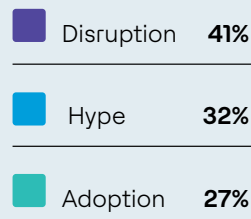
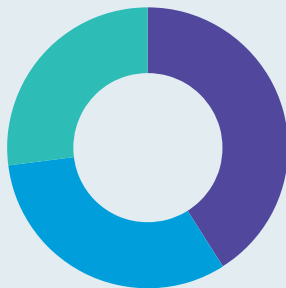
55%

Respondents believe GenAI is leading disruption in AI

58%

Respondents believe Machine Learning (ML) is leading adoption in AI

Mega trend landscape - AI



The AI Landscape: Understanding the Trends

Top 3 AI Micro Trends:

Ethical AI

Generative AI

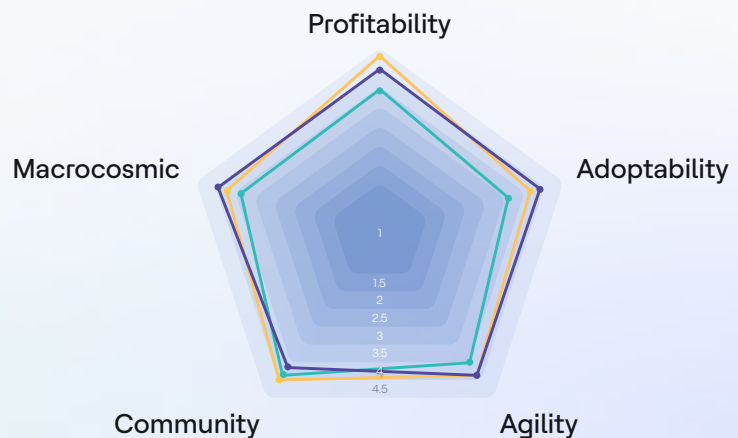
Machine Learning

ETO Mesh of Possibilities: Key Findings

Ethical Ai

GenAi

Machine Learning



Profitability

Generative AI has the highest impact on profitability backed by conventional technologies, implying it is here to stay.

Adoptability

The current adoption quotient is highest for Machine Learning (ML), primarily due to its long-term prior existence.

Community

All three micro trends are somewhat similar here. However, Ethical AI is one of the leading trends, indicating it will have a larger societal impact.

Macrocosmic

All three micro trends in AI have the potential to create a sustainable impact in the future by developing, optimizing and promoting sustainable practices.

AI Micro Trend: Ethical AI

Happening Hype

Ethical AI is on course to become mainstream with rapid advancements in AI systems.

Why Ethical AI?

- As AI algorithms become more complex and influential, there is a growing concern about biases, transparency, accountability and the potential for unintended consequences.
- As AI continues to impact society, ethical considerations are crucial for fostering trust, mitigating risks and ensuring that the benefits of AI are equitably distributed.

Market Size

Ethical AI is projected to reach
\$5.4B
by 2032

48%
CAGR

Why is Ethical AI in the Hype Stage?

- The agility quotient is relatively low, leading to hesitation in adoption.
- Values/benefits are multi-fold, so it is becoming increasingly popular.
- Organizations have started expressing their interest, indicating growing awareness and implying that it will soon shift gears toward adoption.

Challenges for Adoption

- New and complex, making integration challenging due to limited familiarity.
- Limited access to high-quality data, which might lead to biased AI outcomes.
- Dearth of clear strategies can result in ineffective implementations.
- Compliance with evolving regulations can be difficult, varying by region and industry.
- Brings cybersecurity risks that need mitigation to protect data and systems.



AI Micro Trend: Generative AI

Daring Disruptor

Generative AI meets the enterprise

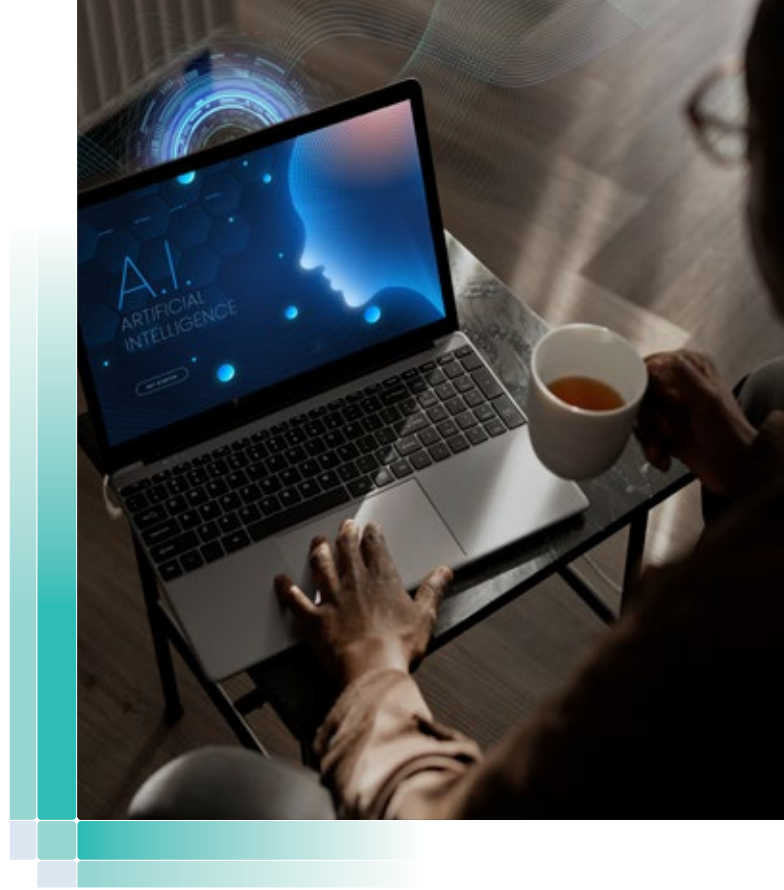
Why is Generative AI in the Disruption Stage?

- Among the top three micro trends, GenAI has the highest impact on potential revenue streams.
- It also has the highest impact on socio-cultural and geopolitical environments.
- Enterprises are witnessing the application of GenAI in innovative ways, revolutionizing and pushing the boundaries in previously unexplored areas.

Market Size

GenAI is projected to reach
\$119B
by 2032

29%
CAGR



Business Value

- Creativity amplification: Ability to create content at scale, reducing the need for extensive manual work.
- Time and cost savings: It automates tasks, saving time and operational costs.
- Hyper-personalization: It customizes experiences by analyzing data to provide personalized recommendations and support.
- Enhanced efficiency: It automates complex processes, optimizing workflows, increasing productivity and providing data-driven insights.

Drivers for Adoption

- Competitive edge: Empowers organizations with unique content and innovative solutions.
- Customer engagement: Personalized content leads to increased customer satisfaction, loyalty and higher engagement rates.
- Innovation: Supports rapid experimentation, product development and idea exploration, fostering innovation.



02

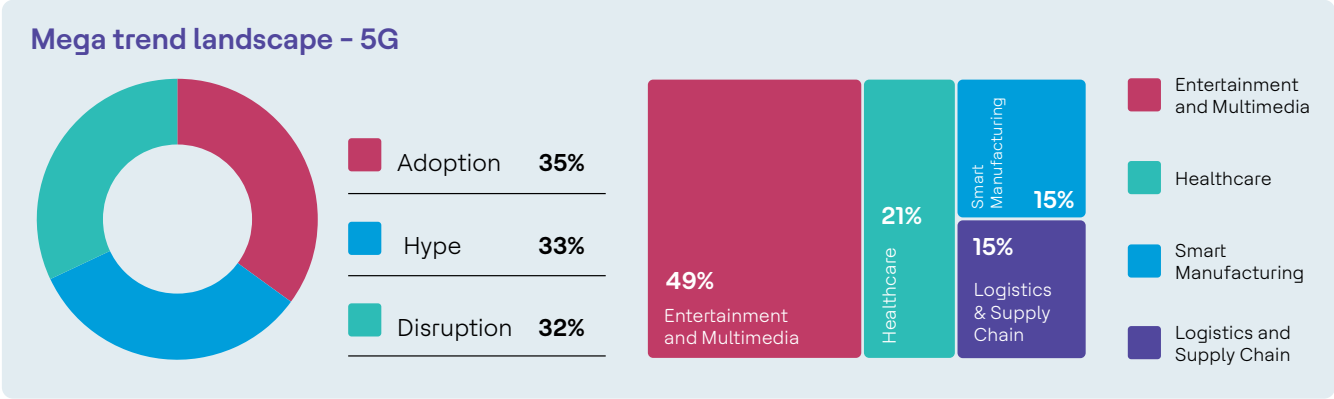
Mega Trend: 5G

Stage: Adoption

Wireless, secure and private networks driving the next wave of 5G adoption

Overview

As 5G marches towards its growth stage, we find a balanced industry perspective indicative of a mature and informed stance. With 3 elements, viz. wireless, secure and personalized network, taking centre stage this year, 5G is becoming a ubiquitous trend.

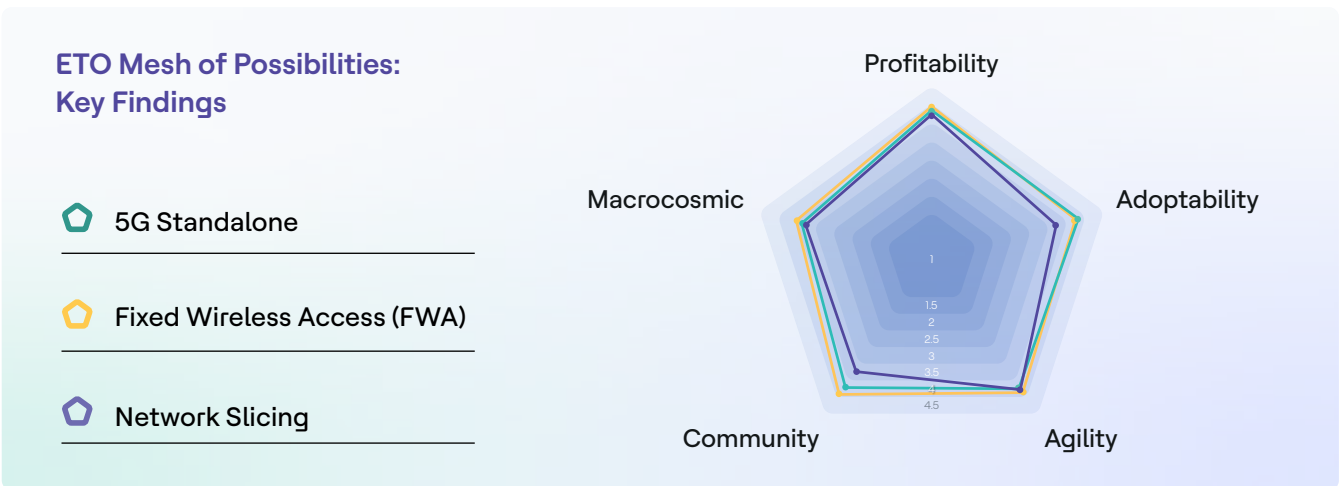


The 5G Landscape: Understanding the Trends

Top 3 5G Micro Trends:

- Network Slicing
- 5G Standalone
- Fixed Wireless Access (FWA)

“The Entertainment and Multimedia sector is bound to witness the most impact when it comes to advancements made in the 5G sector.”



Profitability

The three micro trends each show strong profitability within the mature 5G landscape, substantially affecting potential revenue.

Adoptability

5G Standalone leads in adoption, indicating strong market interest, followed by Fixed Wireless Access, which is poised for widespread adoption.

Agility

This is where all three micro trends seemingly converge, depicting their promise to solve current and emerging problems quickly and efficiently.

Macrocosmic

All three micro trends in 5G have the potential to create a sustainable impact in the future, with FWA leading the charter.

5G Micro Trend: Network Slicing

Happening Hype

Network Slicing to enhance flexibility and scalability in 5G

Why Network Slicing?

- The rollout of 5G enables a myriad of applications, from AR to smart cities and IoT, challenging conventional network structures.
- Network slicing addresses this by segmenting the network into customizable slices tailored to specific demands for bandwidth, latency and security, ensuring flexible adaptation to the diverse needs of the digital era.

Market Size

Network Slicing is projected to reach
\$13.6B
by 2030

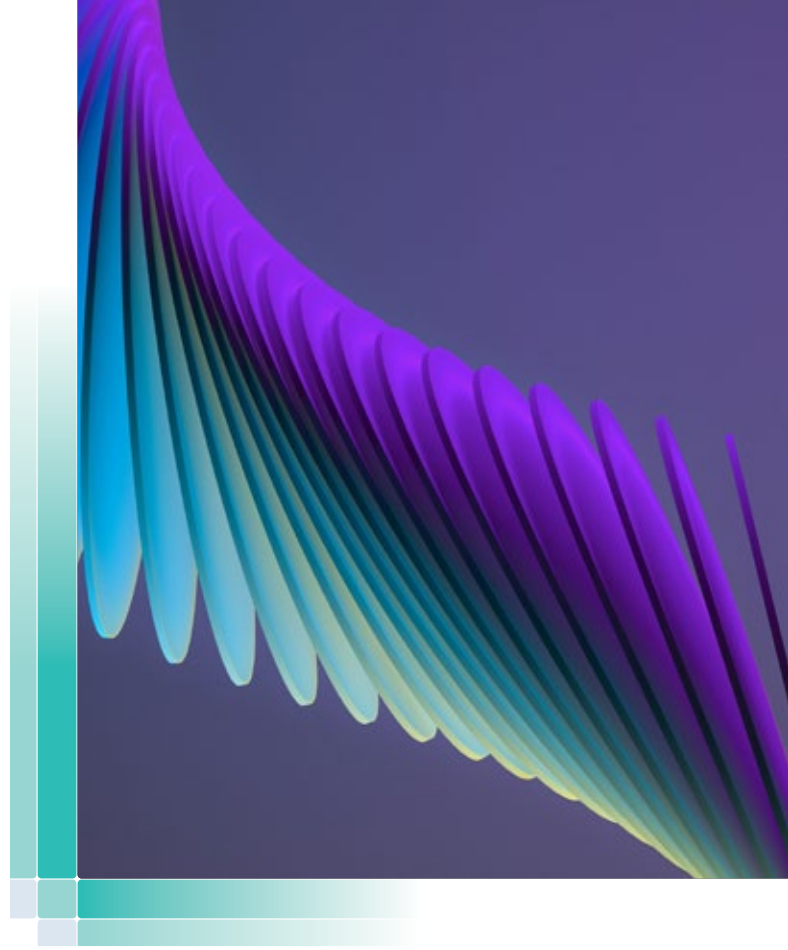
51.1%
CAGR

Why is Network Slicing in the Hype Stage?

- Good profitability, agility and macrocosmic quotient but still far from mass adoption.
- Offers a chance to deliver dynamic tailored services to customers.
- Organizations have started maximizing the profitability quotient that can be churned out of 5G, leading the shift from hype to disruption and adoption.

Challenges for Adoption

- Complexity: Implementing and managing network slices can be complex, requiring sophisticated orchestration and automation systems.
- Resource allocation: Allocating and managing network resources for various slices to meet their specific requirements can be challenging, especially during peak usage times.
- Regulatory restrictions: Regulatory restrictions or changes in regulations could impact the deployment and operation of network slices.



5G Micro Trend: Fixed Wireless Access (FWA)

Daring Disruptor

FWA disrupting the 5G landscape with quick deployment and high performance

Why is FWA in the Disruption Stage?

- Among all three micro trends, FWA has the most well-rounded spider web with the highest impact on potential revenue streams.
- It also has one of the highest impacts on direct profitability quotient. While FWA has moved from the hype to the realization stage, it is still waiting for large-scale implementation. Hence, it remains in the disruption category for this year.

Market Size

FWA is projected to reach
\$153B
by 2028

39%
CAGR



Business Value

- Low latency: Makes FWA suitable for real-time applications like online gaming, video conferencing and IoT devices.
- Enhanced mobility: Can support on-the-go connectivity for vehicles, offering internet access for cars, buses and other mobile applications.
- Quick disaster recovery: In disaster-stricken areas where traditional infrastructure is damaged or unavailable, it can quickly establish connectivity for emergency services and affected communities.

Drivers for Adoption

- Rising dependency on connected devices: Distant learning, autonomous driving, multi-user gaming, video conferencing, live streaming, telemedicine and AR have led to demand increase.
- Integration of AI and IoT: Resulting in greater usage of high-speed internet across industries, integration of other emerging technologies is propelling demand.



03

Mega Trend: Metaverse

Stage: Hype

An interoperable, secure
and affordable Phygital
reality awaiting its dawn

Overview

With notable strides witnessed in the last one year there is still room for growth and improvement in order to drive this trend into disruption and adoption phase. Innovations in display quality, tracking accuracy, haptic feedback and computing power are continuously evolving. NFTs are also playing a significant role today to monetize virtual assets and making them increasingly realistic. Not to mention about the rising digital identity concerns which need to be addressed in current stage.

53%

Respondents believe real-time integrations is a big challenge in XR

36%

Respondents believe XR will drive Total Experience priorities in the near term

27%

Respondents believe Ethics and Governance is the next big thing

69%

Respondents believe XR Ethics and Governance are in the hype stage

The Metaverse Landscape: Understanding the Trends

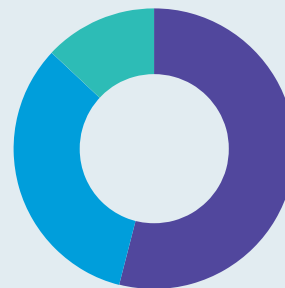
Top 3 Metaverse Micro Trends:

Extended Reality (AR/VR/MR)

Spatial Web

XR Ethics

Mega trend landscape - Metaverse



Hype **54%**

Disruption **33%**

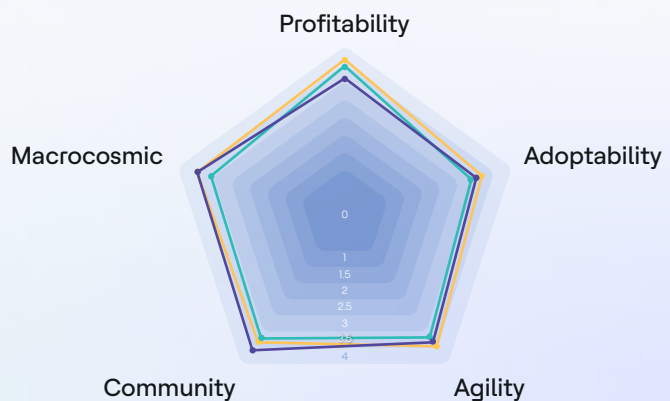
Adoption **13%**

ETO Mesh of Possibilities: Key Findings

Extended Reality (AR/VR/MR)

Spatial Web

XR Ethics



Profitability

Profitability tops Spatial Web and XR. XR Ethics is catching up, implying that its implantation will have a positive impact on enterprises' revenue.

Adoptability

Not that high compared to other parameters, mainly because the overall concept of metaverse is in its early exploration stage.

Agility

All three micro trends are fairly agile, implying their effectiveness in addressing current and future market needs.

Community

This quotient for XR Ethics is the highest, implying its wider-scale impact on society. This is primarily due to the trend of making the metaverse more accessible, fair and secure.

Metaverse Micro Trend: XR Ethics and Governance

Happening Hype

Growing awareness and acknowledgement of ethical concerns are becoming integrated with the evolution of XR technologies

Why XR Ethics and Governance?

- The deeply immersive nature of XR experiences raises concerns related to privacy, data and persona security and the potential for misuse.
- By addressing ethical concerns and implementing robust governance, the XR industry can foster public trust, encourage innovation and navigate the evolving landscape while minimizing potential risks and societal challenges.

Key Insight

69%

Respondents say XR Ethics is in the hype stage or witnessing new advancements.



Why is XR Ethics and Governance in the Hype Stage?

- Impact on community and macrocosmic factors are the highest, despite being at the lower end on profitability and adoptability.
- The metaverse is likely to capture non-verbal data, like physiological responses, enabling AI to deduce mental reactions, raising concerns about "meaningful data consent."

Challenges for Adoption

- Lack of universal standards: Establishing consensus among diverse stakeholders regarding what constitutes ethical practices is challenging.
- Balancing innovation and regulation: Overregulation could stifle creativity and hinder progress, while inadequate regulation may lead to ethical breaches.
- Cross-sectorial complexity: Developing overarching rules and regulations that address the diverse sector needs presents a challenge.

Metaverse Micro Trend: Extended Reality (XR)

Daring Disruptor

XR transcending physical boundaries to forge real-time, interactive and shared experiences in a digital realm

Why is XR in the Disruption Stage?

- Extended Reality (XR) excels across all five performance parameters, showcasing its strong potential for feasible demonstrations.
- Progress in hardware and software will likely lead to XR's expanded use, and with increasing innovation, it is poised to enter the mainstream.

Market Size

XR is projected to reach
\$111.5B
by 2028

22.7%
CAGR



Business Value

- Improved engagement: Immersive capability keeps users engaged.
- Realistic simulations: Users can gain experience in a safe and controlled virtual setting.
- Cost savings: XR can reduce the need for physical resources and travel.
- Enhanced visualization: XR allows for interactive, visual representation of data.

Drivers for Adoption

- Maturity of innovative technologies: These are key enablers of more immersive environments.
- Social and cultural shifts: Rising interest in virtual socializing and innovative education propels XR adoption, with enterprise tools evolving to offer immersive experiences.
- Diverse applications: Beyond gaming, use of XR across enterprise enhances immersive tech appeal with applications like digital twins.



04

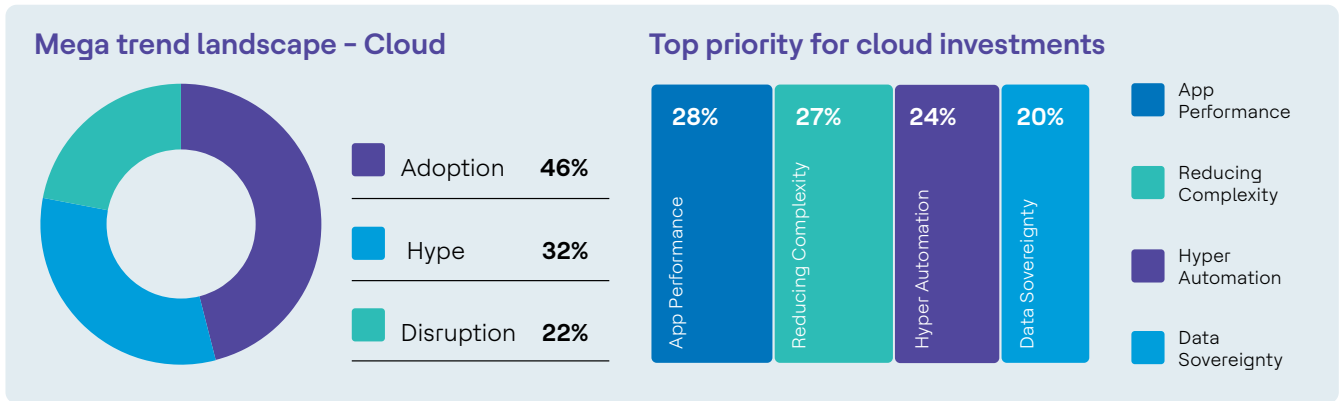
Mega Trend: Cloud

Stage: Adoption

Navigating the cloud
landscape with data
sovereignty, agility
and confidence

Overview

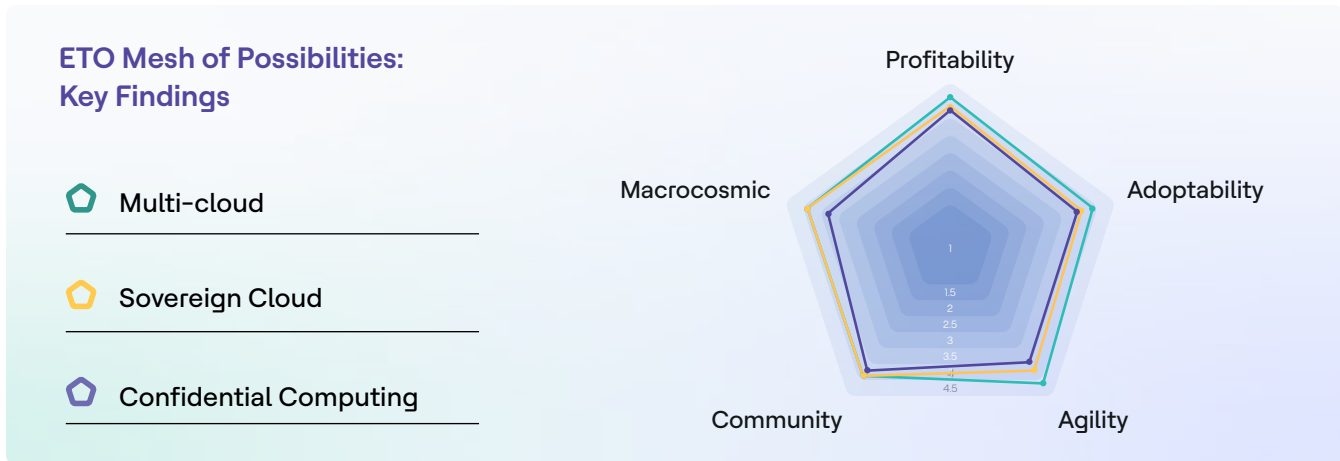
In today's rapidly evolving digital world, organizations face the challenge of balancing the benefits of cloud computing with the need to maintain data sovereignty, agility, and resilience. As more sensitive data is stored and processed in the cloud, ensuring data sovereignty, the right of governments and individuals to control their own data, is paramount. Organizations must also be agile enough to adapt to changing business needs and technological advancements, while also being resilient to cyber attacks and other disruptions.



The Cloud Landscape: Understanding the Trends

Top 3 Cloud Micro Trends:

- Multi-cloud
- Sovereign Cloud
- Confidential Computing



Profitability

The highest is for Multi-cloud, denoting the trend's potential to impact revenue streams directly, primarily due to the fact that enterprises don't rely on single cloud providers, thereby reducing dependencies.

Adoptability

The overall adoptability parameter for all three micro trends is in succession with Multi-cloud leading the charter and Sovereign Cloud and Confidential Computing lagging not far behind. This denotes how the overall cloud landscape is on its way to enterprise-wide adoption.

Community

The community quotient for Sovereign Cloud and Confidential Computing is quite notable due to its ability to secure data from unauthorized access and stay compliant with regulations.

Cloud Micro Trend: Confidential Computing

Happening Hype

Confidential Computing securing
the cloud's blind spots

Why Confidential Computing?

- Traditional cloud computing models have inherent security limitations, as data is decrypted and accessible to cloud providers during processing, exposing data to potential insider threats and data breaches.
- Confidential computing addresses this by isolating data within a trusted execution environment.

Market Size

Confidential Computing is projected to reach **\$184.5B** by 2032

46.8%
CAGR

Why is Confidential Computing in the Hype Stage?

- Almost at-par community factor indicates that it has a good appeal to quickly gain traction for mass adoption.
- Likely to become a critical element of cloud security.
- 34% of respondents suggest that confidential computing is the next big thing for ensuring security and innovation.

Challenges for Adoption

- Implementing confidential computing can be complex, potentially leading to security vulnerabilities.
- Enabling confidentiality can introduce performance issues due to encryption and decryption.
- Specialized hardware or trusted execution environments may be needed, which can be costly and not universally available.
- Ensuring compatibility with existing systems can be challenging.

Cloud Micro Trend: Sovereign Cloud

Daring Disruptor

Fostering digital independence and data autonomy with Sovereign Cloud

Why is Sovereign Cloud in the Disruption Stage?

- Being well-rounded in the mesh of possibilities makes it a good candidate for moving past the current disruption stage into the adoption stage.
- Organizations are embracing it for its alignment with stringent data regulations and ability to address specific business needs, emphasizing security and compliance.

Market Size

Sovereign Cloud is projected to reach
\$99B
by 2030

17.75%
CAGR



Business Value

- Enhanced security: Often operated by government or trusted entities, offering a higher level of security and protection for sensitive data and applications.
- Regulatory compliance: Helps organizations meet regulatory requirements by ensuring data is stored and processed within legal boundaries.
- Reduced latency and improved performance for applications that require real-time data processing.
- Disaster recovery and business continuity solutions ensure data availability even in the face of disasters or disruptions.

Drivers for Adoption

- Increased customer demand for data protection and transparency: Organizations that adopt sovereign cloud can build trust and confidence among customers.
- Geopolitical tensions and risks of data extraterritoriality: Sovereign cloud ensures that data remains subject to local laws and regulations, reducing the risk of data access by foreign governments.



05

Mega Trend: Sustainability

Stage: Adoption

Driving paradigm shift
towards a low-carbon,
eco-conscious future

Overview

Sustainability is not just a trend; it is an imperative for the survival of our planet and the well-being of future generations. The growing awareness of climate change and its far-reaching consequences has propelled sustainability to the forefront of global discussions, driving a paradigm shift towards a low-carbon, eco-conscious future. The transition to a low-carbon economy will require continued innovation, collaboration and policy support, but the potential rewards are immense – a healthier planet, a more resilient society, and a brighter future for generations to come.

59%

Respondents believe Green IT will accelerate sustainability goals

57%

Respondents believe supply chain track and trace is already in adoption

45%

Respondents believe the initiatives implemented will help achieve sustainability goals within 1 year

22%

Respondents suggested green supply chain would accelerate achieving sustainability goals

The Sustainability Landscape: Understanding the Trends

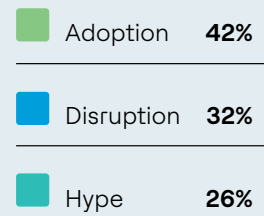
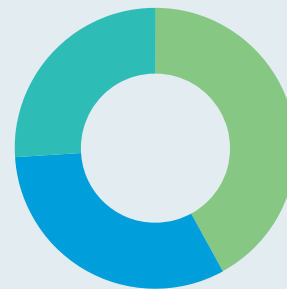
Top 3 Sustainability Micro Trends:

Supply Chain Track and Trace

Decarbonization

Green IT

Mega trend landscape - Sustainability

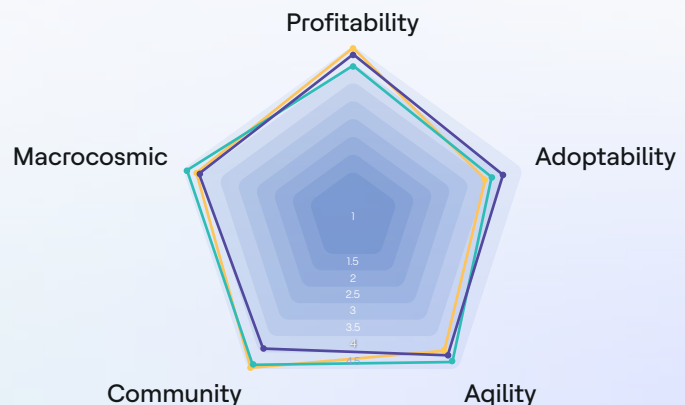


ETO Mesh of Possibilities: Key Findings

Supply Chain Track and Trace

Decarbonization

Green IT



Profitability

Profitability peaks with Decarbonization but is also strong in Green IT and Supply Chain Track and Trace, indicating that sustainability is now closely integrated with enterprise revenue streams.

Adoptability

The overall adoptability quotient is highest for Supply Chain Track and Trace followed by Green IT. This is indicative of how fast sustainability tech is becoming mainstream along with company operations.

Community

The highest impact on larger sustainable development goals and the planet is coming from Green IT, primarily due to its ability to address the planetary needs from multiple angles (energy, air, water, etc.) rather than just one.

Sustainability Micro Trend: Green IT

Happening Hype

Green IT catalyzing a sustainable digital transformation for a greener future

Why Green IT?

Green IT is crucial for reducing energy use and carbon footprints in the energy-intensive IT industry, managing e-waste hazards, conserving water in data centers and improving air quality through renewable energy and efficiency.

Market Size

Green IT is projected to reach
\$42.9B
by 2028

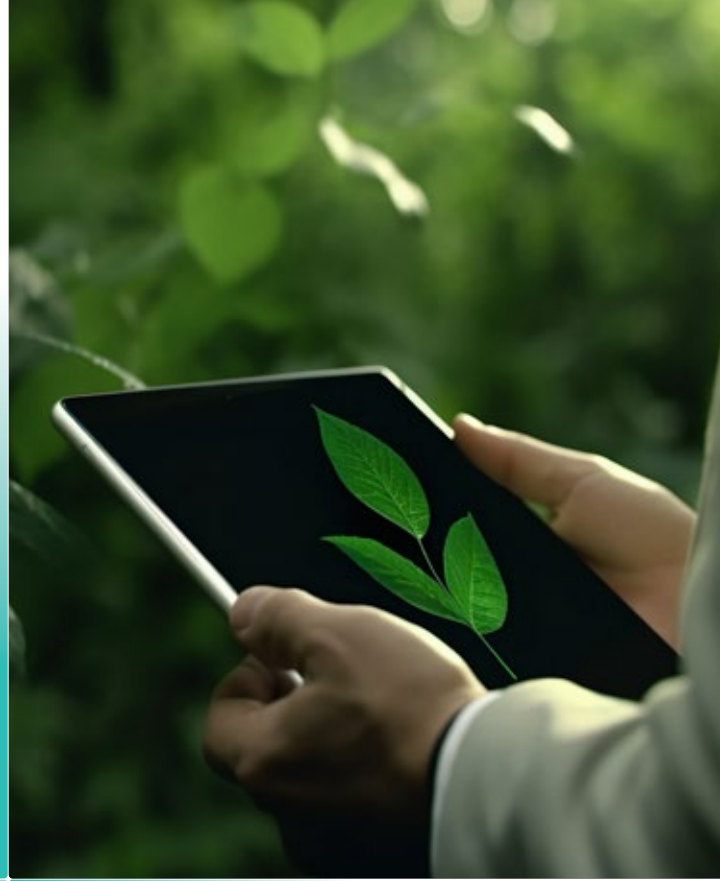
15.21%
CAGR

Why is Green IT in the Hype Stage?

- 'Macrocosmic' and 'Agility' factors associated are quite high because of the buzz.
- The concept is relatively new and enterprises are still figuring out ways to implement greener practices.
- The relatively high community factor implies that Green IT can have a lasting and transformative effect on society across social, political and cultural spheres.

Challenges for Adoption

- Lack of standardization: There is no single, widely accepted standard for Green IT practices.
- Frequent disposal of devices: Changing the devices frequently leads to increased resource consumption and waste generation.
- High power consumption: The GPUs used in Green IT consume 10x more energy than conventional CPUs.
- Affordability: High initial investment can't be afforded by many enterprises.



Sustainability Micro Trend: Decarbonization

Daring Disruptor

Decarbonization becoming a catalyst for driving collaboration and multilateral action to address climate change.

Why is Decarbonization in the Disruption Stage?

- Decarbonization may disrupt the way many sectors function.
- It is expected to create commotion in the future as the cost of inaction is too high.
- With enterprises realizing the potential economic benefits along with the larger environmental impact, decarbonization is proving to be a real game changer.

Market Size

Decarbonization is projected to reach **\$4.06 Trillion** by 2030

11.6%
CAGR



Business Value

- Enhanced risk management: By reducing their GHG emissions, businesses can mitigate the risks associated with climate change.
- Improved cost-efficiency: Decarbonization measures such as reduced energy consumption and improved resource utilization lead to operational cost savings.
- Innovation and competitive advantage: Drives technological advancements, enabling businesses to develop new products, services and processes.
- Regulatory compliance and future-proofing: Businesses that proactively decarbonize can avoid potential compliance costs and legal challenges.

Drivers for Adoption

- The rising cost of carbon emissions will make it even more cost-effective for businesses to decarbonize their operations.
- Need for carbon-based (GHG) accounting and credits management: Stakeholders are demanding more transparency regarding companies' environmental impacts.
- Technological advancements: There have been significant cost-effective advancements in energy efficiency technologies.



06

Mega Trend: Quantum Tech

Stage: Hype

Unveiling the next frontier
of innovation, where
complexity meets security
and intelligence

Overview

Quantum technology offers the potential to revolutionize computation, cryptography, and various scientific fields by leveraging the principles of quantum mechanics. As conventional computers face limitations in solving complex problems, Quantum technology holds promise for addressing challenges that were previously unconquerable. Research institutions and technology companies worldwide are actively pursuing the development of quantum algorithms, protocols, and devices, paving the way for their integration into real-world applications.

72%

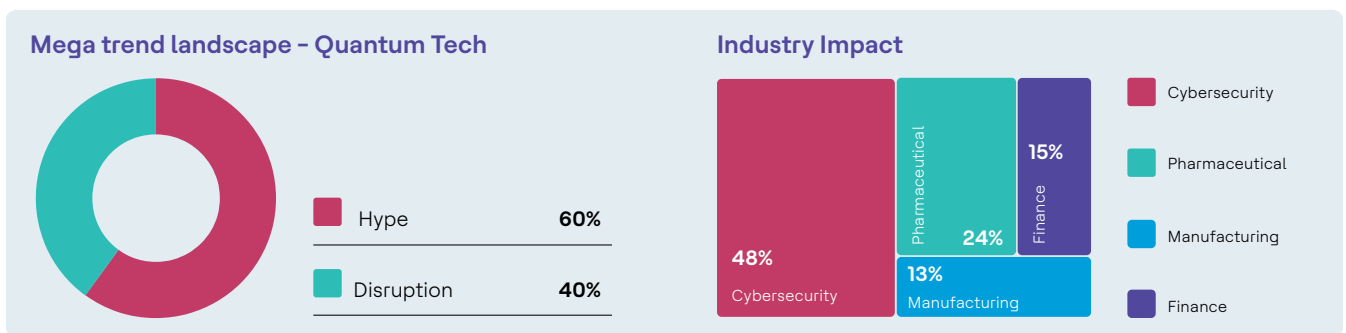
Respondents suggest Quantum Computing and Quantum Machine Learning will be pivotal in the next 1-2 years

14%

Respondents believe Quantum Cryptography will be pivotal in revolutionizing the globe

57%

Respondents believe that Quantum Cryptography is in the disruption stage



The Quantum Tech Landscape: Understanding the Trends

Top 3 Quantum Tech Micro Trends:

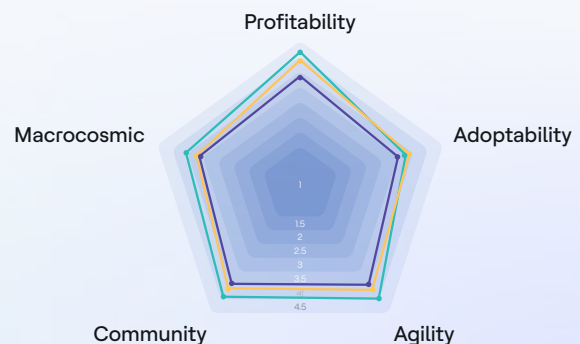
Quantum Computing

Quantum Cryptography

Quantum Machine Learning

ETO Mesh of Possibilities: Key Findings

- Quantum Computing
- Quantum Cryptography
- Quantum Machine Learning



Profitability

While quantum technologies are still very new in the technology market, their inherent potential to offer limitless compute power is already significantly impacting the revenue streams of early adopters.

Agility

With Quantum Computing being the most agile in terms of quickly addressing the current and future market needs, Quantum Machine Learning is not far behind once the technology can find its footing with more enterprise use cases.

Community

Quantum Cryptography is bound to make a significant impact on the overall community due to its ability to facilitate robust, integral and secure communication in the quantum era.

Quantum Tech Micro Trend: Quantum Machine Learning (QML)

Happening Hype

Revolutionizing data analysis with Quantum Machine Learning (QML)

Why QML?

QML offers a breakthrough in computational ability, promising to surmount current quantum computing constraints such as small scale and error susceptibility by harnessing quantum properties like superposition and entanglement for more efficient computation, with vast potential impacts across drug discovery, material science, finance and AI.

Market Size

QML is projected to reach **\$5B** by 2030

30%
CAGR



Why is QML in the Hype Stage?

- QML is still catching up across all parameters with strong potential demonstrated for addressing current and future needs.
- While it remains in its early stages, the ongoing advancements, moderate disruption potential and high level of hype make it an exciting area to follow and invest in.

Challenges for Adoption

- Noise and decoherence: Quantum systems are susceptible to noise and decoherence, which can corrupt quantum states and limit the accuracy of quantum computations.
- Adapting classical ML algorithms to quantum systems is not always straightforward and may require significant modifications.
- Evaluating and benchmarking QML algorithms is challenging due to the limited availability of quantum computing resources.

Quantum Tech Micro Trend: Quantum Cryptography

Daring Disruptor

Quantum Cryptography paving the way for robust security and privacy in the quantum era

Why is Quantum Cryptography in the Disruption Stage?

- It has inherent potential to address growing market needs while at the same time positively impacting revenue.
- High disruption quotient of 57%, suggesting that it has the potential to significantly impact the way we secure and protect data.
- The world has witnessed successful demonstrations of Quantum Key Distribution (QKD) over long distances with commercial QKD systems.

Market Size

Quantum Cryptography is projected to reach

\$3B
by 2028

41.2%
CAGR



Business Value

- Secure communication: It provides demonstrably secure communication channels, ensuring that messages exchanged remain private and resistant.
- Indecipherable keys: It enables the production of encryption keys that are theoretically indecipherable.
- Ensuring integrity: It is a potential technique for safeguarding the expanding IoT, guaranteeing the integrity and privacy of data sent between connected devices in smart homes, smart cities and industrial applications.

Drivers for Adoption

- Crypto-agility allows organizations to adapt to new cryptographic standards and quantum-safe solutions as they become available.
- Hybrid solutions provide a transitional path to quantum-resistant cryptography while maintaining security.
- Cost savings: Crypto-agility in hardware can avoid significant future costs related to hardware replacement.



07

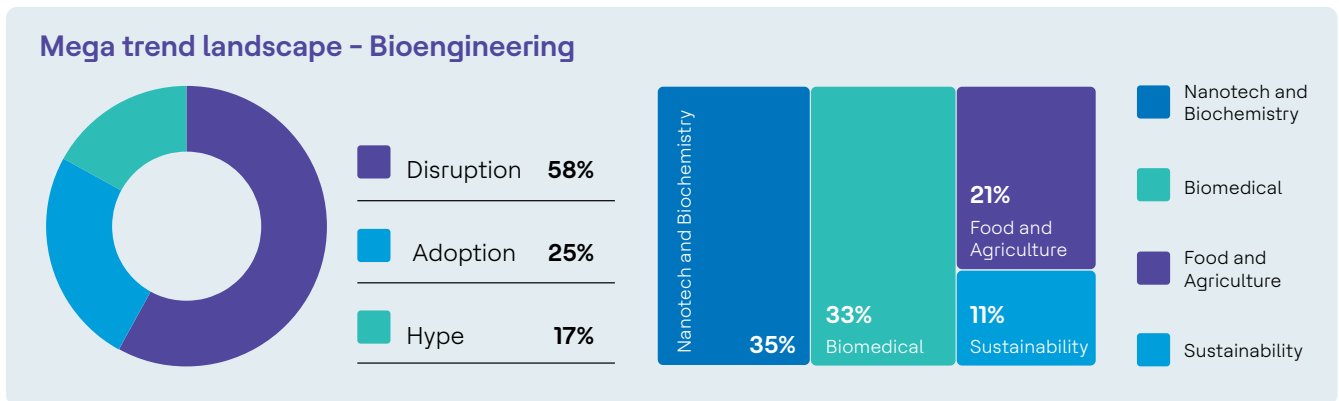
Mega Trend: Bioengineering

Stage: Disruption

Complex compute, fabrication, design and data come together to disrupt life sciences and healthcare

Overview

Bioengineering, at the forefront of innovation, converges a range of technologies like nanotech, biochemistry, 3D printing, AI, IoT and quantum computing. This leads to propelling advancements in biomedical solutions, transforming food and agriculture, all while championing sustainability for a promising and interconnected future. Tailored medical interventions is one of the most prominent and advanced use case of bioengineering. These advancements are paving the way for a future where medicine is not a one-size-fits-all approach but rather a personalized and precise endeavor that optimizes patient outcomes.



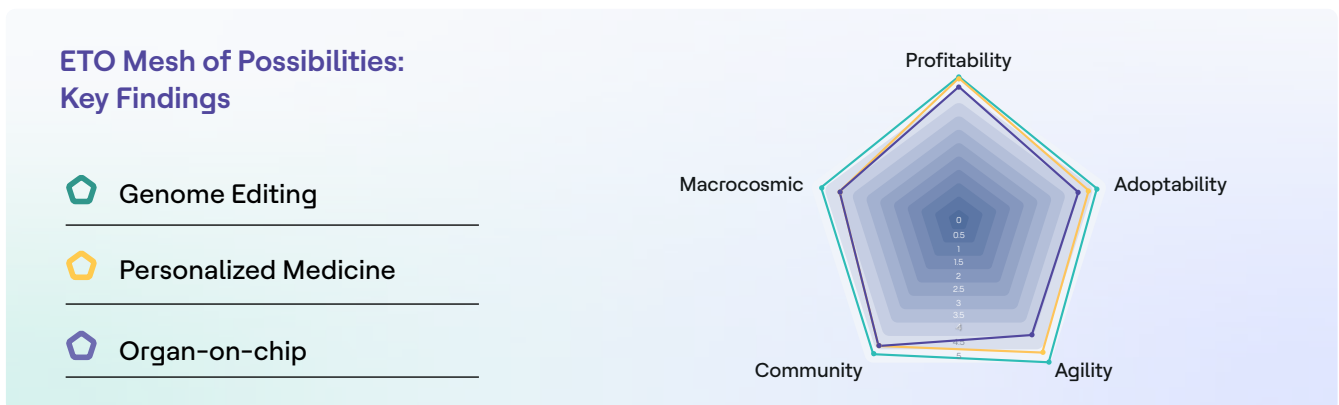
The Bioengineering Landscape: Understanding the Trends

Top 3 Bioengineering Tech Micro Trends:

Personalized Medicine

Genome Editing

Organ-on-chip



Profitability

The impact of Personalized Medicine and Genome Editing on revenue streams is quite high, with Organ-on-chip (OOC) not far behind. As OOCs are fairly new, they are yet to witness large-scale impact on profitability.

Agility

Personal medicine is leading this charter of addressing current and new market needs due simply to being in the market longer than the other two.

Community

The impact of Genome Editing and OOC is more or less equal on the community. The relevance of each is fruitful to overall society, whether for efficient drug discovery or curing genetic disorders.

Bioengineering Micro Trend: Organ-on-chip (OOC)

Happening Hype

Organ-on-chip ushering in a new era of ethical, effective and efficient medical research

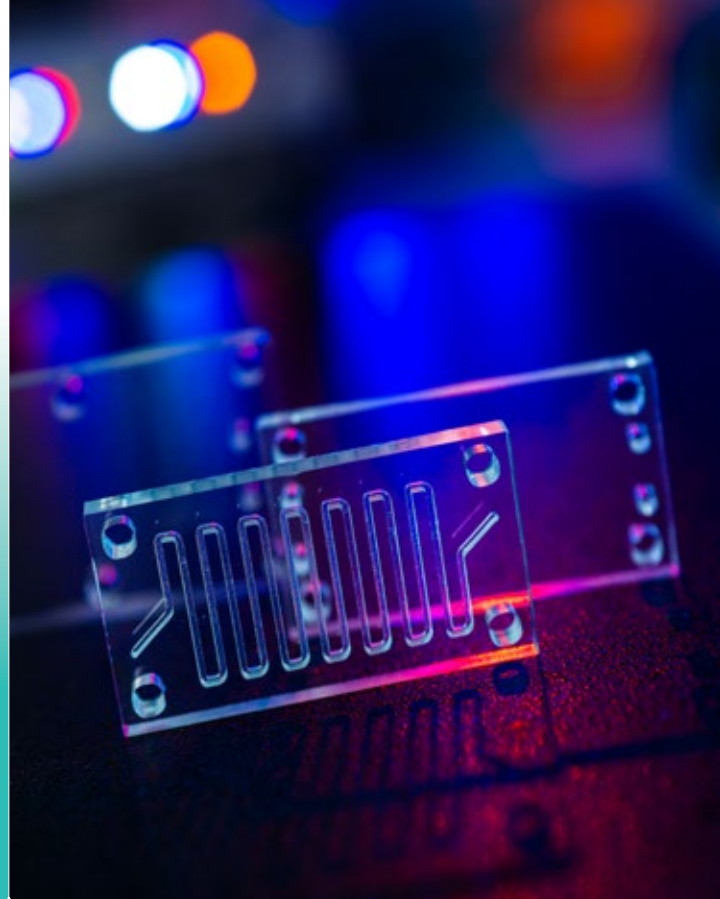
Why OOC?

- OOC technology is revolutionizing the field of bioengineering by providing a more realistic and human-relevant platform for studying human biology and disease.
- OOCs mimic the 3D structure and function of human organs on a microfluidic chip, allowing researchers to study the effects of drugs, toxins and other environmental factors on human tissues in a more controlled and physiologically relevant setting.

Market Size

OOC is projected to reach
\$487M
by 2028

33%
CAGR



Why is OOC in the Hype Stage?

- A fairly high profitability quotient.
- With extra focus on enhanced drug discovery and development, OOCs have gained traction to offer more realistic platforms to test drug efficacy and safety.
- Its ability to mimic physiological conditions and replace traditional animal testing methods positions it as the next frontier of disruptive force in biomedical research.

Challenges for Adoption

- Technical complexity: The intricate design and implementation of OOC systems require expertise in various disciplines.
- High development and maintenance costs hinder adoption, limiting access for researchers with constrained budgets.
- Lack of standardized protocols and methodologies creates challenges in replicating experiments across different OOC devices.
- Scarcity of commercial OOC platforms restricts easy access for researchers, slowing down technology integration.

Bioengineering Trend: Genome Editing

Daring Disruptor

Genome Editing as the flag bearer for a healthier, more sustainable future

Why is Genome Editing in the Disruption Stage?

- Performing significantly well on 3 out of 5 parameters, implying that it is currently finding demos of feasibilities in the market.
- Its ability to modify genetic material offers innovative solutions, signifying that this technology can revolutionize genetic interventions, potentially leading to breakthroughs in healthcare and beyond.
- Its growing pertinence in other industries like agriculture and biotechnology.

Market Size

Genome Editing is projected to reach **\$10.6B** by 2028

15%
CAGR



Business Value

- Correction of disease-causing genes: CRISPR (clustered regularly interspaced short palindromic repeats) prevents hereditary diseases and boosts future health.
- Lifelong protection against infection: CRISPR introduces infection-resistant genes for improved lifelong immunity.
- De-extinction efforts: CRISPR aids in de-extinction, like reviving the woolly mammoth.
- Creation of new, healthier foods: CRISPR advances agriculture by enhancing crops for yield, disease resistance and taste.

Drivers for Adoption

- The potential to cure genetic diseases and enable personalized medicine propels genome editing adoption for transformative medical advancements.
- Genome editing's role in advancing genetics and molecular biology accelerates scientific discoveries, fostering increased adoption.
- Genome editing's potential in creating crops with desirable traits addresses global food security, acting as a driver in the agricultural sector.

08

Mega Trend: Blockchain

Stage: Disruption

Enterprises finding niche
in decentralization and
asset tokenization

Overview

Blockchain technology, with its decentralized and immutable nature, has emerged as a transformative force, redefining the very concept of trust in a connected and decentralized world. By providing a secure and tamper-proof record of transactions, blockchain is redefining trust relationships and enabling new forms of collaboration and innovation. As the technology continues to mature, it has the potential to revolutionize how we interact, share information, and conduct business, ushering in an era of trustless trust in a connected and decentralized world.

23%

Respondents believe decentralized identity will enable the future of blockchain adoption on enterprise side

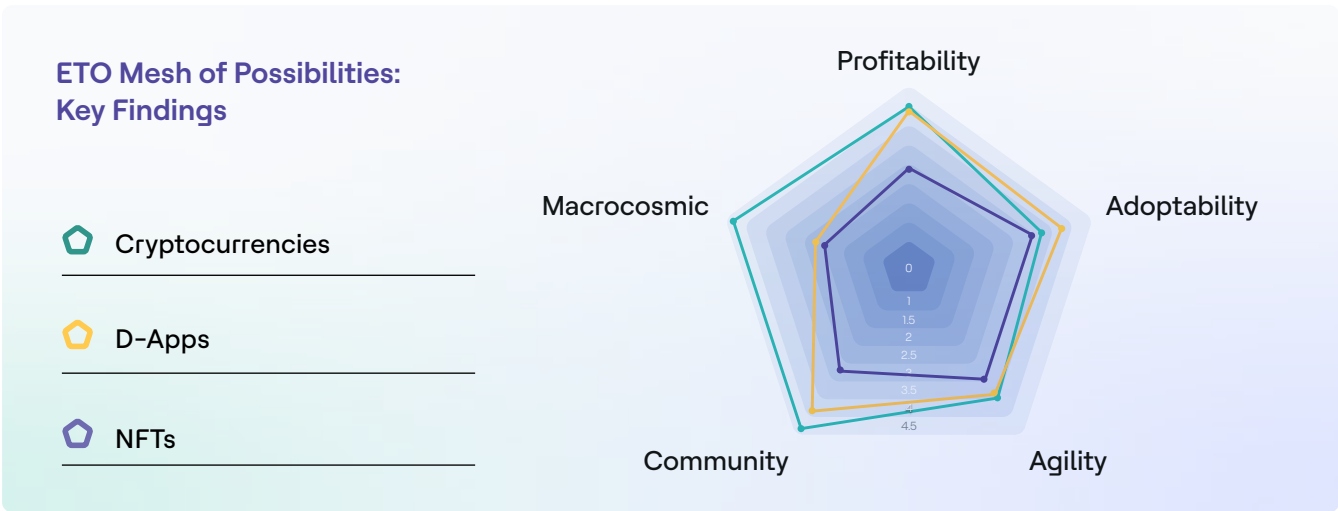
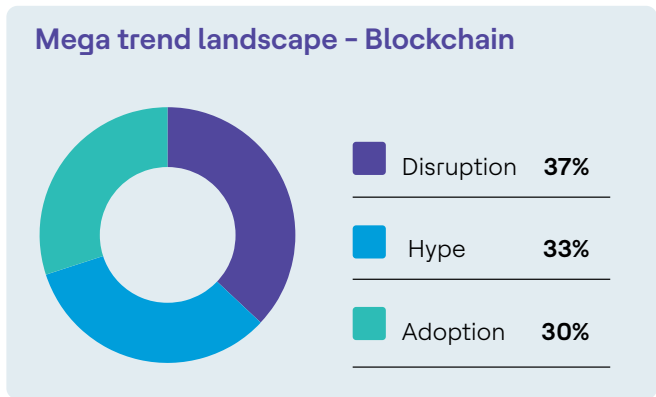
54%

Respondents believe cryptocurrency transactions have most potential for transforming traditional financial systems

The Blockchain Landscape: Understanding the Trends

Top 3 Blockchain Tech Micro Trends:

- Cryptocurrencies
- D-Apps
- NFTs



Adoptability

It is clear that D-Apps are more mature in comparison to its counterparts, primarily because of its wide range of utility across different industries. NFTs are not far behind, with their adoption curve likely to rise with Web 3.0.

Agility

Cryptocurrencies and D-Apps are quite agile, as their capabilities to address growing market needs are currently quite high. Various governments are also looking forward to introducing their cryptocurrencies to meet growing public demand.

Community

The impact of cryptocurrencies is highest on socio-economic and security parameters. With their capabilities to challenge the current financial system and make them more decentralized, cryptocurrencies are bringing rapid changes globally.

Blockchain Micro Trend: Non-Fungible Tokens (NFTs)

Happening Hype

NFTs revolutionizing digital ownership and monetization in a decentralized Web 3.0 landscape

Why NFTs?

NFTs solve Web 3.0's digital ownership issues with unique, verifiable tokens for items like art and virtual goods, extending their use to fields such as ticketing, identity verification, supply chains and voting, potentially transforming multiple industries.

Market Size

NFTs are projected to reach
\$196.7B
by 2030

33.7%
CAGR



Why is NFTs in the Hype Stage?

- An increasing inclination toward agility suggests its inherent potential to quickly address the current and future needs of different markets.
- The rise of Web 3.0 has attracted many speculative investors, leading to a surge in the opening of new markets and monetization opportunities for creators.
- Tech advancements, expanding use cases and interest in digital ownership, creator empowerment, the rise of play-to-earn models and community building.

Challenges for Adoption

- Lack of standardized regulatory measures and platforms can make the NFT space susceptible to fraudulent activities.
- Valuation complexity arises when NFT owners artificially boost the worth of an asset for personal gain, leading to a subsequent drop in value that impacts other collectors.
- Transactional costs and scalability: Unpredictable gas (transaction) fees, potentially surpassing NFT cost, can deter users and make NFT transactions impractical.

Blockchain Micro Trend: Cryptocurrency

Daring Disruptor

Fostering a responsible and compliant crypto ecosystem through robust regulatory policies and consistent supervision

Why is Cryptocurrency in the Disruption Stage?

- Cryptocurrencies affect socio-economic and security greatly, aiding adoption but presenting challenges from their environmental impact.
- Rising crypto interest faces barriers without stronger regulations for broader acceptance.
- Cryptocurrencies are transforming finance by challenging traditional models like banking with DeFi (decentralized finance) and altering the global financial scene.

Market Size

Cryptocurrency is projected to reach
\$64.9B
by 2027

14.4%
CAGR



Business Value

- Financial inclusion: Provide the underbanked with access to financial services.
- Enable instant borderless transactions without currency conversion.
- Ownership and control: Holders have direct ownership and control over their digital assets.
- Some cryptocurrencies allow for programmable money through smart contracts, enabling automated and conditional transfers of funds.

Drivers for Adoption

- Empower individuals with greater control over their finances, allowing them to bypass traditional banking systems.
- Significant returns on investment attract investors to the cryptocurrency market.
- Potential to extend financial services to the unbanked/underbanked.
- The development of user-friendly cryptocurrency wallets and exchanges has simplified the process of buying, holding and utilizing cryptocurrencies.



09

Mega Trend: Internet of Behavior

Stage: Disruption

Stepping into the era
of hyper-personalized
experiences

Overview

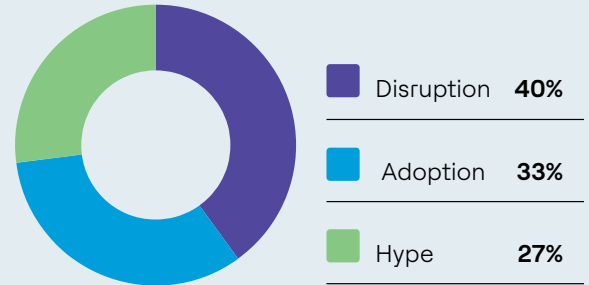
The Internet of Behaviors (IoB) is a burgeoning field that revolves around the meticulous analysis of user data, with a primary focus on behavioral psychology. In this dynamic process, digital activities of users are systematically gathered, scrutinized, and interpreted to extract valuable insights. IoB stands at the crossroads of behavioral science, edge analytics and the Internet of Things (IoT), leveraging cutting-edge technologies like machine learning algorithms to capture, analyze and respond to user behaviors in real time. Ultimately, IoB represents a transformative approach that enables businesses to forge deeper connections with customers, tailor their approaches and navigate the ever-evolving landscape of consumer preferences.

The Internet of Behavior Landscape: Understanding the Trends

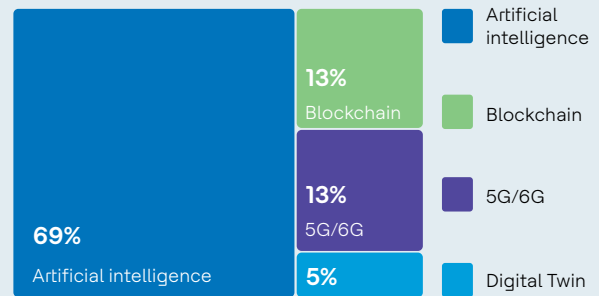
Top 3 IoB Micro Trends:

- Behavioral Experience Orchestration (BEO)
- Behavioral Intent Recognition (BIR)
- Behavioral Profiling

Mega trend landscape - Internet of Behavior

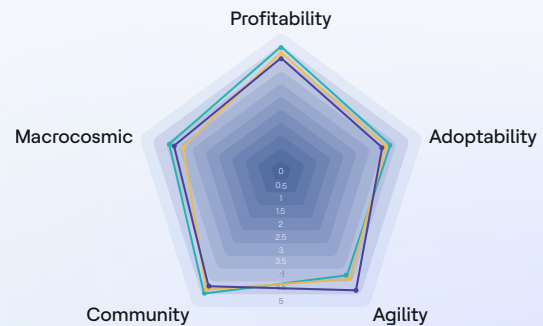


Impact of other technologies on IoB



ETO Mesh of Possibilities: Key Findings

- Behavioral Experience Orchestration (BEO)
- Behavioral Intent Recognition (BIR)
- Behavioral Profiling



Adoptability

The adoption parameter is almost in succession for all three trends, implying that IoB is quite mature in making a mass level impact. This is primarily due to increasing personalization and customization requests coming from end customers.

Agility

BEO and BIR being quite closer to each other indicates their inherent characteristics to address the growing market needs quickly. Both technologies hold the potential to not only capture customer priorities but also influence them.

Community

The overall community impact for IoB is quite notable. This is likely due to the technology's potential to analyze vast amounts of data to interpret and extract valuable insights from user psychology.

IoB Micro Trend: Behavioral Experience Orchestration (BEO)

Happening Hype

Behavioral Experience Orchestration driving customer loyalty, retention and business growth

Why BEO?

BEO is essential for modern businesses to navigate competition by orchestrating customer interactions across all touchpoints, fostering loyalty and growth through personalized, seamless cross-channel experiences.

Market Size

BEO is projected to reach
\$3.3B
by 2027

23.2%
CAGR

Why is BEO in the Hype Stage?

- Significant impact on profitability and community factors due to rise because of data-driven customer experiences and evolving customer expectations.
- With maturity in AI-ML systems, proactive personalization of experiences has become possible.
- Wide-scale application across industries, with businesses of all sizes attempting to jump on the bandwagon.

Challenges for Adoption

- Nudging and manipulation: BEO could be used to nudge or manipulate individuals into making certain choices, raising concerns about individual autonomy and exploitation.
- BEO could create echo chambers and filter bubbles by tailoring experiences to individual preferences, limiting exposure to diverse viewpoints and information.
- BEO could lead to over-personalization, where individuals are only exposed to tailored experiences, limiting creativity.



IoB Micro Trend: Behavioral Intent Recognition (BIR)

Daring Disruptor

Behavioral Intent Recognition paving the way for new-age human-machine collaboration

Why is BIR in the Disruption Stage?

- Has highest impact on community with a substantial score on agility, making it perfect for disruption. It is bound to create an effective and timely impact if implemented correctly and ethically.
- Its 50% disruption score signifies that it holds a moderate potential for transforming the way organizations understand and respond to user intent.

Business Value

- Customized content delivery: Intent recognition empowers AI systems to deliver content tailored to individual user preferences, enhancing engagement and ensuring that users receive information that aligns with their specific interests.

Market Size

BIR is projected to reach
\$4.96B
by 2027

25.2%
CAGR



- Anticipating user needs: By recognizing user intent, AI systems can proactively anticipate user needs, streamlining the user journey. This ensures a more intuitive and efficient experience, as the system can predict and fulfill user requirements in advance.
- Seamless task execution: Understanding user intent enables AI systems to execute tasks seamlessly. Whether it's making reservations, ordering products or navigating complex processes, the system can interpret user intent accurately, leading to swift and successful task completion.
- Natural language understanding: Intent recognition enhances natural language processing capabilities, allowing AI systems to comprehend user queries and commands in a conversational manner. This natural interaction contributes to a more user-friendly and intuitive experience.

Drivers for Adoption

- Personalization: BIR tailors customer experiences by analyzing behavior and preferences live for targeted marketing.
- AI evolution: Enhanced AI and ML improve BIR's data analysis and pattern identification for accuracy and efficiency.
- Security focus: BIR enhances surveillance by detecting threats and preventing crime, prompted by heightened security concerns.



10

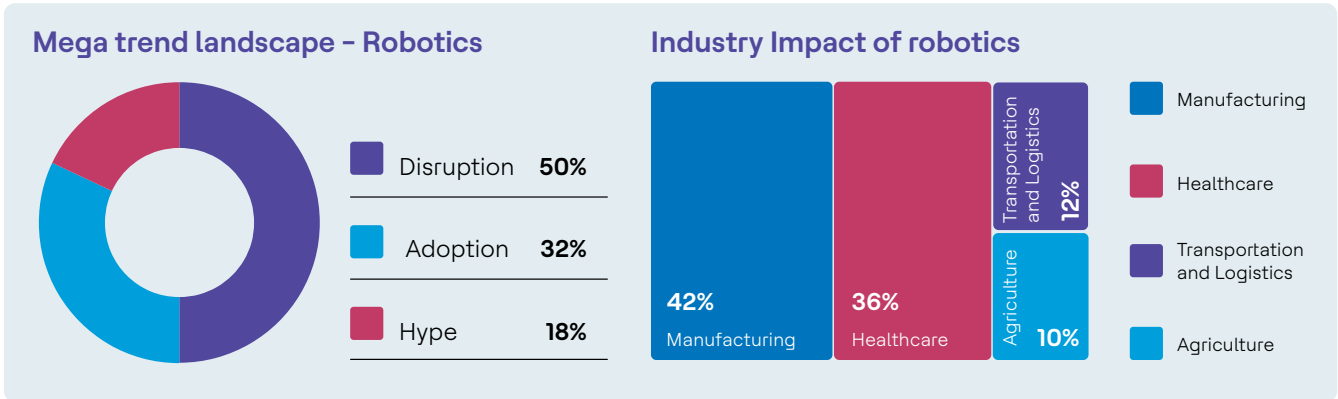
Mega Trend: Robotics

Stage: Disruption

Rising accessibility,
flexibility and scalability
of advanced robots

Overview

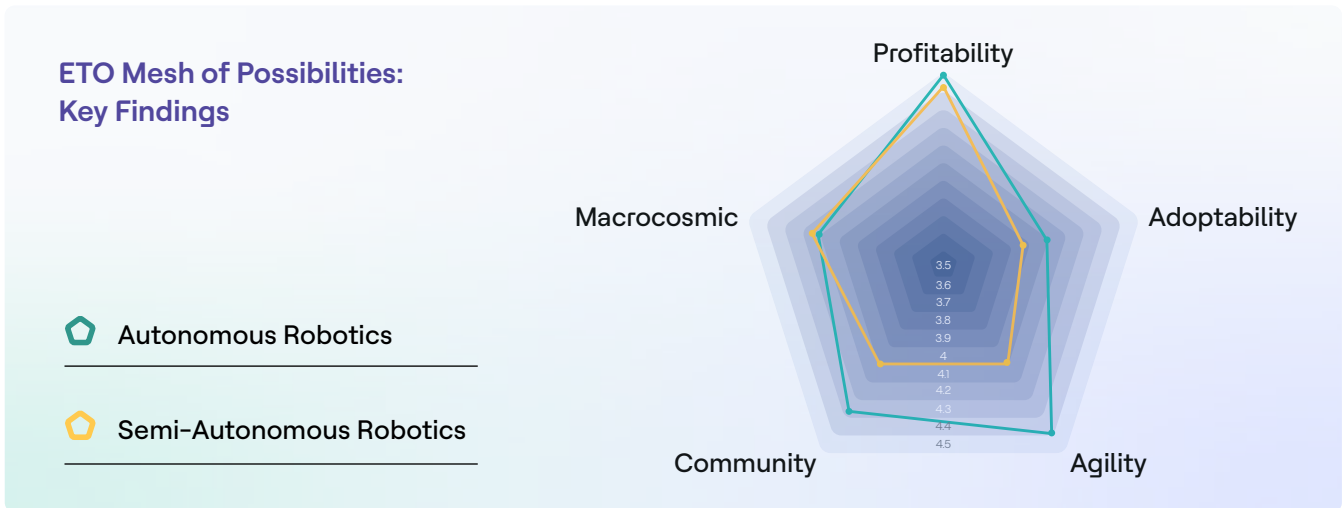
Robotics is a rapidly evolving field, and ongoing research and development continues to advance the capabilities of robots, making them increasingly useful and scalable in a wide range of applications. It combines expertise in various fields, including mechanical engineering, electrical engineering, computer science, artificial intelligence, and more, to create machines that can sense, think, and act in the real world. Robots are becoming smaller, lighter, and more flexible, enabling them to operate in more challenging environments and perform tasks that were previously impossible.



The Robotics Landscape: Understanding the Trends

Top 2 Robotics Micro Trends:

- Autonomous Robotics
- Semi-Autonomous Robotics



Profitability

Profitability for autonomous and semi-autonomous robotics is more or less the same, implying the potential of both to help generate revenue while augmenting human potential.

Agility

Autonomous robotics is more agile, primarily due to its potential to operate independently, bringing in greater precision, efficiency and cost-effectiveness.

Macrocosmic

The overall macrocosmic impact of robotics is quite notable. They can be effectively utilized for resource conservation, optimization and maintenance.

Robotics Micro Trend: Autonomous Robotics

Happening Hype

The convergence of AI, machine learning and sensor technology is fueling the rise of autonomous robotics

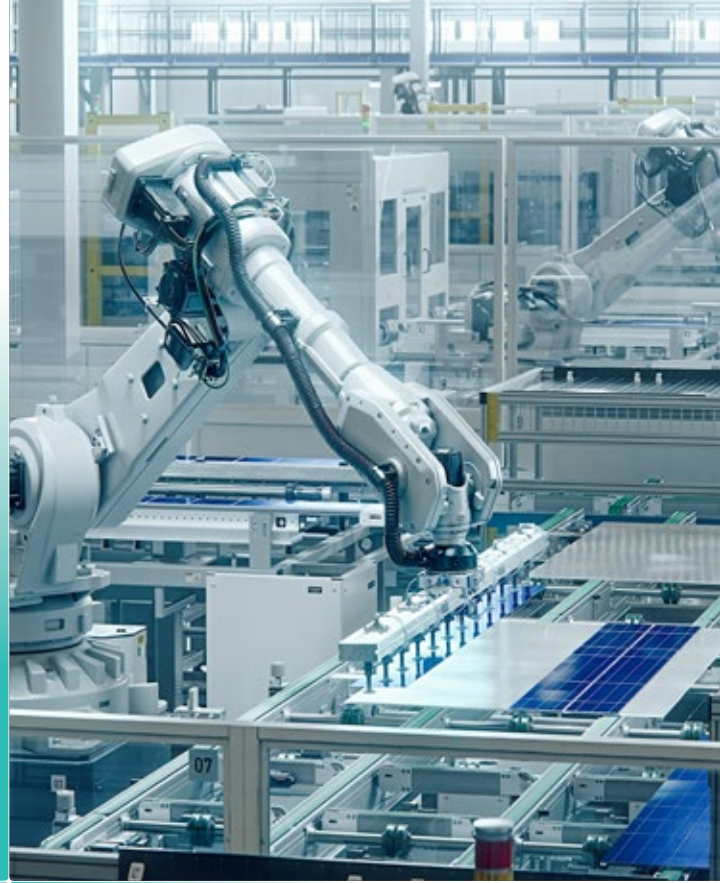
Why Autonomous Robotics?

- Autonomous robots are making our lives safer, easier and more efficient. They are also helping to create new jobs and opportunities.
- According to a recent McKinsey report, 25% of capital spending over the next five years will be allocated to automated systems.

Market Size

Autonomous Robotics is projected to reach **\$4.1B** by 2028

17.5%
CAGR



Why is Autonomous Robotics in the Hype Stage?

- Its agility and profitability quotient is fairly high, implying how quickly, effectively and efficiently the technology can be deployed.
- Major advancements in AI, ML, sensor technology and design have enabled the development of more sophisticated and capable autonomous robots.
- They can adapt to changing environments and task requirements, making them versatile tools for a variety of applications.

Challenges for Adoption

- Ensuring the safety of humans and property when autonomous robots operate in dynamic and uncontrolled environments is a critical challenge. Developing and maintaining autonomous systems is technically complex and requires expertise in various fields.
- Autonomous robots may face ethical dilemmas, such as decision-making in scenarios with moral implications.
- Autonomous systems can be vulnerable to cyberattacks.

Robotics Micro Trend: Semi-autonomous Robotics

Daring Disruptor

The rise of semi-autonomous robotics is transforming industry 4.0, with drones leading the charge

Why are Semi-Autonomous Robotics in the Disruption Stage?

- Its high profitability index is an indicator of how organizations are seeing its potential in contributing towards revenue streams apart from other business and operational benefits.
- They offer a balance between the advantages of autonomous robots and the control and oversight provided by human supervision.

Market Size

Semi-autonomous Robotics is projected to reach **\$16.7B** by 2028

17.4%
CAGR



Business Value

- In sectors like retail and healthcare, they enhance customer experiences by providing a human touch while benefiting from automation.
- Semi-autonomous robots are well-suited for long-term deployments in industries that require both precision and adaptability.
- The lower upfront investment and maintenance costs make them a more cost-effective option. They can be scaled gradually as needs evolve.
- They provide a smoother transition for businesses and workers, allowing for gradual adoption and acceptance of robotic technology.

Drivers for Adoption

- They can help reduce the risk of accidents by automating tasks that are hazardous for humans.
- They can help businesses collect and analyze data that can be used to improve operations.
- They can help to perform complex tasks that are difficult or impossible for humans to do.



Looking ahead: What's in store for these emerging technologies?

Prioritizing the Mega Trends

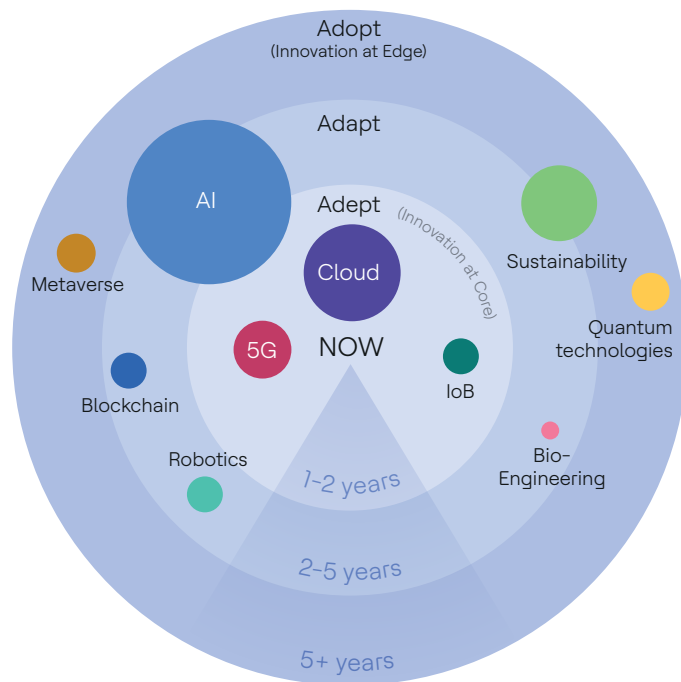
While the technologies are all distinct and have their own respective maturity lifecycles, we believe they all can have significant impact. What is even more exciting is the convergence of these technologies to form combinatorial trends to deliver double the impact and double the innovation.

The proposed framework is for structuring the enterprise priorities in a time-to-realization model via the 3A (Adept-Adapt-Adopt) approach. The 10 Mega Trends have been strategically placed with respect to their time to realization, based on surveys and conversations conducted.

The size of the individual bubbles is determined by the overall impact of these technologies across 5 parameters (ETO Mesh of Opportunities).

Phase	Impact				
	Profitability	Adoptability	Agility	Community	Macrocosmic
Adept	High	High	High	High	High
Adapt	Medium	Medium	High	Low	Medium
Adopt	Low	Low	Medium	Low	High

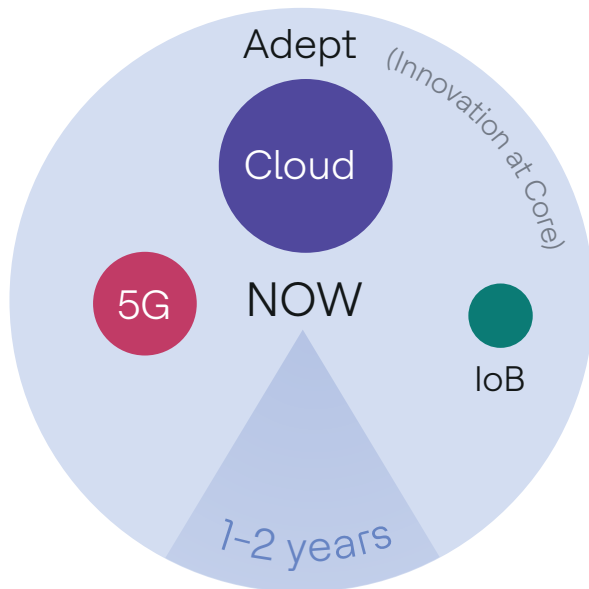
Legend: ● High ◐ Medium ○ Low



3A Framework

What's Next?

Technologies that are expected to scale



Cloud

Impact score - 3.74
Interest score - 14.6%
Risk score - 3.23

IoB

Impact score - 3.96
Interest score - 7.53%
Risk score - 3.31

5G

Impact score - 3.67
Interest score - 9.5%
Risk score - 2.58

What's next in 5G?

5G is expected to play a major role in the development of next-generation technologies, such as 6G and AI. 5G will provide the foundation for these technologies to reach their full potential.

5G trend in action

- Remote vehicle monitoring and diagnostics
- Asset tracking
- Improved remote streaming and monitoring

What's next in Cloud?

Cloud computing is expected to rapidly evolve due to innovation, demand and technological advancements, while edge computing is bringing computing and data storage closer to network edges, aiming to reduce latency and improve IoT performance.

Cloud trend in action

- General purpose AI calculations on HIPAA-compliant data
- Government sensitive projects on national security investigations
- Conducting experiments without exposing trade secrets

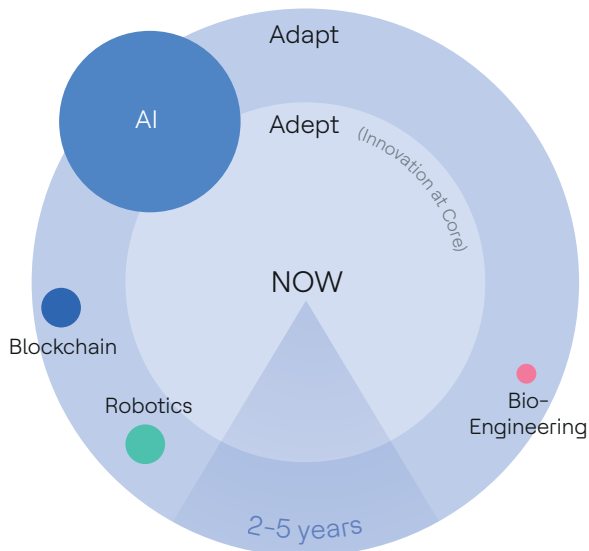
What's next in Internet of Behavior?

IoB devices, embedded in everyday objects, infrastructure and environments, will collect vast data, providing insights into behavior, preferences and personalization, leading to adaptive learning systems.

IoB trend in action

- Fitness and wellness tracking
- Fraud detection
- Employee productivity and engagement

Technologies that are to be revisited



AI
 Impact score - 3.78
 Interest score - 33%
 Risk score - 3.54

Robotics
 Impact score - 4.17
 Interest score - 3.45%
 Risk score - 3.64

Blockchain
 Impact score - 3.39
 Interest score - 5.18%
 Risk score - 3.73

Bio Engineering
 Impact score - 4.48
 Interest score - 2%
 Risk score - 3.00

What's next in AI?

AI is not just a standalone technology but also an enabling force for others, with advanced technologies like GenAI making it increasingly commercial and augmenting humans. Where the conventional AI technologies (like machine learning, deep learning etc.) are advancing progressively and making the impact sooner, more advanced AI technologies like GenAI are making the technology more and more commercial.

AI trend in action

- ➔ Automation and optimization
- ➔ Data analysis and decision making
- ➔ Predictive and generative applications

What's next in Bioengineering?

Bioengineers are developing new technologies to interface with the nervous system. This could lead to breakthroughs in treating neurological disorders, restoring lost functions and enhancing human capabilities.

Bioengineering trend in action

- ➔ Agricultural improvements
- ➔ Biological computing
- ➔ Genetically Modified Organisms (GMOs)

What's next in Blockchain?

Blockchain networks will become interoperable, enabling businesses to develop applications, with privacy-preserving and permissioned solutions gaining traction, especially in industries handling sensitive data like healthcare and finance.

Blockchain trend in action

- ➔ Content licensing and royalties
- ➔ Virtual events and experiences
- ➔ Identity verification

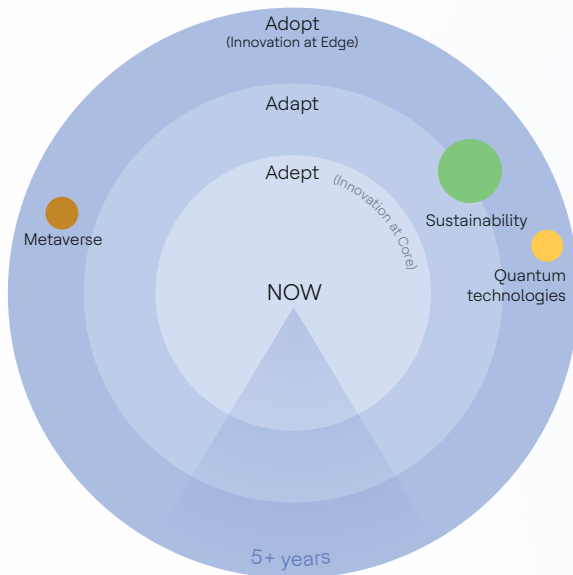
What's next in Robotics?

Robots will become more dexterous and adaptable, able to handle a wider range of tasks and operate in complex environments. This will be driven by advances in AI, ML and sensor technology.

Robotics trend in action

- ➔ Drones
- ➔ Space robotics
- ➔ Animaloids

Technologies that are to be experimented



Sustainability

Impact score - 4.12
Interest score - 11%
Risk score - 3.02

Quantum Tech.

Impact score - 3.60
Interest score - 6.6%
Risk score - 3.2

Metaverse

Impact score - 3.31
Interest score - 7.53%
Risk score - 3.17

What's next in Metaverse?

The metaverse will not be a single, monolithic platform but rather a collection of interconnected virtual worlds and experiences. This will lead to a more diverse and customizable metaverse, catering to different interests and preferences.

Metaverse trend in action

- Education and training
- Transforming workplaces and collaboration
- Urban planning and architecture

What's next in Sustainability?

Navigating between Adapt and Adopt currently, sustainability will be crucial in addressing climate change, resource scarcity and social inequality, focusing on renewables, electric vehicles, circular manufacturing, sustainable cities and more.

Sustainability trend in action

- Ethical manufacturing
- Sustainable farming practices
- Water conservation

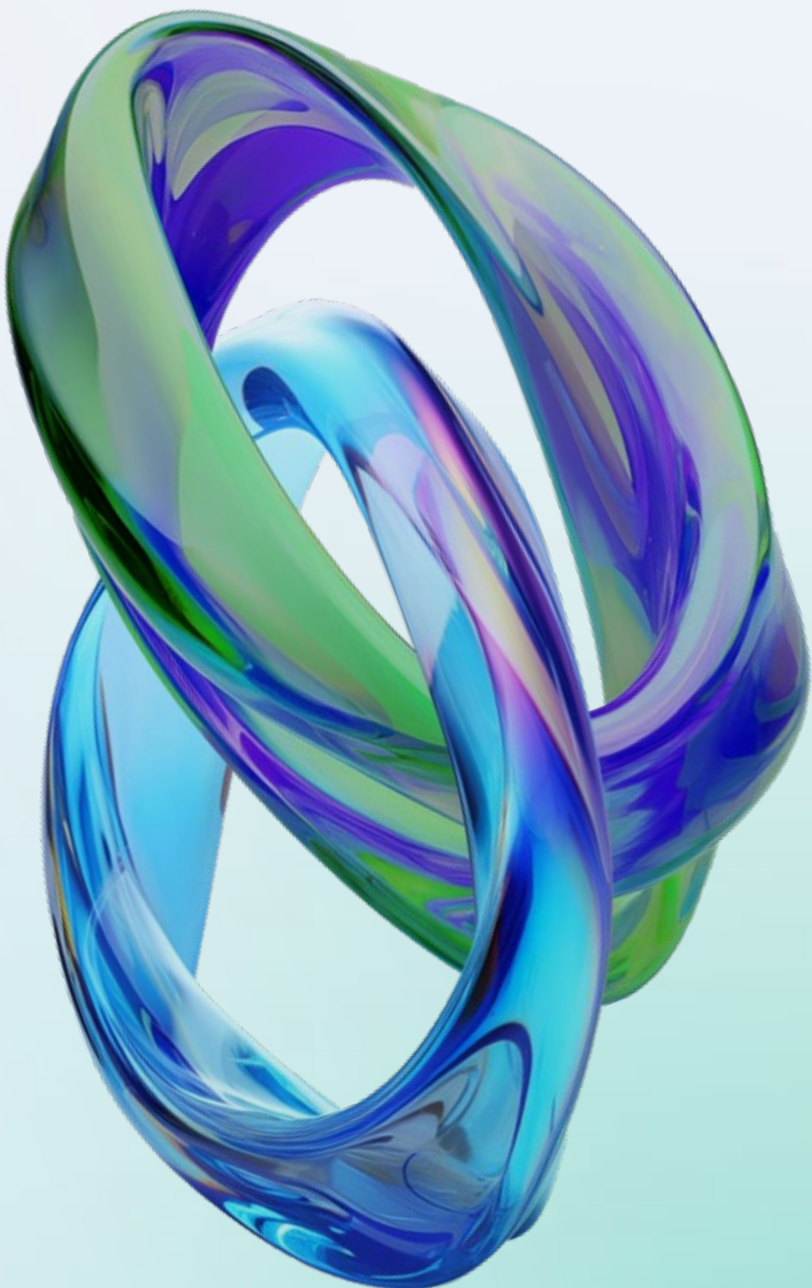
What's next in Quantum Technologies?

Quantum technologies will integrate with existing computing and communication infrastructures, enabling hybrid solutions that combine quantum and classical systems, enhancing precision and sensitivity in quantum sensors.

Quantum Technologies trend in action

- Secure communication channels
- Quantum generative models
- Financial modeling and optimization

About The Tech Trends Report



Tech Trends 2024: An Overview

Tech Trends 2024 in Numbers

40,000

Respondents Engaged

75,000

Sentiments Analyzed

10

Mega Trends

20

Micro Trends

74

Leaders Engaged

Tech Trends 2024 in a Nutshell

Global Impact

The convergence of these trends is poised to reshape the global economy by enhancing productivity and amplifying experiences while ensuring security stays omnipresent. Adoption of these trends demands transcendent ecosystem collaboration.

Challenges

Global standardization, responsible adoption and workforce readiness are the key challenges that need to be addressed.

Industry Implications

Most of these trends are horizontal in nature, with potential implications across all major industries, positioning technology not only as an aiding element but transforming the core business.

Opportunities

The biggest opportunity is presented by the convergence of these trending technologies. This will unlock new business solutions, enabling competitive excellence and exponential value creation.

Embrace Tech Trends 2024

Proactively identify technology catalysts for business transformation.

Evaluate long-term and short-term technology implications and craft strategies in line with business needs.

Focus on developing a continuous cultural cycle of upskilling: Learn-Unlearn-Relearn.

Tech Trends 2024: The Methodology

The Tech Trends report follows the HCLTech ETO's infinity framework, a continuous cycle encompassing research, analysis and curation of the technology trends anticipated to exert significant impact over the next 12-24 months.

This year's report is the culmination of extensive year long research conducted across various phases:

Step 1: Involves secondary research utilizing sentimental analysis, meticulously analyzing over 75,000 data cells.

Step 2: Incorporates primary surveys, at both the consumer and the professional level, involving more than 40,000 participants at the consumer level and 74 technology leaders at the professional level, to determine the adoption trajectory of individual mega-trends.

Step 3: Engaging in focused group discussions and personal interviews with leaders to mitigate any potential research biases.

Step 4: Introduces two new strategic frameworks for charting the future roadmap:

ETO Mesh of Possibilities

This framework is a comprehensive way of representing technologies across 5 broad parameters/factors that underscore how much the technology in question will trend in the coming year. The 5 factors considered are:



Profitability

1. What is the technology impact on potential revenue streams?
2. How much financial potential does the technology hold?

Adoptability

1. How easily can the technology get adopted in different markets?
2. How quickly can it scale?

Agility

1. How effective is the technology in addressing current needs?
2. How reliable is the technology to cater to future demands?

Community

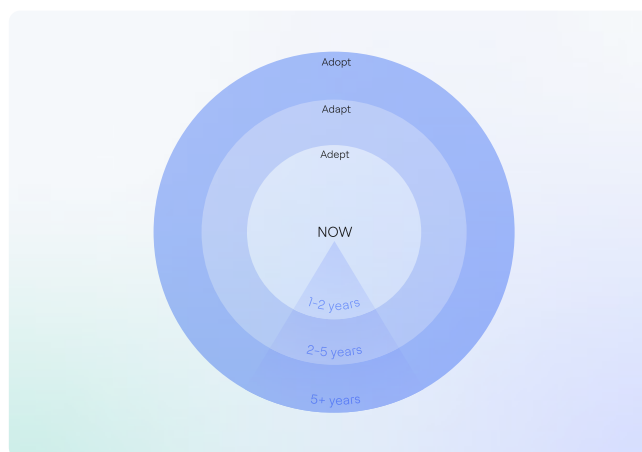
1. What is the impact on socio-cultural and geopolitical scenarios?
2. How secure is the implementation at mass level?

Macrocosmic

1. What is the impact on larger sustainable goals?
2. How does the tech help in attaining larger ESG goals rapidly?

3A Framework (Adept-Adapt-Adopt)

This framework provides strategic guidance on navigating the challenges of each trend in the upcoming 12-24 months. The top 10 mega trends identified for 2024 have been classified into the 3A framework depending upon when enterprises should start acting on them.



Adopt (Innovation at edge)

These technologies have shown good promise and will provide the edge to ensure businesses stay resilient as these technologies become mainstream in the next 5+ years.

Action Plan:

- Understand market progression, identify new skillsets and conduct PoCs
- Begin research and identifying relevant use cases/applications

Adapt

These technologies have already been experimented with across industries and have now progressed further with recent advancements and new use cases. Enterprises should reassess the technology's compatibility with their present and future strategies for transformation in the next 2-5 years.

Action Plan:

- Start active evangelization and attaining competitive excellence
- Continuously identify additional relevant use cases that can be applied

Adept (Innovation at core)

These technologies have showcased their impact at scale across industries. Enterprises should look at active expansion, try to integrate these technologies to the core and attempt to achieve operational excellency in the next 1-2 years.

Action Plan:

- Prepare to scale to different markets while considering socio-economic and macrocosmic impacts
- Attract and retain top talent to stay relevant in the market

Our Approach to Identify the Top 10 Tech Trends for 2024

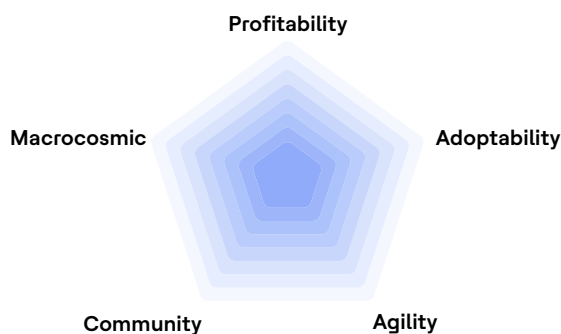
This report explores 10 mega trends revolutionizing the digital world. Each mega trend includes two micro trends that are driving the mega trend forward.

How were Tech Trends 2023 actioned?

- Tech Trends in Action (TTiA) is an internal annual program launched to identify potential use cases across the 10 tech trends. Last year ~12,000 HCLTechies across the globe were associated with this program.
- Based on the ideas, skillsets and existing portfolio of solutions/services, a feasibility scan is done to check how these trends will perform.
- External market sentiment and customer pulses are also gauged via different engagements.
- Possible adoption challenges are identified to better chalk out/refine the trends for next year.

How are the Mega Tech Trends 2024 shaped?

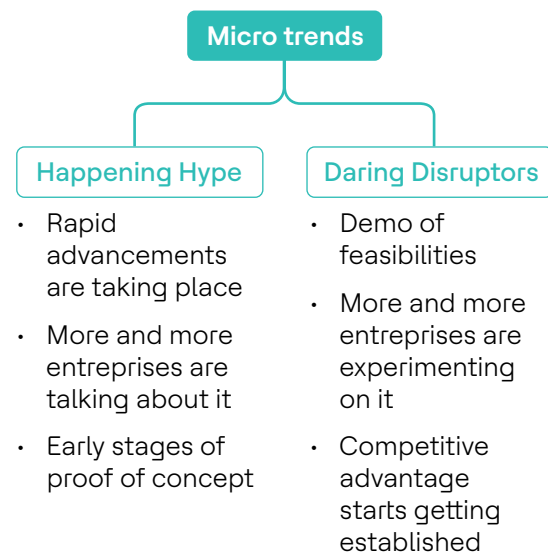
- The overall stage of each of the 10 mega trends has been classified into: (1) Hype (2) Disruption (3) Adoption depending on their maturity cycle.
- The ETO Mesh of Possibilities is introduced for the first time to gauge the impact of the 10 mega trends across 5 parameters.



How are the Micro Tech Trends 2024 classified?

Each of the 20 Micro trends have been classified into two areas:

- **Happening Hype:** This segment covers technologies that are witnessing new advancements.
- **Daring Disruptors:** This covers technologies that are witnessing the demo of feasibilities.



How are the Mega Tech Trends 2024 prioritized?

Finally, the 3A strategy is applied to the 10 mega trends, categorizing them into 3 broad areas for prioritization:

- **Adept (1-2 Years):** Technologies in which enterprises should start active expansion and growth.
- **Adapt (2-5 Years):** Technologies in which enterprises should start gaining competitive edge and actively action.
- **Adopt (5+ Years):** Technologies in which enterprises should start investing and identifying relevant use cases/applications.

About Tech Trends 2024

The trends are based on reflections formed from market research and ecosystem sentiment. They are liable to change based on market dynamics and may only cover a part of the technology landscape. Our goal is to draw upon the research and experience from our ecosystem of startups, VCs, academia, customers, innovation forums and government trade commissions to advance the conversation on a broad spectrum of topics of interest to industry leaders.



Primary Research

Primary research involved two levels: (1) Consumer and (2) Professional. Secondary research findings were reaffirmed through a 35-day global survey. Leading technologists and market leaders endorsed these trends via 1:1 interviews, providing primary inputs for the proposed strategic prioritization of the 10 mega trends.



Secondary Research

An extensive secondary research has been done by analyzing various technology reports, analyst reports, news mentions and podcasts from venture capitals. After the observations, a statistical weighted average method has been used to evaluate these trends.

Analyzing the Sentiments of the technologies

Market sentiment was gauged by analyzing information from the below sources. These sentiments were then consolidated into a final score, calculated via our proprietary weighted average methodology.



News mentions



IT budgets



VC funding



Customers



Market size



Analyst mentions

Survey Demographics

Respondent Roles	Percentages*
Executives	28%
Presidents	8%
Directors	58%
Regional Heads	4%

Regional Impact	Percentages*
Asia	52%
North America	33%
Europe	11%
Africa	1.5%
South America	0.5%
Oceania	1%

Disclaimer: The information on this document is provided for information purpose only. It does not constitute any offer, recommendation or solicitation to any person to enter into any transaction or adopt any hedging, trading or investment strategy, nor does it constitute any prediction of likely future movement in rates or prices or any representation that any such future movements will not exceed those shown in any illustration.

Industries	Percentages*
Technology	39%
Bpm Services	7%
Banking & Insurance	8%
Telecom	6%
Healthcare	5%
Manufacturing & Automotive	6%
Travel, Transport, Logistics & Hospitality	4%
Energy & Utilities	2%
Public Sector & Education	4%
Retail & Consumer Goods	1.4%
Media & Entertainment	1%
Oil & Gas	1%
Mining & Natural Resources	1%
Aerospace & Defense	1%
Others	16%

*The overall percentages have been rounded off and hence the total might not result into complete 100

About Enterprise Technology Office (ETO)

Accelerating future tech in HCLTech

Responsible for driving innovation and thought leadership across the HCLTech horizons, the ETO team has incubated various emerging technologies that have a potential future and positions HCLTech at the forefront of thought leadership.

Business units and initiatives:



HCLTech Trends: ETO's annual exercise of launching the global technology market landscape



HCLTech MetaLabs: HCLTech MetaLabs is where you will find 40+ HCLTech industry creator zones in the world of virtual reality



HCLTech SportsTech: Strategic open innovation ecosystem dedicated to the field of SportsTech



HCLTech eSTiP™: ETO's flagship open innovation platform and program



HCLTech Q-Labs: HCLTech Q-Labs is the flagship quantum business unit stationed on four strategic pillars: academy, RandD, industry offerings and ecosystem



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