



DIGITAL ECONOMY TRENDS 2026

The following legal disclaimer ("Disclaimer") applies to this document ("Document") and by accessing or using the Document, you ("User" or "Reader") acknowledge and agree to be bound by this Disclaimer. If you do not agree to this Disclaimer, please refrain from using the Document.

This Document has been prepared by the Digital Cooperation Organization (DCO). While reasonable efforts have been made to ensure the accuracy and relevance of the information provided, DCO makes no representation or warranties of any kind, express or implied, about the completeness, accuracy, reliability, suitability, or availability of the information contained in this Document.

This Document and any map included herein are without prejudice to the status of or sovereignty over any territory, to the delimitation of international frontiers and boundaries and to the name of any territory, city, or area.

The information provided in this Document is intended for general informational purposes only and should not be considered as professional advice. DCO disclaims any liability for any actions taken or not taken based on the information provided in this Document.

DCO reserves the right to update, modify, or remove content from this Document without prior notice. The publication of this Document does not create a consultant-client relationship between DCO and the User.

The use of this Document is solely at the User's own risk. Under no circumstances shall DCO be liable for any loss or damage, including but not limited to, direct, indirect, or consequential loss or damage, or any loss whatsoever arising from the use of this Document.

Unless expressly stated otherwise, the findings, interpretations, and conclusions expressed in this Document do not necessarily represent the views of the DCO. The User shall not reproduce any content of this Document without obtaining DCO's consent or shall provide a reference to DCO's information in all cases.

By accessing and using this Document, the Reader acknowledges and agrees to the terms of this Disclaimer, which is subject to change without notice, and any updates will be effective upon posting.

DIGITAL ECONOMY TRENDS 2026

See last year's report

<https://dco.org/digital-economy-trends-2025-report/>

Visit the DET website



Image credits:

Istock, Adobe Stock





CONTENTS

| | |
|-------------------|----|
| Foreword | 06 |
| Preface | 08 |
| Acknowledgements | 11 |
| Executive Summary | 12 |

INTRODUCTION 18

| | |
|----------------------------------|----|
| Digital Economy Ecosystem | 19 |
| Digital Economy Trends Framework | 22 |
| Research Process | 24 |
| Digital Economy Trends | 25 |



01. THE DIGITAL ECONOMY IN 2026 28

| | |
|----------------------------------|----|
| Digital Economy Trends Blueprint | 30 |
|----------------------------------|----|



02. DIGITAL ECONOMY TRENDS 52

| | |
|--|-----------|
| Theme 1: Sustainable Intelligent Ecosystems | 53 |
| Trends Comprising Theme 1 | |
| 1.1 The Rise of Vertical AI | 56 |
| 1.2 API Enabled Data Collaboration | 66 |

| | |
|--|-----|
| 1.3 The Dawn of Ambient Intelligence | 76 |
| 1.4 Powering a Sustainable Digital Economy | 86 |
| 1.5 The Emergence of Agentic AI | 96 |
| 1.6 The Rise of Generalist Robots | 104 |

Theme 2: Empowered Communities 113

| | |
|---|-----|
| Trends Comprising Theme 2 | |
| 2.1 Delivering Hyper-Personalization | 116 |
| 2.2 AI Accelerated Workforce Transformation | 126 |
| 2.3 Safeguarding Digital Wellbeing | 136 |
| 2.4 Embracing Immersive Hybrid Experiences | 146 |
| 2.5 The AI Divide | 156 |
| 2.6 The Evolving Brain-Machine Interface | 164 |

Theme 3: Trust and Security 173

| | |
|--|-----|
| Trends Comprising Theme 3 | |
| 3.1 Strengthening of End-to-End Cybersecurity | 176 |
| 3.2 The Spread of Digital Sovereignty Strategies | 186 |
| 3.3 The Emergence of Competing Technology Blocs | 196 |
| 3.4 The Holistic Digital Trade Revolution | 206 |
| 3.5 Preparing for the Quantum Era | 216 |
| 3.6 Converging Frontier Technologies | 224 |

CONCLUSION 232

APPENDIX 234

| | |
|-------------|-----|
| Methodology | 234 |
| Glossary | 243 |

FOREWORD



A shared understanding of these trends is the starting point for stronger cooperation among governments, industries, academic institutions, and civil society. This spirit of cooperation is at the heart of the DCO's mission.

Deemah AlYahya
Secretary-General
The Digital Cooperation Organization

The digital economy continues to accelerate at remarkable speed, reshaping how we live, work, and connect. Driven by breakthroughs in artificial intelligence (AI), data-powered services, and increasingly integrated digital platforms, technology is redefining our possibilities. As the pace of change quickens, the need for clarity, evidence, and actionable guidance becomes even more urgent.

At the Digital Cooperation Organization (DCO), our commitment remains steadfast: to lead with research, innovation, and practical tools that empower Member States and the global community to navigate this new landscape with confidence.

Now in its third edition, the DCO's Digital Economy Trends (DET) report stands as more than an annual publication; it has become a trusted lens through which policymakers, business leaders, and innovators can understand the next chapter of digital transformation. This report does more than track trends. It examines the forces shaping them, brought to life through the voices of hundreds of leaders across sectors and regions. Their insights offer both quantitative grounding and human context, helping us understand not only where digital trends are heading, but why they matter for our societies.

This year's findings point to a defining moment in the evolution of AI. Vertical AI is reshaping specialized industries, agentic AI is redefining autonomy and interaction, and ambient AI is weaving intelligence seamlessly into daily life. Together, these shifts reveal a profound truth: the next wave of digital innovation will only be as inclusive as the infrastructure that enables it. If every nation is to benefit, we must work tirelessly to strengthen the foundations that make AI accessible, safe, and empowering for all.

While the scale and speed of technological change can seem overwhelming, many of the trends explored this year are built on foundations laid in previous editions of this report. What we are witnessing is not disruption for its own sake, but an evolution, reflecting the deepening integration of digital technologies into economies, institutions, and communities. These technologies are no longer optional enhancements. They are fast becoming the engines of economic resilience, the gateways to social participation, and the determinants of global competitiveness. Yet uncertainty persists, making it essential for leaders to understand both the opportunities emerging before us and the challenges that demand collective attention.

A shared understanding of these trends is the starting point for stronger cooperation among governments, industries, academic institutions, and civil society. This spirit of cooperation is at the heart of the DCO's mission: to create a world where every country, every business, and every individual has a fair chance to prosper in an inclusive, cross-border, and sustainable digital economy.

We hope the insights and recommendations in this report inspire deeper reflection, stronger partnerships, and decisive action. As nations navigate a rapidly expanding and interconnected digital era, our purpose at the DCO remains clear: to expand digital prosperity, ensure meaningful participation for all, and support Member States as they shape a future where technology becomes a bridge to opportunities for all.

This report is offered as both a tool and a call to action; one that we hope will guide the global community toward a more inclusive, secure, and sustainably thriving digital economy.

PREFACE



Looking at how the findings have evolved through the three editions of the DET, it is evident that the theme Trust and Security is increasingly critical to the effective functioning of the global digital ecosystem.

Alaa Abdulaal

Chief of Digital Economy Foresight,
The Digital Cooperation Organization

The third edition of the DET report provides a longitudinal view of key trends in the digital economy, equipping Member States and a wider readership with actionable insights to track and respond to evolving digital developments.

The DET report supports digital economy stakeholders by providing unique qualitative and quantitative analysis on critical digital trends shaping the global digital economy. It builds on seamless integration with the DCO Digital Economy Navigator to analyze 12 current trends and six emerging trends, combining survey findings with data-driven insights to offer stakeholders a forward-looking perspective.

This edition provides an expanded assessment of the anticipated impact of digital economy trends on the economy and industries. Building on this assessment, it provides each stakeholder group with detailed and actionable recommendations to help governments, businesses, and individuals capitalize on the trends.

Looking at how the findings have evolved through the three editions of the DET, it is evident that the theme Trust and Security is increasingly critical to the effective functioning of the global digital ecosystem. This is exemplified by the trend Strengthening of End-to-End Cybersecurity, which survey respondents identified as the most impactful for the year ahead.

Overall, the report points to a strategic shift from expanding digital access to empowering people to engage effectively. Beyond cybersecurity, the next two most impactful trends: The Dawn of Ambient Intelligence and Converging Frontier Technologies, highlight the essential role of skills, awareness, and knowledge that individuals need to navigate the fast-changing digital world.

The report also highlights the most important drivers of national readiness to support their citizens in navigating digital economy trends. Based on the DET Survey data, Digital Infrastructure, Digital Innovation, and Digital Capabilities emerge as the most critical areas. Stakeholders, including policymakers, should focus primarily on these areas to effectively leverage the trends identified in this report.

We extend our gratitude to DCO Member States' representatives for enabling the development of this report, with special thanks to the participants of the expert panels.

We hope this edition continues the legacy of the first two editions as a valuable resource for diverse stakeholders, providing guidance and support as they navigate the complexities of the digital economy.



Acknowledgements

This report represents a collaborative effort that would not have been possible without the dedication and contributions of numerous individuals. We extend our heartfelt gratitude to all those who played a pivotal role in bringing this research to fruition.

We express our thanks to the research teams, analysts, and contributors who worked on designing, analyzing, and presenting the research in this report. Their commitment to excellence is evident throughout these pages.

Our appreciation goes to the experts from the Digital Cooperation Organization (DCO) Member States who contributed their valuable time to the research by participating in the expert workshops, deep-dive sessions, and stakeholder consultations.

In the same vein, we extend our gratitude to the DCO Digital Economy Trends 2025 expert panel:

» **Narrimane Benakcha**, Director, Middle East Government Affairs, Oracle

» **Stefania Gallo**, Digital Trade Policy Officer, Digital Trade and Frontier Technologies Hub, World Trade Organization

» **Anja Kaspersen**, Director, Global Markets, New Frontiers and Critical Technologies, IEEE

» **Samia Melhem**, Lead Digital Specialist, World Bank

» **Calvain Nangue**, Strategic Advisor — ICT Skills and SADA Sustainability, Smart Africa Secretariat

» **Miguel Ángel Porrúa Vigón**, Data and Digital Government Coordinator IFD/ICS, Inter-American Development Bank

» **Florian Ramseger**, Data Scientist and tech-podcaster

» **Emrys Schoemaker**, Senior Director, Policy and Advisory, Caribou

» **Prof. Carolien van den Berg**, Deputy Dean of Learning and Teaching, EMS Faculty, University of the Western Cape

» **Dr. Antonio García Zaballos**, Director, Digital Sector Office, Asian Development Bank

Their support and guidance have been instrumental in shaping the direction and focus of this report.

We would also like to express our sincere gratitude to the following DCO technical team members for their unwavering support, review, feedback, guidance, and dedication throughout this report.

» **Dr. Syed Iftikhar Shah**, Technical Publications Director, DCO

» **Fabrice Nkusi**, Technical Publications Manager, DCO

EXECUTIVE SUMMARY

The third edition of Digital Economy Trends (DET) identifies the transformative shifts set to shape 2026 and beyond, offering clear and actionable insights that empower leaders to drive strategy, policy, and investment across a rapidly evolving digital economy.



Listen to the DET 2026 AI-generated podcast by clicking this QR code.

The digital economy is a cornerstone of today's world. It shapes how societies function, how governments operate, and how businesses across all industries create value. Rapidly expanding and continually evolving, the digital economy is projected to grow at 9.5%¹ in 2026, three times faster than the global economy.

With this acceleration, stakeholders need a current and comprehensive insight into the digital economy trends that are driving opportunities for innovation, economic growth, and social and environmental progress. They must also understand new risks that require both long-term vision and near-term action to ensure the digital economy remains inclusive, resilient, and sustainable.

This third edition of the Digital Economy Trends report identifies 18 trends for 2026, grouped under three themes: Sustainable Intelligent Ecosystems, Empowered Communities, and Trust and Security. They include 12 'current' trends, which are expected to accelerate in the next 12-18 months, and six 'emerging' trends, with the potential to be disruptive in the next 3-5 years. Reflecting the rapid pace of change, only three trends are a *continuation* from last year's report. Eleven are *evolutions* of earlier trends. One has *materialized* — emerging last year, current this year. The remaining three are *new*.

The DET report draws from a global survey of 406 respondents, including 272 senior technologists in large companies, 60 policymakers, and 74 digital economy experts from 26 countries, covering 80% of global GDP. These insights are complemented by reputable secondary sources, such as the DCO Digital Economy Navigator (DEN), to provide a shared view of the outlook, potential impact, and national readiness for each trend. The report gives targeted, strategic recommendations for each stakeholder group — private sector, public sector, and intergovernmental organizations (IGOs), international organizations (IOs) and others — for each trend.

The DCO Digital Economy Trends Blueprint (Figure E1) visualizes the trends by their expected socio-economic impact, based on findings from the DET survey. Among digital economy trends, the Strengthening of End-to-End Cybersecurity and the Dawn of Ambient Intelligence are expected to have the most significant positive socio-economic impact in 2026. Over the 3-5 year horizon, Converging Frontier Technologies is anticipated to be the most transformative trend.

Two major shifts stand out compared with last year. First, emphasis is moving from expanding access to the digital economy toward strengthening people's capacity to participate meaningfully in it. This reflects deeper integration of digital tools across societies and the need to ensure inclusion. Second, attention has expanded from the operational resilience of digital systems to the strategic resilience of national digital economies, as digital resources become central to competitiveness.

The digital economy will continue to drive innovation, socio-economic growth, and global competitiveness. While the exact direction of technological progress remains uncertain, investing in national digital infrastructure, innovation, and capabilities remains a reliable strategy for long-term competitiveness and resilience. All stakeholders will benefit from working collaboratively to harness the near- and long-term economic, environmental, and societal opportunities of the digital economy.

Figure E.1
DCO Digital Economy Trends Blueprint

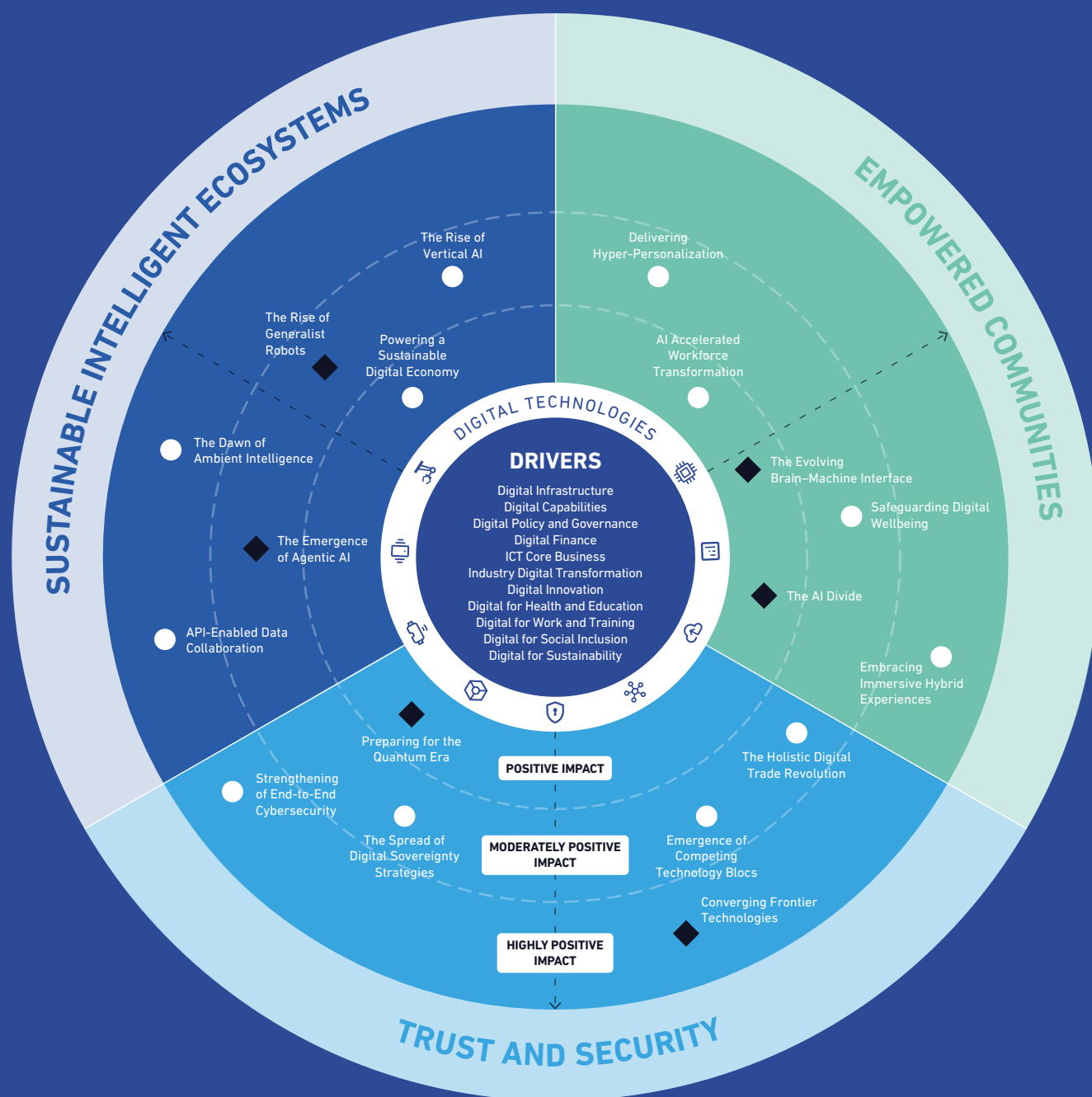
Legend

Digital economy trends:

- Current
- ◆ Emerging
- > Degree of positive impact

----- Concentric circles:

Expected potential impact
(average socio-economic impact)



Source: DCO DET Survey 2025

Theme 1 | Sustainable Intelligent Ecosystems

With artificial intelligence (AI) and data creating value in the digital economy, collaboration among businesses, governments, and civil society is needed to balance rapid digital innovation with resource sustainability and equitable access to digital technology.

● Current trends

The Rise of Vertical AI: competitive advantage in AI is shifting from big foundational models to specialized, industry-focused solutions using proprietary data to solve domain-specific problems.

API-Enabled Data Collaboration: Application Programming Interfaces (APIs) create the potential for organizations and nations to unlock innovation by sharing data while remaining in control of sensitive information.

The Dawn of Ambient Intelligence: sensors in everyday environments are forming an invisible layer of intelligence, using edge computing to enhance services, optimize decisions, and enrich user experiences.

Powering a Sustainable Digital Economy: AI and data centers' demand for electricity is constraining their potential to scale, making clean energy and efficiency strategic priorities.

◆ Emerging trends

The Emergence of Agentic AI: AI agents can increasingly execute workflows proactively and autonomously, creating the potential to make organizations smaller and more efficient.

The Rise of Generalist Robots: sophisticated robots capable of flexibly performing diverse tasks are becoming affordable, promising efficiency gains but raising challenges for employment.

Recommendations

👤 Private sector

- **Introduce vertical AI solutions through modular components** to reduce deployment complexity and lower cost.
- **Partner across value chains to define simple data-sharing rules and co-create certified API-enabled collaboration zones** that ensure secure, sovereign, and trusted data exchanges.
- **Invest in workforce upskilling to turn real-time data insights into operational value** across key domains, including manufacturing, energy, and healthcare.
- **Set an energy-first growth plan** for 2026 onwards to reduce resource use, strengthen resilience, and unlock new business opportunities by prioritizing efficiency and clean power.
- **Develop digital interoperability norms, clear human-oversight protocols, and cross-industry pilot consortia to safely deploy agentic AI and generalist robots** in controlled, high-value settings, sharing standards, liability frameworks, and lessons learned to accelerate responsible scaling.

👥 Public sector

- **Launch national trust compacts with industry and civil society to define sector-specific governance for vertical AI and create regulatory sandboxes for ambient intelligence**, ensuring clear safeguards, defined limits for high-risk applications, and co-designed privacy, security, and equity protections.
- Create national data trusts for high-value public datasets and implement regulatory green lanes for **certified, API-enabled data collaboration**.
- **Strengthen public-private cooperation to upgrade national energy infrastructure** so it can accommodate next-generation computing needs while supporting climate objectives and fair access to digital services.
- **Co-invest in digital skills initiatives** to enable a workforce capable of collaborating with, supervising, and jointly developing solutions with agentic AI systems.
- **Define clear robot-liability frameworks** assigning responsibilities to manufacturers, deployers, and operators, supported by auditable records and proportionate penalties.

🌐 IGOs, IOs, and others

- **Coordinate training programs, toolkits, and targeted technical assistance** to enable small and medium-sized enterprises and underserved regions to develop, deploy, and maintain vertical AI solutions adapted to diverse local contexts.
- **Convene a multi-sector interoperability initiative to promote trusted API networks** with model templates and neutral certification that ensures transparency, explainability, and accountability of digital public infrastructure.
- **Launch a simple, credible clean energy label** to guide global buyers and unlock financing, empowering organizations to build and maintain sustainable digital infrastructure.
- **Develop open-source playbooks, blueprint libraries and workflow templates** to guide smaller organizations in the responsible development and deployment of ambient intelligent systems and agentic AI.
- **Establish a global robotics common** that publishes open reference models, shared simulation environments, and plain-language safety checklists as global public goods, lowering adoption costs for emerging economies.

Theme 2 | Empowered Communities

The digital economy can transform the lives of individuals and communities if stakeholders collaborate to address challenges such as skills development and cultural adaptation, while boosting equitable, inclusive, and sustainable growth of the digital economy.

● Current trends

Delivering Hyper-Personalization: AI systems that continuously learn from users are tailoring solutions to individuals in real time in areas such as healthcare and education.

AI-Accelerated Workforce Transformation: AI is reshaping work, displacing certain jobs while driving the need for new skills such as data literacy and digital collaboration.

Safeguarding Digital Wellbeing: concern is growing that unhealthy digital habits and misinformation are challenging mental health and social cohesion in ways that require new measures to safeguard digital wellbeing.

Embracing Immersive Hybrid Experiences: digital twins, virtual reality, augmented reality, mixed reality, and spatial computing are blurring physical–virtual boundaries in life and work.

◆ Emerging trends

The AI Divide: AI's benefits are concentrated among a few leading companies and nations, amplifying inequalities in ways that threaten lasting technological stratification.

The Evolving Brain–Machine Interface: early-stage brain–machine interfaces are merging the digital and biological, creating the potential for profound societal change through cognitive enhancement.

Recommendations

👤 Private sector

- **Embed trust- and health-by-design principles** into digital platforms and services by integrating safeguards that strengthen transparency, wellbeing, and measures to address misinformation as part of core risk-management practices.
- **Establish enterprise-wide AI transition programs** that treat reskilling as a strategic investment.
- **Define shared disclosure metrics to report the performance of hybrid-experience solutions**, demonstrating cost reductions, safety improvements, and accessibility gains compared with traditional benchmark to unlock investment.
- **Partner with development banks to create financing models for AI adoption in emerging markets**, while sharing both risks and rewards among stakeholders.
- **Co-invest in inclusive, ethical, and affordable clinical trials for brain-machine interfaces** with continuous post-market monitoring to ensure safety and equitable distribution of benefits.

👥 Public sector

- **Develop secure public digital platforms** that enable individuals to easily manage access to their personal data.
- **Establish public-private reskilling funds**, supported by tax incentives and matching grants, to support displaced workers in acquiring new digital skills.
- **Invest in digital wellbeing initiatives** through schools, libraries, and community centers to strengthen public capacity for the safe and responsible use of digital technologies.
- **Leverage public procurement to catalyze trustworthy solutions of hybrid experiences** in priority sectors, such as healthcare, energy, and urban transport.
- **Mandate open standards, API portability, and rights-preserving data sharing** to support local-language datasets and safe model fine-tuning to help narrow the AI divide in the development of large language models.
- **Create national testing spaces with clear governance and liability structures** where companies can safely experiment with personalized AI systems, brain-machine interfaces, and immersive tools before broader deployment.

🌐 IGOs, IOs, and others

- **Advance shared global norms for data ownership, user consent, and responsible AI governance** across both hyper-personalized digital services and immersive experiences.
- **Co-develop shared competency standards for AI and digital workplace skills** with governments, businesses, and educators. Use these standards to create cross-border learning credentials that ensure workers' skills are valued globally.
- Convene international public–private coalitions to **establish global principles for digital wellbeing, content authenticity, and equitable access**, helping align national and industry practices.
- **Coordinate technology transfer programs** that link advanced institutions with emerging-market universities to co-create open-source AI models through global networks.
- **Fund capacity-building initiatives** to enable developing countries to actively participate in shaping, regulating, and deploying neuro-technologies, brain–machine interfaces, immersive systems, and advanced AI.

Theme 3 | Trust and Security

The digital economy can achieve its full potential only if people have confidence in their ability to interact and transact securely online. Cybersecurity is a growing challenge, while the rise of business models that profit from preying on users' vulnerability points to the need to revisit incentive structures, especially aim at growing digital sovereignty, the digital trade, and the emergence of frontier technologies.

● Current trends

Strengthening of End-to-End Cybersecurity: more collective, adaptive, and resilient approaches to cyber defense are needed to safeguard complex and interconnected digital ecosystems.

The Spread of Digital Sovereignty Strategies: more nations are building their own AI systems and cloud infrastructures, aiming to achieve strategic autonomy and minimize reliance on foreign technologies but risking global digital fragmentation.

Emergence of Competing Technology Blocs: countries and corporations are coalescing into blocs that share standards, improving digital interoperability within but not between blocs.

The Holistic Digital Trade Revolution: international trade is shifting toward digital services, demanding new trade agreements and standards for cross-border data flows, interoperability, and regulations to create a trusted and secure digital landscape.

◆ Emerging trends

Preparing for the Quantum Era: advances in quantum computing are opening new opportunities but requiring more active implementation of advanced cryptographic methods to protect data.

Converging Frontier Technologies: the convergence of diverse frontier technologies has the potential to bring about groundbreaking cross-sectoral innovations.

Recommendations

👤 Private sector

- **Partner across supply chains to establish shared cybersecurity standards,** exchange threat intelligence in real time, coordinate joint incident response protocols, and help vulnerable partners in strengthening their defense ecosystems.
- **Implement architectures that balance data-residency requirements with operational efficiency,** and collaborate through industry consortia to advance interoperable standards for data exchange, AI governance, identity management, and cloud services to support scaling across technology blocs.
- **Invest in solutions that balance the principles of digital sovereignty with enabling seamless digital trade,** including cross-border payment rails, standardized e-invoicing, and trusted digital identity frameworks.
- **Modernize cryptographic systems** by mapping current assets, piloting post-quantum cryptography in low-risk environments, and adopting crypto-agile key management.
- **Collaborate with universities and research labs** to accelerate innovation in converging frontier technologies.

👥 Public sector

- **Require minimum security controls for critical vendors** and offer subsidized shared cybersecurity services to SMEs and essential sectors.
- **Design efficient sovereignty frameworks** that achieve data residency and security goals through regional cooperation and shared infrastructure, avoiding costs, unnecessary energy consumption, and market fragmentation.
- **Establish mutual recognition frameworks** across regulatory systems that enable technology transfers, talent mobility, and digital interoperability, allowing firms to operate across technology blocs without excessive compliance burdens.
- **Modernize trade infrastructure** by digitalizing customs, simplifying tax compliance for digital services, and streamlining consumer protection rules to make cross-border digital commerce more accessible to SMEs.
- **Launch public-private partnerships** to create shared national testbeds and cloud labs where SMEs can access quantum-readiness tools, compute resources, datasets, and digital-twin environments, enabling them to prepare for the quantum era and the convergence of frontier technologies.

🌐 IGOs, IOs, and others

- Enable emerging economies and SMEs to adopt secure technologies and cybersecurity protocols through **practical toolkits, frameworks, guidelines, and training for resource-constrained settings.**
- **Create independent monitoring agencies** to measure the cross-border impact of digital sovereignty policies on regulatory fragmentation, equity, and sustainability to promote harmonized approaches across countries.
- **Advance regional cooperation mechanisms and co-develop interoperable standards** for cybersecurity, digital identity, digital payments, and encryption to reduce duplication, enhance transparency, and enable systems to operate seamlessly across technology blocs.
- **Implement practical capacity-building programs,** such as open-source toolkits for digital identity integration, payment system compliance, e-invoicing, and cross-border data governance, to enable all actors to participate effectively in digital trade.
- **Convene regional hubs and establish cross-sector task forces** to strengthen readiness for, and guide the ethical deployment and adaptive governance of, quantum and converging frontier technologies.

Key Results of Digital Economy Trends Survey

9.5%

digital economy growth rate
expected in 2026 – **three times
faster** than the global economy

Top two expected benefits

34% better access to
goods and services

27% greater goods and
services affordability

Top two expected challenges

31% increased industry
concentration

24% increased gap between
capital and labor income

Same top
benefits and
challenges as
in DET 2025

Top digital economy trends by positive impact

Economic

- 1 Strengthening of End-to-End Cybersecurity
- 2 The Rise of Vertical AI
- 3 The Dawn of Ambient Intelligence

Social

- 1 Strengthening of End-to-End Cybersecurity
- 2 Safeguarding Digital Wellbeing
- 3 The Dawn of Ambient Intelligence

Environmental

- 1 Safeguarding Digital Wellbeing
- 2 The Dawn of Ambient Intelligence
- 3 The Holistic Digital Trade Revolution

Public sector highlights

65%

of respondents
expect digital
economy regulations
to increase in 2026

40%

of respondents
prioritize the
Holistic Digital
Trade Revolution
for international
collaboration

100%

of emerging trends
preparedness
depends on Digital
Infrastructure, Digital
Innovation, and
Digital Capabilities

Private sector highlights

47%

of respondents
expect the
healthcare and life
sciences industry to
benefit most from
the digital economy

40%

of companies
prioritize developing
tailored AI tools
in 2026

2.4%

expect an increase
in companies'
headcount due to
digital technologies
in 2026

Regional view: top trends by socio-economic impact and readiness level

North America

- 1 Strengthening of
End-to-End Cybersecurity
PIONEER*
- 2 Converging Frontier Technologies
ADVANCED

Latin America

- 1 Strengthening of
End-to-End Cybersecurity
FUNCTIONAL
- 2 The Holistic Digital
Trade Revolution
ESTABLISHED

Europe and Central Asia

- 1 Strengthening of
End-to-End Cybersecurity
ADVANCED*
- 2 The Rise of Generalist Robots
ADVANCED

Middle East and Africa

- 1 Strengthening of
End-to-End Cybersecurity
FUNCTIONAL
- 2 API-Enabled Data Collaboration
FUNCTIONAL

Indo-Asia and Pacific

- 1 The Dawn of Ambient
Intelligence (Established)
- 2 Strengthening of
End-to-End Cybersecurity
ADVANCED*

*This is also the region's
highest readiness score

INTRODUCTION

The digital economy is a cornerstone of today's world. No longer confined to technology sectors, it shapes modern societies, economies, and institutions. Fast-moving and continually evolving, it transforms industries, redefines governance, and changes the way people live, work, and connect.

The trajectory of the digital economy depends on how a few key digital economy trends unfold. To ensure these trends serve the greater good of society, it is vital for decision-makers including governments, businesses, international organizations, and civil society to clearly understand what is changing, why it matters, and how to prepare for opportunities and risks.

Since its first edition, the DCO Digital Economy Trends (DET) report has provided a structured, evidence-based view of these evolving trends, offering timely, impartial analysis to help decision-makers across regions and institutions anticipate disruption, harness innovation, and shape a digital future that is inclusive, secure, and sustainable for all. Over time the series has become a reliable resource for digital economy leaders.

The DET 2026 report comes at a pivotal moment. The pace of digital adoption continues to accelerate, with AI, immersive technologies, and automation moving rapidly into mainstream use. However, digital technologies are less likely to use common architecture and infrastructure, as investments in the digital space are increasingly intertwined with national competitiveness strategies. Digital market fragmentation is creating an additional layer of complexity.

As a result, the impacts of digital technology trends are likely to materialize both unequally and faster than ever across critical industries. Understanding how to harness these trends for inclusive and sustainable growth of the digital economy has never been more important. The DET 2026 report offers a common reference to guide decision-making. Drawing on expert insights and systematic analysis, it provides practical recommendations to different stakeholders on how to leverage the most important current and emerging digital economy trends in the pursuit of shared global goals.

Digital economy definition

The economic activity reliant on, significantly enhanced by, or enabled by digital technologies and their applications. This includes activities that increase human wellbeing or lead to social or environmental benefits.²



Digital Economy Ecosystem

Digital economy trends do not unfold in isolation, they are part of an evolving technical, socio-economic, cultural, and political ecosystem. Two foundational dimensions influence their development: national enabling capacities (referred to as drivers) and digital technologies, which create the conditions for their uptake and scale. The **Digital Economy Trend Framework** visualizes digital economy trends as part of the digital ecosystem.

Each digital economy trend is underpinned by a combination of drivers and digital technologies,³ shaping how it emerges, how quickly it scales, and who benefits. The relative importance of each driver and digital technology differs among the trends.

National enabling capacities (drivers) function as both prerequisites for, and accelerators of, the adoption of digital economy trends. When strong drivers are in place, adoption costs fall, risks diminish, and diffusion accelerates. When drivers are weak, scale is constrained and disparities in access and outcomes widen. These national enabling capabilities are measured by the **DCO Digital Economy Navigator (DEN) pillars**:

Digital Infrastructure

The telecommunications and internet infrastructure that enables people and businesses to participate in the digital economy.

Digital Capabilities

The availability of talent with the skills to effectively engage and participate in the digital economy.

Digital Policy and Governance

The digital policy, administrative, and regulatory environment foundational to all digital economy activities.

Digital Finance

The maturity of the financial system, combined with accessible and inclusive digital banking services and related financial activities that contribute to developing the wider digital economy.

ICT Core Business

The level of economic activity of the hardware and software businesses that form the core of the digital economy.

Industry Digital Transformation

The degree to which traditional industries are being transformed by digital technologies and services.

Digital Innovation

How a country supports startups and researchers to use digital technologies for new products, services, and business models.

Digital for Health and Education

The degree to which digital technologies are used in healthcare and education.

Digital for Work and Training

The degree to which digital tools and platforms are used for training, upskilling, and accessing new income opportunities.

Digital for Social Inclusion

Inclusive access to digital technologies and services for all population groups.

Digital for Sustainability

The adoption of practices that improve the environmental performance of the digital economy including reducing the digital footprint of products and services and increasing energy efficiency.

Alongside these drivers, nine clusters of digital technologies underpin trend development by defining what is possible and at what scale. These technologies rarely operate in isolation. Instead, they interact in mutually reinforcing ways that enable new waves of digital economy development. Compared with 2025, two new digital technology clusters have been added: semiconductors and chips; and immersive technologies.

Artificial Intelligence (AI) and advanced analytics

A general-purpose technology that amplifies all other trends. The market is pivoting from large general models to specialized vertical AI, continuously operating ambient AI, and autonomous agentic systems that can execute complex workflows.

Cloud services

A continuum of distributed infrastructure, from centralized hyperscale data centers (cloud) to localized processing nodes (edge). Hybrid architectures combine the high-performance computing power required for AI training in the cloud with the low-latency, real-time processing capabilities provided by localized edge nodes.

Semiconductors and chips

The specialized hardware (e.g., graphics processing units, or GPUs, and application specific integrated circuit) that forms the physical substrate for AI and high-performance computing. Demand for AI application-specific chips is making semiconductor capabilities a key strategic and geopolitical asset for governments, hyperscalers, and digital industries.

Digital connectivity

This is the backbone of ubiquitous, high-bandwidth, low-latency communication that connects cloud and edge, enables real-time data flows, and powers the Internet of Things (IoT), autonomous systems, and immersive experiences.

Encryption and cybersecurity

The practice of defending interconnected digital ecosystems from an expanding array of sophisticated cybersecurity threats. The focus is shifting from static, perimeter-based defense to autonomous, adaptive, and resilient security infrastructure that can protect entire digital and physical supply chains across industries.

Blockchain and decentralized technologies

Technologies that allow data to be stored and verified across a network of independent nodes enabling secure, transparent, and immutable record-keeping. Their tamper-resistant design enables trusted interactions across multi-party collaborations, supply chains, and digital transactions.

Immersive technologies

Technologies that merge the physical and virtual worlds, creating platforms for interaction, collaboration, and simulation. Applications include digital twins — virtual replicas of physical systems used for real-time monitoring and optimization.

Digital devices and the IoT

The network of ubiquitous, low-cost, connected sensors embedded in physical objects and environments. This creates a layer of 'ambient intelligence' that generates massive real-time data streams, which are the lifeblood for AI and digital twins.

Robotics and autonomous systems

The field of designing and deploying physical machines that can perceive, reason, and act in the real world. AI foundation models are enabling a new generation of generalist robots that are capable of learning and performing diverse, complex tasks autonomously.

► The DET framework is visualized on page 23

The DET report and the DEN are designed as complementary tools. Together, they provide a comprehensive view of the digital economy — linking forward-looking insights on trends with current assessments of maturity and readiness.

- The DET identifies and assesses the most impactful current and emerging digital economy trends. It takes a forward-looking perspective, highlighting how technologies and innovations may shape the future of economies and societies.
- The DEN measures the maturity of digital economies today across countries, providing a benchmark of enabling conditions such as infrastructure, capabilities, regulation, and innovation.

These perspectives are interdependent. The trends tracked in the DET are grounded in, and supported by, the enabling environment captured by the DEN. To reflect this foundational link, the DET 'drivers' are the DEN 'pillars' — the underlying digital infrastructure, human skills and competencies, financial resources, and policy and regulatory factors that determine the capacity of countries to leverage digital economy trends. By connecting the DET's forward-looking insights with the DEN's current maturity assessments, stakeholders can better understand not only where economies stand today but also how prepared they are to adapt to and benefit from emerging trends.

Digital technologies are at different stages of development. The expected evolution and current growth dynamics are as follows:

AI and advanced analytics

EXPONENTIAL IMPACT AND ADOPTION



- General-purpose AI models becoming commoditized with rapid capability replication
- Strategic pivoting toward vertical AI tools with proprietary domain expertise
- Evolution from passive assistants to active intelligence embedded across environments
- Agentic model architectures enabling AI to undertake multistep tasks autonomously
- Model performance improving through automated feedback
- Integration of multimodal data with context memory for simultaneous interaction

Cloud services

RAPIDLY SCALING



- Cloud infrastructure expanding with higher compute capacity
- Data centers redesigned around AI workloads, with accelerator-heavy processing
- Specialized cloud hardware (such as GPUs and tensor processing units) becoming central to cloud architecture
- Edge computing experiencing rapid expansion for low latency, real-time processing

Semiconductors and chips

SUSTAINED MOMENTUM



- Industry approaching unprecedented scale to develop advanced nodes driven by AI demand
- Specialized AI chips becoming dominant over general-purpose processors
- Hardware renaissance as AI requirements drive custom chip architectures
- Breakthroughs in efficiency addressing energy constraints in AI-centric hardware

Digital connectivity

RAPIDLY SCALING



- 5G networks achieving global scale with widespread adoption
- Next-generation 6G development focusing on AI-native ultra-low latency
- Integration of terrestrial and satellite networks to enable seamless coverage
- Rise of programmable telecommunications services through standardized application programming interfaces (APIs)
- Network infrastructure becoming the foundation for distributed intelligence

Encryption and cybersecurity

SUSTAINED MOMENTUM



- Fundamental shift from static to adaptive, autonomous protection of digital systems
- AI-powered attacks increasing in complexity and scale
- Encryption standards migrating to post-quantum algorithms
- Identity-centric architectures becoming core security foundations

Blockchain and decentralized technologies

SUSTAINED MOMENTUM



- Market transitioning from speculative to practical enterprise applications
- Focus shifting to supply chain transparency and digital identity
- Advances in cross-chain interoperability enabling trustless collaboration between organizations
- Growth of environmental verification and circular economy initiatives
- Providing foundation for new models of digital governance

Digital devices and the IoT

RAPIDLY SCALING



- Ubiquitous sensor deployment creating invisible intelligence layer
- Low-cost connectivity enabling massive device proliferation
- Edge processing bringing computation closer to data sources
- Environmental awareness systems operating without human intervention
- Real-time data streams becoming essential input for AI systems

Immersive technologies

RAPIDLY SCALING



- Advances in augmented reality (AR), virtual reality (VR), and mixed reality (XR) hardware blurring physical-virtual world boundaries
- Digital twins enabling real-time system monitoring and optimization
- Industrial applications transforming training and maintenance
- New interaction paradigms (hand-eye and haptic feedback) emerging beyond traditional interfaces

Robotics and autonomous systems

RAPIDLY SCALING



- Service robotics expanding beyond manufacturing
- AI foundation models enabling adaptive, learning capabilities
- Generalist robots emerging beyond single-purpose automation
- Commercial viability expanding to traditionally labor-intensive sectors

Digital Economy Trends Framework

The digital economy framework is completed by the 18 digital economy trends: 12 current trends that are already unfolding and are expected to accelerate in the next 12-18 months; and six emerging digital economy trends that have the potential to transform economies and societies over the next 3-5 years.

Although the 18 digital economy trends vary across the years in line with broader shifts in the digital landscape — some continuing, others evolving, and some materializing from emerging to current — they are, for analytical clarity and continuity, grouped under the same three themes first introduced in DET 2025:

Theme 1

Sustainable Intelligent Ecosystems

AI and data play a pivotal role in creating value in the digital economy. Collaboration among businesses, governments, and civil society is needed to balance rapid innovation with resource sustainability and equitable access to technology.

Theme 2

Empowered Communities

The digital economy can transform the lives of individuals and communities — but only if stakeholders collaborate on tackling challenges such as skill building and cultural adaptation, with a focus on boosting equitable, inclusive, and sustainable development.

Theme 3

Trust and Security

The digital economy can achieve its full potential only if people have confidence in their ability to interact and transact online. Cybersecurity is a growing challenge, while the rise of business models that profit from preying on users' vulnerability points to the need to revisit incentive structures.

Digital economy trend definition

In the context of this report, a digital economy trend results from the emergence or deployment of a digital technology or platform that supports or accelerates innovation, provides access to information and services, or connects individuals, communities, and markets. A digital economy trend has a discernible direction, and offers measurable, positive financial, social, and/or environmental benefits. Trends are differentiated into:

Current trends

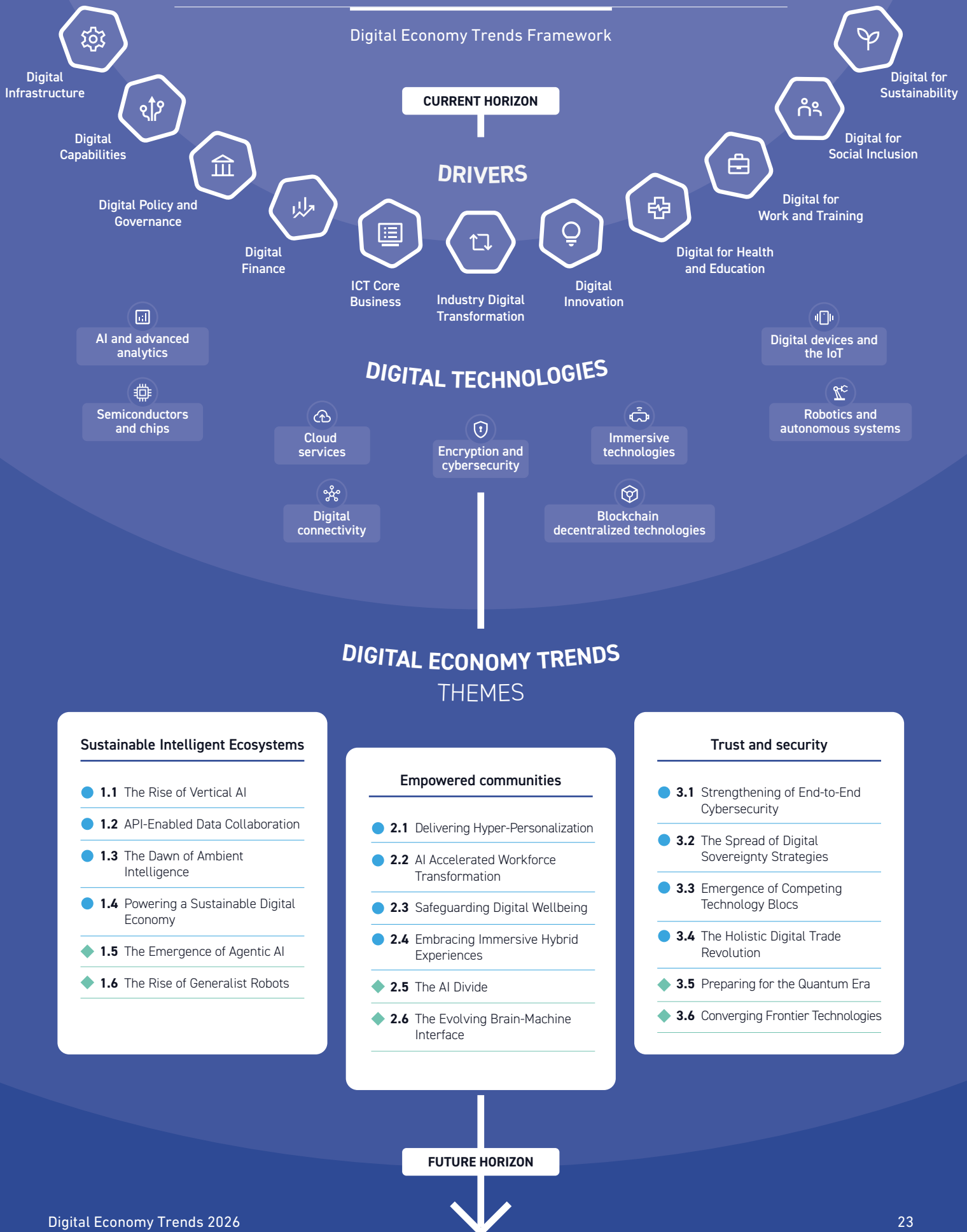


Have already demonstrated impacts that are expected to continue in the next 12-18 months.

Emerging trends



May not yet have had a significant impact but could disrupt the global economy in the next 3-5 years.



Research Process

The DET framework provided the foundation for this year's research. Its core components were reviewed for continued relevance and alignment with the report's strategic objectives. The research followed a purpose-built, four-stage methodology to define, identify, and measure the most important digital economy trends in the short and medium term.

1. Definitions and objectives

The strategic objectives of the DET were confirmed for this edition. Accordingly, the report's definitions remain unchanged from last year and the DET framework was reviewed to ensure that it reflects the latest developments in the digital economy ecosystem.

2. Literature review and secondary data collection

Publications by international organizations, think tanks, consulting firms, and academic institutions were reviewed to identify an initial broad list of trends.

3. Validation by multi-stakeholder experts

Each identified trend was benchmarked against the DET trend criteria (see the methodology annex in the appendix), reviewed by the project team, and prioritized or consolidated through additional research on expected impact. This list was narrowed down through a validation workshop with experts representing different stakeholder groups: business, government, international organizations, non-governmental organizations, and academia.

4. Collection of primary data through the DET Survey and expert consultations

The DET Survey 2025, which took place in September–October 2025, captured the perspectives of 406 respondents from 26 countries that represent 80% of global GDP. They comprised 272 chief technology officers and senior technologists working in large companies (250+ employees, operating across at least two countries), and 134 experts (60 policymakers and 74 digital economy and financial experts). Complementary consultations were conducted with experts on the survey findings.

5. Data analysis of both primary and secondary data

Data analysis focused on examining the DET Survey results and integrating them with secondary sources, such as the DEN 2025, to build a comprehensive picture of the digital economy trends covered in this report — including their expected socio-economic impact, speed of change, and potential value creation. The findings constitute the majority of this report and inform the stakeholder recommendations.

The full list of experts is provided in the Acknowledgements section, while the methodology, including details on the DET Survey and underlying calculations, is described in the Appendix.

Digital Economy Trends

The 18 most important digital economy trends for 2026 are:

Sustainable Intelligent Ecosystems

● Current trends

The Rise of Vertical AI: competitive advantage in AI is shifting from big foundational models to specialized solutions using proprietary data to solve specific problems.

API-Enabled Data Collaboration: APIs create potential for organizations and nations to unlock innovation by sharing data while remaining in control of sensitive information.

The Dawn of Ambient Intelligence: sensors in everyday environments are forming an invisible layer of intelligence, using edge computing to optimize decisions and experiences.

Powering a Sustainable Digital Economy: AI and data centers' demand for electricity is constraining their potential to scale, making clean energy and efficiency strategic priorities.

◆ Emerging trends

The Emergence of Agentic AI: AI agents can increasingly execute workflows proactively and autonomously, creating the potential for organizations to become smaller and more efficient.

The Rise of Generalist Robots: sophisticated robots that can flexibly perform diverse tasks are becoming cheaper, promising efficiency gains but also disrupting employment.

Empowered Communities

● Current trends

Delivering Hyper-Personalization: AI systems that continuously learn from users are tailoring solutions to individuals in real time in areas such as healthcare and education.

AI Accelerated Workforce Transformation: AI is rapidly reshaping work, displacing jobs while necessitating investment in new skills such as data literacy and digital collaboration.

Safeguarding Digital Wellbeing: concern is growing that unhealthy digital habits are challenging mental health and social cohesion in ways that require new policy solutions.

Embracing Immersive Hybrid Experiences: digital twins, VR, XR, and spatial computing are blurring physical–virtual boundaries, reshaping how we work and live.

◆ Emerging trends

The AI Divide: AI's benefits are concentrated among a few large technology companies and nations, amplifying inequalities in ways that threaten lasting technological stratification.

The Evolving Brain–Machine Interface: early-stage brain–machine interfaces are blurring the lines between the digital and biological, creating the potential for profound societal change through cognitive enhancement.

Trust and Security

● Current trends

Strengthening of End-to-End Cybersecurity: more collective and adaptive approaches are needed to protect increasingly complex and interconnected digital ecosystems.

The Spread of Digital Sovereignty Strategies: more nations are building their own AI systems and clouds, targeting strategic autonomy but risking global digital fragmentation.

Emergence of Competing Technology Blocs: countries and corporations are coalescing into blocs that share standards, improving interoperability within but not between blocs.

The Holistic Digital Trade Revolution: international trade is shifting toward digital services, requiring new agreements on cross-border data flows and regulatory frameworks.

◆ Emerging trends

Preparing for the Quantum Era: advances in quantum computing are opening new opportunities but requiring more active implementation of new methods to encrypt data.

Converging Frontier Technologies: the convergence of diverse frontier technologies has the potential to bring about groundbreaking cross-sectoral innovations.

Evolution since 2025

The 18 trends identified in this edition reflect three major changes since last year.

First, access to AI has become broader and more cross-cutting with a proliferation of tools that have diverse geographical origins, decision-making structures and underlying knowledge sources.⁴ Yet concern is also growing about ever-increasing costs and wide inequalities in underlying capacity in infrastructure.

Second, digital technologies are transforming societies more profoundly and quickly than ever, as continuous digital touch-points create new opportunities for interaction and enable the development of more tailored products and services. Intensifying concerns about the responsible use of data and algorithms call for renewed focus on ensuring that individuals and communities possess the skills to engage with digital technologies.

Third, digital technologies are increasingly interconnected with geopolitical trends. Amid a tense geopolitical climate, and with the economic outlook increasingly dependent on digital resources and assets, many nations are looking at ways to reduce dependence on foreign systems and boost industrial resilience.

These overarching shifts are reshaping the digital economy, and as a result this year's 18 trends fall into four distinct categories. Three are *continuations* of digital economy trends observed last year, with their momentum expected to accelerate. Eleven are *evolutions*, reflecting how earlier trends are developing in response to these shifts. One trend has *materialized* — having progressed from an emerging trend in the previous edition to a current trend that is now demonstrating clear, visible impacts for stakeholders. Finally, three trends are *new*, pointing to fresh areas of strategic importance as the digital landscape continues to evolve.

More than ever, there is global recognition that digital economy trends raise systemic risks as well as opportunities for stakeholders, reflected in notable increases in both investments and regulations. Whether these trends can be leveraged in a sustainable and equitable manner is a question with increasingly high stakes.

Digital economy trends evolution at a glance



trends are a
continuations
from DET 2025



trends are
evolutions from
DET 2025



trends are new for
DET 2026



trend has materialized
— having progressed
from an emerging
trend in DET 2025 to
a current trend 2026



The digital economy in 2026

Rapid advances in digital technologies continue to reshape the economic, social, and environmental landscape. Unsurprisingly, most of the digital economy trends identified in this year's report represent an evolution from those in the previous report rather than a radical departure.

Digital economy trends had a major economic impact in 2025 and are set to do so again in 2026. In particular, investments in digital technologies, such as ICT equipment, software, and databases, emerged as a key driver of economic growth.⁵ DET survey respondents expect this to continue, as they anticipate that the **digital economy will grow by 9.5% in 2026** — more than three times the International Monetary Fund's projection for GDP growth.⁶ Based on this outlook, the digital economy is expected to constitute 22% of global GDP in 2026, corresponding to an estimated valuation of approximately US\$28 trillion.⁷

When asked how digital economy trends will shape the economy over the next 3-5 years, Survey respondents see a mix of positive and negative impacts, as shown in Figure 1. They are most optimistic about improvements in access to and affordability of digital goods and services and most concerned about industry concentration — including the risk that advances in AI could be driven by a small number of hyperscalers — and the widening gap between returns to capital and labor.

As a whole, this year's survey results indicate a notable shift in emphasis from widening access to participate in the digital economy toward building people's skills capacity so they can actively participate. This reflects the deeper integration of digital technologies across societies and economies and the need to ensure that no one is left behind.

In this context, it is notable that survey responses indicate continuing concern about labor market impacts. While the results here are marginally more optimistic than last year, still almost as many respondents expect digital technology to decrease (24.6%) as increase (29.6%) the number of jobs available. Respondents are more optimistic about the impact of the digital economy on wages, with 16.7% expecting a positive effect. This could be aligned with recent research suggesting that AI may be reducing productivity differentials between workers.⁸

Amid a rapid pace of change, we should not forget that the digital economy journey remains at an early stage. Uncertainty continues to surround which pathways will prevail, whether evolving business models will prove sustainable (see sidebar), how regulatory frameworks will take shape, and how challenges such as compute constraints and diverse data governance approaches will influence future trajectories.

Despite uncertainty over details, overall the emerging digital economy trends outlined in this report are expected to drive the next wave of innovation, productivity and economic growth as well as social progress. Investing in digital infrastructure, digital innovation, and digital capabilities at the national level therefore remains a sound and forward-looking strategy. For these investments to deliver results for all, they must be coupled with coherent and coordinated strategies and policies and regulations that reduce fragmentation, strengthen alignment, and reinforce the foundations of a trusted and competitive digital economy.



Digital economy growth rate expected in 2026

This is three times faster than the global economy

The trillion dollar bubble?

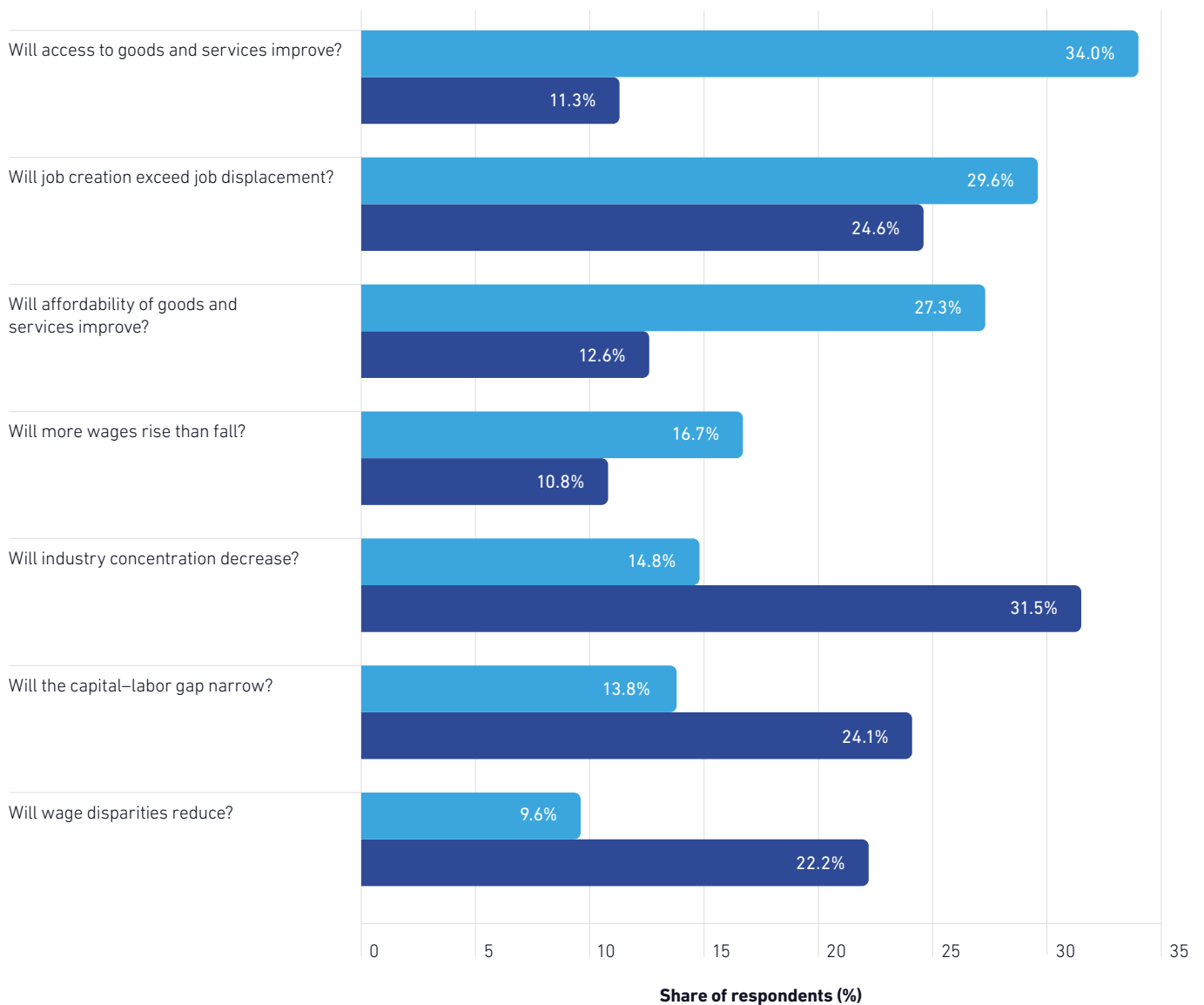
There is growing caution within the financial sector that the artificial intelligence (AI) boom may be showing early signs of overvaluation. Three factors are contributing to these concerns.

First, a significant portion of current investment in AI is essentially circular: chip manufacturers invest in AI labs, which then use that capital to buy cloud compute from cloud providers, and these providers use that revenue to buy more chips from the same original manufacturers. The cycle continues in a closed loop, creating perceptions of demand that are not fully based on market dynamics reflecting evidence of productivity improvements, which so far remains limited.⁹

Second, hyperscalers and cloud providers are using complex financial structures, corporate subsidiaries, and joint ventures to raise finance for investing in data centers and graphics processing units, allowing them to expand capacity without directly recording the associated liability on their balance sheets.¹⁰ This intentional debt opacity echoes behaviors of the 2008-09 global financial crisis and the 2000 dot-com crash.

Finally, open-weight AI models that run locally are becoming increasingly efficient and cost-effective.¹¹ Competition from these models makes it more difficult for the frontier providers to charge enterprise premiums. If their revenues fall short of expectations, the AI boom could quickly unwind.

Figure 1: How will digital economy trends shape the global economy in the next 3-5 years?



Legend: ● Yes ● No

Source: DCO 2025 Digital Economy Trends Survey.

Q: Select up to three areas where you anticipate the most significant impact of digital economy trends in the next 3-5 years.

Respondents: 272 CTOs and senior technologists working in large companies (+250 employees), 60 policymakers, and 74 digital economy experts.

Figure 2
Digital Economy Trends Blueprint

Legend

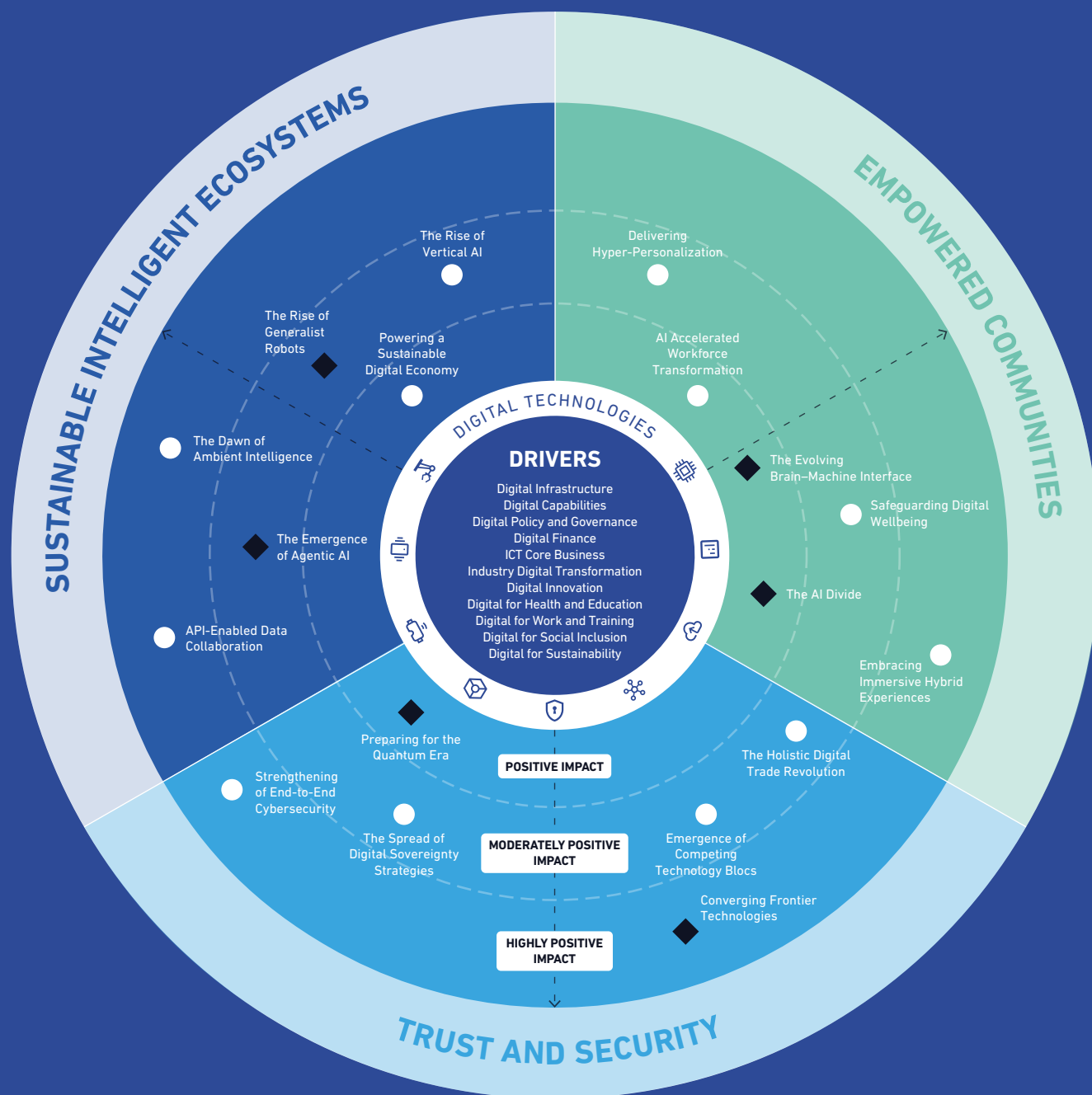
Digital economy trends:

● Current ◆ Emerging

-----> Degree of positive impact

----- Concentric circles:

Expected potential impact
 (average socio-economic impact)



Source: DCO DET Survey 2025

Most impactful digital economy trends

The DCO Digital Economy Trends Blueprint (Figure 2) presents a consolidated view of the key trends anticipated to shape the digital landscape in 2026. Drawing on the DET Survey results, these trends have been classified as positive, moderately positive, and highly positive in terms of expected socio-economic impact.

The digital economy trends anticipated to deliver the strongest socio-economic impact are expected to exert the greatest influence on the future development of the digital economy. Survey respondents expect these to be: Strengthening of End-to-End Cybersecurity, the Dawn of Ambient Intelligence, and Converging Frontier Technologies.

Strengthening of End-to-End Cybersecurity

The Dawn of Ambient Intelligence

Converging Frontier Technologies.

The survey results indicate a shift in the center of gravity to reflect concerns about how digital systems can be integrated and scaled in a responsible manner. The top trends in the 2025 DET Survey — Extending Global Connectivity, Deploying Specialized, Accessible and Localized AI, and Building Digital Skills and Continuous Learning — were more focused on expanding specific technologies and capacities. While these trends remain relevant, evolution in technologies and contexts has lessened their anticipated socio-economic impact relative to other digital economy trends.

Strengthening of End-to-End Cybersecurity

Cyber-resilience, which ranked as one of the top five priorities in 2025, has grown to be the top trend for socio-economic impact in 2026. Looking back further to changes since the 2024 survey, it is clear that the theme of Trust and Security is becoming increasingly important over time.

A changing security threat landscape has intensified the imperative for end-to-end cybersecurity. Generative AI is powering more sophisticated attacks, while the growing complexity of digital ecosystems increase overall exposure to security risks. At the same time, unprecedented volumes of information — including sensitive data and widespread misinformation — are circulating online, broadening overall exposure to digital risks. As the digital economy becomes ever more critical to daily life and economic activity, the need to safeguard it is becoming increasingly urgent. Yet widening resource gaps leave smaller organizations and under-resourced countries particularly vulnerable.

This reinforces why strengthening end-to-end cybersecurity holds such significant potential for positive socio-economic impact: stronger protection reduces risk exposure and the socio-economic costs of outages and cyberattacks, while strengthening trust across digital services. As systems handle more sensitive data and businesses rely on dependable supply chains, robust cybersecurity remains vital to ensuring operational continuity and maintaining public and subscriber confidence.

Trust in the integrity of systems is the foundation of the digital economy. Growing systemic and existential risks to the digital economy demand robust and holistic approaches to cyber resilience that protect the entire ecosystem.

The Dawn of Ambient Intelligence

The Dawn of Ambient Intelligence reflects the evolution of the DET 2025 trend, Strengthening Collaborative Data Ecosystems, by shifting from the sharing and governance of data to the real-time use of multimodal data embedded directly in environments. The foundations highlighted in the DET 2025 trend — interoperability, data quality, and secure access — now underpin the ambient intelligence systems that sense, process, and respond locally. This shift reflects the convergence of localized AI, faster connectivity, and maturing data architectures, which enable real-time, on-device computation rather than relying on periodic data exchange.

Ambient Intelligence is scaling from pilot projects to pervasive systems, with ambient sensors improving safety in transportation and workplaces, strengthening healthcare through patient monitoring, and easing administrative workloads by undertaking routine information capture. Achieving its potential will depend on more than technology: human-centered governance must keep pace, as new frameworks are needed to regulate invisible systems. A consensus must be found on obtaining meaningful consent for continuous, biometric data collection. Collective action is needed to protect the privacy of all individuals, especially children and vulnerable populations, from the risks of passive and pervasive surveillance.

Converging Frontier Technologies

This emerging trend highlights AI's role as a powerful amplifier of other frontier technologies such as robotics, spatial computing, and biology. While its socio-economic impact is expected to mature over the next 2-3 years, it is already increasing the velocity, scope, and efficiency of innovation. Biotechnology labs can autonomously run thousands of experiments daily, accelerating drug design. Advanced manufacturing factories can be reconfigured in hours.

However, radically compressing the timeline of innovation raises urgent practical challenges. Faster discovery cycles and factory deployments increase skill obsolescence, intensify demand for advanced technical capabilities, and require new strategies for managing workforce transitions. Safety and governance issues become more acute, as sensitive domains such as biological design and autonomous systems could scale more rapidly than existing oversight mechanisms. Hence successfully managing these human and regulatory challenges will determine whether the powerful gains from AI-fueled convergence are realized broadly and safely.

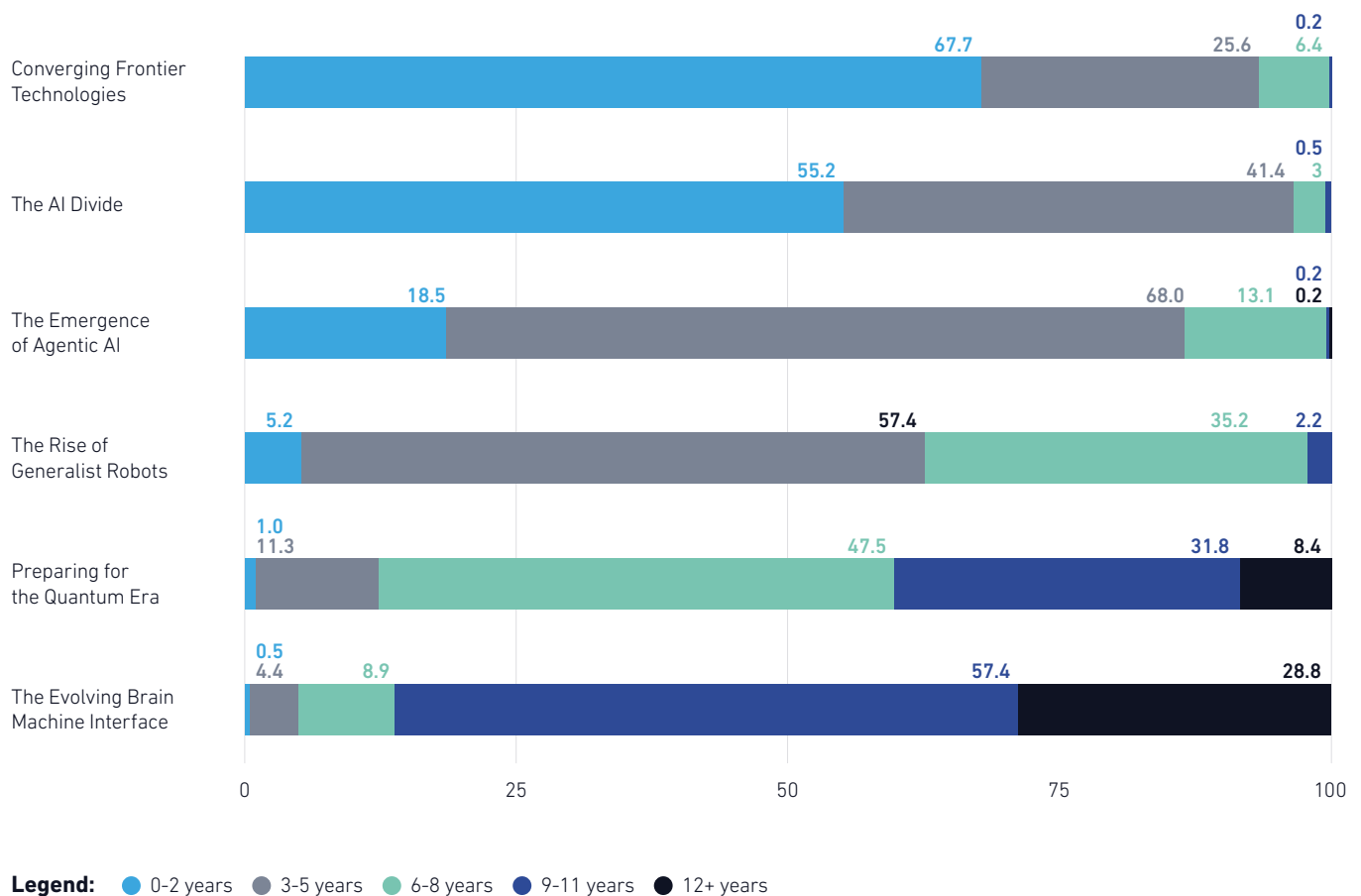
Materialization of emerging trends

Among the six emerging digital economy trends considered in the report, survey respondents expect the trend of technological convergence to materialize fastest (in just over 2 years), as shown in Figure 3. More than half of respondents foresee this convergence happening within the next 2 years, and a large majority expect it to take no longer than 5 years. The same observations also apply to the emerging trend on the widening AI divide.

Stakeholders expect brain-machine interfaces to take the longest to materialize out of all the emerging trends, with most anticipating a timeline of over 9 years — and a significant minority expecting at least 12 years — before such devices reach their potential. The quantum era is considered the next most distant trend, with a strong majority expecting at least 6 years before materialization.

Generalist robots and agentic AI come in the middle of the pack, with a majority view that materialization will take 3-5 five years in both cases. Respondents who differ from this consensus are more likely to foresee a shorter timeline for agentic AI, and a longer timeline for generalist robots.

Figure 3: Expected years until the materialization of emerging trends



Source: DCO 2025 Digital Economy Trends Survey.

Q: In the country where you work, when do you expect the following emerging Digital Economy trends to affect businesses and societies?

Respondents: 272 CTOs and senior technologists working in large companies (+250 employees), 60 policymakers, and 74 digital economy experts.

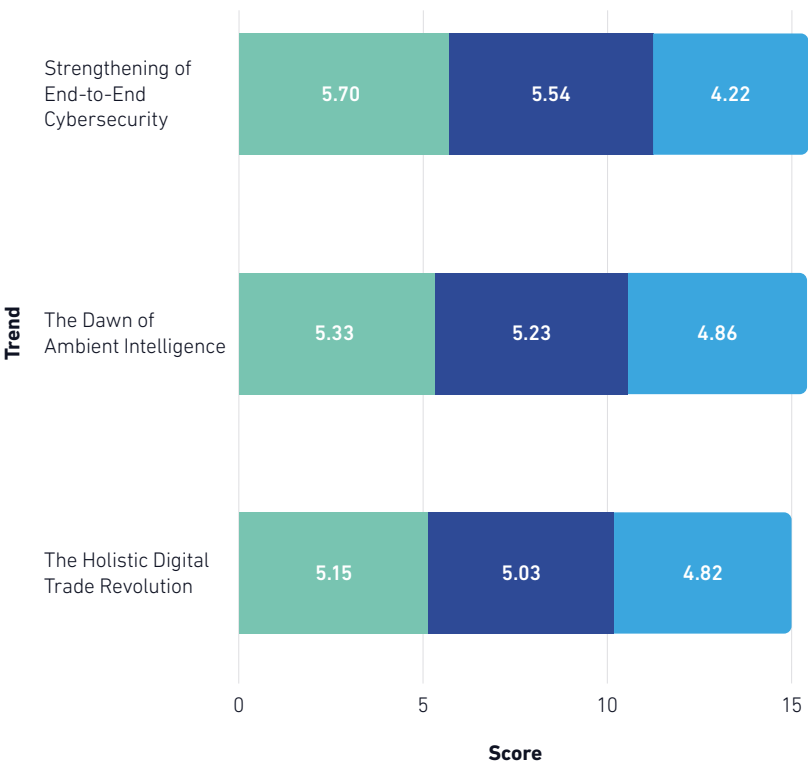
Collective impact of trends

As environmental considerations are increasingly important for the digital economy, we asked survey respondents to rate current trends for their environmental impacts as well as their impacts on the economy and society. Across all 18 trends, respondents are more optimistic about the potential economic (5.00) and social (4.75) impacts than the environmental impact (4.03). Nonetheless, this represents a significantly more positive outlook for environmental impacts than in last year's survey.

Top current trends by collective economic, social, and environmental impact

When we add environmental considerations, the top two trends by socio-economic impact remain unchanged — Strengthening of End-to-End Cybersecurity and The Dawn of Ambient Intelligence — but The Holistic Digital Trade Revolution replaces Converging Frontier Technologies in third position, as shown in Figure 4. It does not have the highest environmental impact, but features strongly across all the three areas.

Figure 4: Top three current trends by combined economic, social, and environmental impact



Legend: Economic Social Environmental

Source: DCO 2025 Digital Economy Trends Survey.

Q: In the country where you work, how would you assess the economic/social impact of these current digital trends in the next 12-18 months?

Respondents: 272 CTOs and senior technologists working in large companies (+250 employees), 60 policymakers, and 74 digital economy experts.

Top trends shaping the digital economy in 2026

Economic

- 1 Strengthening of End-to-End Cybersecurity
- 2 The Rise of Vertical AI
- 3 The Dawn of Ambient Intelligence

Social

- 1 Strengthening of End-to-End Cybersecurity
- 2 Safeguarding Digital Wellbeing
- 3 The Dawn of Ambient Intelligence

Environmental

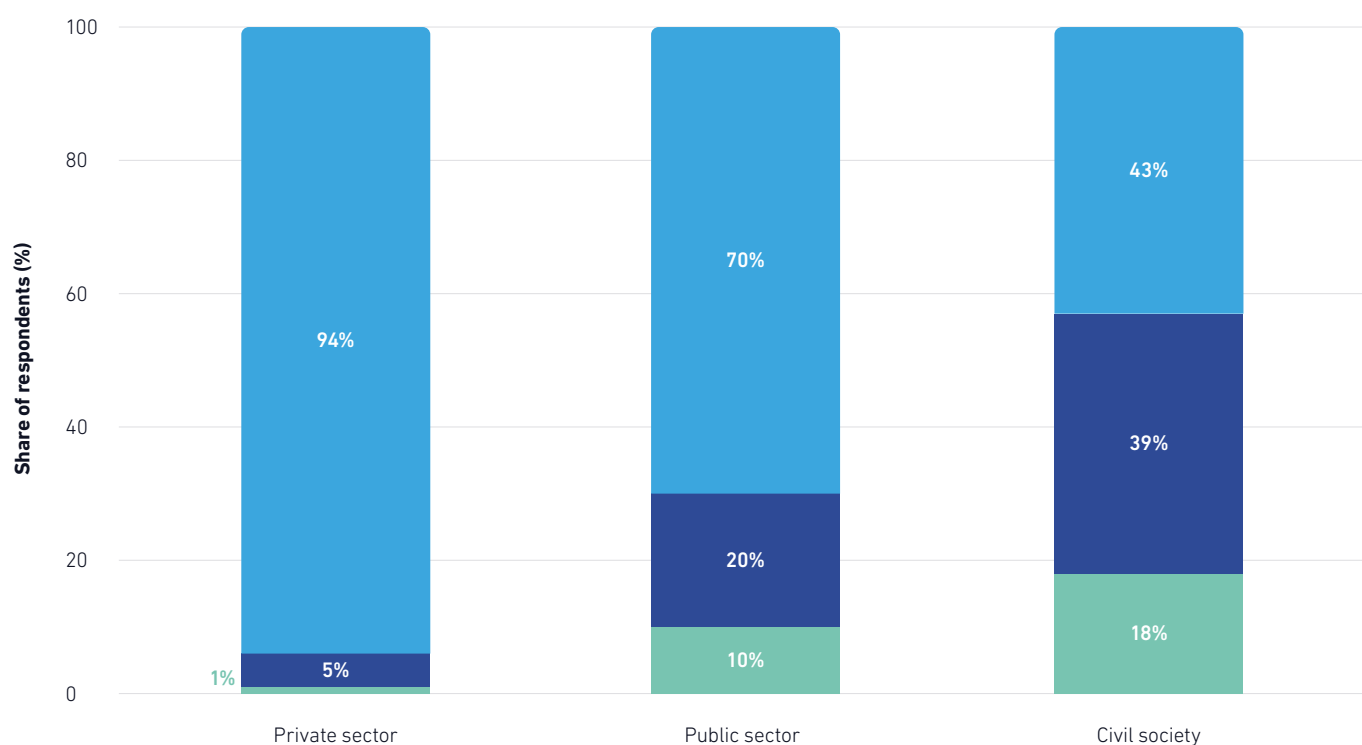
- 1 Safeguarding Digital Wellbeing
- 2 The Dawn of Ambient Intelligence
- 3 The Holistic Digital Trade Revolution

Stakeholder preparedness

DET Survey responses indicate a substantially higher level of preparedness than last year's survey across all stakeholder groups, with the private sector seen as being best prepared. As shown in Figure 5, 94% of all respondents see the private sector as being prepared for digital economy trends, up from 49% last year. For the public sector, 70% of respondents indicate preparedness, up from 37% last year.

Respondents consider civil society to be the least well prepared for digital economy trends of all stakeholder groups. Nonetheless, the 43% who rate these stakeholders as prepared is up from just 30% in last year's results.

Figure 5: Stakeholders' preparedness for the shifts associated with digital economy trends



Legend: ● Unprepared ● Neither prepared nor unprepared ● Prepared

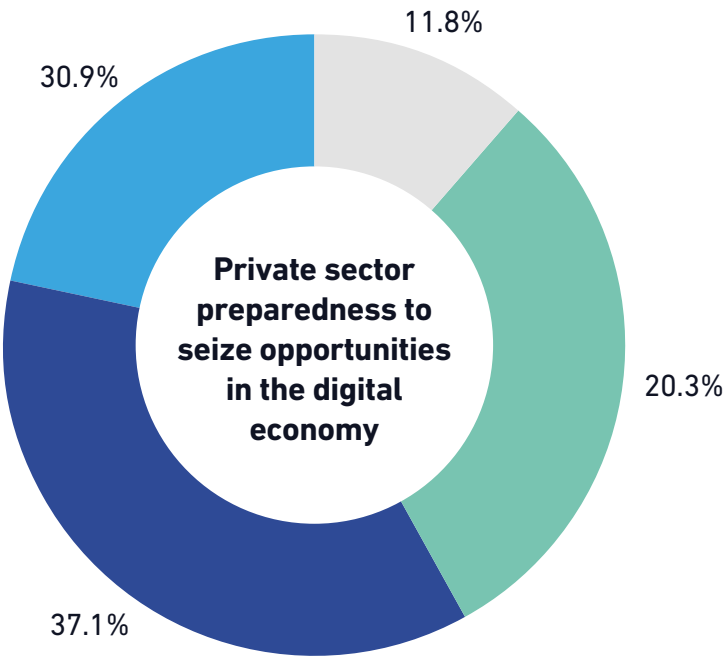
Source: DCO 2025 Digital Economy Trends Survey.

Q: In the country where you work, to what degree do you believe governments, businesses, societies, and individuals are prepared for the changes that these trends could bring about in the next 12-18 months?

Respondents: 272 CTOs and senior technologists working in large companies (+250 employees), 60 policymakers, and 74 digital economy experts.

Among the private sector respondents in the DET Survey, 57.4% feel either very or fully prepared to seize opportunities in the digital economy, as shown in Figure 6.

Figure 6: Private sector preparedness to seize opportunities in the digital economy



Legend: Slightly prepared Moderately prepared Very prepared Fully prepared

Source: DCO 2025 Digital Economy Trends Survey.

Q: In the country where you work, to what degree do you believe governments, businesses, societies, and individuals are prepared for the changes that these trends could bring about in the next 12-18 months?

Respondents: 272 CTOs and senior technologists working in large companies (+250 employees) and 68 digital economy experts from the private sector



Readiness and preparedness for digital economy trends

Drivers are the conditions that allow countries to effectively harness opportunities emerging from current and emerging digital economy trends. They are the same as the pillars in the DCO DEN. While all drivers facilitate the adoption and development of trends, certain drivers are more fundamental to certain trends than others, as illustrated by the findings from the DET Survey in Figure 7.

In this edition of the DET 2026 report, the enabling capacity for each digital economy trend is assessed at the country level, based on a weighted average of the DEN pillar scores. For current trends, the assessment measures countries' readiness to capture opportunities from digital economy trends, focusing on the top three drivers. For emerging digital economy trends, the assessment evaluates countries' preparedness for the materialization of digital economy trends, based on the top five drivers identified by DET respondents. The inclusion of two additional drivers reflects the forward-looking nature of emerging trends, which require a broader set of enabling conditions for countries to effectively leverage their potential. The calculation approach is further explained in the Methodology note.

The survey results show clear agreement among digital economy experts. To be prepared for emerging digital economy trends, countries should prioritize the following key drivers: Digital Infrastructure, Digital Innovation, and Digital Capabilities. As these three drivers consistently rank among the top five across almost all emerging digital economy trends, they can be regarded as horizontal drivers. High-level recommendations from the DEN for these pillars are:



Digital Infrastructure

Less-developed economies

Prioritize universal connectivity by fostering competition to improve affordability and promoting inclusive policies for underserved communities, and invest in data centers and exchange points to improve reliability.

More-developed economies

Prioritize strengthening digital systems, cross-border connectivity, and digital interoperability, improving resilience through data security standards and sustainable investment in next-generation infrastructure.



Digital Capabilities

Less-developed economies

Expand access to digital literacy by integrating basic skills into schools, community programs, and the public sector, and align advanced skills in higher education with market needs through public-private partnerships.

More-developed economies

Further strengthen the skills of citizens and institutions in areas such as digital privacy, cybersecurity awareness, and verifying online information, building their capacity to adopt cutting edge-technologies responsibly.



Digital Innovation

Less-developed economies

Establish national strategies for supporting innovation, covering areas such as research funds, startup incubators, access to venture, and sandboxes for fintech and govtech.

More-developed economies

Deepen university-industry linkages in areas such as joint research projects, internships, and co-supervised student work, and scale up innovation ecosystems by integrating regional markets.

Readers seeking to better understand how DEN pillars are measured, or how to improve their maturity score in a specific DEN pillar, should refer to the main [DEN report](#).

Figure 7: Essential drivers per digital economy trends

| | | | | | |
|--|----|----|----|----|----|
| ● The Rise of Vertical AI | 💡 | ↺↻ | ⚙️ | | |
| ● API-Enabled Data Collaboration | ⚙️ | 💡 | 🌱 | | |
| ● The Dawn of Ambient Intelligence | 💡 | ⚙️ | ↺↻ | | |
| ● Powering a Sustainable Digital Economy | 💡 | 🌱 | ⚙️ | | |
| ◆ The Emergence of Agentic AI | 💡 | ⚙️ | 👤 | ↺↻ | 🏛️ |
| ◆ The Rise of Generalist Robots | ⚙️ | ↺↻ | 💡 | 👤 | 🏥 |
| ● Delivering Hyper-Personalization | 💼 | 👤 | 💡 | | |
| ● AI Accelerated Workforce Transformation | 💼 | ↺↻ | 👤 | | |
| ● Safeguarding Digital Wellbeing | 🏥 | 🌱 | 👤 | | |
| ● Embracing Immersive Hybrid Experiences | ⚙️ | ↺↻ | 💡 | | |
| ◆ The AI Divide | ⚙️ | 💡 | 👤 | ↺↻ | 💼 |
| ◆ The Brain–Machine Interface | 💡 | ⚙️ | 👤 | ↺↻ | 🏥 |
| ● Strengthening of End-to-End Cybersecurity | ⚙️ | 🏛️ | 💡 | | |
| ● The Spread of Digital Sovereignty Strategies | ⚙️ | 💡 | 📈 | | |
| ● Emergence of Competing Technology Blocs | ↺↻ | 👤 | 💡 | | |
| ● The Holistic Digital Trade Revolution | ⚙️ | ↺↻ | 👤 | | |
| ◆ Preparing for the Quantum Era | 💡 | ⚙️ | 👤 | ↺↻ | 🌱 |
| ◆ Converging Frontier Technologies | ⚙️ | 📈 | 💡 | 👤 | ↺↻ |

Legend: Drivers are ranked 1–3 from left to right in terms of importance.

⚙️ Digital infrastructure 👤 Digital capabilities 🏛️ Digital Regulation and Public Administration 📈 Digital Finance 💼 ICT Core Business
 ↺↻ Industry digital transformation 💡 Digital innovation 🏥 Digital for Health and Education 💼 Digital for Work and Training
 👤 Digital for Social Inclusion 🌱 Digital for Sustainability

Source: DCO 2025 Digital Economy Trends Survey.

Q: At a global level, select the three key enabling factors countries need in order to benefit from the opportunities provided by the following digital economy trends.

Respondents: 272 CTOs and senior technologists working in large companies (+250 employees), 60 policymakers, and 74 digital economy experts.

How technologies and trends interact

The DET 2026 digital technology-trend matrix (Figure 8) shows that a core set of digital technologies underpins most DET 2026 trends, most notably AI and advanced analytics. The digital economy is not entirely about AI, but AI features prominently across this report because it has become the main layer through which data are interpreted, workflows are automated, and digital services are scaled.

Digital connectivity, cloud services, encryption and cybersecurity, and semiconductors and chips are foundational digital technologies for trends that rely on the movement, storage, and protection of data at scale, such as The Dawn of Ambient Intelligence, Strengthening of End-to-End Cybersecurity, Emergence of Competing Technology Blocs, and The Spread of Digital Sovereignty Strategies.

By contrast, digital devices and the IoT, automation and robotics, immersive technologies, and blockchain and decentralized technologies play more of a role in trends where physical sensing, embodied action, spatial interaction, or decentralized verification are required, such as Embracing Immersive Hybrid Experiences, Safeguarding Digital Wellbeing, The Holistic Digital Trade Revolution, and The Rise of Generalist Robots.

Overall, the pattern indicates that countries need uniformly strong capacity in the foundational digital technologies, complemented by selective depth in the specialized stacks that matter most for their priority trends.

Technology definition

Primary technology: the foundational technology whose development and application are essential catalysts for that trend's growth.

Secondary technology: technology that plays a supporting role to the primary technology and the overall trend, by helping to scale, secure, or make the primary technology more effective.

Figure 8: Primary and secondary digital technologies per digital economy trend

| |  |  |  |  |  |  |  |  |  |
|--|---|---|---|---|---|--|---|---|---|
| ● The Rise of Vertical AI | ● | | | ● | | | | ● | |
| ● API-Enabled Data Collaboration | | ● | | ● | ● | | | | |
| ● The Dawn of Ambient Intelligence | | ● | ● | ● | | | | | |
| ● Powering a Sustainable Digital Economy | ● | | | ● | | | | ● | |
| ◆ The Emergence of Agentic AI | ● | | | ● | | | | ● | |
| ◆ The Rise of Generalist Robots | ● | | | | | | ● | ● | |
| ● Delivering Hyper-Personalization | ● | ● | | ● | | | | | |
| ● AI Accelerated Workforce Transformation | ● | | | | | | ● | | ● |
| ● Safeguarding Digital Wellbeing | | ● | | | ● | | | | ● |
| ● Embracing Immersive Hybrid Experiences | ● | | ● | | | | | | ● |
| ◆ The AI divide | ● | ● | | | | | | ● | |
| ◆ The Evolving Brain-Machine Interface | ● | | ● | | | | ● | | |
| ● Strengthening of End-to-End Cybersecurity | ● | ● | | | ● | | | | |
| ● The Spread of Digital Sovereignty Strategies | | | | ● | ● | | | ● | |
| ● Emergence of Competing Technology Blocs | ● | | | | ● | | | ● | |
| ● The Holistic Digital Trade Revolution | | | | ● | ● | ● | | | |
| ◆ Preparing for the Quantum era | | | | | ● | ● | | ● | |
| ◆ Converging Frontier Technologies | ● | | | | | | ● | ● | |

Legend: ● Primary ● Secondary  AI and advanced analytics  Semiconductors and chips  Cloud services  Digital connectivity  Encryption and cybersecurity  Immersive technologies  Blockchain decentralized technologies  Digital devices and the IoT  Robotics and autonomous systems

Source: DET 2026 team research

Regional outlook on the digital economy

Respondents across regions generally agreed on priority trends. Strengthening of End-to-End Cybersecurity ranks first for expected socio-economic impact in all regions but one (Indo-Pacific and Asia, where it ranks second).

Taken together, this pattern demonstrates that countries see it as foundational for the next phase of the digital economy to protect the integrity of increasingly interconnected systems that deliver daily digital services, while managing the transition toward more embedded, real-time intelligence across public and private sectors.

However, regions also exhibit distinct focal points based on their unique conditions, as shown in Figure 9. This highlights the need for tailored approaches to maximize the benefits of digital economy trends.

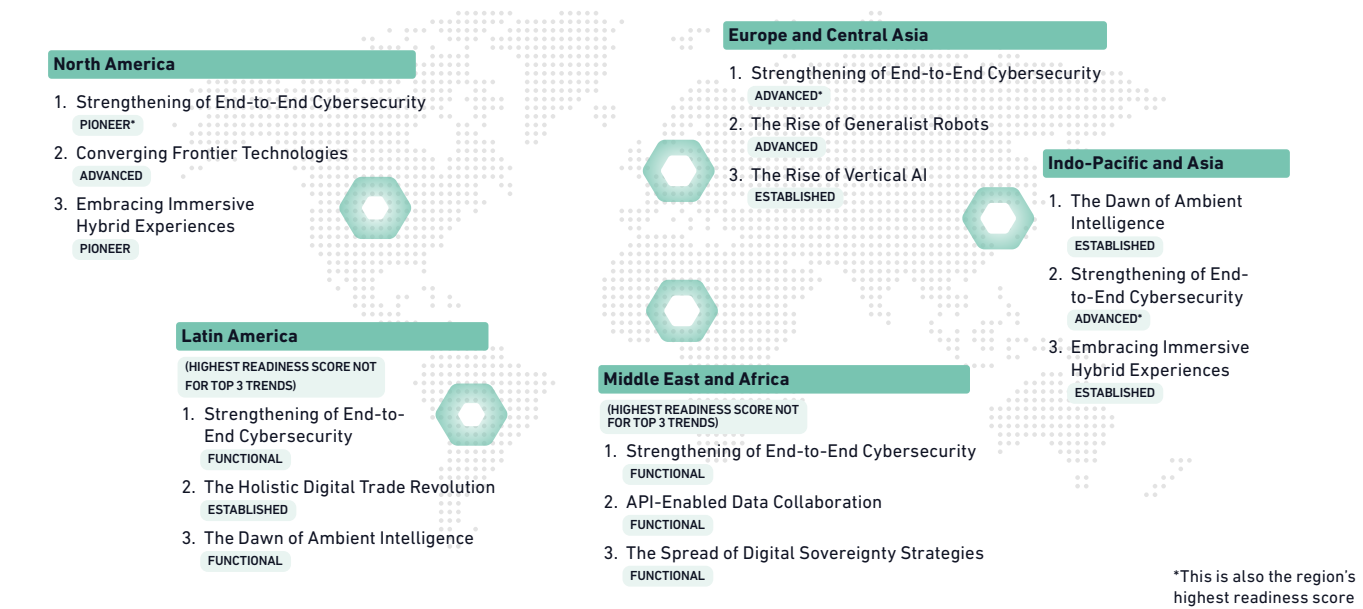
In Indo-Pacific and Asia, The Dawn of Ambient Intelligence, Strengthening of End-to-End Cybersecurity, and Embracing Immersive Hybrid Experiences form the top three, pointing to a stronger emphasis on citizen-facing experiences and social risks as intelligent systems and immersive interfaces scale. Encouragingly, the region records its highest readiness score for Strengthening of End-to-End Cybersecurity.

In the Middle East and Africa, API-Enabled Data Collaboration and The Spread of Digital Sovereignty Strategies complete the top three alongside Strengthening of End-to-End Cybersecurity. These choices highlight greater concerns around control over data, platforms, and cross-border digital flows.

Europe and Central Asia and North America feature an emerging trend in their top three — respectively, The Rise of Generalist Robots and Converging Frontier Technologies. This signals a stronger focus on cross-border services, competitiveness, and integration of ambient services into everyday life. Both regions are well positioned to take advantage of the top-ranked trend, Strengthening of End-to-End Cybersecurity, recording their highest readiness score for this trend.

Across regions, respondents tend to favor system-level conditions — such as security, digital trade, and sovereignty — over individual technology waves. For example, Embracing Immersive Hybrid Experiences is among the top three trends in only two regions (Indo-Pacific and Asia and North America).

Figure 9: Top digital economy trends for socio-economic impact and readiness at the regional level



Legend: Pilot (<50), Functional (50–59.9), Established (60–69.9), Advanced (70–79.9), Pioneer (>80)

Source: DCO 2025 Digital Economy Trends Survey.

Q: In the country where you work, how would you assess the economic/social impact of these current digital trends in the next 12-18 months? And, In the country where you work, to what extent do you believe the following emerging trends will have a net positive or negative socio-economic impact in the next 3-5 years?

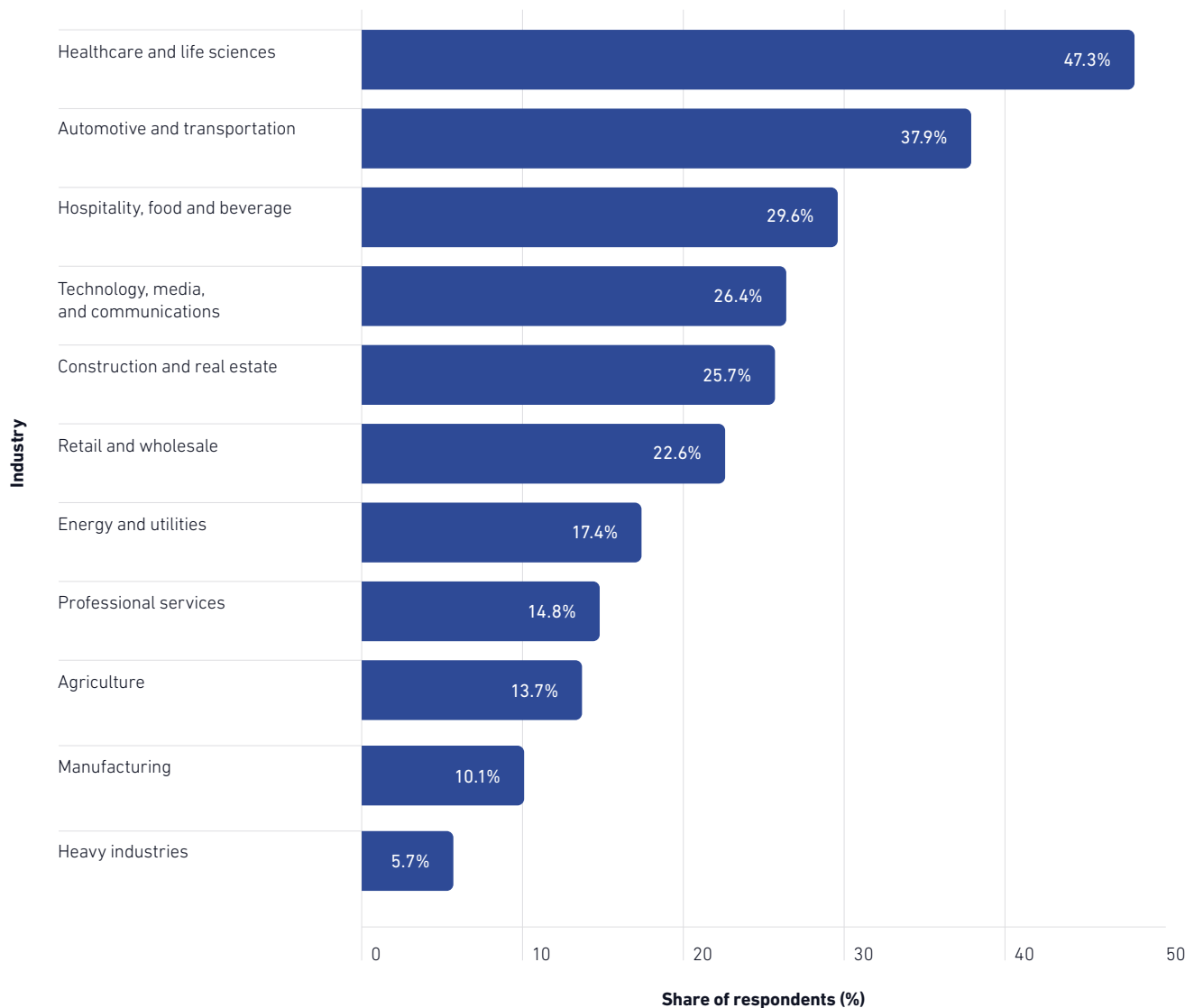
Respondents: 272 CTOs and senior technologists working in large companies (+250 employees), 60 policymakers, and 74 digital economy experts.

Industry outlook

Survey respondents expect the healthcare and life sciences sector to see the most benefits from digital economy trends, as shown in Figure 10, with nearly half the respondents choosing it among the three sectors they anticipate being most impacted — an increase from 33% in last year's survey. It is closely followed by automotive and transportation (37.9%, up from 31% last year).

These results indicate that digital economy trends are increasingly reaching into the wider economy: the technology, media, and communications sector was mentioned by only 26.4% of respondents, down from 41.0% last year — not because its importance has diminished, but because participants increasingly identified other sectors as being equally or more affected by digital economy trends. Nonetheless, some industries remain relatively isolated from digital trends, with only 5.7% of respondents foreseeing heavy industries to be among the most-affected sectors.

Figure 10: Industries most likely to benefit from digital economy trends



Source: DCO 2025 Digital Economy Trends Survey.

Q: At a global level, select the three industries, in order of importance you believe are most likely to significantly benefit from the digital economy in the next 12-18 months.

Respondents: 272 CTOs and senior technologists working in large companies (+250 employees) and 68 digital economy experts from the private sector

Top current trends by industry

The top trends for each industry (Figure 11) are those expected to create the most growth opportunities — for example, in terms of new markets and customers or reducing operational costs — over the next 12-18 months. The picture is significantly different to the top trends by region, as Strengthening of End-to-End Cybersecurity, which is top for most regions, ranks first for only one industry: hospitality, food, and beverage. This may reflect the fact that strengthening cybersecurity delivers substantial socio-economic benefits, such as reducing risk exposure, preventing costly disruptions, and protecting trust, but does not always generate the largest direct growth opportunities for industries, for example, through expanding into new markets, attracting new customers, or lowering operational costs. The digital economy trends closest related to AI dominate the priority trends for growth opportunities at the industry level. AI Accelerated Workforce Transformation ranks first for six industries out of 11, and is in the top three for three of the others. The Rise of Vertical AI is top in one industry (automotive and transportation) and in the top three for another six.

Several of this year's priorities at the industry level represent a direct continuation of 2025, showing that sectors are advancing rather than redefining their digital trajectories. The prominence of The Rise of Vertical AI and AI Accelerated Workforce Transformation illustrates this continuity, as both trends were top priorities last year. By contrast, Delivering Hyper-Personalization and the Dawn of Ambient Intelligence represent genuinely new areas of focus. Their growing adoption in sectors such as energy, healthcare, manufacturing, and professional services reflects a shift toward more adaptive and context-aware technological environments. Taken together, these developments indicate a transition from broad digital transformation efforts to production-ready capabilities that support real-time decision-making, remote operations, and more advanced customer and workforce interactions.



Figure 11: Top digital economy trends by industry

| | | |
|---|---|--|
| Agriculture <ol style="list-style-type: none"> 1. Safeguarding Digital Wellbeing 2. Delivering Hyper-Personalization 3. AI Accelerated Workforce Transformation | Automotive and transportation <ol style="list-style-type: none"> 1. The Rise of vertical AI 2. AI Accelerated Workforce Transformation 3. API-Enabled Data Collaboration | Construction and real estate <ol style="list-style-type: none"> 1. AI Accelerated Workforce Transformation 2. Delivering Hyper-Personalization 3. The Rise of Vertical AI |
| Energy and utilities <ol style="list-style-type: none"> 1. The Dawn of Ambient Intelligence 2. AI Accelerated Workforce Transformation 3. Delivering Hyper-Personalization | Healthcare and life sciences <ol style="list-style-type: none"> 1. AI Accelerated Workforce Transformation 2. Embracing Immersive Hybrid Experiences 3. Delivering Hyper-Personalization | Heavy industries <ol style="list-style-type: none"> 1. Embracing Immersive Hybrid Experiences 2. The Rise of Vertical AI 3. Emergence of Competing Technology Blocs |
| Hospitality, food, and beverage <ol style="list-style-type: none"> 1. Strengthening of End-to-End Cybersecurity 2. The Holistic Digital Trade Revolution 3. The Rise of Vertical AI | Manufacturing <ol style="list-style-type: none"> 1. AI Accelerated Workforce Transformation 2. The Dawn of Ambient Intelligence 3. The Rise of Vertical AI | Professional services <ol style="list-style-type: none"> 1. AI Accelerated Workforce Transformation 2. The Dawn of Ambient Intelligence 3. Emergence of Competing Technology Blocs |
| Retail and wholesale <ol style="list-style-type: none"> 1. AI Accelerated Workforce Transformation 2. The Rise of Vertical AI 3. The Holistic Digital Trade Revolution | Technology, media and communication <ol style="list-style-type: none"> 1. AI Accelerated Workforce Transformation 2. The Rise of Vertical AI 3. Strengthening of End-to-End Cybersecurity | |

Source: DCO 2025 Digital Economy Trends Survey.

Q: In your industry, select the THREE digital economy trends, in order of importance, that you expect to create the most growth opportunities (e.g., new markets and customers or reducing operational costs) in the next 12-18 months.

Respondents: 272 CTOs and senior technologists working in large companies (+250 employees) and 68 digital economy experts from the private sector

Industry strategies

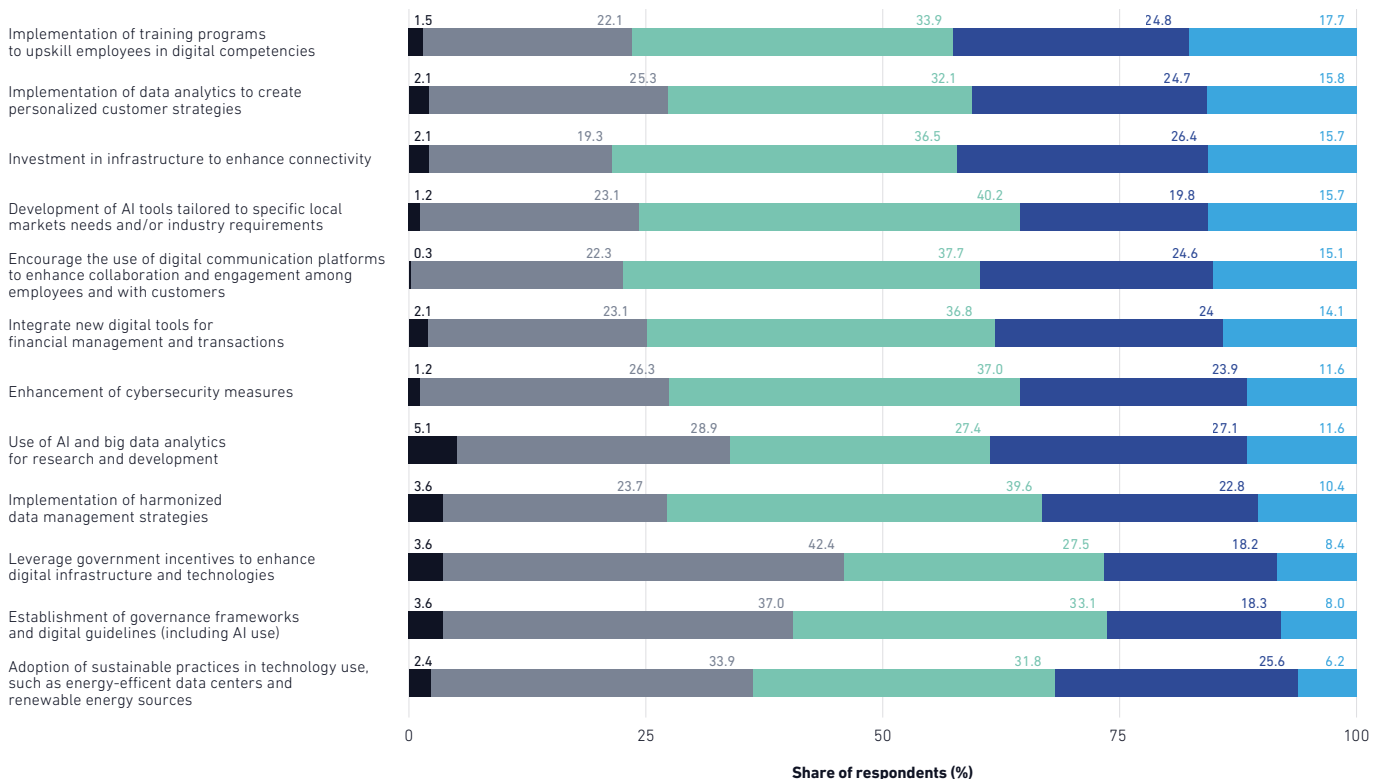
When asked how they are planning to capitalize on digital economy trends, corporates were most advanced in training programs to upskill employees in digital competencies: 17.7% are already seeing benefits from these programs, while 24.8% have implemented them organization-wide even if benefits are yet to manifest, as shown in Figure 12.

Organizations are most likely to say they are benefiting from the development of AI tools tailored to local market needs or industry-specific requirements: 44.2% of those that already adopted this strategy are experiencing benefits. By contrast, the adoption of sustainable practices in technology use is a strategy that many companies have begun implementing without yet realizing tangible gains. This is aligned with the nature of such initiatives, which generally unfold over longer time horizons and whose benefits become evident only gradually.

The priority strategies for companies in the coming year are developing tailored AI tools (40.2%) and harmonizing data-management strategies (39.6%), highlighting a strong focus on customization and coherence in digital transformation initiatives.

Interestingly, compared with last year, respondents appear more cautious about the successful implementation of strategies: they report lower perceived benefits across all areas, except the development of AI tools tailored to specific local market needs or industry requirements. This may reflect a growing recognition within the private sector that delivering tangible benefits from digital-economy strategies is more complex than previously anticipated.

Figure 12: Strategies and plans companies are pursuing to capitalize on digital economy trends by implementation status



Legend: ● Not planning to implement ● Exploring implementation ● Being implemented ● Implemented organization wide but not yet realizing benefits ● Implemented and realizing benefits

Source: DCO 2025 Digital Economy Trends Survey.

Q: To what extent is your company implementing or planning to implement (in the next 12-18 months) the following strategies/plans.

Respondents: 272 CTOs and senior technologists working in large companies (+250 employees) and 68 digital economy experts from the private sector

Industry employment outlook

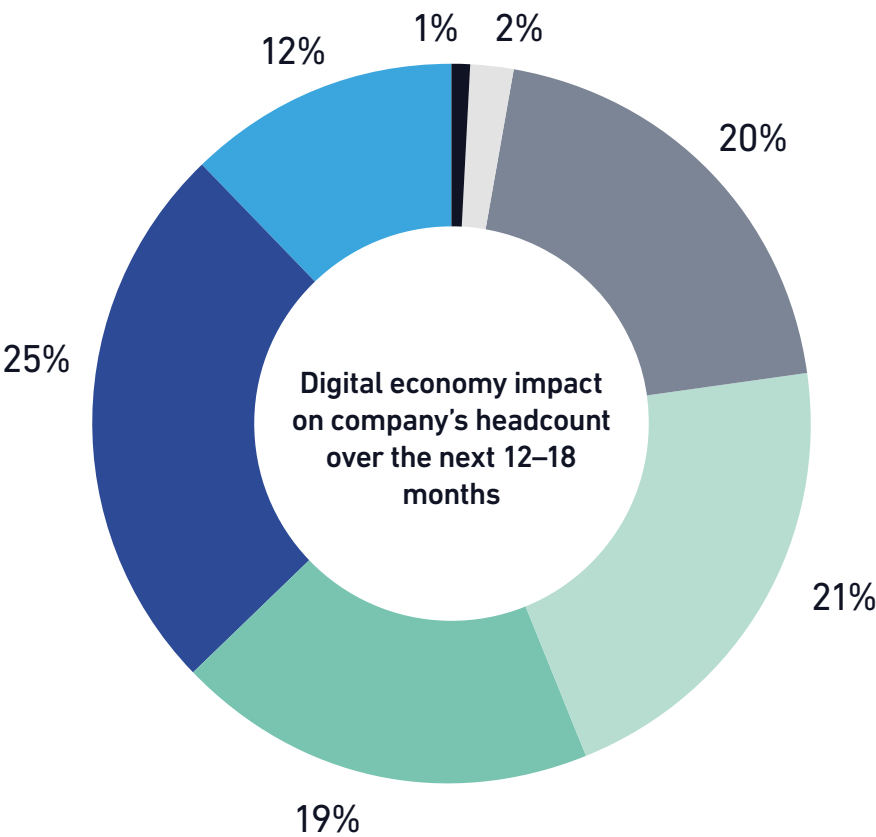
When it comes to the impact on employment of digital economy trends in the next 12-18 months, respondents were cautiously optimistic across industries. The implementation of digital technologies, according to DET Survey respondents, could increase companies' headcount, on average, by 2.4% in the next 12-18 months (For more disaggregated survey results see Figure 13). Disaggregating these survey responses by sector of economic activity and drawing on employment estimates from the International Labour Organization (ILO) suggests that digital technologies could add approximately 86.4 million jobs in 2026. As the sector-level projections combine ILO employment estimates with survey-based expectations, this estimate is an indicative scenario of the high-level impact of this trend, rather than an exact forecast. The survey-based growth rates carry uncertainty as well as survey sample data limitations, and digital technologies represent only one of several drivers of employment change, meaning the estimate illustrates respondents' expectations rather than a definitive causal impact.

Digital technologies could add approximately

86.4 million

jobs in 2026.

Figure 13: Digital economy impact on company's headcount over the next 12-18 months



Legend: ● Significant decrease (-9% or more) ● Moderate decrease (-4% to -8%) ● Slight decrease (-1% to -3%) ● Neutral (0%) ● Slight increase (+1% to +3%) ● Moderate increase (+4% to +8%) ● Significant increase (+9% or more)

Source: DCO 2025 Digital Economy Trends Survey.

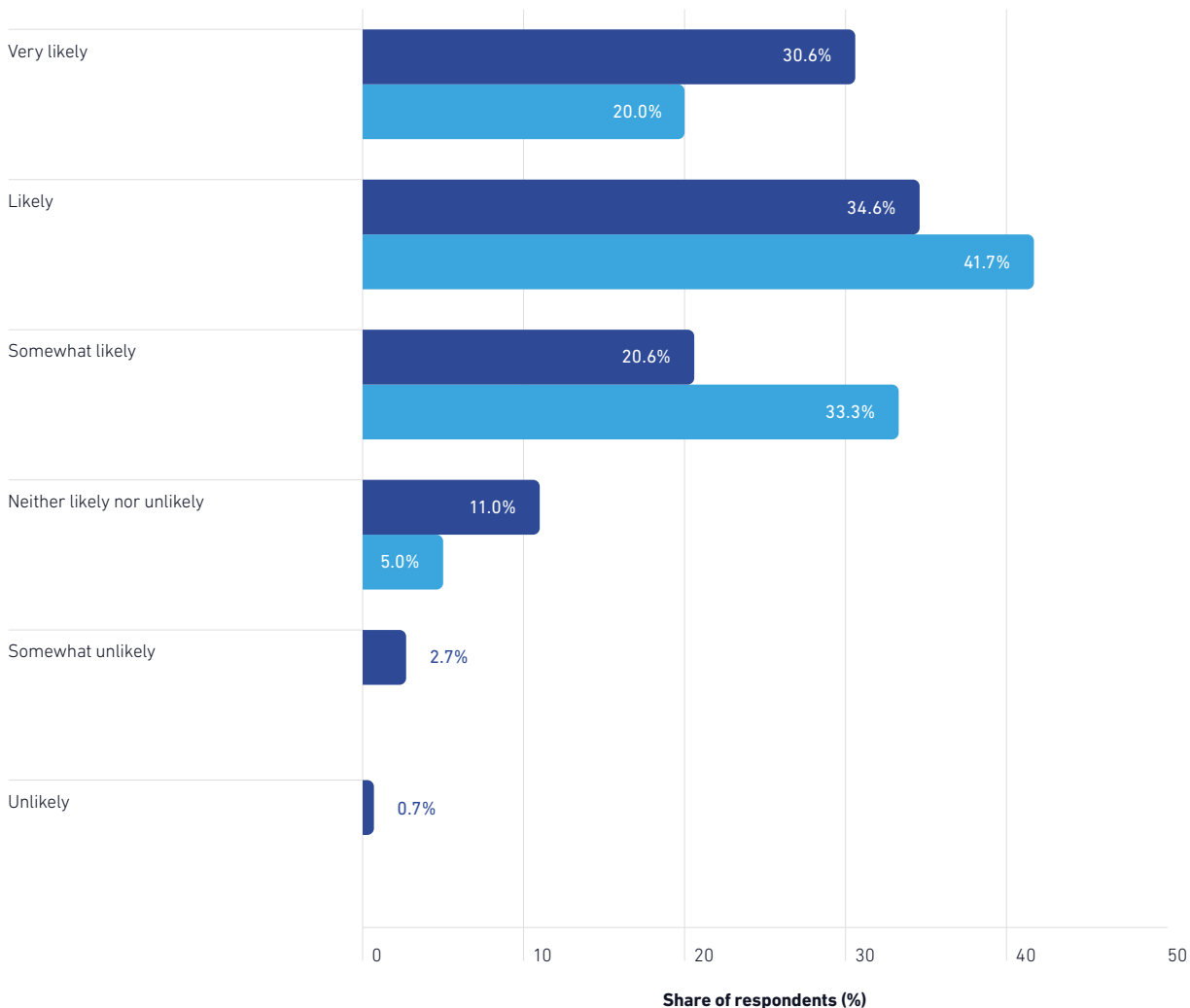
Q: In your view, what net impact do you expect the implementation of digital technologies to have on your company's headcount over the next 12-18 months?

Respondents: 272 CTOs and senior technologists working in large companies (+250 employees) and 68 digital economy experts from the private sector

Likelihood of regulatory change

There is a widespread expectation of an increase in legislation and regulation related to digital economy trends: 95.0% of public sector respondents and 85.8% of those in the private sector consider it at least somewhat likely (see Figure 14). Overall, the expected increase in regulatory changes is broadly in line with last year. However, a notable difference is that the public sector now foresees a greater level of activity in this area than the private sector. This likely reflects a maturing policy environment, with governments gaining a clearer understanding of emerging technologies and drawing on early regulatory frameworks from major jurisdictions, which has increased confidence to move forward. By contrast, private sector expectations may have moderated as initial expectations of faster regulatory progress did not materialize.

Figure 14: Expected increase in legislation and regulation related to digital economy trends



Legend: ● Private sector ● Public sector

Source: DCO 2025 Digital Economy Trends Survey.

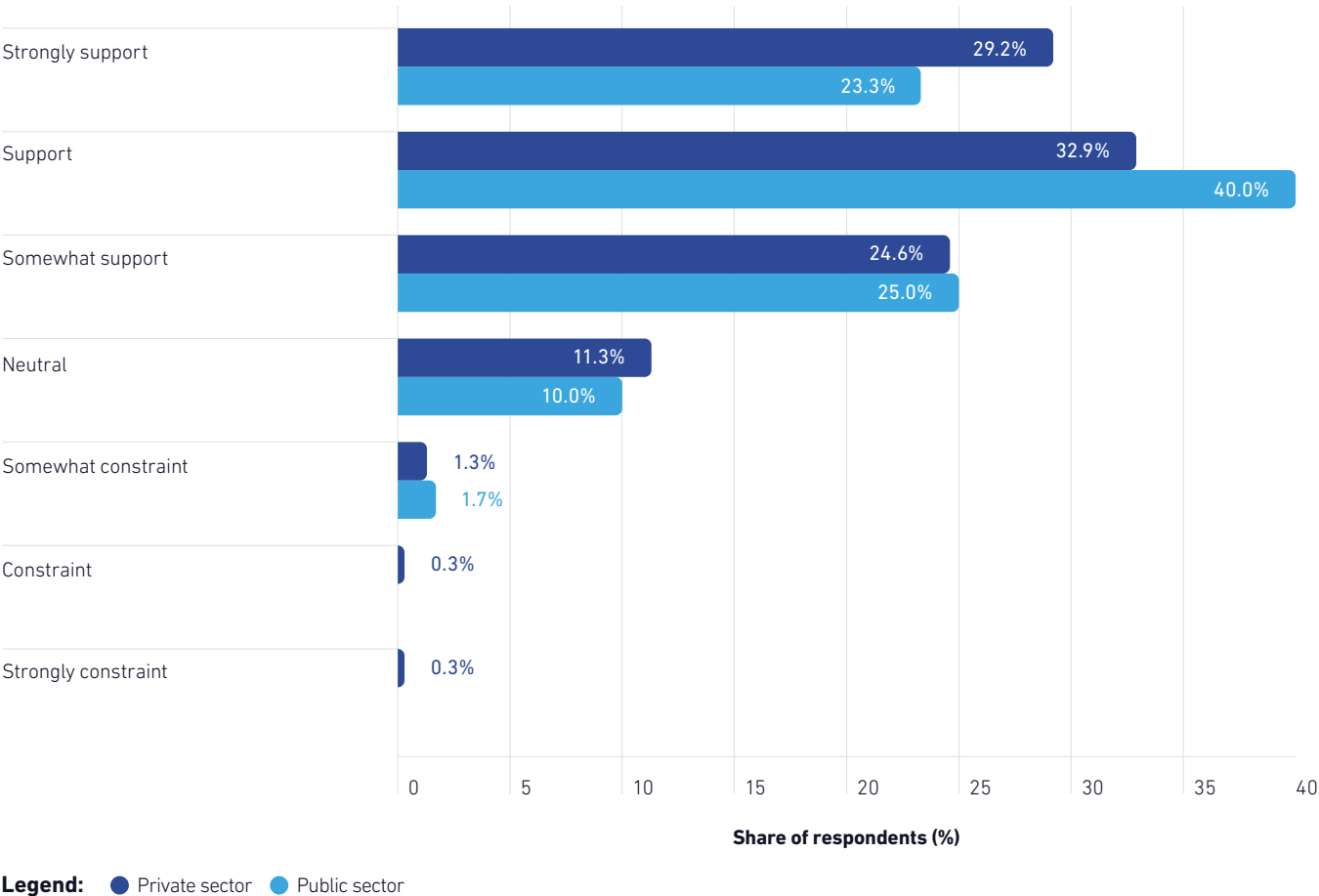
Q: In the country where you work, how likely do you think it is that we will see an increase in legislative and regulatory activities related to the following trends in the Digital Economy over the next 12 to 18 months?

Respondents: 272 CTOs and senior technologists working in large companies (+250 employees), 60 policymakers, and 74 digital economy experts.

Impact of new regulations

While new regulations can impose costs, they can also be a significant driver of growth in the digital economy: implementing guardrails can create stability and foster innovation by reducing uncertainty. There is wide consensus that new regulations are likely to support rather than hinder the realization of benefits from the digital economy: 86.7% of private sector respondents and 88.3% of public sector respondents are at least somewhat supportive of regulatory measures, as shown in Figure 15. Nonetheless, sentiment has eased slightly since last year, with the most common response shifting from “strongly support” to “support.”

Figure 15: Expected impact of new legislation or regulation activity on digital economy



Source: DCO 2025 Digital Economy Trends Survey.
Q: In the country where you work, how do you expect these legislative and regulatory activities to influence the adoption of Digital Economy trends in the next 12 to 18 months?
Respondents: 272 CTOs and senior technologists working in large companies (+250 employees), 60 policymakers, and 74 digital economy experts.

Policy priorities

DET Survey responses point toward the importance of a wide range of policies. For each trend, the survey asked respondents to identify policy priorities — but when aggregating the responses across trends, there is relatively little difference in which policies are considered important overall (Figure 16). This may reflect the high degree of coordination and systemic interdependence required in the digital economy, where progress in one policy area often depends on complementary advances in others.

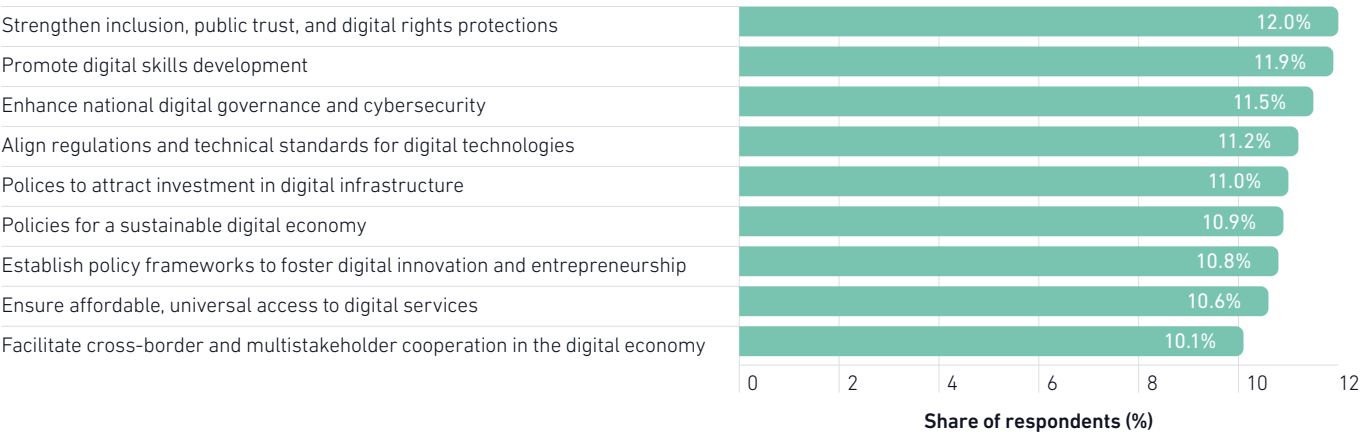
Strengthening inclusion, public trust, and digital rights protections is the most commonly mentioned policy priority across trends. With enhancing national digital governance and cybersecurity also featuring in the top three, these results reflect the more general shift toward a greater emphasis on trust and security in the digital economy. The top three is completed by promoting digital skills development, reflecting the importance of equipping people to participate actively in the digital economy.

Nonetheless, the gaps between these and other priorities are narrow. This shows that policymakers and regulators need to use their entire policy kit to guide and support the development of a digital economy that empowers all actors.

"AI policy must shift from chasing scale to shaping context and serving needs for Africans. Locally cocreated and governed AI is where real public value, sovereignty, and meaningful innovation will be won."

Irene Mwendu
(Organization for Ethical Source)

Figure 16: Policy priorities



Source: DCO 2025 Digital Economy Trends Survey.
Q: In the country where you work, select the three most critical national policy actions needed for people, businesses and states to benefit from each of the following current digital economy trends.
Respondents: 272 CTOs and senior technologists working in large companies (+250 employees), 60 policymakers, and 74 digital economy experts.

Trends that require most international collaboration

When asked which trend requires most international collaboration, survey respondents were more likely to mention The Holistic Digital Trade Revolution than any other trend (as shown in Figure 17). This underscores the importance of global coordination and harmonized legal frameworks to enable efficient digital trade. Without such coordination, regulatory fragmentation increases, creating complexity and compliance costs for companies operating across borders, especially in areas like cybersecurity, data protection, and consumer protection.

In this context, the DCO's Digital Trade Acceleration Initiative¹² can play a significant role in unlocking the potential of digital trade across Member States by identifying barriers and strategies to address them, through a combination of research, business surveys, and multilateral dialogue.

The second-placed answer was Preparing for the Quantum Era. International cooperation is complicated by the dominance of private sector players in quantum research, as well as the potential

for significant disruption to encryption standards. Greater cooperation among industry, governments, and research institutions can help ensure that policy frameworks keep pace with technological developments, encourage digital interoperability and trust, and support the responsible and secure deployment of frontier technologies across the global economy. For example, the CERN Quantum Technology Initiative (CERN QTI) brings¹³ researchers to exchange knowledge and coordinate collaborative efforts.

Defending interconnected ecosystems completes the top three. Increasingly, cybersecurity depends on collaboration and trust between public and private sectors, and across national borders, to share intelligence, develop protocols, and support countries and organizations that lack the resources to fight cybercriminals. The recently established UN Cybercrime Convention, which sets out a framework for handling offences committed online,¹⁴ is one example of how stakeholders can collaborate across sectors and borders to enhance the overall security of the global digital economy.

Figure 17: Trends that will require the most international collaboration



Source: DCO 2025 Digital Economy Trends Survey.

Q: In your opinion, which three trends require most international collaboration?

Respondents: 272 CTOs and senior technologists working in large companies (+250 employees), 60 policymakers, and 74 digital economy experts.

Asking AI

To evaluate current uncertainties in the digital economy and the potential for progress across key strategic domains, we consulted ChatGPT, DeepSeek, and Gemini.

We asked each model to **assess the potential progress outlook** for each of the DET 2026 report's key themes.



Given the three digital economy themes of Sustainable Intelligent Ecosystems, Empowered Communities, and Trust and Security, please evaluate the potential for progress in each area on a scale from 1 to 10. Each score should be supported by a brief, formal justification.

1. Sustainable Intelligent Ecosystems

Chat GPT-5

Score: 8/10

Progress is expected as AI, renewable-energy-powered infrastructure, and low-power digital technologies continue to advance. Efforts will need to align global standards, energy integration, and equitable access.

DeepSeek V3.2

Score: 8/10

Potential is high as AI and IoT could enable transformative resource optimization. Realizing this will depend on overcoming significant investment and systems integration hurdles.

Gemini 2.5 Flash

Score: 7/10

The potential for a breakthrough remains high, driven by AI/IoT integration that could revolutionize resource optimization and enable autonomous infrastructure for net-zero goals.

2. Empowered Communities

Chat GPT-5

Score: 7/10

Digital skills and technical capabilities are likely to expand further, fostering inclusion and local innovation. Addressing disparities in access, affordability, and literacy will remain essential for meaningful empowerment.

DeepSeek V3.2

Score: 7/10

Digital tools could greatly enhance civic and economic participation. Achieving this potential will require a concerted effort to bridge digital literacy and access gaps globally.

Gemini 2.5 Flash

Score: 8/10

This area holds the highest potential for impact, as greater digital access and decentralized platforms are set to fundamentally shift power dynamics toward individual and collective agency.

3. Trust and Security

Chat GPT-5

Score: 6/10

Cybersecurity frameworks, data governance, and accountability mechanisms are projected to strengthen, though continued AI adoption and cross-border digital trade will require vigilance to ensure resilient, trusted systems.

DeepSeek V3.2

Score: 9/10

The critical need for digital trust is likely to drive rapid advances in secure frameworks and technologies, though it will demand continuous adaptation to counter emerging threats.

Gemini 2.5 Flash

Score: 5/10

Achieving meaningful progress will likely be an uphill struggle, as the rate of defensive innovation must continuously surpass the exponentially growing threat surface from advanced cyber adversaries.

02

DIGITAL ECONOMY TRENDS

This section presents profiles for each digital economy trend identified in the report, grouped into three themes. Each trend profile follows a common structure, adapted to its time horizon, and can be read independently.



[Back to contents page](#)



SUSTAINABLE INTELLIGENT ECOSYSTEMS

● Current trend

1.1

The Rise of Vertical AI

● Current trend

1.2

API-Enabled Data Collaboration

● Current trend

1.3

The Dawn of Ambient Intelligence

● Current trend

1.4

Powering a Sustainable Digital Economy

◆ Emerging trend

1.5

The Emergence of Agentic AI

◆ Emerging trend

1.6

The Rise of Generalist Robots

Theme overview

The Sustainable Intelligent Ecosystems theme reflects how AI and data are central to value creation in the digital economy. Business, government, and civil society leaders need to collaborate on trust, sustainability, and inclusion, balancing the speed of innovation with resource consumption and equitable access.

Evolution since 2025

Over the past year, the Sustainable Intelligent Ecosystems theme has moved from one of broad experimentation to mainstream adoption. Artificial intelligence (AI) now reaches over 1 billion users globally¹⁵. Specialized vertical AI applications, open-weight models, ambient sensors, and cross-border data frameworks are just some of the ways this theme has evolved.

Yet this rapid growth has exposed a critical paradox: while access to AI tools has expanded dramatically, access to the underlying infrastructure needed to sustain this growth remains profoundly unequal.

Energy has emerged as a defining constraint on the sustainable growth of the digital economy. Data center and AI electricity consumption is projected to double by 2030, outpacing clean energy development.¹⁶ This bottleneck is compounded by persistent disparities in access to computing power and related infrastructure, including semiconductors, graphics processing units (GPU), and other essential hardware. Ensuring equitable availability of these resources is increasingly recognized as critical to preventing further fragmentation of the global digital economy.

Consequently, current trends have shifted focus from democratizing AI systems to securing the foundational infrastructure and resources that make AI work: renewable energy, sovereign computing capacity, and trusted frameworks for sharing unique datasets. As shown in Figure I.1, most of the digital economy trends in this theme are evolutions from last year with only Powering a Sustainable Digital Economy reflecting continuity.

When it comes to emerging trends, the advances made in the last year in the “Deploying Autonomous Systems at Scale” trend have given rise to two separate axes of progress: the cognitive and physical autonomy of systems. These two dimensions, despite being closely intertwined, are progressing at different speeds each with its own

research frontier, industrial ecosystem, and societal implications. Agentic AI is reshaping how digital systems process information and achieve cognitive tasks, while Generalist Robots are redefining how systems interact with, and transform, the physical world. Both demand tailored responses around safety standards, liability frameworks, and workforce transition programs.

Without urgent action to build inclusive, equitable, and sustainable digital and energy infrastructure, the promise of broadly shared prosperity risks giving way to deeper fragmentation and inequality.

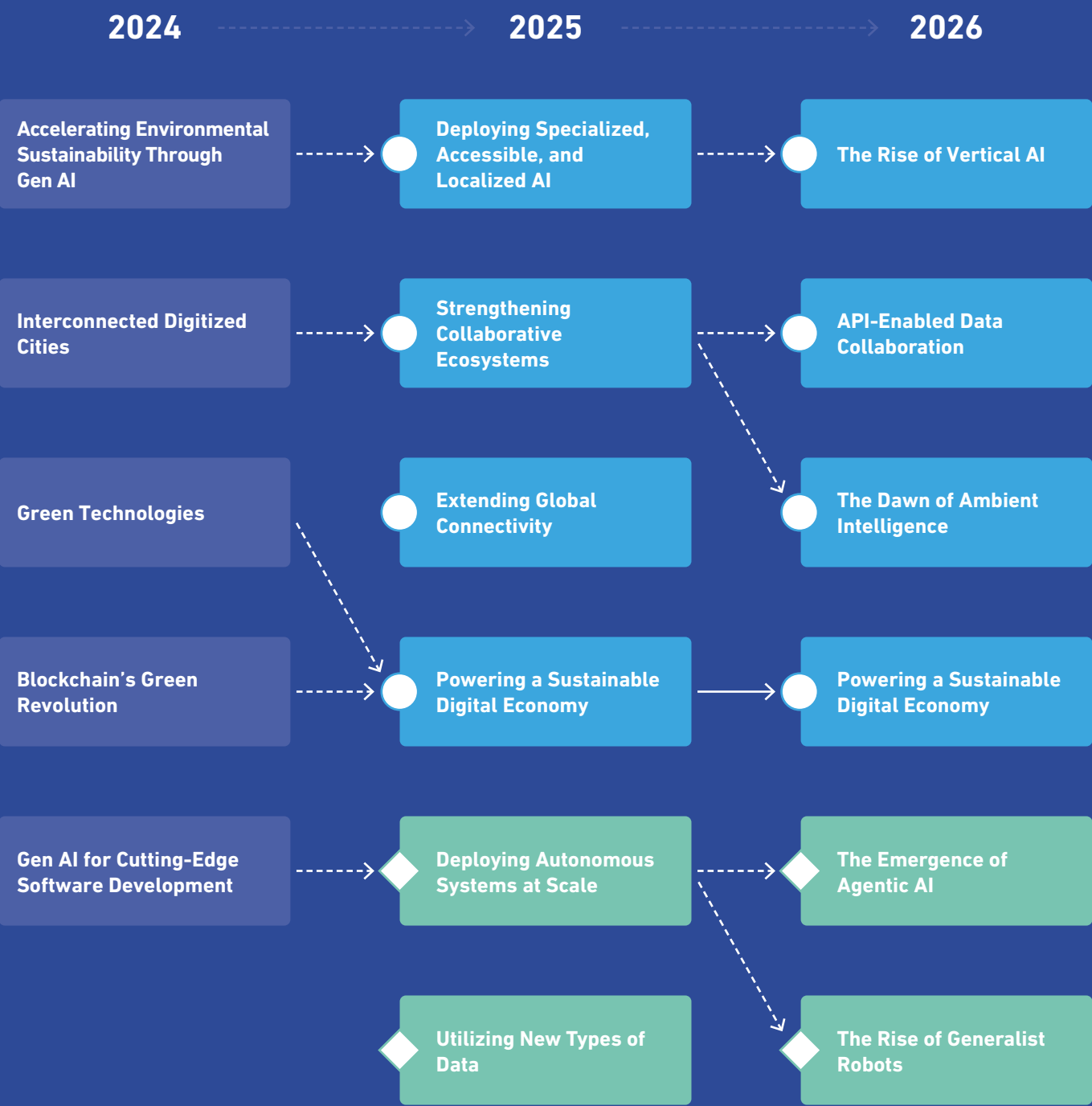
How to build Sustainable Intelligent Ecosystems?

To capitalize on the opportunities presented by the digital economy trends in this theme, stakeholders should collaborate to develop:

- › **Interoperable digital infrastructure:** common standards to integrate intelligent systems securely and efficiently into specific industry workflows.
- › **Trustworthy data governance:** robust frameworks on secure data sharing, protecting individual privacy, and defining liability for autonomous systems.
- › **Sustainable resource management:** energy-efficient digital infrastructure and circular design to manage the escalating resource demands of AI deployment.



Figure I.1: **Sustainable Intelligent Ecosystems: Evolution of Digital Economy Trends Across DET 2024–2026**



Legend

Digital economy trends:

● Current ◆ Emerging

-----> Evolution ———> Continuation

Source: DCO Digital Economy Trends (DET) report 2024–26

● **Current trend**

1.1

The Rise of Vertical AI

Evolution of DET 2025 trend: Deploying Specialized, Accessible, and Localized AI

What does the trend encompass?

A fundamental shift is reshaping the AI ecosystem: as foundational models expand in scale and accessibility, their competitive advantage is migrating from model size to context, data, and application. Hyperscalers continue to invest billions into foundational models, racing toward artificial general intelligence, yet differentiation is increasingly being driven by specialized, vertical AI solutions integrated into industry workflows to solve domain-specific problems across sectors and value chains. Building on 2025's focus on broad AI accessibility, this trend creates unprecedented opportunities for sector-focused innovators, particularly in highly regulated industries such as healthcare, finance, and oil and gas, to capture value that even the most sophisticated foundational models cannot address.

Vertical AI definition

Vertical AI refers to artificial intelligence (AI) systems that are specifically designed and optimized to be applied within particular industries or supply chains. This contrasts with horizontal AI, which is designed for a broad range of uses across many industries.

Why is it important?

One-size-fits-all generic AI is being outcompeted by smaller, more resource efficient vertical AI solutions built on proprietary data. These smaller models can make AI applications more productive and accessible, while their localized deployment helps to address growing AI sovereignty and compliance requirements.

Economic outlook¹⁷

This trend is expected to generate the highest potential for value creation over the next 18 months by unlocking new opportunities across high gross-value-added industries where abundant domain-specific data enables powerful vertical AI applications. All regions are expected to grow by around 5% on average, with the strongest expansion in North America. Stakeholders can unlock this potential value by implementing the measures described in the stakeholder recommendations section that concludes this trend profile.

Total potential economic value creation:

US\$ 5.07 trillion

Growth rate:

5.7%

Notable developments

Overview of past and likely future developments showcasing the trends materialization.

2017

The US Food and Drug Administration (FDA) granted clearance to Arterys Cardio DL for magnetic resonance imaging (MRI) — an early example of domain-specific AI in healthcare imaging, and a precursor of what is now termed vertical AI.¹⁸

2022

The life sciences domain exhibits the capabilities of vertical AI as AlphaFold DB sequences over 200 million protein structures, with its developers receiving the Nobel Prize in Chemistry in 2024.^{19,20}

2023

BloombergGPT becomes the first finance-specialized large language model (LLM), showcasing enterprise-level rollout of vertical AI to Bloomberg Terminal's large and specialized user-base.^{21,22}

2024

Klarna's AI assistant handled over 2.3 million customer interactions per month (equivalent to 700 agents, while reducing routine task resolution from 11 minutes to two), demonstrating how vertical AI is achieving scalable efficiency in customer operations.²³

2025

India's BHASHINI, a government initiative to help citizens translate content, shows how localized, vertical AI can be simultaneously deployed across multiple sectors as it integrates into railway ticketing, payments, and police documentation.²⁴

2027

No-code and low-code tools improve accessibility to vertical AI models for small and medium-sized enterprises (SMEs), allowing them to utilize vertical AI-driven automation strategies to increase productivity.²⁵

2028

Driven by the availability of specialized datasets, industry-specific regulatory frameworks, and integration with industry-standard software and processes, Software-as-a-Service evolves into vertical AI-as-a-Service, embedding domain-trained intelligence directly into enterprise workflows.²⁶

What's
next? →

Enabling conditions and countries' readiness

Key drivers

According to DET Survey respondents, the widespread adoption of vertical AI solutions depends on:



Digital innovation

The advancement of vertical AI requires structures that enable collaboration between industry, researchers, and AI solution providers, supported by innovation environments such as testbeds, regulatory sandboxes, or AI–industry clusters.



Industry digital transformation

Businesses need to adapt workflows and processes to integrate vertical AI solutions effectively from its development, by unifying fragmented data sources, to its implementation, by establishing clear data governance practices and creating industry platforms to facilitate peer-exchanges.



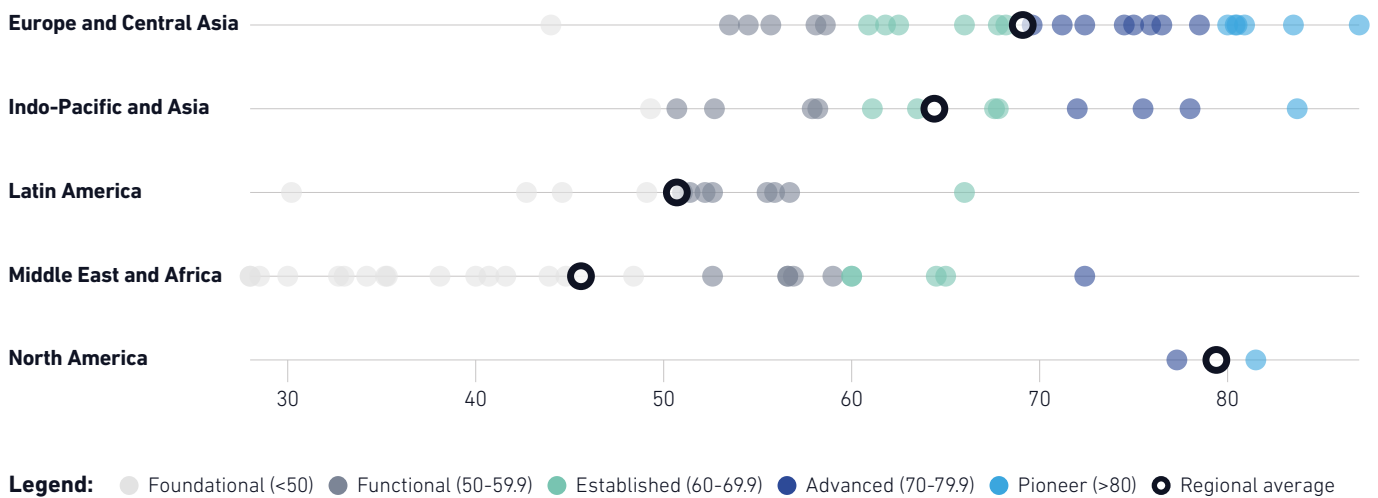
Digital infrastructure

The processing of proprietary domain data requires high-speed, low-latency connectivity and advanced computing infrastructure supported by robust security, data sharing, and data protection frameworks.

Countries' readiness for trend adoption²⁷

An assessment of these key drivers shows that countries are not yet fully ready to capitalize on The Rise of Vertical AI. On average, they achieve a score of 57.9 out of 100 based on data from the Digital Economy Navigator (DEN 2025). As shown in Figure I.2, North America (79.4), with its mature innovation ecosystems, powerful compute infrastructure, and deep industry integration, is the most ready. Europe and Central Asia (69.1) has strong institutions and skilled labor markets, but uneven readiness between the eastern and western countries. While Indo-Pacific and Asia (64.4) is at only *established* on average, countries such as Australia, Singapore, and South Korea are making rapid progress. Latin America (50.7) and the Middle East and Africa (45.6) are developing capabilities but remain on average at *functional* and *foundational*, respectively.

Figure I.2: The Rise of Vertical AI: trend readiness by region



Source: Results from the DCO's 2025 Digital Economy Trends Survey combined with data from the DCO's Digital Economy Navigator 2025.

Q: At a global level, select the three key enabling factors countries need in order to benefit from the opportunities provided by the following digital economy trends.

Respondents: 272 CTOs and senior technologists working in large companies (+250 employees), 60 policymakers, and 74 digital economy experts.

How is the trend materializing

Energy and utilities

Given its operational complexity and stringent requirements for efficiency, safety, and compliance, the sector has been among the earliest adopters of vertical AI solutions. As shown in Figure I.3, more than 50% of utilities are using AI applications in asset operations and maintenance. These are used for subsurface exploration, reservoir simulation, remote operations, predictive maintenance, compliance, and leak detection.²⁸ Wide adoption could yield up to US\$110 billion/year savings by 2035 and provide up to 175 GW extra transfer capacity on existing lines.

Figure I.3:
The Rise of Vertical AI: solutions across utilities operational domains



Legend: ● Using vertical AI solutions ● No use of AI

Source: International Energy Agency (IEA) report on AI for energy optimisation and innovation (2024)

Technology, media, and communications

Companies such as Adobe and Blackmagic Design have integrated vertical AI into their creative suites to simplify complex editing and content generation tasks.^{29,30} By training specialized models, they have managed to automate, albeit not at a perfect quality, facial recognition and scene detection, object removal, color correction, and the generation of realistic 3D animations and visual effects, increasing the user-friendliness of video generation tools and reshaping the competitive landscape and the nature of creative work itself.

AI server economy

The AI server market is expected to grow from US\$205 billion in 2024 to US\$298 billion in 2025 (making up 70% of the total server market). Higher server capacity lowers unit costs and broadens access to enterprise-level platforms, enabling vertical AI integration for a wider range of sectors from media and hospitals to manufacturing and banking. Through deploying domain-specific models, connecting them to proprietary repositories, running them in-house (or in sovereign clouds), and fully embedding them in core workflows, AI servers provide the infrastructural compute necessary to capitalize on the gains from vertical AI integration.³¹

Country spotlights

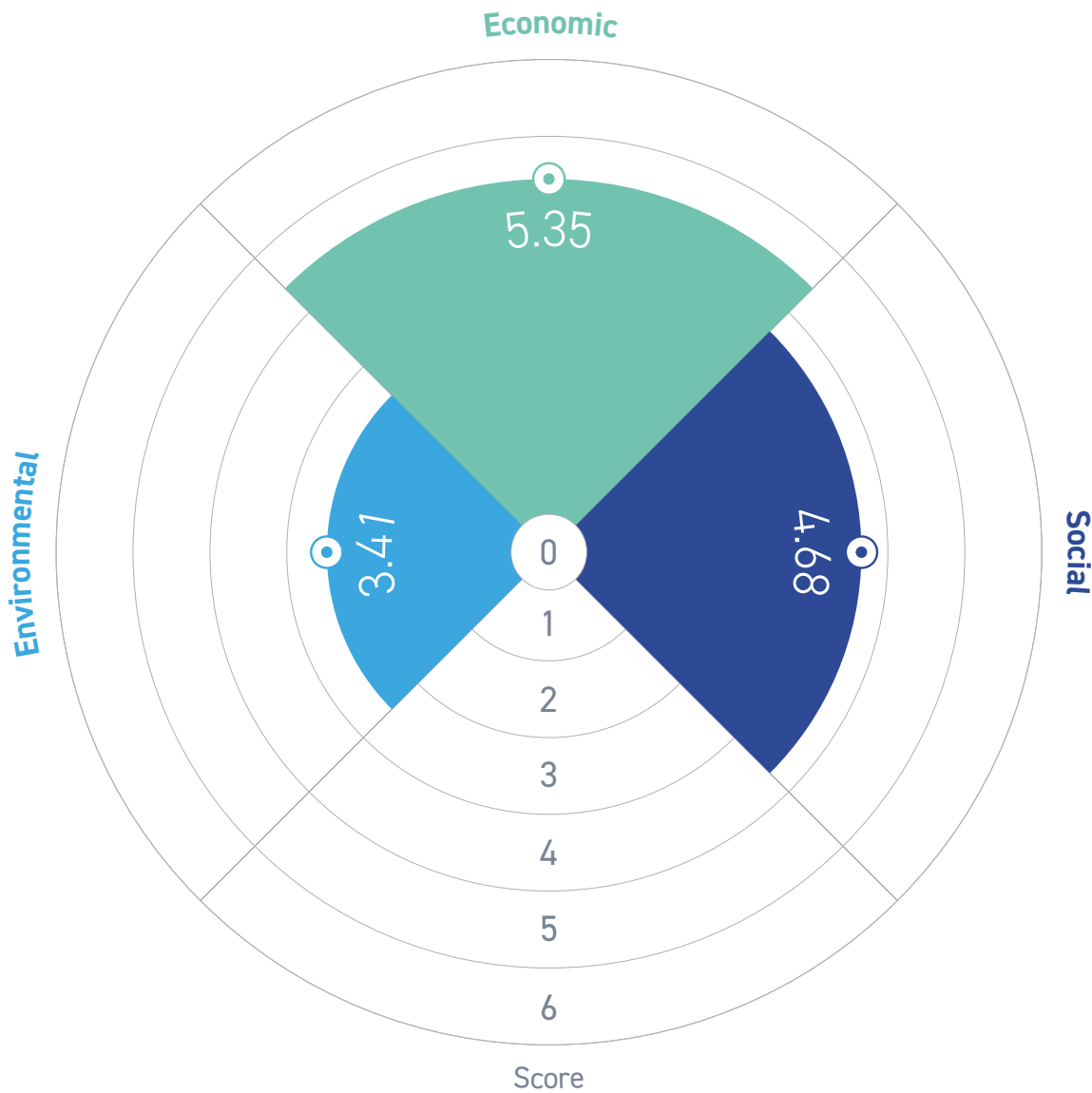
Norway's sovereign wealth fund — one of the world's largest equity investors, owning an average of 1.5% of every listed company globally — is deploying specialized AI to cut transaction costs and fees. It has already saved US\$100 million, and targets savings of US\$400 million/year, by relying on domain-trained AI for predicting internal flows, timing orders, and internalizing orders.³²

In **Pakistan**, the South Punjab agriculture department developed a vertical AI solution specifically to detect pink bollworm infestations in cotton cultivations. Utilizing tailored data inputs, detection algorithms, and farmer advisory workflows, the implementation of these AI smart traps allows cotton farmers to time sprays precisely, cut losses, and reduce inputs across thousands of hectares.³³

Economic, social, and environmental impact

This trend ranks second in positive economic impact (5.35) but lower in social (4.68) and environmental (3.41) dimensions, reflecting risks such as job displacement, algorithmic bias, and increased energy and water usage. The highest economic impact is expected in Indo-Pacific and Asia and North America, with comparatively higher social and environmental impacts in the Middle East and Africa and Latin America.

Figure I.4: The Rise of Vertical AI: expected positive impact



Legend: ● Average score per impact area

Source: DCO 2025 Digital Economy Trends Survey.

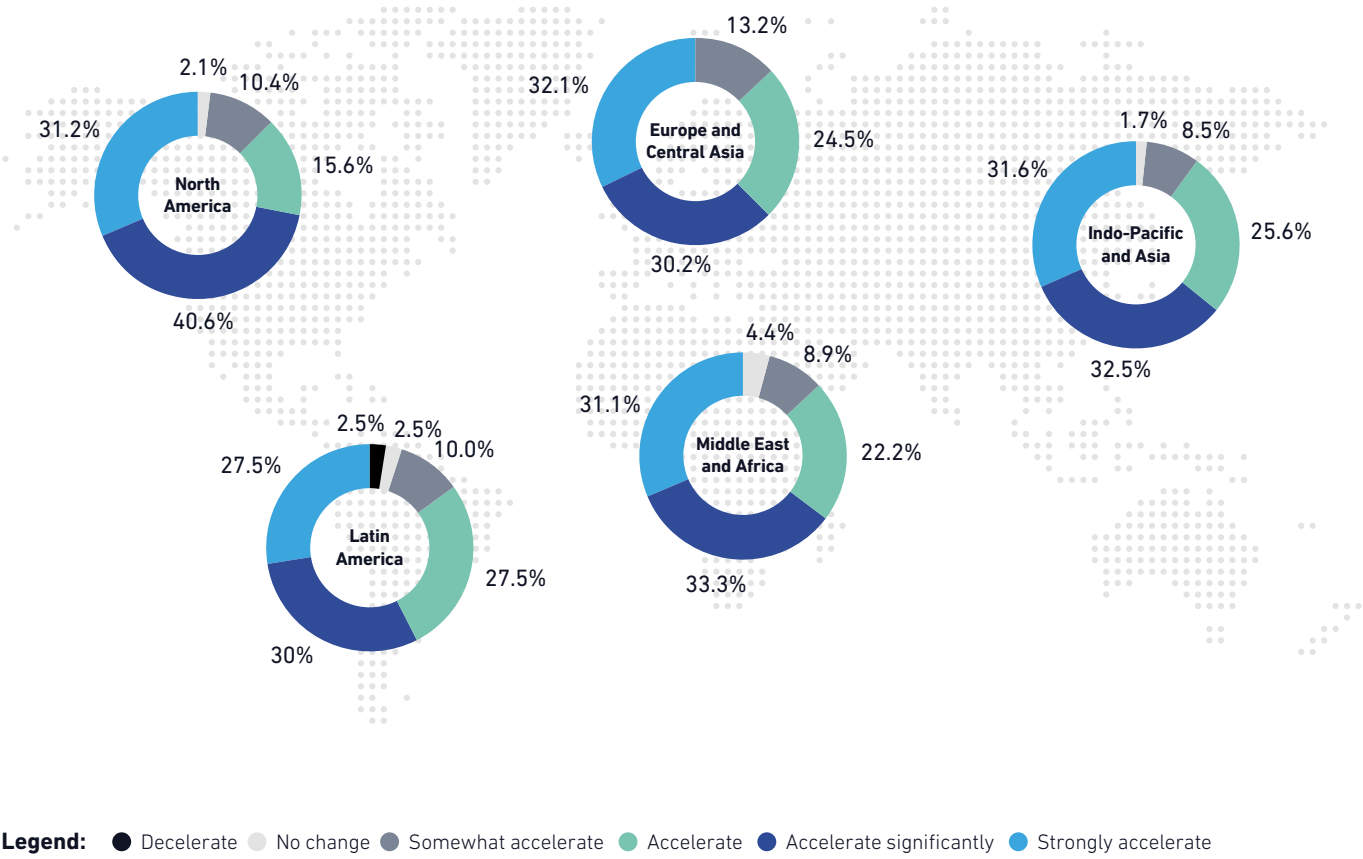
Q: In your country, how would you assess the economic/social/environmental impact of these current digital trends in the next 12-18 months?

Respondents: 272 CTOs and senior technologists working in large companies (+250 employees), 60 policymakers, and 74 digital economy and financial experts.

Pace of change

Survey responses show a global consensus: across regions, about nine in ten respondents expect the trend's pace to continue to accelerate over the next 12-18 months, while three out of ten respondents foresee strong acceleration. Only in Latin America do a small minority of respondents expect deceleration. Responses are similar across the private sector and government.

Figure I.5: The Rise of Vertical AI: anticipated speed of change by region



Source: DCO 2025 Digital Economy Trends Survey.

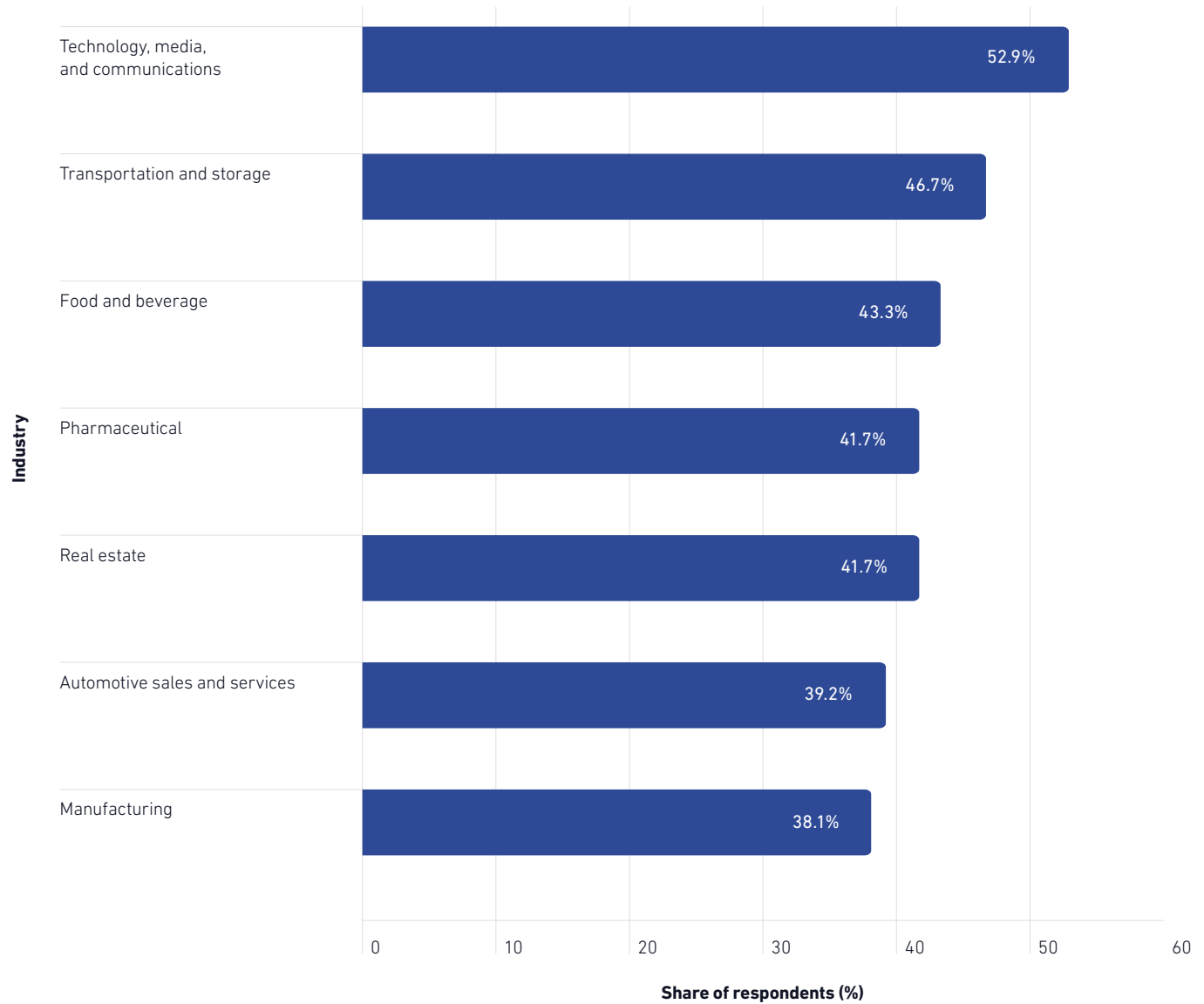
Q: In your country, how do you anticipate the speed at which the following digital economy trends will evolve in the next 12-18 months?

Respondents: 272 CTOs and senior technologists working in large companies (+250 employees), 60 policymakers, and 74 digital economy and financial experts.

Industry outlook

DET 2026 respondents from the private sector foresee the largest growth from this trend in technology, media, and communications (52.9%), where specialized models are being fine-tuned and tested by tech and social media companies. In transportation and storage (46.7%), gains come from route optimization and predictive maintenance. The food and beverage sector (43.3%) benefits from demand prediction, supply-chain optimization, and automated quality control.

Figure I.6: The Rise of Vertical AI: top industries for expected growth



Source: DCO 2025 Digital Economy Trends Survey.

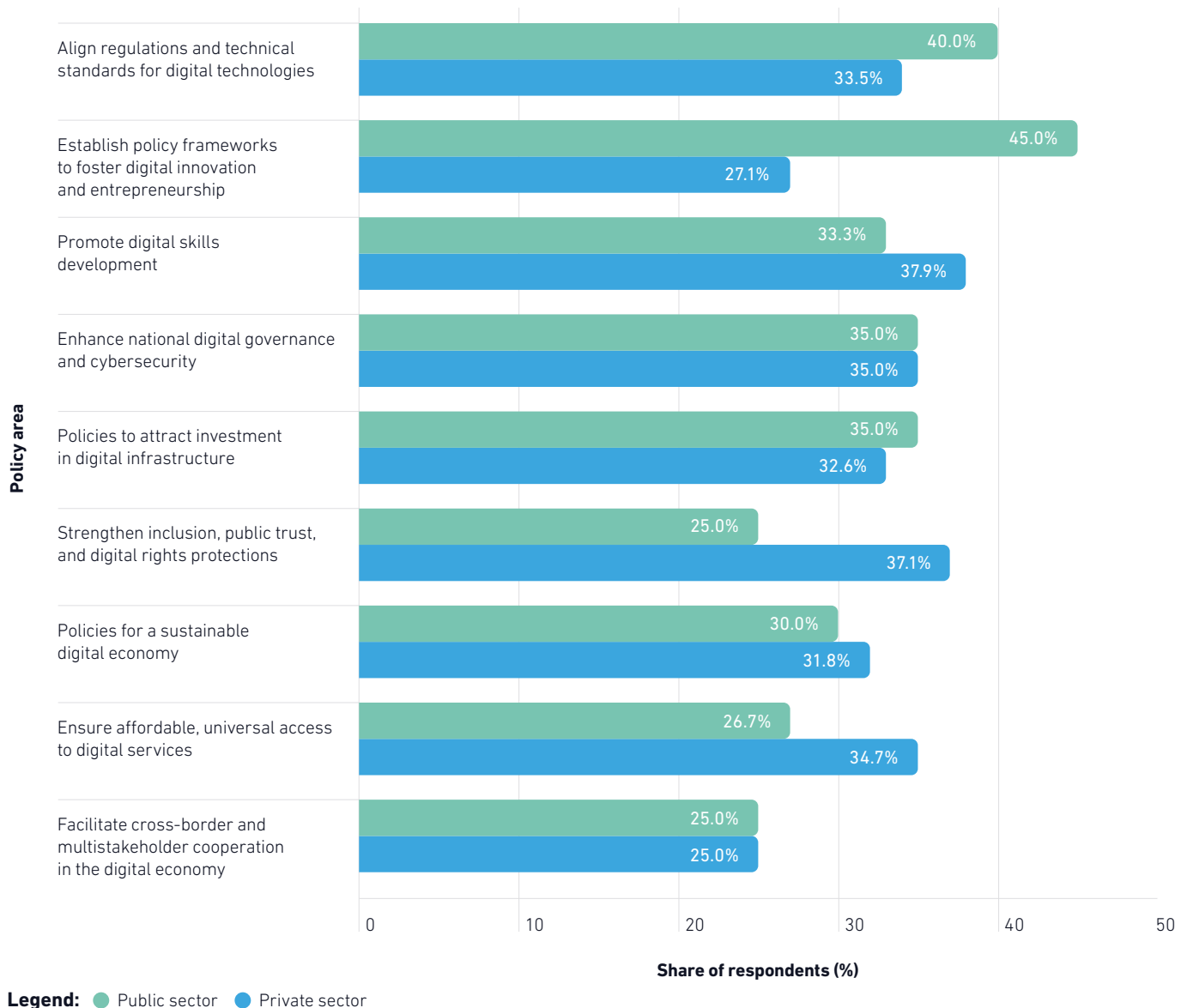
Q: In your industry, select the three digital economy trends, in order of importance, that you expect to create the most growth opportunities (e.g., new markets and customers or reducing operational costs) in the next 12-18 months.

Respondents: 272 CTOs and senior technologists working in large companies (+250 employees) and 74 digital economy and financial experts.

Policy actions

As shown in Figure I.7, public sector respondents prioritize policies to foster digital innovation and entrepreneurship (45.0%) and align regulations and standards (40.0%) to create a friction-free innovation ecosystem. As highlighted in the trend description, vertical AI creates opportunities for firms with limited investment capacity to compete in the AI space, as the narrow scope of such solutions lowers development costs. Policies reducing the costs of regulation for emerging businesses could therefore increase business dynamism while guarding against firms building monopolistic positions in AI. Private-sector priorities center on digital skills development (37.9%), strengthening inclusion, trust, and digital rights (37.1%), and supporting affordable, universal access to digital services (34.7%) to widen the adoption of vertical AI solutions.

Figure I.7: The Rise of Vertical AI – priority policy actions



Source: DCO 2025 Digital Economy Trends Survey.

Q: In your country, select the three most critical national policy actions needed for people, businesses, and states to benefit from each of the following current digital economy trends.




Respondents: 272 CTOs and senior technologists working in large companies (+250 employees), 60 policymakers, and 74 digital economy and financial experts.

Asking AI

We asked three leading LLMs (ChatGPT-5, Gemini 2.5 Flash, and DeepSeek-V3.2) to predict the likely impacts of this trend over the next 12-18 months.

Please refer to the methodology annex to see the exact prompts used.

Prompt >_

|  Economic impact |  Social impact |  Environmental impact |
|--|--|---|
| <p>ChatGPT:</p> <p>"Over the next 12-18 months, the rise of vertical AI is expected to boost productivity and efficiency across sectors by enabling domain-specific automation, reducing operational costs, and creating new market opportunities — particularly in healthcare, finance, manufacturing, and professional services."</p> | <p>Gemini:</p> <p>"Increased efficiency in specialized sectors (e.g., healthcare and finance) will enhance service access and quality. However, job displacement for routine cognitive tasks may occur, increasing the need for worker reskilling."</p> | <p>DeepSeek:</p> <p>"The trend's environmental impact is mixed. While specialized AI is more computationally efficient than general models, the net effect will be a significant global increase in energy use and associated emissions due to the sheer proliferation of new AI applications and data centers."</p> |
| <p>Note: these insights from LLMs are not data driven. They are provided as directional and sentimental and the LLMs have not had access to the survey data.</p> | | |



Vertical AI, rooted in local data and domain expertise, will beat generic models by delivering trusted, context-aware decisions for real people, not benchmarks.

Dr. Lindsey Moore
CEO and Founder DevelopMetrics

Stakeholder recommendations

Private sector

To build defensible vertical AI solutions that unlock global scalability, lower integration costs, and deliver accountable automation through domain-specific intelligence, business leaders need to:

Introduce vertical AI solutions through a modular approach to reduce deployment friction and cost and allow for automated actions to be more easily verified, helping to foster trust and transparency.

Co-lead certified affiliated data collaboration zones with industry peers, suppliers, and cloud partners to pool the proprietary domain data that fuels competitive vertical AI models, establishing shared governance for access rules, consent records, and audit trails.

Run cross-border pilots demonstrating how vertical AI improves sector-specific outcomes like onboarding speed, fraud detection, and supply chain traceability through specialized models trained on industry data.

Embed efficiency-by-design into vertical AI development through data minimization and energy-smart architectures that make specialized models sustainable and scalable.

Public sector

To accelerate sector-specific AI innovation, enable fair competition in vertical markets, and ensure the accountable deployment of specialized AI systems, policymakers and regulators need to:

Launch national trust compacts on vertical AI with industry and civil society to establish sector-specific rules and define enforceable usage limits for high-risk applications (e.g., healthcare, finance, and the protection of vulnerable groups), ensuring accountability, transparency, and meaningful human oversight.

Provide open testbeds and model contracts tailored to high-value sectors, using procurement and grants to prioritize vertical AI solutions that demonstrate inclusion, energy efficiency, and cross-border interoperability.

Enable mutual recognition of vertical AI certifications across borders to reduce compliance burdens and allow specialized AI models to scale efficiently across international markets.

IGOs, IOs, and others

To expand access to vertical AI capabilities, prevent concentration in a few tech giants, and ensure specialized AI systems serve diverse communities equitably, intergovernmental organizations, international organizations, civil society, and academia need to:

Fund cross-sector demonstrations proving how vertical AI delivers superior outcomes in healthcare, agriculture, finance, and other domains, with open results on inclusion and sustainability metrics.

Coordinate global policy alignment and knowledge exchange to support mutual recognition of sector-specific AI standards including clear thresholds and enforceable usage limits for high-risk applications to enable specialized models to operate safely and seamlessly across different regulatory environments while protecting vulnerable groups.

Build capacity for SMEs and underserved regions through training programs and toolkits focused on developing, deploying, and maintaining vertical AI solutions in local contexts.

Foster inclusive AI ecosystems by engaging SMEs, civil society, and all major groups across sectors in dialogues that inform the development of AI policies, ensuring they remain agile enough to account for the specificities of vertical AI and help spread the benefits of AI implementation across all communities.

● **Current trend**

1.2

API-Enabled Data Collaboration

Evolution of DET 2025 trend: Strengthening Collaborative Data Ecosystems

What does the trend encompass?

Application programming interfaces (APIs), the foundational infrastructure of data sharing, have transformed digital services by connecting isolated systems and platforms to distributed networks. They create the potential for secure, trustworthy, accountable, and auditable data sharing across organizations and national borders. With the right governance, APIs can drive the development of standardized frameworks for cross-border collaboration that allow industries and governments to participate in data ecosystems, unlock shared data-driven insights, and foster innovation without surrendering control over sensitive information. This trend builds on 2025's focus on strengthening data ecosystems for broad AI accessibility, especially as autonomous agents add a new execution layer through planning and executing workflows that potentially interface with multiple APIs.

API definition

API (application programming interface): a set of protocols, tools, and definitions that allow different software applications to communicate with each other, enabling the integration of functionalities and data across systems.

Why is it important?

Industries and governments can use APIs as a framework for collaboration to unlock insights and foster innovation while supporting privacy and regulatory compliance through governed data access. This approach provides AI models with the rich and specific data they need to maximize effectiveness while keeping data owners in control. Integrating APIs in workflows is the foundational layer paving the way for autonomous agents.

Economic outlook

This trend is expected to create value, as API-enabled data collaboration provides opportunities to share information and improve monitoring and transparency across products, projects, sectors, and supply chains. All regions are expected to record growth in gross value creation of around 4%, with the strongest expansion in the Middle East and Africa. Stakeholders can realize the potential impact of this trend by attending to the measures specified in the stakeholder recommendations section at the conclusion of this profile.

Total potential economic value creation:

US\$ 3.53 trillion

Growth rate:

4.0%

Notable developments

Overview of key past and likely future developments shaping the evolution of API-Enabled Data Collaboration:



Enabling conditions and countries' readiness

Key drivers

As identified by DET Survey respondents, the growth of API-Enabled Data Collaboration depends on:



Digital Infrastructure

Scalable and interoperable systems that provide reliable connectivity, secure cloud environments, and aligned data standards to support efficient and secure API deployment across borders.



Digital Innovation

Continuous research, experimentation, and developer engagement that advance API design, improve interoperability, and expand use cases across sectors. With the development of AI in particular, this offers new opportunities for expanding use cases.



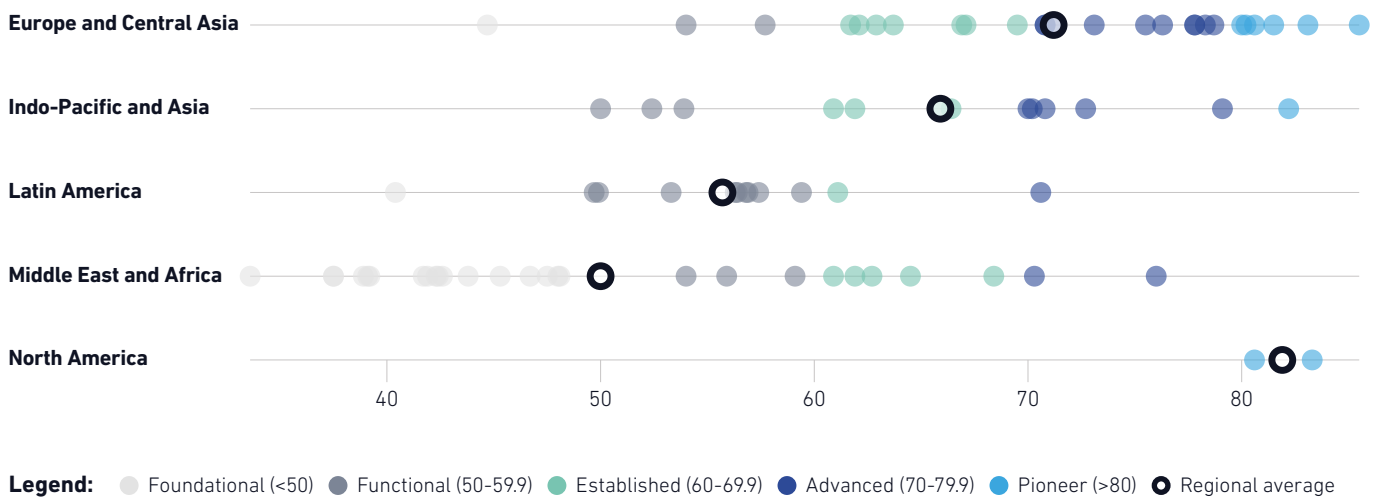
Digital for Sustainability

Sustainable architecture and resource-efficient infrastructure that ensure the long-term reliability, scalability, and affordability of API ecosystems, minimizing their environmental footprint while maximizing inclusion and resilience.

Countries' readiness for trend adoption

An assessment of these key drivers shows that, on average, countries' readiness to capitalize on API-Enabled Data Collaboration is still developing, with an average score of 61.1 out of 100 based on DEN 2025 scores. As indicated in Figure I.8, North America (81.9) is at *pioneer* readiness for this trend, having pioneered secure interoperability through the private sector and strong data governance frameworks. Europe and Central Asia (71.2) is at *pioneer* readiness for this trend, having pioneered secure interoperability through the private sector and strong data governance frameworks. Europe and Central Asia (71.2) has a structured environment for API standardization across the continent. Indo-Pacific and Asia (65.9) is at *established* readiness level: smaller countries have developed mature API ecosystems, but regional fragmentation in data sharing frameworks persists. Cross-border interoperability has yet to take off in Latin America (55.7), while early progress in the Middle East and Africa (50.0) is concentrated in the Gulf economies.

Figure I.8: API-Enabled Data Collaboration — trend readiness by region



Source: Results from the DCO's 2025 Digital Economy Trends Survey combined with data from the DCO's Digital Economy Navigator 2025.

Q: At a global level, select the three key enabling factors countries need in order to benefit from the opportunities provided by the following digital economy trends.

Respondents: 272 CTOs and senior technologists working in large companies (+250 employees), 60 policymakers, and 74 digital economy experts.

How is the trend materializing

Transportation

APIs enable all value-chain actors to exchange verifiable data on product specifications, enhancing traceability, quality, and carbon-footprint monitoring. In the automotive industry, for example, Catena-X uses standardized APIs and interfaces to enable secure, partner-to-partner data sharing across the globe.^{40 41}

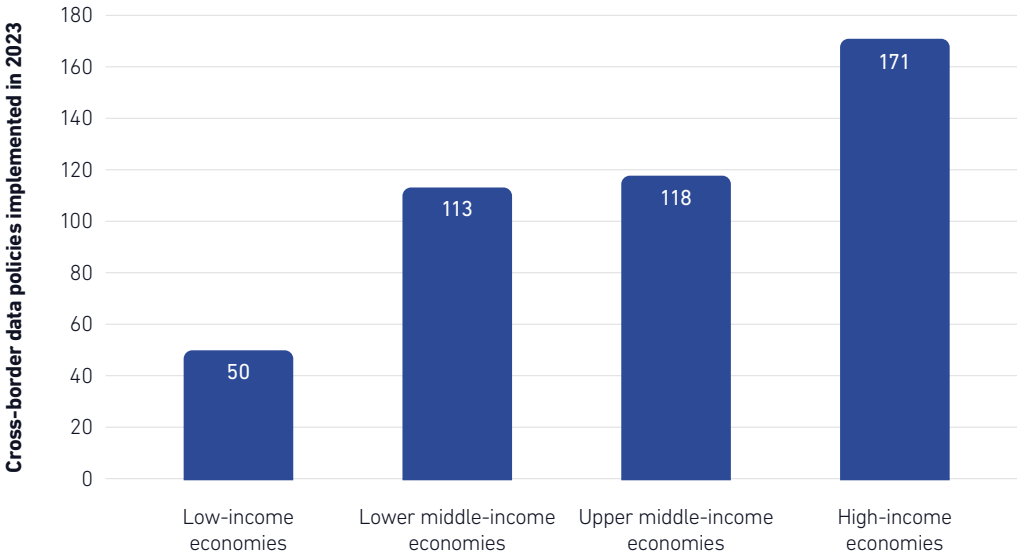
Telecommunications

API-enabled data collaboration in the telecommunications sector enables financial and public service providers to verify users without sharing content or personal data. For example, 73 operator groups, covering 80% of global mobile connections, are committed to the GSMA Open Gateway framework of common APIs, standardizing security and identity checks in areas such as SIM-swap status, number verification, and Know Your Customer rules.^{42 43}

Policy developments

Countries at higher income levels have generally introduced more regulatory measures to facilitate cross-border data flows, which are widely regarded as essential foundations for API-enabled collaboration, as shown in Figure I.9. For example, the EU Data Act contains detailed provisions on interoperability and data portability including standardized formats for data exports and no charges for data transfer.⁴⁴ These measures aim to remove portability frictions, facilitating API-collaboration across multiple clouds.⁴⁵

Figure I.9: Cross-border data regulation increases with income



Source: WTO Secretariat calculations based on the Digital Trade Integration Project by Ferracane, Ugarte and Wilson (2025).

Country spotlights

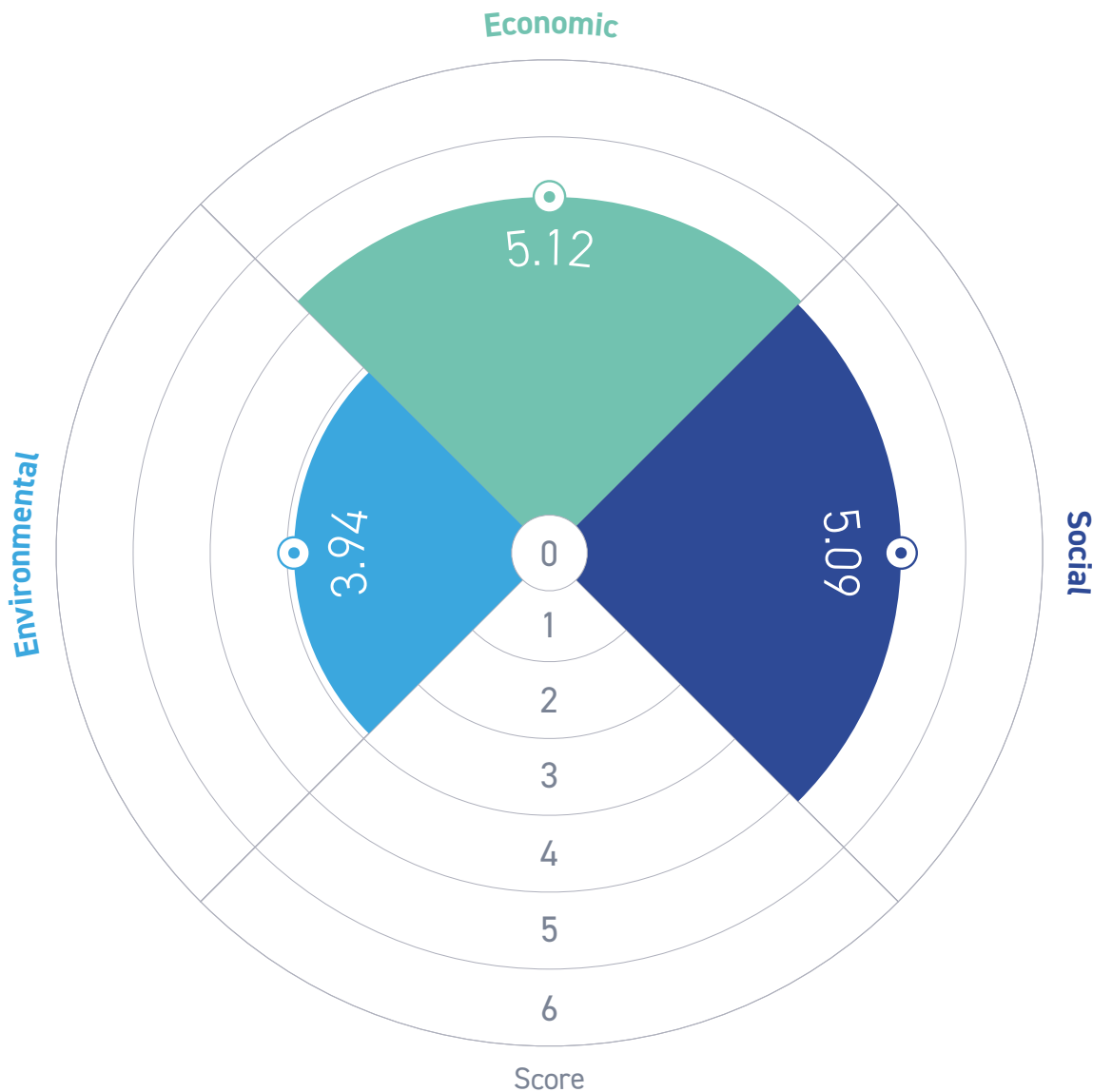
India's Open Network for Digital Commerce connects buyer apps, seller apps, and logistics through standard, interoperable application programming interfaces, letting millions of small firms transact without a single platform gatekeeper. The network crossed 204 million cumulative transactions in March 2025.⁴⁶

Nigeria has set out plans to use open-banking application programming interfaces (APIs) to enable banks and licensed fintechs to share consented data with audit trails, with the aim of widening financial inclusion. Beginning in early 2026, the roll-out of this API-enabled data collaboration will be phased to ensure consumer protection.⁴⁷

Economic, social, and environmental impact

Figure I.10 shows that this trend ranks middle to low overall for its positive economic (5.12), social (5.09), and environmental (3.94) impacts. Economic benefits come from interoperability improving productivity and are expected to be highest in North America (5.50) and the Middle East and Africa (5.50). Social benefits, which include the potential to improve privacy in data sharing, are highest in Latin America (4.26) and Indo-Pacific and Asia (4.30). Environmental impacts reflect the energy demands from higher storage capacity and compute intensity.

Figure I.10: API-Enabled Data Collaboration: expected positive impact



Legend: ● Average score per impact area

Source: DCO 2025 Digital Economy Trends Survey.

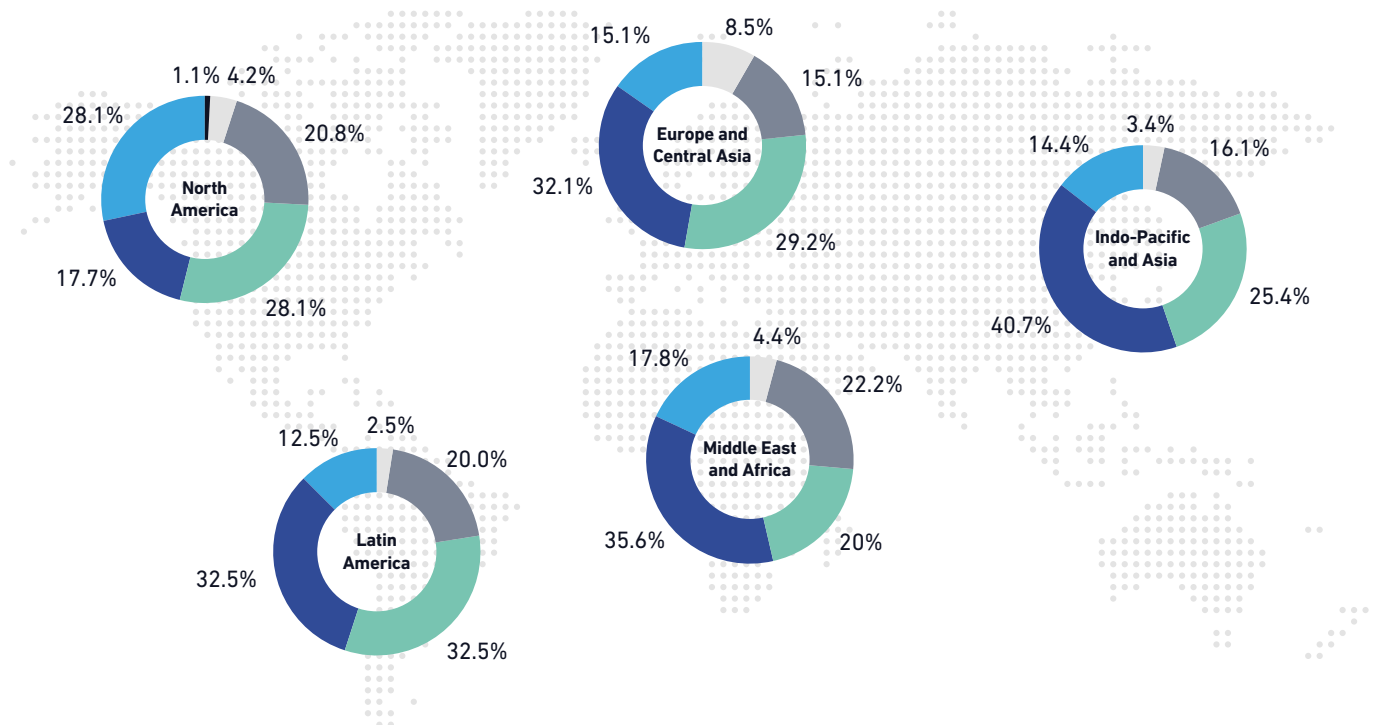
Q: In your country, how would you assess the economic/social/environmental impact of these current digital trends in the next 12-18 months?

Respondents: 272 CTOs and senior technologists working in large companies (+250 employees), 60 policymakers, and 74 digital economy and financial experts.

Pace of change

As shown in Figure I.11, Indo-Pacific and Asia (55.1%) and the Middle East and Africa (53.4%) have the highest share of respondents expecting this trend to accelerate at either a strong or a significant pace, indicating a high sense of untapped potential for API-enabled data collaboration in these regions. Private sector and government respondents are aligned, with 48-50% expecting strong or significant acceleration, reflecting the importance of collaborative data ecosystems for both these stakeholders.

Figure I.11: API-Enabled Data Collaboration: anticipated speed of change by region



Legend: ● Decelerate ● No change ● Somewhat accelerate ● Accelerate ● Accelerate significantly ● Strongly accelerate

Source: DCO 2025 Digital Economy Trends Survey.

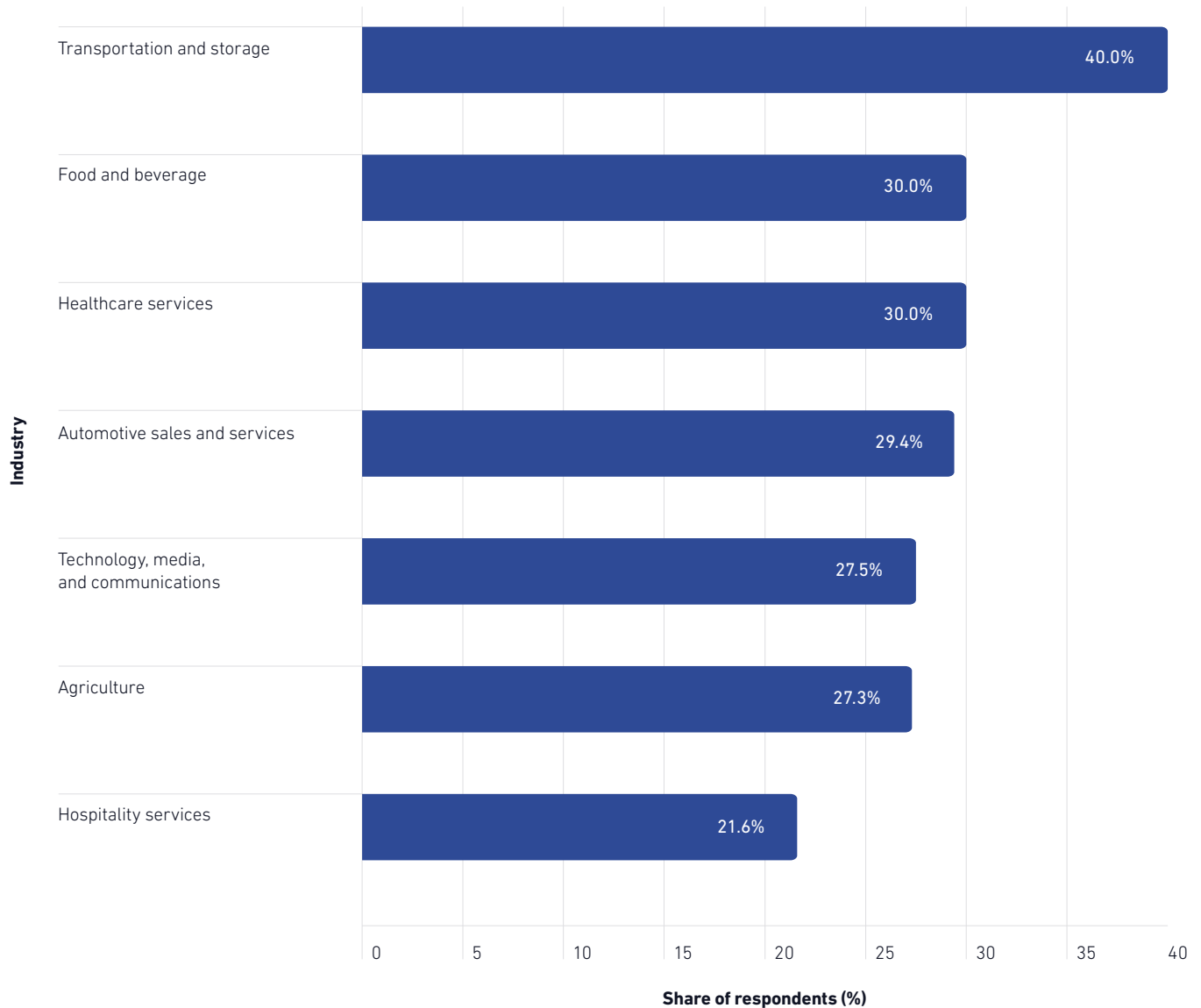
Q: In your country, how do you anticipate the speed at which the following digital economy trends will evolve in the next 12-18 months?

Respondents: 272 CTOs and senior technologists working in large companies (+250 employees), 60 policymakers, and 74 digital economy and financial experts.

Industry outlook

Figure I.12 shows that respondents expect transportation and storage (40.0%) to benefit most from this trend out of all industries, as secure APIs would let carriers, ports, and customs exchange data and improve controls. In the food and beverage sector (30.0%), API collaboration would let suppliers, manufacturers, and retailers share provenance. Healthcare services (30.0%) stand to benefit from the interoperability of information, claims data, and fraud alerts.

Figure I.12: API-Enabled Data Collaboration: top industries for expected growth



Source: DCO 2025 Digital Economy Trends Survey.

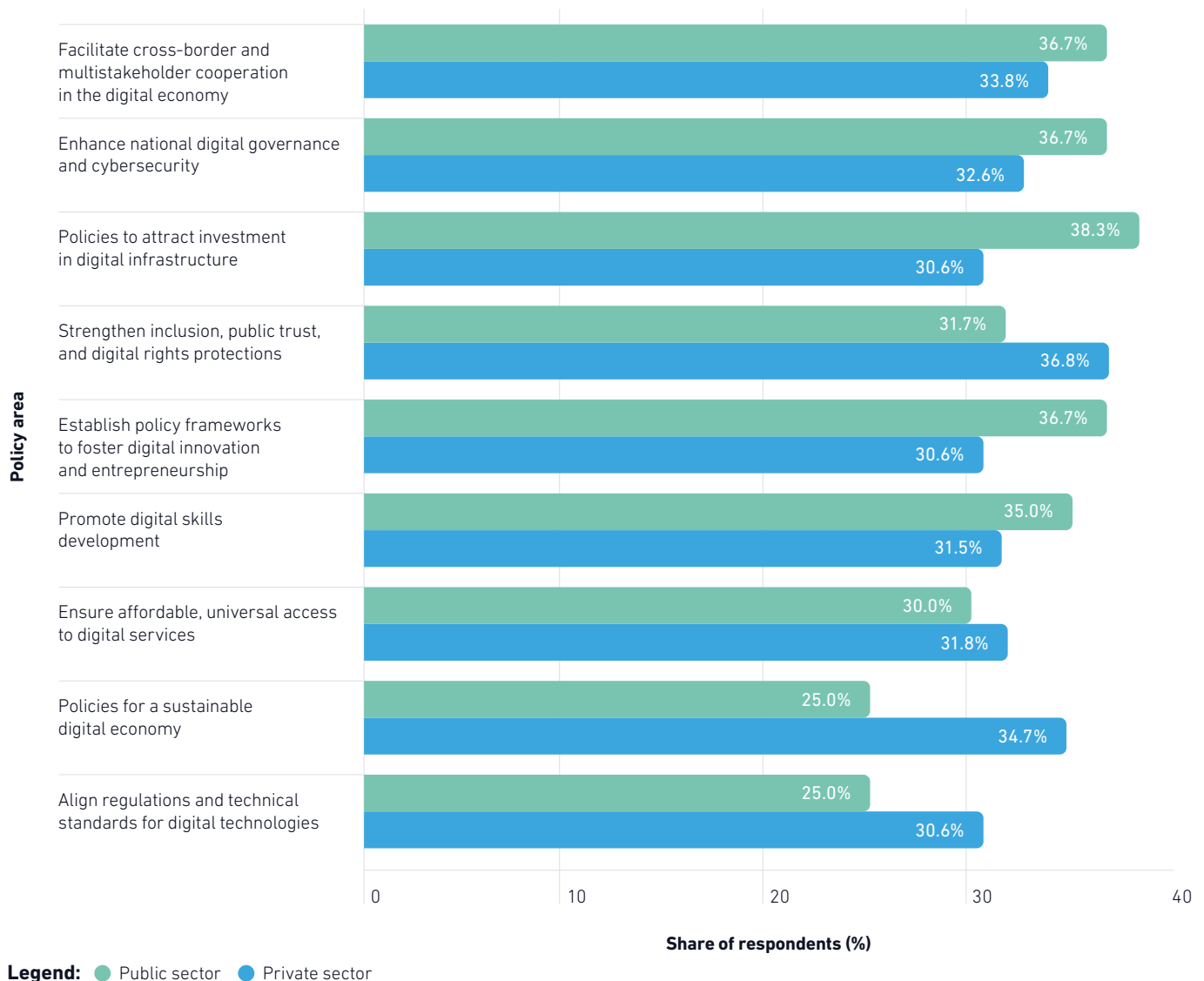
Q: In your industry, select the three digital economy trends, in order of importance, that you expect to create the most growth opportunities (e.g., new markets and customers or reducing operational costs) in the next 12-18 months.

Respondents: 272 CTOs and senior technologists working in large companies (+250 employees) and 74 digital economy and financial experts.

Policy actions

As shown in Figure I.13, government respondents prioritize attracting investment in digital infrastructure (38.3%) to strengthen the foundations for the API-enabled interoperable exchange, alongside strengthening national digital governance and cybersecurity (36.7%) and facilitating cross-border and multistakeholder cooperation (36.7%). On the private side, the emphasis is on strengthening inclusion, public trust, and digital-rights protections (36.8%), embedding policies for a sustainable digital economy (34.7%), and advancing cross-border cooperation (33.8%) to scale collaborations responsibly. API standardization, which could enable interoperability across API implementations independently of the underlying technology, would help advance many of these priorities. Important advances in this area have been made under ISO 20022 within the financial services sector, which provides a common data model and message schema for API resources together with the JSON Schema transformation rules and implementation best-practice guidelines.⁴⁸

Figure I.13: API-Enabled Data Collaboration: priority policy actions



Source: DCO 2025 Digital Economy Trends Survey.

Q: In your country, select the three most critical national policy actions needed for people, businesses, and states to benefit from each of the following current digital economy trends.




Respondents: 272 CTOs and senior technologists working in large companies (+250 employees), 60 policymakers, and 74 digital economy and financial experts.

Asking AI

We asked three leading LLMs (ChatGPT-5, Gemini 2.5 Flash, and DeepSeek-V3.2) to predict the likely impacts of this trend over the next 12-18 months.

Please refer to the methodology annex to see the exact prompts used.

Prompt >_

|  Economic impact |  Social impact |  Environmental impact |
|---|---|---|
| <p>DeepSeek:</p> <p>“This trend will unlock significant economic value by accelerating product development and creating new data-driven services. It will reduce integration costs, foster innovation ecosystems, and enable more efficient, automated business processes across supply chains and markets.”</p> | <p>ChatGPT:</p> <p>“Over the next 12-18 months, API-enabled trustworthy data collaboration will enhance social outcomes by improving transparency, fostering cross-sector partnerships, and enabling better-informed policymaking. It will also expand access to public services and research insights while strengthening data privacy and user trust.”</p> | <p>Gemini:</p> <p>“Accelerated cross-organizational data analysis will enable better environmental monitoring and resource optimization across industries like logistics and manufacturing. This rapid, trustworthy sharing will lead to the faster identification of supply chain emissions hotspots and support green energy grid management.”</p> |
| <p>Note: these insights from LLMs are not data driven. They are provided as directional and sentimental and the LLMs have not had access to the survey data.</p> | | |



API’s help to resolve a core tension in the digital economy by enabling cross-border and cross-sectoral insights-sharing while safeguarding sensitive data and people behind it.

Angela Oduor Lungati,
Executive Director, Ushahidi

Stakeholder recommendations

Private sector

To achieve faster partner onboarding, lower integration costs, new services across markets, and a competitive edge through API-enabled access to trusted, portable data, business leaders need to:

Partner across value chains to establish simple data-sharing rules and co-create a certified affiliated data collaboration zone for trusted exchange that reduces integration costs and provides the foundation for transparent and explainable AI decisions.

Co-fund a neutral trust layer with peers and platforms featuring clear roles, access lists, consent records, and independent oversight so that all parties — including distributed ledger-based technologies and autonomous systems — can verify activity with audit trails while lowering integration costs through shared technical infrastructure.

Launch joint pilots with suppliers, focusing on priority customer journeys such as onboarding, product traceability, cross-border payments, and fraud prevention, to create new value by enabling the auditing and accountability of transparent and verifiable data flows.

Support the skills development and technical resource requirements of SMEs to integrate with API ecosystems in emerging economies.

Public sector

To deliver safer data flows, strengthened investor confidence, ensure fairer access to digital services, and establish a foundation for responsible AI systems through trusted API frameworks, policymakers and regulators need to:

Enhance the incentives for digital public infrastructure investment by advancing a clear agenda for industry, government, and civil society to collaborate that sets clear rules for the trustworthy and collaborative flow of data, inferences, and insights across jurisdictional boundaries.

Provide open test environments where organizations can safely pilot API solutions using incentive-based, government procurement to reward trusted, inclusive, and water- and energy-efficient networking environments.

Connect national frameworks with regional networks to create a cross-border trusted data ecosystem that reduces compliance burdens while supporting transparency and regulatory-compliant AI systems.

Communicate in plain language so citizens and SMEs understand their rights, permissions, and the benefits of participation in data ecosystems that power the responsible use of data and AI.

IGOs, IOs, and others

To enable simpler cooperation across borders and wider participation in the digital economy to serve the public good, intergovernmental organizations, international organizations, civil society, and academia need to:

Convene a multi-sector interoperability initiative to promote trusted API networks with model templates and neutral certification that ensures transparency, explainability, and accountability of digital public infrastructure.

Create and maintain a global API sustainability and equity index that independently rates API-based data ecosystems on energy efficiency, water usage, data minimization, accessibility, defined liabilities, and fairness to incentivize investment and scale.

Fund cross-border demonstrations in high-impact areas such as transport, logistics, health, and food that prove how trustworthy APIs can create long-term value with inclusion, transparency, and climate resilience.

Promote mutual recognition between regional frameworks to reduce duplication and accelerate responsible AI development through standardized, auditable data-exchange mechanisms.

● **Current trend**

1.3

The Dawn of Ambient Intelligence

Evolution of DET 2025 trend: Strengthening Collaborative Data Ecosystems

What does the trend encompass?

Sensors are increasingly being integrated into everyday objects and environments to provide a layer of ambient intelligence, driven by their decreasing cost. The sensors are often combined with edge computing — in which data are processed closer to their source — as centralized systems cannot efficiently handle the data volumes and latency requirements. Smart systems are seamlessly embedded into the physical and digital spaces around us, forming an invisible layer of ambient intelligence that operates in the background to enhance services, optimize decision-making, and enrich user experiences.

Why is it important?

Ambient intelligence continually interprets real-time data and takes adaptive actions, powering autonomous systems and optimizing processes in multiple domains in ways that can offer societal and economic benefits. However, its pervasive data collection and automated decision-making raise complex questions about privacy, accountability, and whether those benefits are distributed equitably.

Economic outlook

Value creation from ambient intelligence is estimated to be highest in production-based industries where the introduction of low-cost sensors can add a layer of intelligence to operations such as construction and manufacturing. These industries drive significant value creation in the Middle East and Africa, suggesting the region can tap into greater benefits through wider implementation. For this trend's full potential economic value to be realized, stakeholders should adopt the measures listed in the stakeholder recommendations section below.

Total potential economic value creation:

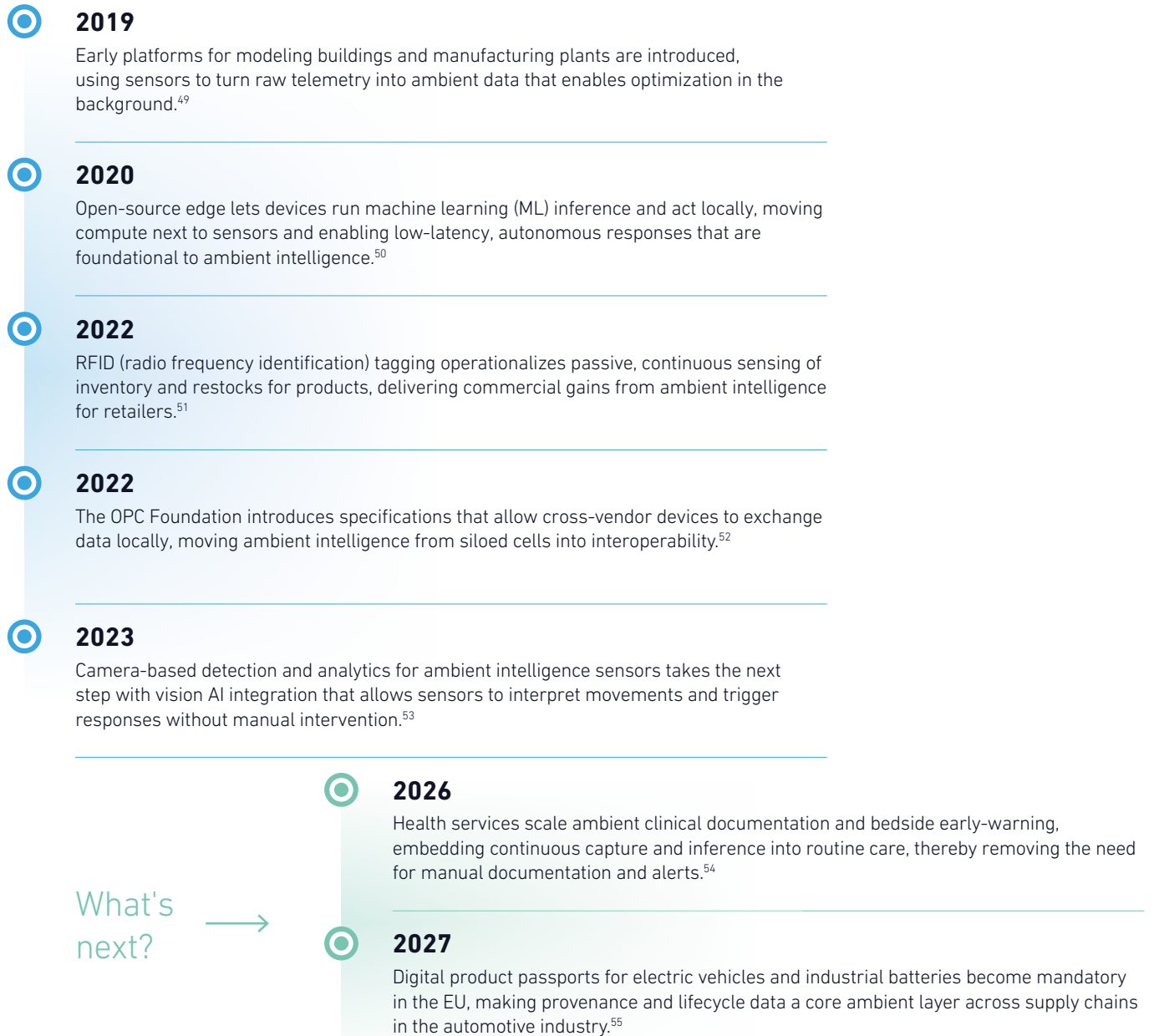
US\$ 4.21 trillion

Growth rate:

4.7%

Notable developments

Overview of past and likely future developments shaping The Dawn of Ambient Intelligence:



Enabling conditions and countries' readiness

Key drivers

According to DET Survey respondents, the Dawn of Ambient Intelligence depends on:



Digital Innovation

Startup incubators dedicated to ambient intelligence in specific sectors with a strong focus on fostering and enabling collaboration and bringing relevant actors together.



Digital Infrastructure

Seamless, reliable, and high-speed connectivity is the foundation for ambient intelligence, alongside edge computing infrastructure.



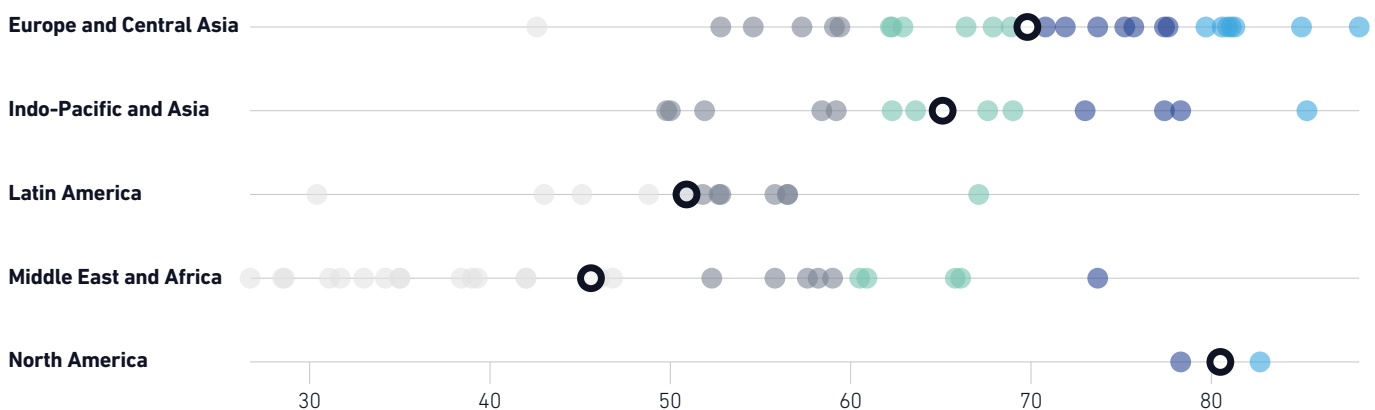
Industry Digital Transformation

Industries need to adapt workflows and systems, develop and deploy shared standards, and embed AI and sensors in their physical environment to reap the benefits of ambient intelligence.

Countries' readiness for trend adoption

With an average readiness score of 58.3, The Dawn of Ambient Intelligence is in the late stage of *functional* deployment.⁵⁶ North America (80.5) is at the *leading* level and best positioned to leverage ambient intelligence — its digital industries are built on a dense network of interconnected systems. Europe and Central Asia (69.8) is approaching *advanced*, reflecting its continent-wide digitalization and harmonization measures across sectors. Regional integration is *established* but less advanced in Indo-Pacific and Asia (65.1), while *functional* applications rather than system-wide adoption remain the key drivers in Latin America (50.9). The Middle East and Africa (45.6) is at *foundational* overall, with smart infrastructure being built in the Middle East while much of Africa is still constrained by energy, access, and affordability issues.

Figure I.14: The Dawn of Ambient Intelligence: trend readiness by region



Legend: ● Foundational (<50) ● Functional (50-59.9) ● Established (60-69.9) ● Advanced (70-79.9) ● Pioneer (>80) ● Regional average

Source: Results from the DCO's 2025 Digital Economy Trends Survey combined with data from the DCO's DEN 2025.

Q: At a global level, select the three key enabling factors countries need in order to benefit from the opportunities provided by the following digital economy trends.

Respondents: 272 CTOs and senior technologists working in large companies (+250 employees), 60 policymakers, and 74 digital economy experts.

How is the trend materializing

Energy and utilities

Ambient intelligence is modernizing the energy and utilities industry via real-time sensors, which gather asset performance and consumption data for analytics, enabling predictive maintenance on turbines (using vibration sensors to detect early signs of failure), smart grid energy balancing to prevent blackouts (using two-way communication and AI to dynamically reroute power during peak demand), and the integration of renewable energy sources (predicting variable solar or wind output to balance grid energy needs). European utilities have been early adopters of such operations, with Germany's E.ON and Italy's Enel among the leading providers.^{57,58,59}

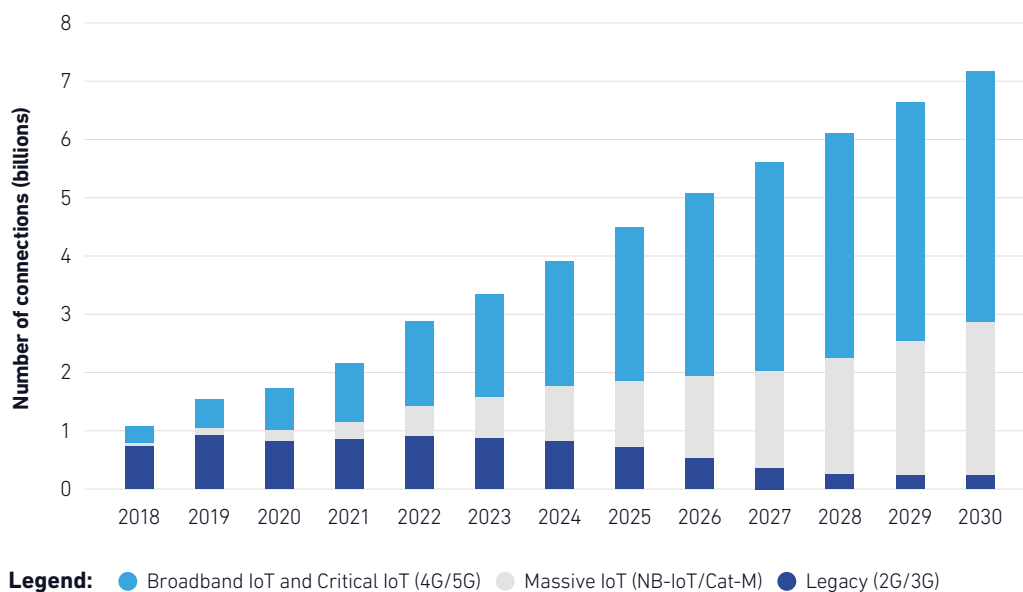
Hospitality services

Real-time and context-aware analytics enabled by affordable ambient intelligence systems have the potential to significantly enhance efficiency in dynamic, real-time service settings. For example, Taco Bell (a US fast-food chain) is rolling out camera- and sensor-based systems in 500 restaurants to monitor drive-thru activity and kitchen workflows, optimizing efficiency and labor allocation through real-time analytics and automated alerts.⁶⁰

Developments in connectivity

Cellular Internet-of-Things (IoT) modules and 5G standalone networks are among the strongest enablers of ambient intelligence. A growing number of countries are investing in 5G standalone networks, which enable more low-latency, local processing.⁶¹ As shown in Figure I.15, the total number of cellular IoT connections is expected to grow from nearly 4 billion in 2024 to over 7 billion by 2030.⁶² However, shifting regulations and geopolitical tensions are reshaping dynamics in the cellular IoT modules market.⁶³

Figure I.15:
Cellular IoT connections by segment and technology



Source: Ericsson's IoT connections outlook (2025)

Frontier use case

Extreme wildfires are projected to rise by up to 30% by 2050 and 50% by 2100, increasing humanitarian, ecological, and economic losses.⁶⁴ To tackle this, Google Research has led the introduction of ambient intelligence in forests through artificial intelligence cameras and low-power sensors connected to satellites to detect signs of fire and push immediate alerts to disaster response teams.⁶⁵

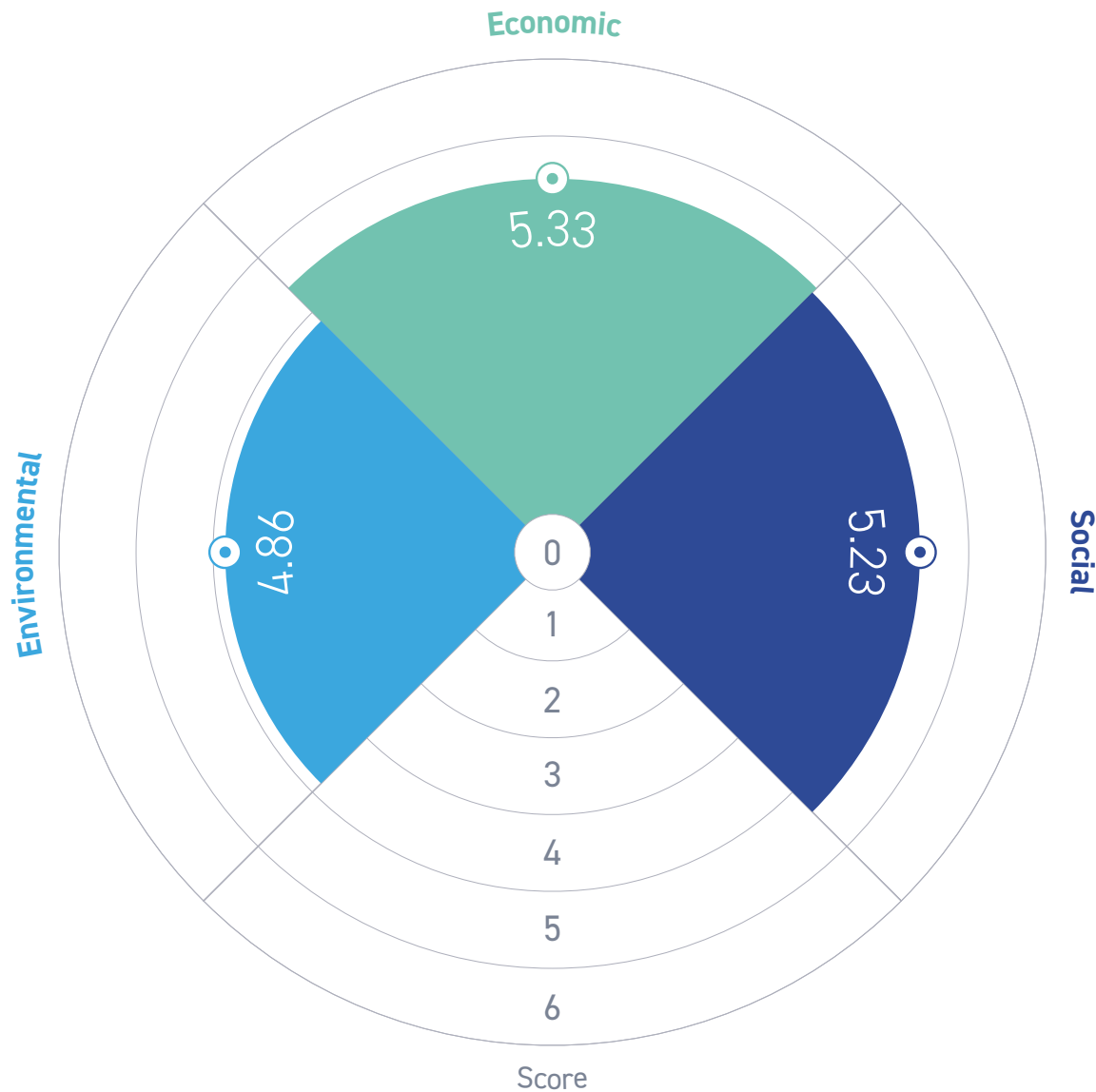
Country spotlight

Kuwait is using artificial intelligence cameras, mobile radar, smart patrol cars, and edge analytics in an early-stage ambient intelligence system aimed at improving road safety and efficiency. Early results report violations such as speeding dropping by up to 95% and faster responses to emergencies.^{66,67}

Economic, social, and environmental impact

Figure I.16 highlights that this trend performs strongly across positive economic (5.33), social (5.23), and environmental (4.86) domains, reflecting benefits from improved accessibility to energy efficiency and material and environmental savings. Latin America (5.84) and Indo-Pacific and Asia (5.69) rank the highest for economic impact, while Indo-Pacific and Asia and North America are the leaders for social and environmental impacts.

Figure I.16: The Dawn of Ambient Intelligence: expected positive impact



Legend: ● Average score per impact area

Source: DCO 2025 Digital Economy Trends Survey.

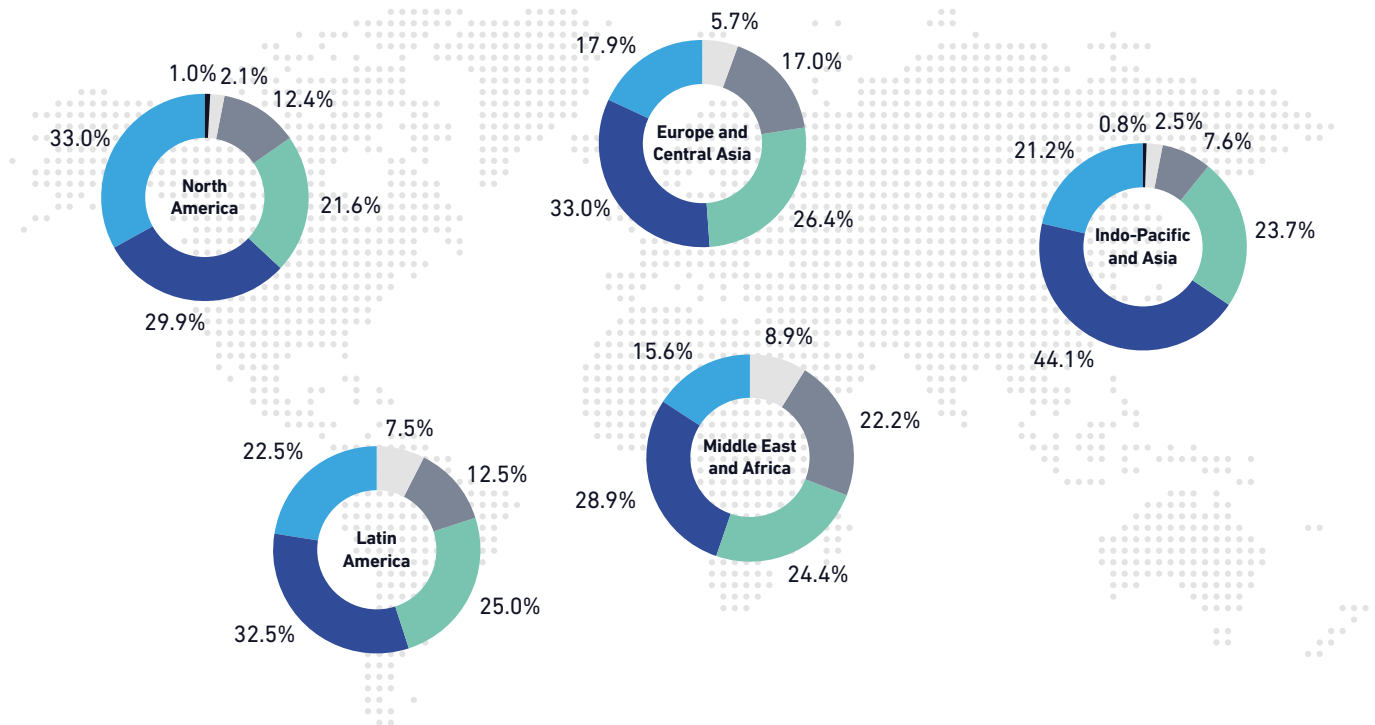
Q: In your country, how would you assess the economic/social/environmental impact of these current digital trends in the next 12-18 months?

Respondents: 272 CTOs and senior technologists working in large companies (+250 employees), 60 policymakers, and 74 digital economy and financial experts.

Pace of change

As shown in Figure I.17, respondents in Indo-Pacific and Asia (65.3%) are most likely to expect either strong or significant acceleration in the trend's pace of change, with those in the Middle East and Africa (44.5%) the least likely. Private sector stakeholders are notably more bullish (60.9%) than their government counterparts (43.3%), signaling that momentum is more driven by enterprises than the public sector.

Figure I.17: The Dawn of Ambient Intelligence: anticipated speed of change by region



Legend: ● Decelerate ● No change ● Somewhat accelerate ● Accelerate ● Accelerate significantly ● Strongly accelerate

Source: DCO 2025 Digital Economy Trends Survey.

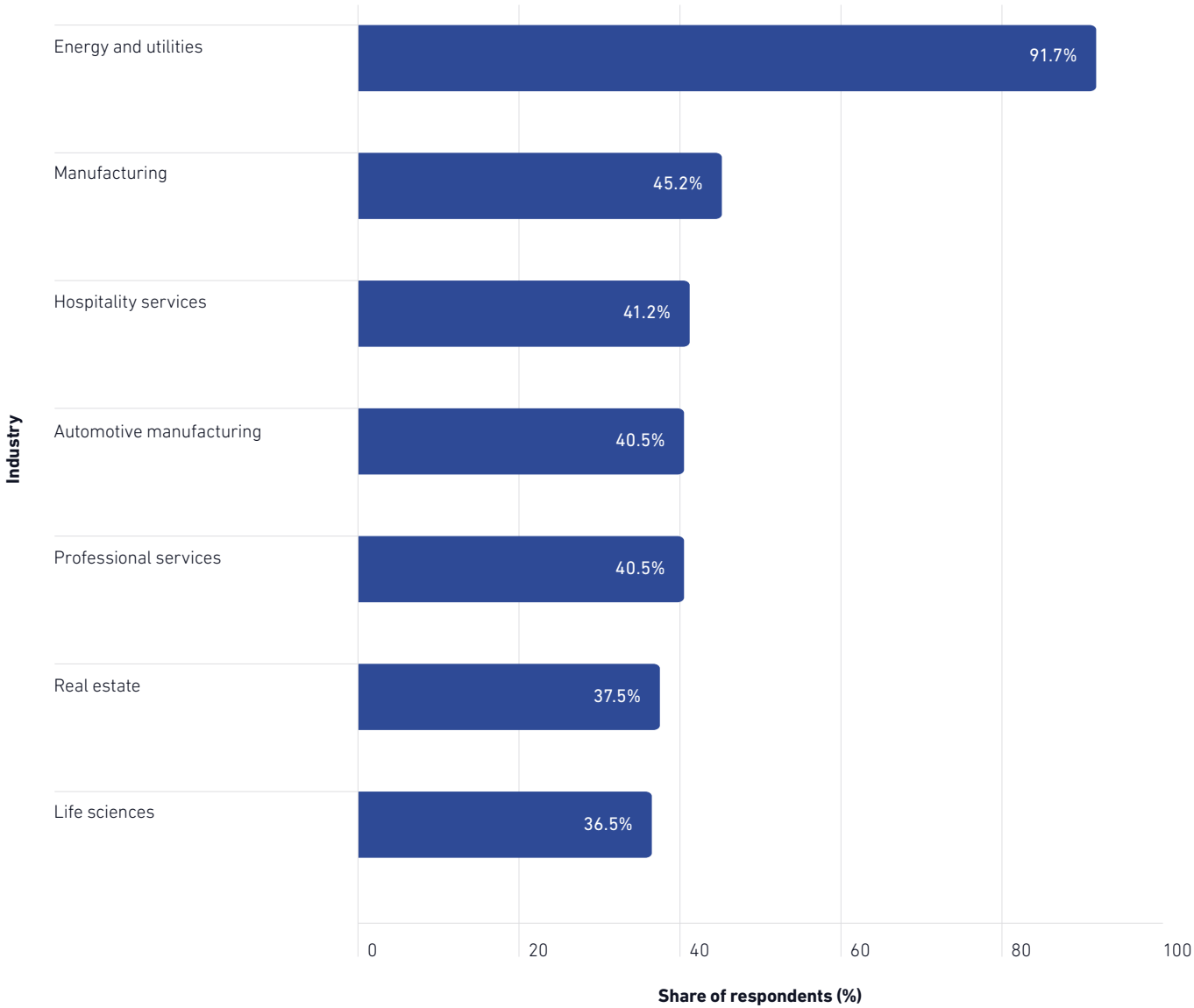
Q: In your country, how do you anticipate the speed at which the following digital economy trends will evolve in the next 12-18 months?

Respondents: 272 CTOs and senior technologists working in large companies (+250 employees), 60 policymakers, and 74 digital economy and financial experts.

Industry outlook

Figure I.18 shows that respondents expect the energy and utilities sector (91.7%) to benefit most, as ambient intelligence improves energy efficiency and predictive maintenance. In manufacturing (45.2%), sensors on production lines allow for real-time quality control and adaptive scheduling. The hospitality sector (41.2%) benefits from ambient intelligence in areas such as housekeeping, as systems detect when rooms are vacated or supplies need replenishing.

Figure I.18: The Dawn of Ambient Intelligence: top industries for expected growth

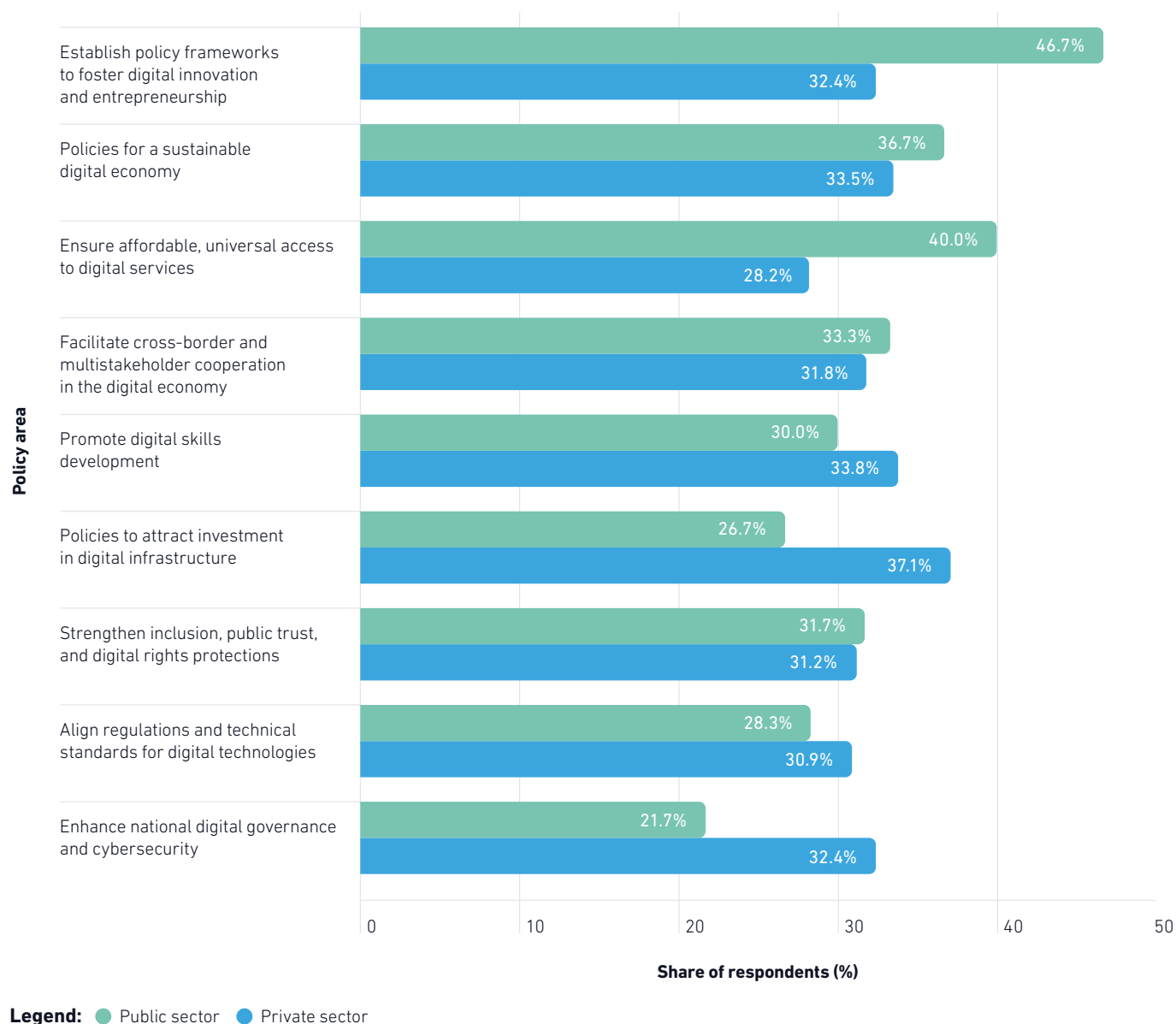


Source: DCO 2025 Digital Economy Trends Survey.
Q: In your industry, select the three digital economy trends, in order of importance, that you expect to create the most growth opportunities (e.g., new markets and customers or reducing operational costs) in the next 12-18 months.
Respondents: 272 CTOs and senior technologists working in large companies (+250 employees) and 74 digital economy and financial experts.

Policy actions

Government respondents prioritize creating policy frameworks for ambient intelligence that foster innovation and entrepreneurship (46.7%) while promoting universal, affordable access (40.0%), as illustrated in Figure I.19. Those from the private sector focus on investment in digital infrastructure (37.1%) and digital skills development (33.8%). Both agree on the importance of fostering sustainable digital economy policies (36.7% government, 33.5% private) in areas such as e-waste, as ambient systems will expand the use of connected devices and less than a quarter of such devices are currently properly collected and recycled when replaced.⁶⁸

Figure I.19: The Dawn of Ambient Intelligence: priority policy actions



Source: DCO 2025 Digital Economy Trends Survey.

Q: In your country, select the three most critical national policy actions needed for people, businesses, and states to benefit from each of the following current digital economy trends.




Respondents: 272 CTOs and senior technologists working in large companies (+250 employees), 60 policymakers, and 74 digital economy and financial experts.

Asking AI

We asked leading LLMs (ChatGPT-5, Gemini 2.5 Flash, and DeepSeek-V3.2) to predict the likely impacts of this trend over the next 12-18 months.

Please refer to the methodology annex to see the exact prompts used.

Prompt >_

| | | |
|--|--|---|
|  Economic impact |  Social impact |  Environmental impact |
| <p>Gemini: "The initial economic impact will be a rapid 20-25% market growth for ambient computing components (sensors, edge AI, and services). Businesses will see short term cost reductions through optimized resource usage (e.g., energy and inventory) and increased productivity from real-time operational insights."</p> | <p>DeepSeek: "This trend will enhance personal convenience and safety through predictive services. However, it will also intensify societal debates over data privacy and the ethical use of pervasive surveillance, potentially creating a divide between those who can afford these intelligent services and those who cannot."</p> | <p>ChatGPT: "Over the next 12-18 months, the rise of ambient intelligence will improve environmental outcomes by optimizing energy and resource use through real-time monitoring, enabling smarter logistics and manufacturing, and supporting predictive maintenance that reduces waste, emissions, and environmental degradation."</p> |

Note: these insights from LLMs are not data driven. They are provided as directional and sentimental and the LLMs have not had access to the survey data.



As technologies become embedded into services, there is growing awareness of the importance of human-in-the-loop accountability mechanisms to mitigate risk.

Emrys Schoemaker
Senior Director,
Policy & Advisory
Caribou

Stakeholder recommendations

Private sector

To unlock scalable growth, reduce integration costs, and build societal trust in ambient intelligence systems, business leaders need to:

Establish a cross-industry alliance on trusted ambient ecosystems to co-develop and fund open interoperability standards for low-cost sensors and edge computing, shifting from proprietary silos to infrastructure that enables collaboration.

Prioritize privacy-by-design frameworks that embed transparency into ambient services from inception, earning consumer confidence and grounding competition in responsible innovation.

Invest in workforce upskilling to enable teams to interpret real-time data insights and translate them into operational value across manufacturing, energy, and healthcare.

Co-develop trusted deployments with governments and academia through cross-sector compacts that combine interoperable sensors with edge analytics and use third-party audits to verify user consent.

Public sector

To de-risk investment, harmonize standards, and position nations as leaders in trusted ambient intelligence, policymakers and regulators need to:

Launch sandboxes for innovation in ambient intelligent systems, enabling entrepreneurs and civil society to co-design and future-proof governance that balances rapid innovation with robust privacy, security, and equity safeguards for vulnerable populations.

Establish national data trusts for high-value public datasets and create regulatory green lanes for certified ambient solutions built on open standards, providing clear rules and safe harbors for innovators.

Partner with the private sector to pilot ambient systems in public services like healthcare, transportation, and emergency response, demonstrating responsible deployment at scale and building citizen trust.

Use procurement to reward privacy-by-design, interoperability, and local data minimization while aligning incentives for SMEs to adopt standards and skills that promote universal and affordable access to ambient intelligence technologies.

IGOs, IOs, and others

To ensure globally inclusive, rights-respecting ambient intelligence that advances sustainable development goals, international organizations, civil society, and academia need to:

Develop open-source playbooks for the ethical deployment of smart systems, focusing on interoperability, data sovereignty, and human rights protections.

Create a global ambient intelligence public stack with open-source software, reference architectures, and auditable algorithms that lower barriers for entrepreneurs in emerging markets.

Direct capacity-building programs and funding for emerging economies, ensuring equitable and affordable access to ambient intelligence and preventing digital divides.

Advocate for inclusive design principles in ambient intelligence that prioritize accessibility and protect marginalized communities from surveillance harms through shared best practices and equity impact studies.

● **Current trend**

1.4

Powering a Sustainable Digital Economy

Continuation of DET 2025 trend: Powering a Sustainable Digital Economy

What does the trend encompass?

Energy is becoming a major constraint on scaling digital technologies. The energy demand of data centers and AI infrastructure is growing faster than clean energy integration in many regions. It has become a strategic priority to invest in integrating renewable energy, while advancing efficiency innovations such as low-power chips, cooling systems, and AI-optimized energy use. With energy demand continuing to rise, this trend continues to play a critical role for the global digital economy.

Why is it important?

Without continued investment in energy generation capacity, and notably in low-carbon solutions and grid upgrades, the growth of the digital economy will be constrained. High and volatile energy prices could cause market power to concentrate, as it raises entry barriers and operating costs that disproportionately affect new and smaller market entrants. This could threaten market competitiveness, digital sovereignty, inclusion, and environmental sustainability.

Economic outlook

The value creation outlook from this trend is moderately positive, led by opportunities in value creation in transport, storage, and communications that stem from the modernization of infrastructure for energy efficiency, with positive knock-on effects in energy cost savings for all industries except agriculture. The greatest opportunities are expected in the Middle East and Africa, given its opportunities in increasing investment in clean energy technologies, particularly solar. For this economic value to be achieved in full, stakeholders will need to follow the recommendations outlined at the end of this trend profile.

Total potential economic value creation:

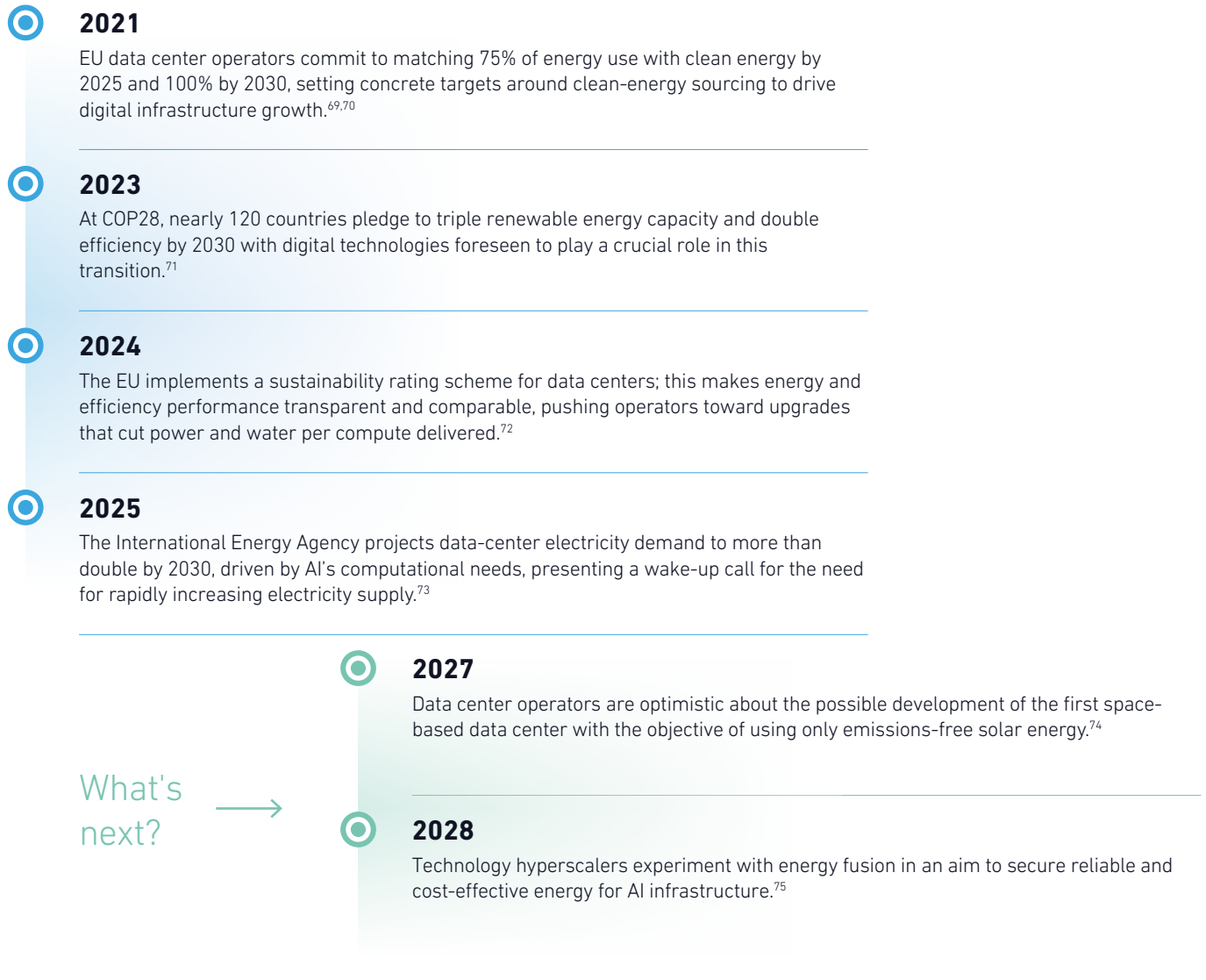
US\$ 2.86 trillion

Growth rate:

3.2%

Notable developments

Overview of past and likely future developments illustrating the growth of a sustainable digital economy:



Enabling conditions and countries' readiness

Key drivers

Combining technology developments with sustainability will require three key drivers, as identified by DET Survey respondents:



Digital Innovation

Research and development (R&D) funding aimed at improving the energy efficiency of AI models, together with a policy environment that supports startups and incentivizes the roll-out and adoption of energy-efficient solutions, is essential to address the core challenge underpinning a sustainable digital economy.



Digital for Sustainability

Digital technologies can support sustainability — for example, through grid efficiency — with key priorities including energy efficiency, waste reduction, and investment in sustainable energy generation, including renewable sources.



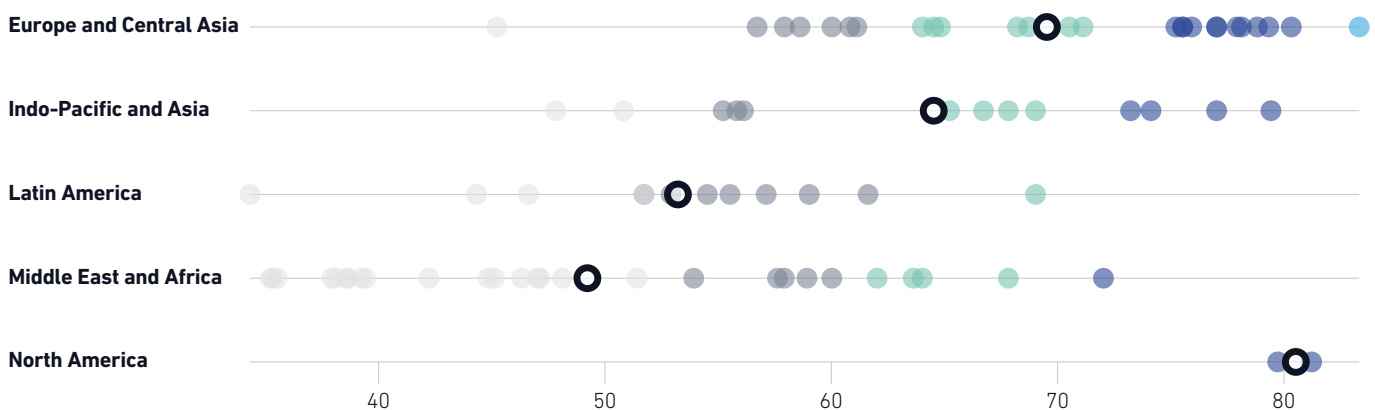
Digital Infrastructure

Upgrading to modern power grid infrastructure such as smart grids, which combine advanced analytics, communication networks, and energy storage systems, would reduce energy losses in transmission and distribution, enable more efficient operations, and help to minimize environmental impacts.

Countries' readiness for trend adoption

Aggregating DEN 2025 pillar scores for these three key drivers, Figure I.20 shows that North America (78.3) stands out as the most ready to link technology expansion with clean power supply. Europe and Central Asia (67.3) remain a global benchmark for policy alignment on the clean energy transition, yet national performance is uneven. Across Indo-Pacific and Asia (62.3), readiness is accelerating but fragmented, with China and India still relying largely on coal and aging transmission networks. Low scores in Latin America (51.0) and the Middle East and Africa (47.0) reflect their relative lack of sustainable power, however, the Gulf economies are investing heavily in solar and hydrogen.

Figure I.20: Powering a Sustainable Digital Economy: trend readiness by region



Legend: ● Foundational (<50) ● Functional (50-59.9) ● Established (60-69.9) ● Advanced (70-79.9) ● Pioneer (>80) ● Regional average

Source: Results from the DCO's 2025 Digital Economy Trends Survey combined with data from the DCO's Digital Economy Navigator 2025.

Q: At a global level, select the three key enabling factors countries need in order to benefit from the opportunities provided by the following digital economy trends.

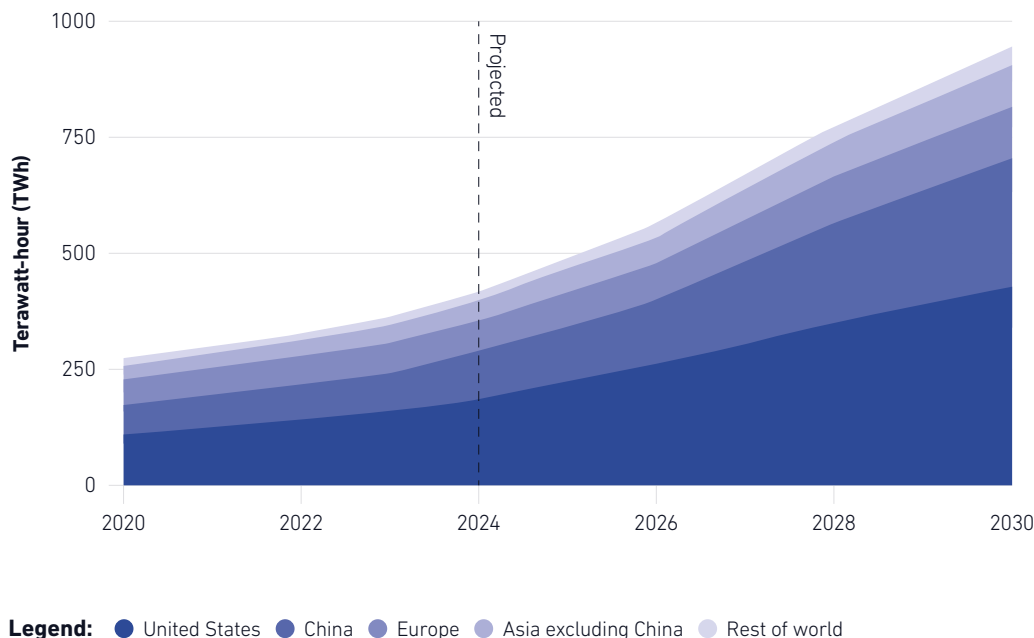
Respondents: 272 CTOs and senior technologists working in large companies (+250 employees), 60 policymakers, and 74 digital economy experts.

How is the trend materializing

Manufacturing

There is growing demand for electricity from AI-enabling infrastructure, especially data centers, as shown by Figure I.21. In response, chipmakers are shifting to renewables and closed-loop utilities to lower the upstream footprint of AI hardware and improve cost stability.⁷⁶ In 2024, for example, TSMC brought forward its 100% renewable target by then years to 2040.

Figure I.21:
Data center electricity consumption by region, 2020-30⁷⁷



Source: IEA report on data center electricity consumption by region (2025)

Infrastructure and real estate

Powering a sustainable digital economy depends on improving sustainability in infrastructure construction. Fifth-generation district heating and cooling networks show how digital technologies can make urban infrastructure smarter and more sustainable. They can also capture waste heat (for example, from data centers) and convert it into a steady input for municipal energy, lowering fuel use and emissions.⁷⁸

Solar energy projects

Solar and small modular reactors will play a critical role in balancing data-center energy needs with sustainability targets. Microsoft signed a record 10.5-GW solar power purchase agreement for delivery by 2026, while Amazon and Google advanced similar small-modular-reactor partnerships. Saudi Arabia secured US\$3.2 billion in financing for 5.5 GW of solar projects, with commercial operations expected by 2027.⁷⁹

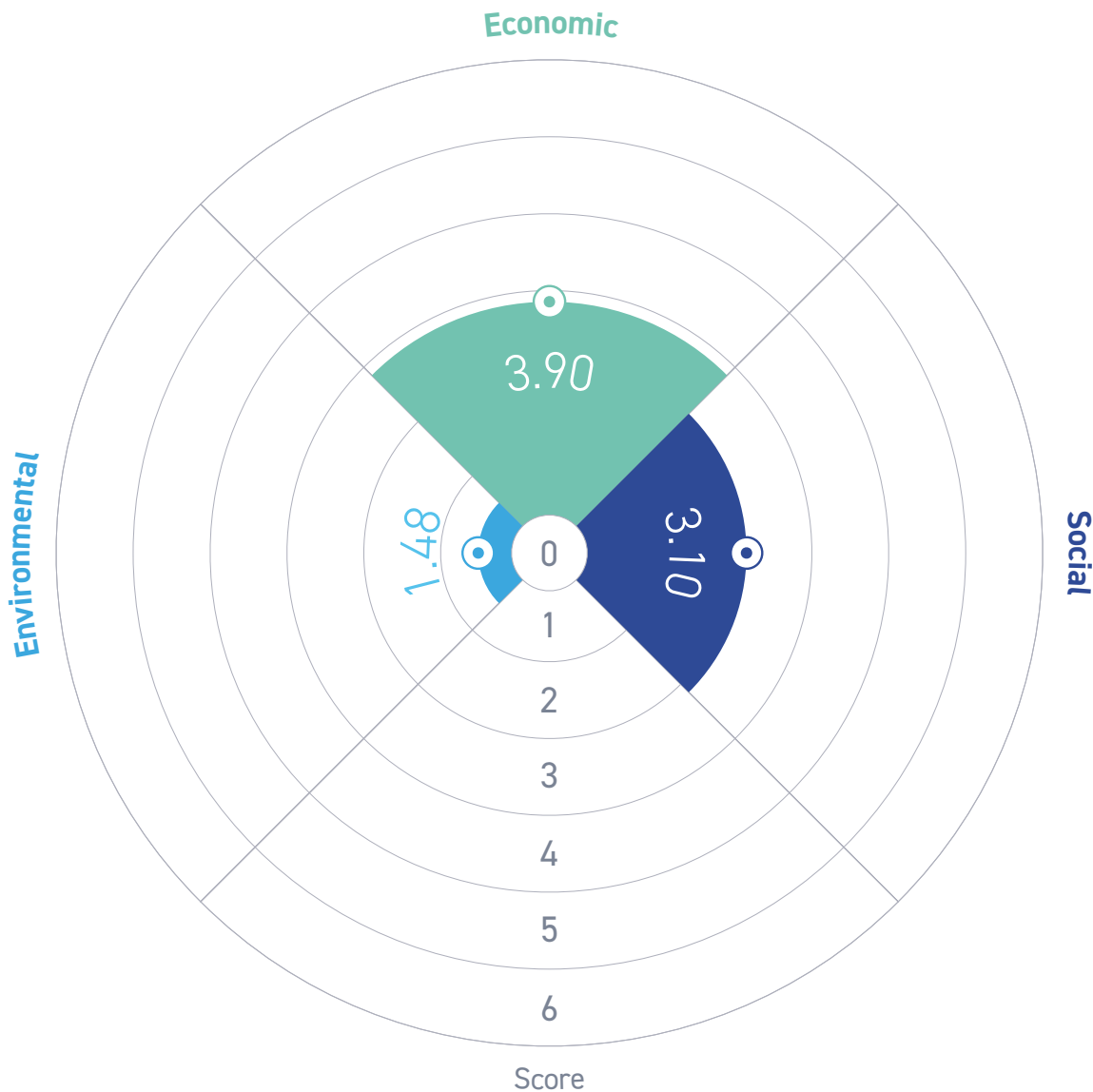
Country spotlight

Morocco's government unveiled plans for a 500-MW hyperscale data center in Dakhla powered by renewables. A consortium including Republic of Korea's Naver, Maroc Telecom, and Lloyds Capital will build this facility, based on wind and solar with a national grid connection for reliability.⁸⁰

Economic, social, and environmental impact

Figure I.22 reveals that this trend ranks lowest across all three dimensions of positive economic (3.90), social (3.10), and environmental (1.48) impacts, reflecting ongoing challenges in meeting the growing demand for digital technologies while avoiding increases in emissions and the use of natural resources associated with rising energy consumption. Indo-Pacific and Asia (4.30) and the Middle East and Africa (4.24) rank highest for economic impact, and Latin America leads in social (3.41) and environmental impacts (2.09).

Figure I.22: Powering a Sustainable Digital Economy: expected positive impact



Legend: ● Average score per impact area

Source: DCO 2025 Digital Economy Trends Survey.

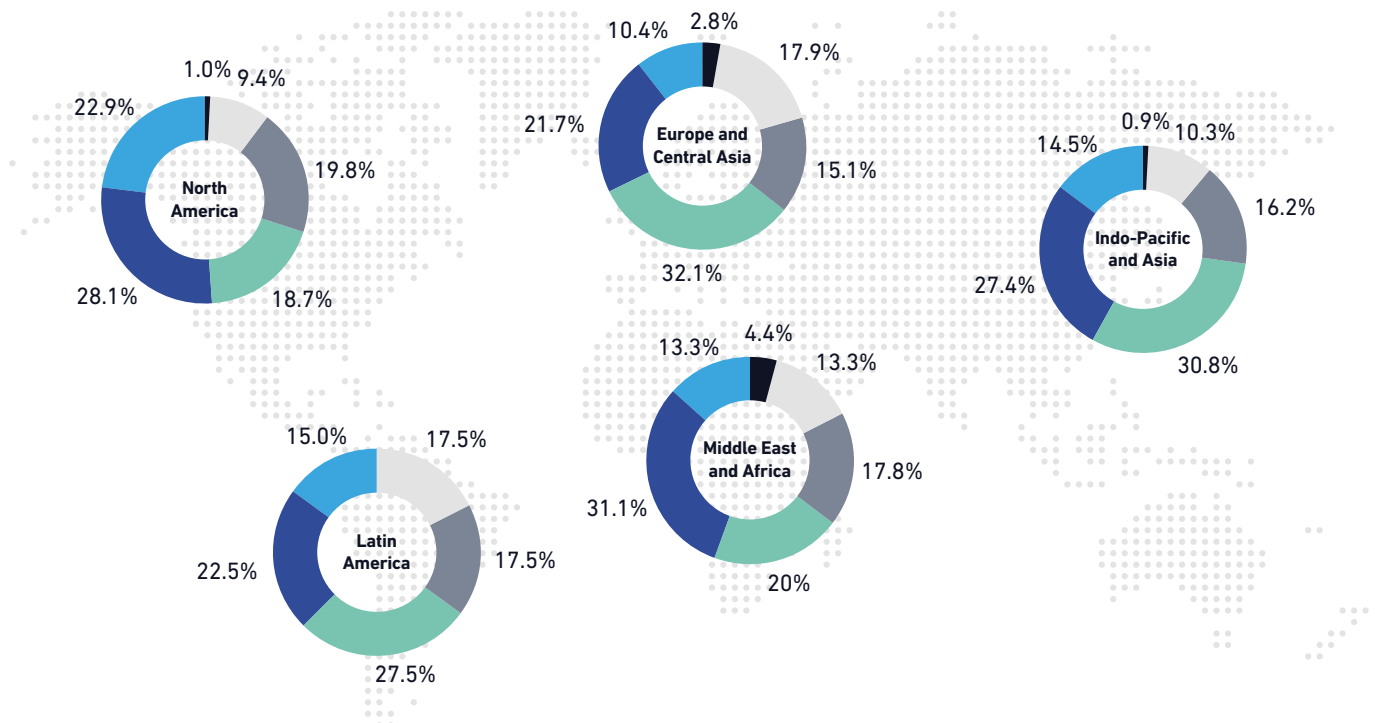
Q: In your country, how would you assess the economic/social/environmental impact of these current digital trends in the next 12-18 months?

Respondents: 272 CTOs and senior technologists working in large companies (+250 employees), 60 policymakers, and 74 digital economy and financial experts.

Pace of change

As shown in Figure I.23, approximately 40% of respondents believe the trend's pace of change will accelerate strongly or significantly. This acceleration is highest in North America (51.0%) and the Middle East and Africa (44.4%), and lowest in Europe and Central Asia (32.1%), where roughly 15% expect no change. Private and government stakeholders have similar expectations, which could reflect the growing public-private partnership in this domain.

Figure I.23: Powering a Sustainable Digital Economy: anticipated speed of change by region



Legend: ● Decelerate ● No change ● Somewhat accelerate ● Accelerate ● Accelerate significantly ● Strongly accelerate

Source: DCO 2025 Digital Economy Trends Survey.

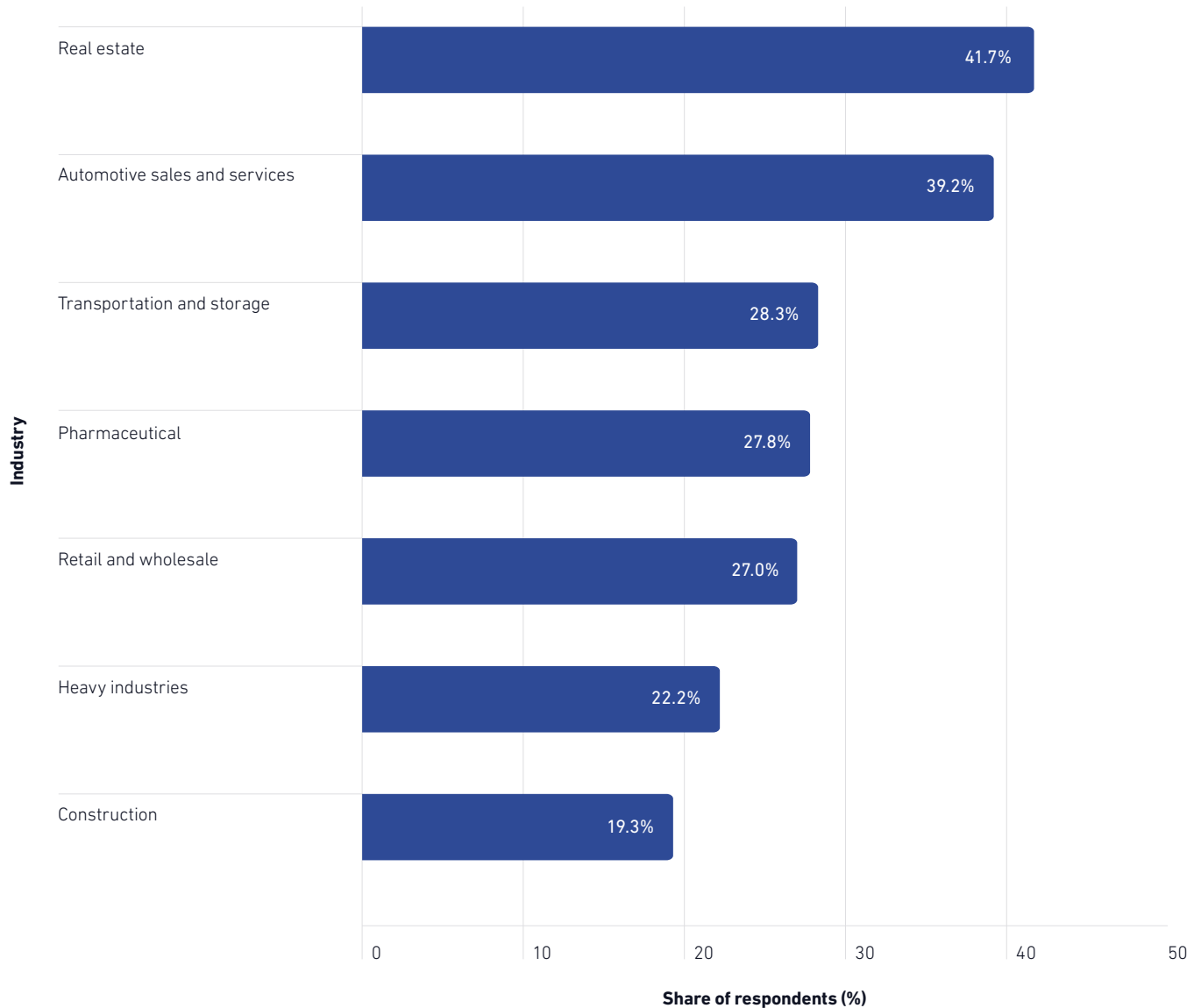
Q: In your country, how do you anticipate the speed at which the following digital economy trends will evolve in the next 12-18 months?

Respondents: 272 CTOs and senior technologists working in large companies (+250 employees), 60 policymakers, and 74 Digital Economy and financial experts.

Industry outlook

Respondents expect the real estate sector (41.7%) to gain the most from this trend, as smart buildings improve energy management. As shown by Figure I.24, the increasing use of energy-efficient batteries will allow the automotives sector (39.2%) to reduce dependence on fossil fuels. This shift also strengthens sustainability in the transportation and storage sector (28.3%), where cleaner logistics systems and electrified fleets are expanding.

Figure I.24: Powering a Sustainable Digital Economy: top industries for expected growth



Source: DCO 2025 Digital Economy Trends Survey.

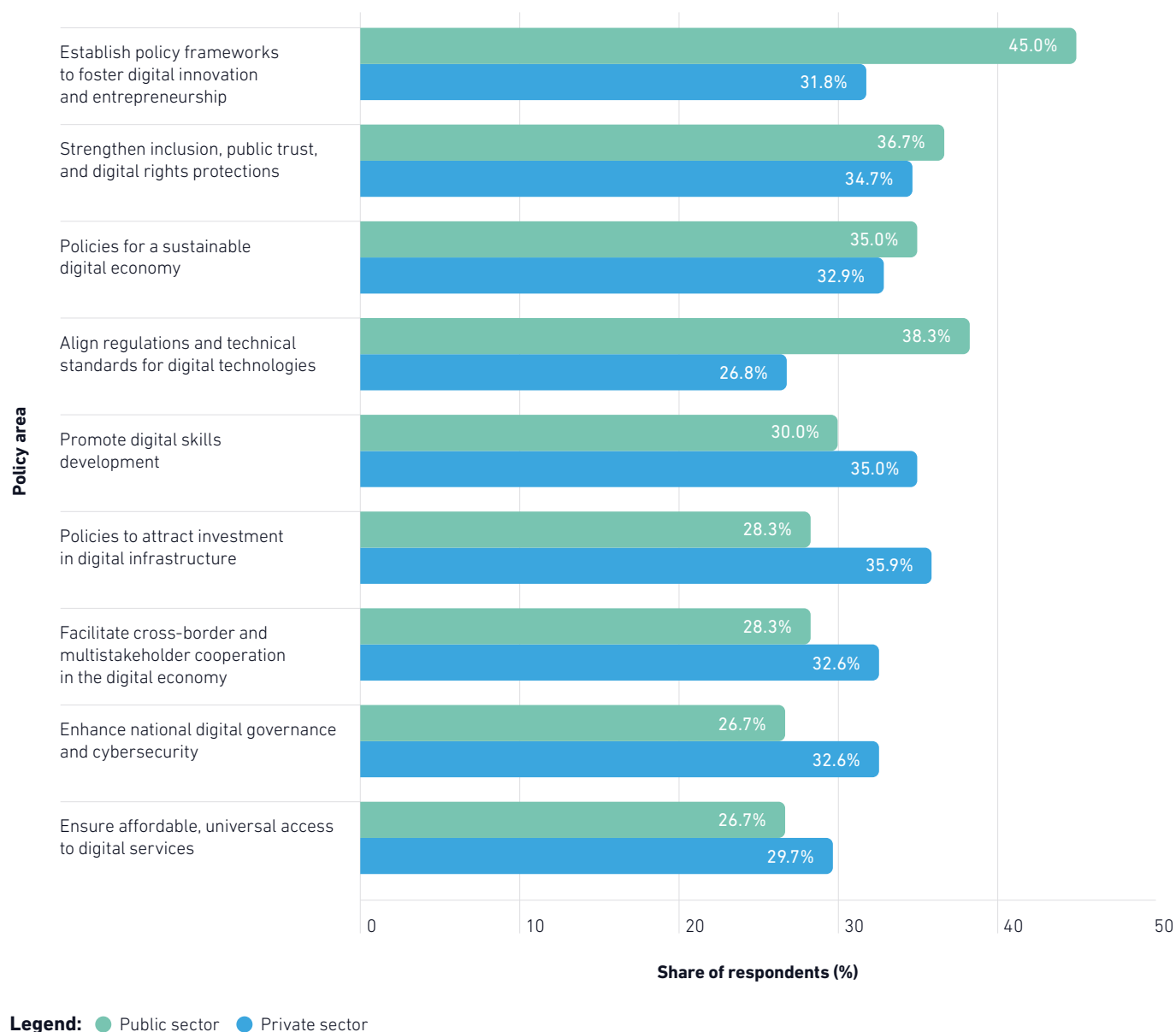
Q: In your industry, select the three digital economy trends, in order of importance, that you expect to create the most growth opportunities (e.g., new markets and customers or reducing operational costs) in the next 12-18 months.

Respondents: 272 CTOs and senior technologists working in large companies (+250 employees) and 74 digital economy and financial experts.

Policy actions

Figure I.25 highlights that government and public sector respondents significantly prioritize pro-innovation policy frameworks (45.0%) and aligning regulations and technical standards (38.3%). Private-sector priorities include expanding investment in digital infrastructure (35.9%) and digital skills development (35.0%). These responses point to the need for the wider deployment of existing climate-tech innovations, through creating business conditions that foster competition and using direct public procurement to accelerate market uptake.

Figure I.25: Powering a Sustainable Digital Economy: priority policy actions



Source: DCO 2025 Digital Economy Trends Survey.

Q: In your country, select the three most critical national policy actions needed for people, businesses, and states to benefit from each of the following current digital economy trends.




Respondents: 272 CTOs and senior technologists working in large companies (+250 employees), 60 policymakers, and 74 digital economy and financial experts.

Asking AI

We asked three leading LLMs (ChatGPT-5, Gemini 2.5 Flash, and DeepSeek-V3.2) to predict the likely impacts of this trend over the next 12-18 months.

Please refer to the methodology annex to see the exact prompts used.

Prompt >_

|  Economic impact |  Social impact |  Environmental impact |
|--|---|---|
| <p>ChatGPT:</p> <p>“Over the next 12-18 months, rising energy demands from AI will drive increased investment in green data infrastructure and renewable energy, raising short-term operational costs but accelerating innovation in efficiency technologies and creating new markets for sustainable computing solutions.”</p> | <p>Gemini:</p> <p>“The increasing competition for low-carbon energy to power AI risks widening the digital divide. It may lead to resource allocation conflicts, where data centers in wealthier regions strain local grids, potentially increasing energy costs and reducing reliable access for essential public services and vulnerable communities.”</p> | <p>DeepSeek:</p> <p>“This trend’s primary environmental impact will be a substantial increase in global energy consumption and carbon emissions from data centers. This will strain power grids and potentially slow the adoption of broader AI solutions due to physical and sustainability constraints.”</p> |
| <p>Note: these insights from LLMs are not data driven. They are provided as directional and sentimental and the LLMs have not had access to the survey data.</p> | | |



Countries must balance growth in digital services with clean energy adoption. Without investments and policies for efficient energy systems, scaling the digital economy risks outpacing energy capacity globally.

Rama Suhaimat
Economic Researcher –
Ministry of Digital Economy
and Entrepreneurship, Jordan

Stakeholder recommendations

Private sector

To integrate digital technologies in business operations through reliable and efficient energy and natural resource use to limit costs and strengthen competitiveness, business leaders need to:

Set an energy-first growth plan for 2026 onwards that prioritizes efficiency and clean power, committing to saving energy in every product and data operation while partnering with energy providers and local governments to lock in dependable renewables and pilot safe next-generation options.

Team up with peers to co-fund grid upgrades and green digital infrastructure, sharing standardized simple, comparable energy metrics per AI task to drive collective efficiency, improve sustainability, and reduce operational risk.

Invest in innovative solutions to reuse data-center waste heat as a municipal energy input, thereby reducing energy costs and company emissions.

Publicly track and report simple energy, water consumption, and emissions metrics, treating energy and water availability as a strategic imperative to de-risk future growth and ensure scalable AI deployment

Public sector

To attract investment, build energy resilience, and scale digital technologies responsibly while meeting climate goals, policymakers and regulators need to:

Create pre-approved 'clean compute zones' by 2026, where clean energy projects and data centers are fast-tracked with guaranteed grid connections, clear rules, and simple reporting requirements for round-the-clock clean power use and heat reuse.

Co-fund grid improvements and energy storage with the private sector, mobilizing blended public-private funds for transmission infrastructure to make regions investment-ready.

Foster public-private partnerships to modernize national energy grids, ensuring they can support next-generation computing demands while advancing climate goals and equitable digital access.

Promote cross-sector initiatives that foster interdisciplinary innovation and scale up climate finance to accelerate the development and adoption of more energy efficient digital technologies.

IGOs, IOs, and others

To ensure fairer access to digital infrastructure and a just energy transition that includes emerging economies, intergovernmental organizations, international organizations, civil society, and academia need to:

Publish practical energy-wise toolkits covering heat reuse, better recycling, and circular economy principles for hardware, while running technical training programs to build local capacity.

Introduce a simple, trustworthy clean compute label to guide global buyers and unlock finance, making it easier for organizations to support sustainable digital infrastructure.

Promote the adoption of shared global standards and best practices for energy-efficient AI to foster a more inclusive digital economy, enhance global resilience, and support equitable participation.

◆ Emerging trend

1.5

The Emergence of Agentic AI

Evolution of DET 2025 trend: Deploying Autonomous Systems at Scale

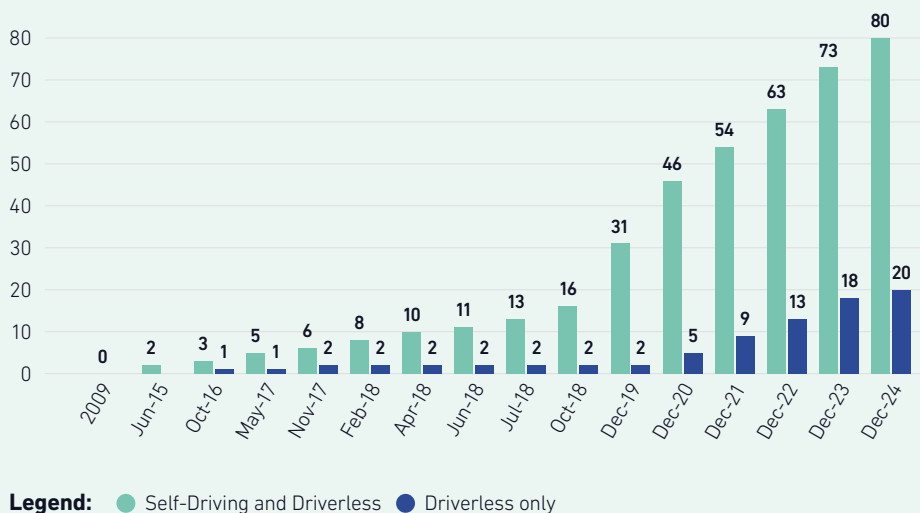
What does the trend encompass?

AI agents are becoming more proactive and autonomous, with their capabilities expanding to generate chain-of-thought reasoning and perform structured, goal-directed reasoning. Agents are becoming increasingly capable of planning, deploying, and executing complex business workflows across multiple functions without human intervention, conducting transactions and managing resources. If governance and accountability challenges can be solved, this could enable organizations to become more efficient and faster decision-making. As a subset of the 2025 trend on Deploying Autonomous Systems at Scale, this trend focuses specifically on systems' cognitive autonomy.

Why is it important?

Since AI agents are trained on and embed powerful domain knowledge, they can transform businesses and create significant disruption, as well as prompting the need for adaptation. Unless access is widened, their transformative benefits may concentrate in large enterprises. Building trust in AI agents will demand robust oversight, accountability frameworks, and human-centered mechanisms to ensure they operate reliably and align with organizational and societal values.

Figure I.27: Waymo cumulative self-driving and driverless kilometers (millions)



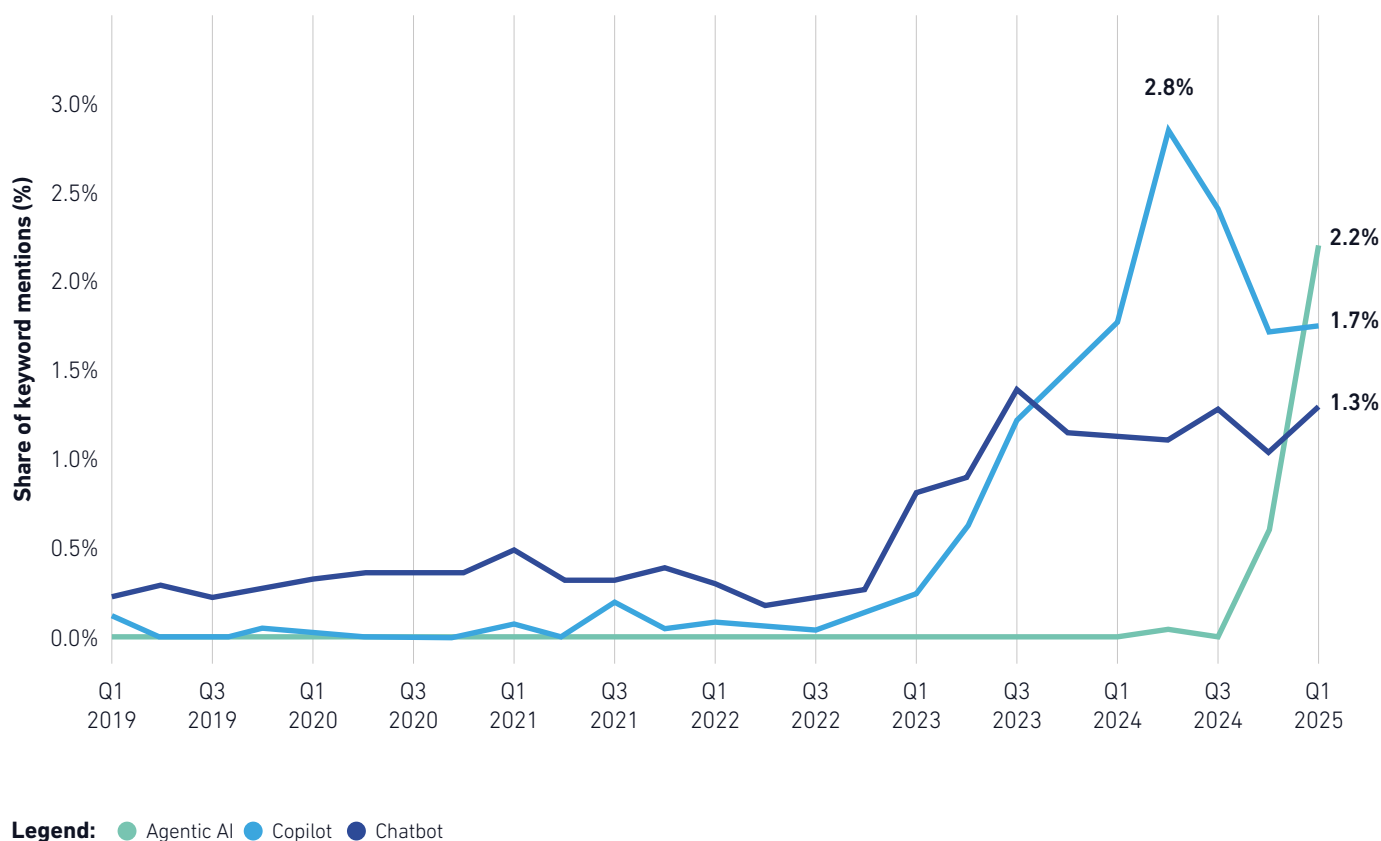
Frontier use case

Waymo, Alphabet's robotaxi unit, runs a fully driverless ride-hail service in several cities in the United States. As shown in Figure I.27, in April 2025 it served about 250,000 paid rides per week, proving end-to-end autonomous planning, perception, and execution at scale. The first international deployment is planned in London in 2026.^{81,82}

Impacts on the horizon

Agents move from simply answering questions to running multi-step processes such as taking orders, processing claims, or running procurement. Companies redeploy staff from routine coordination to oversight, shrinking cycle times and operating costs. The potential economic gains from successfully implementing agentic AI in companies are evidenced in Figure I.26, which shows that 2.2% of company earnings calls in the first quarter of 2025 mentioned agentic AI — more than terms such as Copilot, chatbot, or ChatGPT. However, successful deployment requires agents' autonomy to be bounded by auditability through encoded rules on policy adherence, binding agent actions to verified identities with authorized access, and ensuring human verification and sign-off on high-impact actions (payments, contract ordering, and supplier changes).

Figure I.26: Keyword mentions in corporate earning calls, Q1 2019 to Q1 2025⁸³



Source: IoT Analytics article on what CEOs talked about in Q1 2025

Potential developments

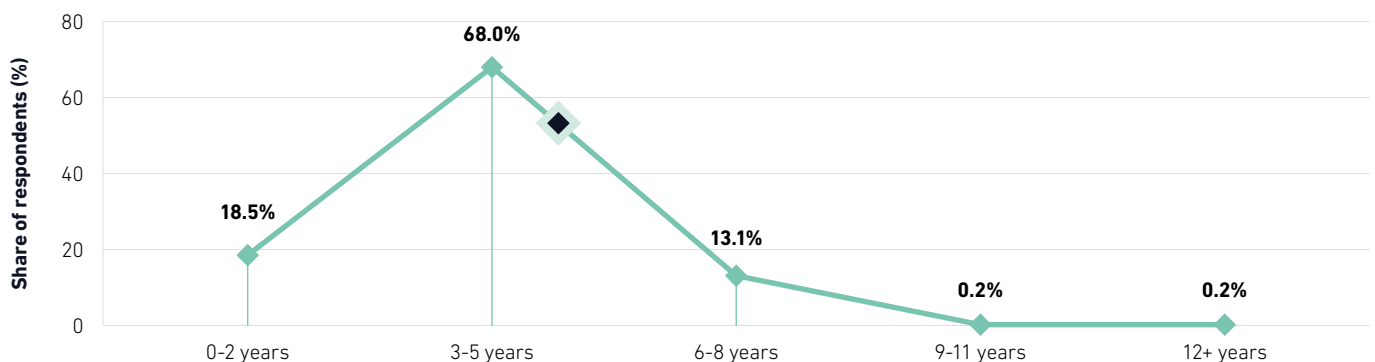
Prospective turning points that could catalyze this trend into rapid, widespread materialization:

- 2026**
 Production guardrails for AI agents become default as major providers include built-in policy checks and human-review paths, standardizing and safe-guarding agent workflows.^{84,85}
- 2027**
 Cross-app execution normalizes, allowing agents to carry out tasks across diverse functions such as resource planning, customer relationship management, and software delivery under one verified identity.⁸⁶
- 2030**
 Agent-run transactions become mainstream as payment systems and machine identities mature into an integrated ecosystem, allowing agents to place (low-risk) orders and reconcile invoices under spend limits and audit trails.^{87,88}

When will this trend materialize?

Figure I.28 highlights that most survey respondents expect this trend to materialize by 2030, with the latest date placed at 2035. Those in Europe and Central Asia and North America expect materialization about 2 years earlier than those in Latin America and the Middle East and Africa. Private sector respondents foresee materialization about a year sooner than those in the public sector.

Figure I.28: The Emergence of Agentic AI: likely materialization timeline



Legend: ◆ Expected number of years until materialization (average)

Source: DCO 2025 Digital Economy Trends Survey.

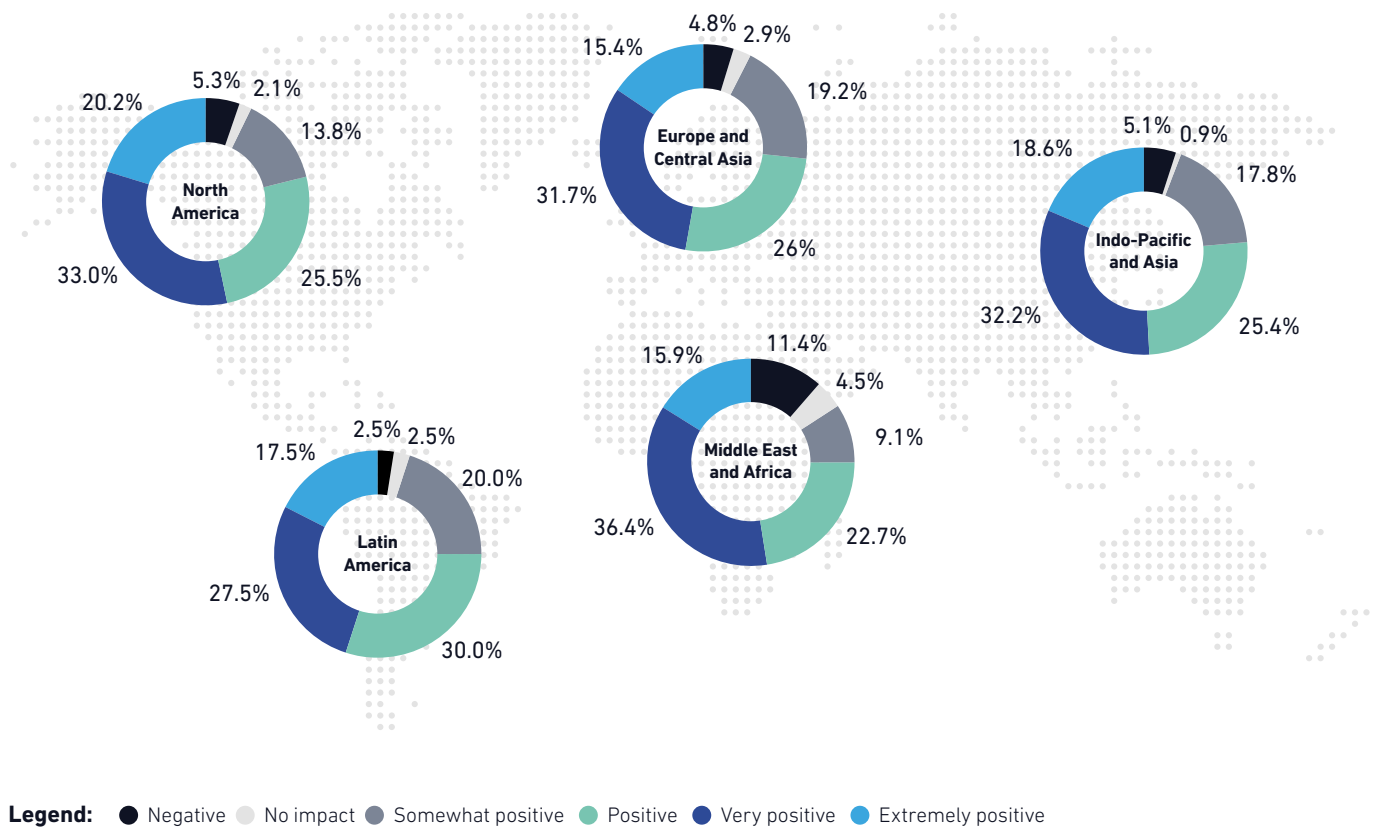
Q: In your country, when do you expect the following emerging digital economy trends to affect businesses and societies?

Respondents: 272 CTOs and senior technologists working in large companies (+250 employees), 60 policymakers, and 74 digital economy and financial experts.

Expected socio-economic impact in 3-5 years

As shown in Figure I.29, DET Survey respondents expect the trend to have a moderately positive socio-economic impact, regarding it as the third most promising of the six emerging digital economy trends. Respondents in North America are the most optimistic, with 20.2% expecting the trend to have an extremely positive socio-economic impact, followed closely by those in Indo-Pacific and Asia. Respondents in the Middle East and Africa are most likely to expect a negative socio-economic impact (11.4%). Public sector respondents are significantly more optimistic about this trend than private sector ones.

Figure I.29: The Emergence of Agentic AI: expected socio-economic impact by region



Source: DCO 2025 Digital Economy Trends Survey.

Q: In your country, to what extent do you believe the following emerging trends will have a net positive or negative socio-economic impact in the next 3-5 years?

Respondents: 272 CTOs and senior technologists working in large companies (+250 employees), 60 policymakers, and 74 digital economy and financial experts.

How can stakeholders prepare?

As highlighted by DET Survey respondents, preparing for the materialization of this trend at the country level depends on the following key drivers:



Digital Innovation

While R&D and innovation drive the development of agentic AI, an important consideration in this process is the conversion of workflows into blueprints for agents that incorporate safety tests.



Digital Infrastructure

Scalable compute is needed in the form of servers, data centers, and high-speed communication networks so multiple agents can run reliably without overloading core systems.



Digital Capabilities

Workers will need to be (re)trained to have the capability to collaborate with, provide clear workflow instructions to, and effectively supervise agents' actions.



Industry Digital Transformation

Industries will need to revise and adapt existing workflows to define permissible, industry-specific sets of actions for agents to take while creating intermittent checkpoints and final, key handoffs where human review will be needed.



Digital Policy and Governance

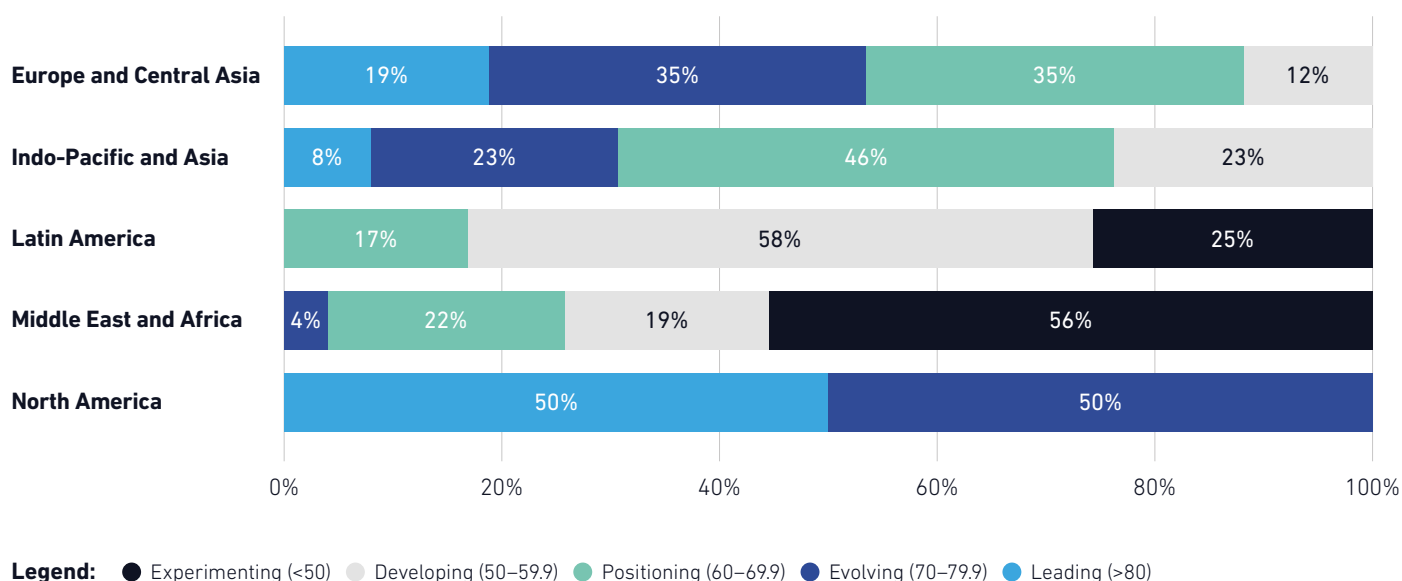
Regulation must focus on setting guardrails around agent actions, provenance, incident reporting, and minimum safety tests to ensure that agent actions remain auditable and accountable across workflow processes.



Countries' preparedness for trend materialization

As illustrated in Figure I.30, aggregating the DEN pillar scores for these key drivers reveals countries' preparedness for agentic AI. Overall, seven out of the eighty countries covered in the DEN 2025 are categorized as having *leading* preparedness. North America has the highest average regional preparedness score. With its strong governance frameworks and efficient research capabilities, Europe and Central Asia has a mix of *leading* (19%), *evolving* (35%), and *positioning* (35%) economies. Indo-Pacific and Asia's high concentration of *positioning* economies (46%, with 23% *evolving* and 8% *leading*) reflects its expanding experimentation base — from industrial automation in Japan to data-rich innovation clusters in India. Across both Latin America and the Middle East and Africa, roughly 75% of countries are in the *developing* or *experimenting* stages, indicating structural barriers in compute infrastructure and specialized talent.

Figure I.30: The Emergence of Agentic AI: trend preparedness by region



Source: DCO 2025 Digital Economy Trends Survey.

Q: At a global level, select the three key enabling factors countries need in order to benefit from the opportunities provided by the following digital economy trends.

Respondents: 272 CTOs and senior technologists working in large companies (+250 employees), 60 policymakers, and 74 digital economy and financial experts.

Open questions

Agentic AI depends on real-time access to a variety of data, multiplying the chances of security failures, compliance breaches, or prompt hijacking. How should data governance practices evolve to prevent creating vulnerabilities with potentially devastating cascading effects?

Integrating agentic AI into workflows requires rethinking long-standing systems. With new agents emerging rapidly, how can organizations balance innovation with stability and safety?

As organizations deploy agentic AI and robotic systems at scale, traditional oversight mechanisms may no longer suffice. How should control systems, accountability mechanisms, and interoperability standards be rethought so agentic AI ecosystems operate securely and efficiently across distributed digital infrastructures?

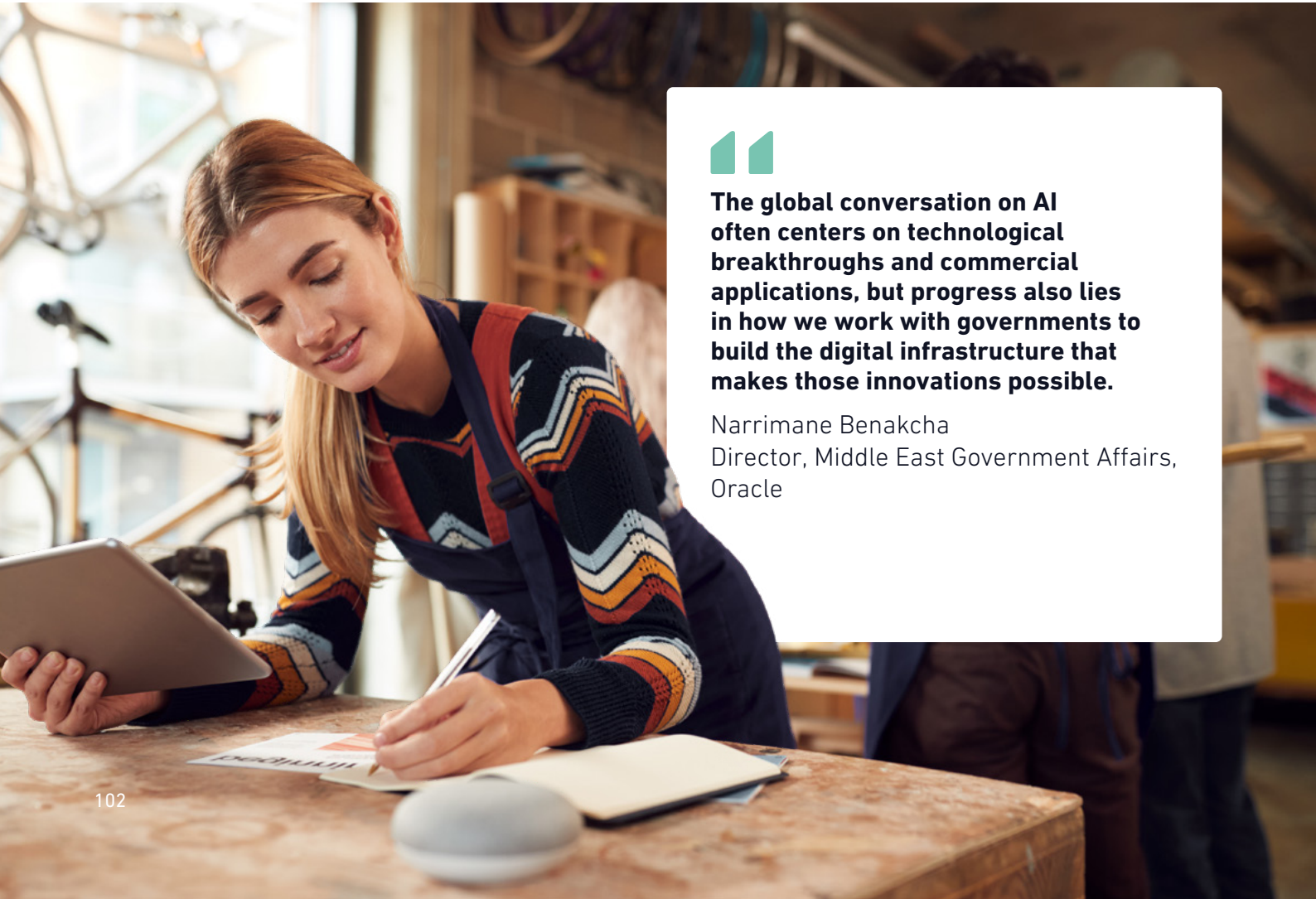
Asking AI

We asked a leading LLM: what are the potential benefits, challenges, and considerations for this trend over the next 3-5 years?

Please refer to the methodology annex to see the exact prompts used.

Prompt >_

| Deepseek response | | |
|---|--|---|
| <p>Benefits</p> <p>"This promises dramatic productivity gains, hyper-efficiency, and 24/7 operational optimization. It could enable smaller teams to achieve massive output, reducing costs and accelerating innovation across all sectors."</p> | <p>Challenges</p> <p>"Significant job market disruption is likely, creating societal friction. Ensuring the security, reliability, and predictable behavior of these autonomous systems will pose a major technical and governance hurdle."</p> | <p>Considerations</p> <p>"Robust legal and ethical frameworks are urgently needed to govern liability, decision-making, and data privacy. A cultural shift in human — AI collaboration will be required, alongside strategies for workforce reskilling."</p> |
| <p>Note: these insights from LLMs are not data driven. They are provided as directional and sentimental and the LLMs have not had access to the survey data.</p> | | |



The global conversation on AI often centers on technological breakthroughs and commercial applications, but progress also lies in how we work with governments to build the digital infrastructure that makes those innovations possible.

Narrimane Benakcha
Director, Middle East Government Affairs,
Oracle

Stakeholder recommendations

Private sector

To achieve faster service delivery, lower operational costs, and build competitive advantage through cognitive autonomy, business leaders need to:

Pilot agentic AI in high-volume digital workflows such as customer inquiries, invoice matching, and order tracking, establishing clear spending limits, approval authorities, and human review triggers for autonomous decision-making.

Co-develop an 'AgentOps' governance layer with industry peers that standardizes identity verification, policy adherence checks, budget caps, and audit trails to enable traceable, accountable autonomous operations.

Plan for interconnected agentic AI ecosystems by developing interoperability norms and defining protocols that specify when a human review is required versus when AI agents can proceed independently within companies and entire value-chains.

Retrain workers to supervise agent-led processes, focusing on reviewing agent decisions, mapping workflows into agent blueprints with clear goals and safety tests, and establishing productive human-agent collaboration rhythms.

Public sector

To enable trustworthy autonomous digital operations while protecting market integrity and consumer rights, policymakers and regulators need to:

Establish role-based liability frameworks that clearly assign responsibility: data holders accountable for data quality and misuse, model providers for system behavior under stated uses, deployers for proper configuration and monitoring, and operators for oversight and escalation.

Launch regulatory sandboxes where organizations can test agentic systems conducting end-to-end digital transactions (processing claims, running procurement, and placing orders) under supervised conditions with clear audit trails and spending limits.

Require minimum safety standards including guardrails around agent actions, provenance tracking, incident reporting protocols, and human-in-the-loop review paths before agents can execute financial or legally binding transactions.

Co-invest in digital skills initiatives to develop a workforce equipped to collaborate, supervise, and co-create with agentic AI systems through, for example, prompt engineering, agent orchestration, and AI ethics.

IGOs, IOs, and others

To democratize access, as much as possible, to cognitive autonomy and ensure agentic systems operate transparently and equitably across all communities, international organizations, civil society, and academia need to:

Convene a global forum for agentic interoperability to develop common standards for agent identity, cross-application execution, and machine-to-machine transactions that enable agents to operate across different platforms and jurisdictions.

Create an independent certification system evaluating agentic AI on decision transparency, data provenance, policy adherence, and audit trail completeness — providing clear trust signals for consumers and businesses navigating autonomous digital services.

Develop open-source agent blueprint libraries and workflow templates that smaller organizations can adapt, lowering barriers to deploying cognitive autonomy and preventing concentration among tech giants with proprietary systems.

Fund demonstration projects showing how agentic AI can automate bureaucratic processes, improve public service delivery, and reduce administrative burdens in emerging economies through transparent, accountable autonomous operations.

◆ Emerging trend

1.6

The Rise of Generalist Robots

Evolution of DET 2025 trend: Deploying Autonomous Systems at Scale

What does the trend encompass?

Autonomous, AI-enabled machines are learning to adapt and operate effectively in more complex environments. These generalist robots, capable of moving beyond single-purpose tasks, are performing diverse physical operations with unprecedented flexibility. Falling costs are making robotics commercially viable even in low-wage economies, promising efficiency gains but raising questions about the scope for workers to be redeployed in complementary roles. This trend is a subset of the 2025 trend, Deploying Autonomous Systems at Scale.

Why is it important?

As costs decline and the technology matures, the deployment of robotics is set to expand beyond manufacturing into other sectors currently dependent on human labor. Proactive transition programs, safety frameworks, and inclusive policies will be vital to ensure the benefits of generalist robots are broadly shared.

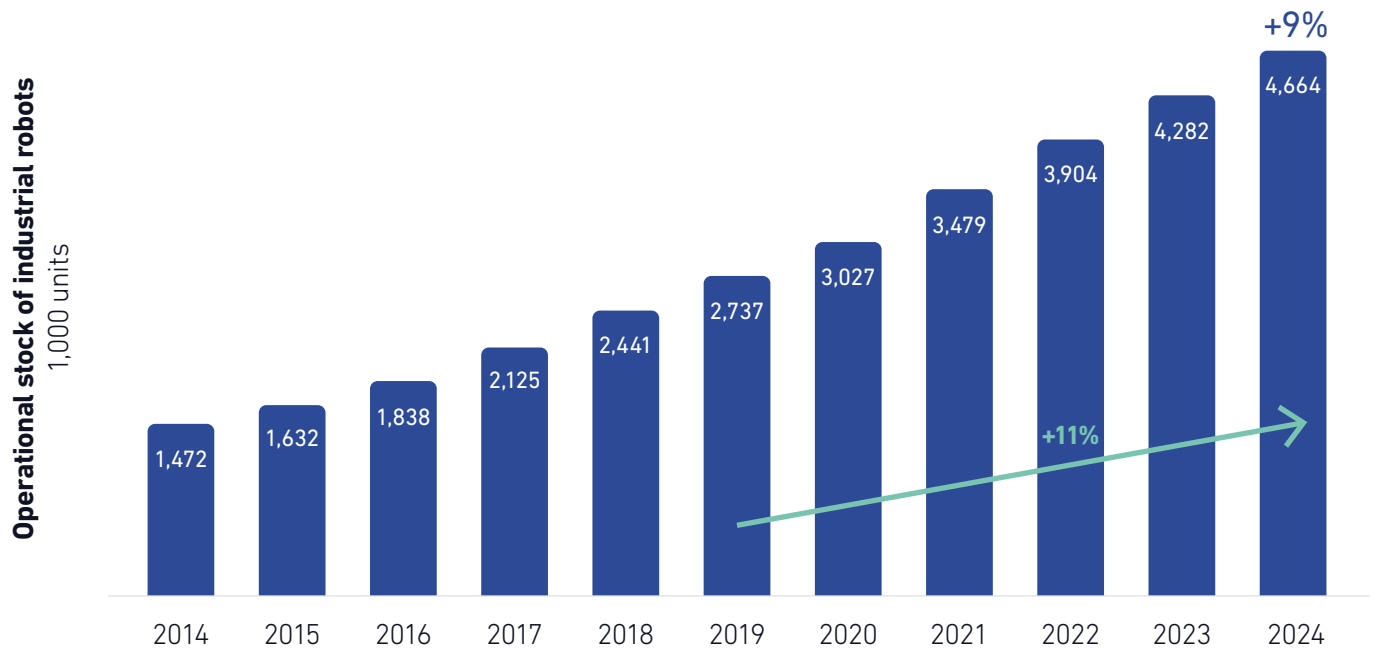
Impacts on the horizon

Over the next decade, robots will shift from single tasks to generalists: training can be done in simulated environments; a single robot's learned skill can be replicated across a fleet through shared models; and modular machines can swap tools depending on the task. As robots' per-task operating costs approach human wages, adoption spreads across industries, as shown in Figure I.31. Further innovation is expected to continue fueling the rise of generalist robots, given the momentum in venture capital activity since 2021 (Figure I.32). The key guardrails become safety certification, liability cover, and funded reskilling for displaced workers.

**Frontier
use case**

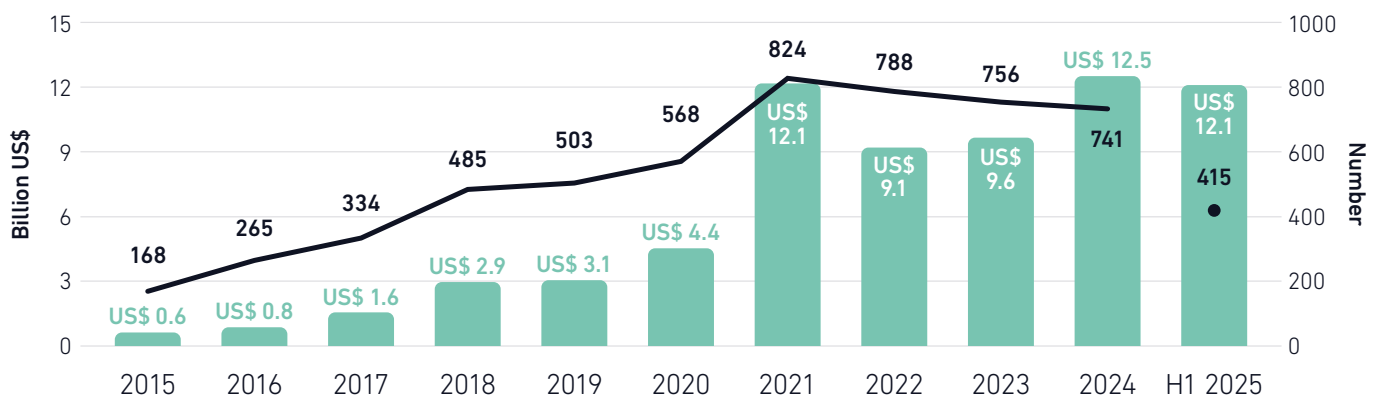
Boston Dynamics and Toyota Research Institute showed a large behavior model running on the Atlas humanoid in 2025. The model learns from demonstrations, plans multi-step actions, and performs contact-rich tasks without task-specific code, providing early proof that one brain can drive many behaviors on a general-purpose robot body.⁸⁹

Figure I.31: Operational stock of industrial robots worldwide in 1,000 units, 2014-24⁹⁰



Source: World Robotics 2024 Report by the International Federation of Robotics

Figure I.32: Venture capital activity in robotics, 2015 to mid-2025⁹¹



Legend: ● Deal value (US\$ billion) ● Deal count

Source: Pitchbook report titled 'Vertical Snapshot: Robotics' (2025)

Potential developments

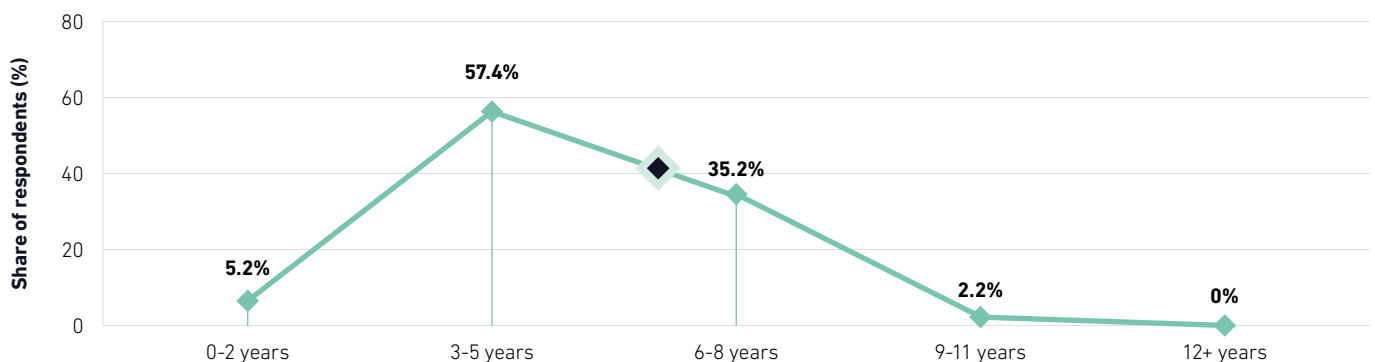
Prospective turning points that could catalyze the trend into rapid, widespread materialization:

- 2026**
 Open foundation models and simulation libraries become the default research-to-production path for robotics; major universities and research centers adopt open-source reasoning, vision-language-action models and cutting-edge physics libraries, speeding skill transfer across robot bodies.⁹²
- 2027**
 The EU Machinery Regulation updates standards, requiring clearer risk tests, emergency stops, and safe spacing between humans and robots. This ensures that robotics development does not prioritize innovation speed over human safety.⁹³
- 2030**
 General-purpose robots handle mixed tasks in logistics and assembly using unified and modular tools, combining foundation models with high-end edge compute.^{94,95}

When will this trend materialize?

As shown in Figure I.33, most respondents (62%) expect the trend to materialize within 5 years, with almost 98% stating before 2035. Respondents in North America (4.1 years) and Europe and Central Asia (4.5 years) have the shortest timeframes, reflecting the existing infrastructure and know-how in these regions, followed by Indo-Pacific and Asia (5.3 years), Latin America (6.1 years), and the Middle East and Africa (6.7 years). Private and government respondents are aligned.

Figure I.33: The Rise of Generalist Robots: likely materialization timeline



Legend: ◆ Expected number of years until materialization (average)

Source: DCO 2025 Digital Economy Trends Survey.

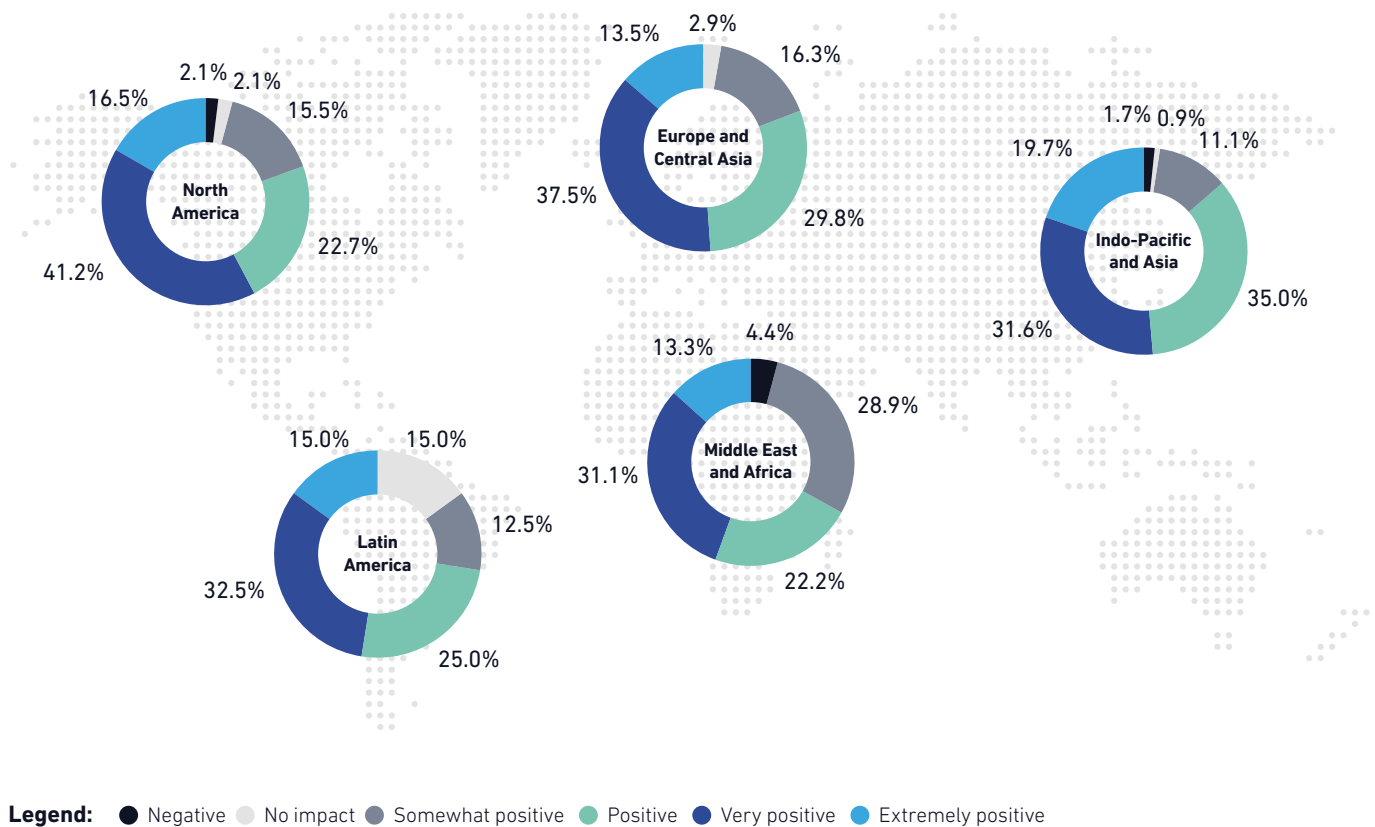
Q: In your country, when do you expect the following emerging digital economy trends to affect businesses and societies?

Respondents: 272 CTOs and senior technologists working in large companies (+250 employees), 60 policymakers, and 74 digital economy and financial experts.

Expected socio-economic impact in 3-5 years

Figure I.34 shows that most DET respondents in every region expect The Rise of Generalist Robots to have a very or extremely positive impact over the next 3-5 years. Indo-Pacific and Asia has the highest share of extremely positive respondents (19.7%), followed by North America (16.5%). The Middle East and Africa has the highest share of negative responses, while Latin America has the most expecting no impact. Optimism levels are practically equal among private sector and government respondents.

Figure I.34: The Rise of Generalist Robots: expected socio-economic impact by region



Source: DCO 2025 Digital Economy Trends Survey.

Q: In your country, to what extent do you believe the following emerging trends will have a net positive or negative socio-economic impact in the next 3-5 years?

Respondents: 272 CTOs and senior technologists working in large companies (+250 employees), 60 policymakers, and 74 digital economy and financial experts.

How can stakeholders prepare?

As identified by DET Survey respondents, preparing for the materialization of this trend at the country level depends on the following key drivers:



Digital Infrastructure

Reliable edge computing, safety sensors, and secure fleet management form the backbone of generalist robots, enabling real-time data exchange, adaptive learning, and safe, scalable operations across environments.



Industry Digital Transformation

Industrial processes and workflows need to be redesigned to allow for the flexible, efficient, and safe integration of general robots in production systems that allow for human–robot collaboration rather than replacement.



Digital Innovation

Open-source models, shared simulators, and reference designs accelerate experimentation through wider and cheaper access, driving cost-saving and efficiency innovations in the development of generalist robots.



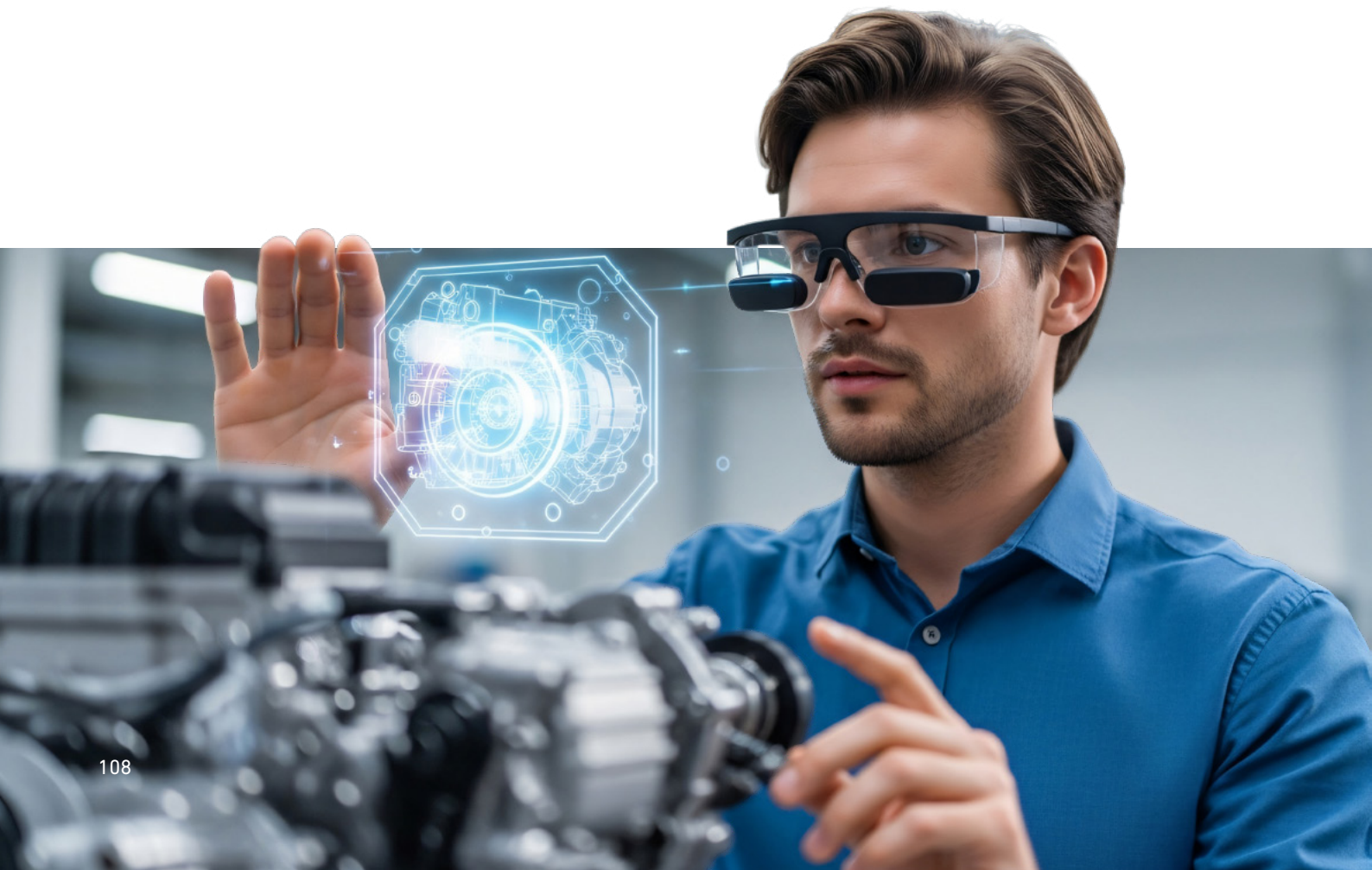
Digital Capabilities

Specialized training in robot operation, safety, and maintenance is necessary to build the workforce expertise required for safe and effective human–robot collaboration.



Digital for Health and Education

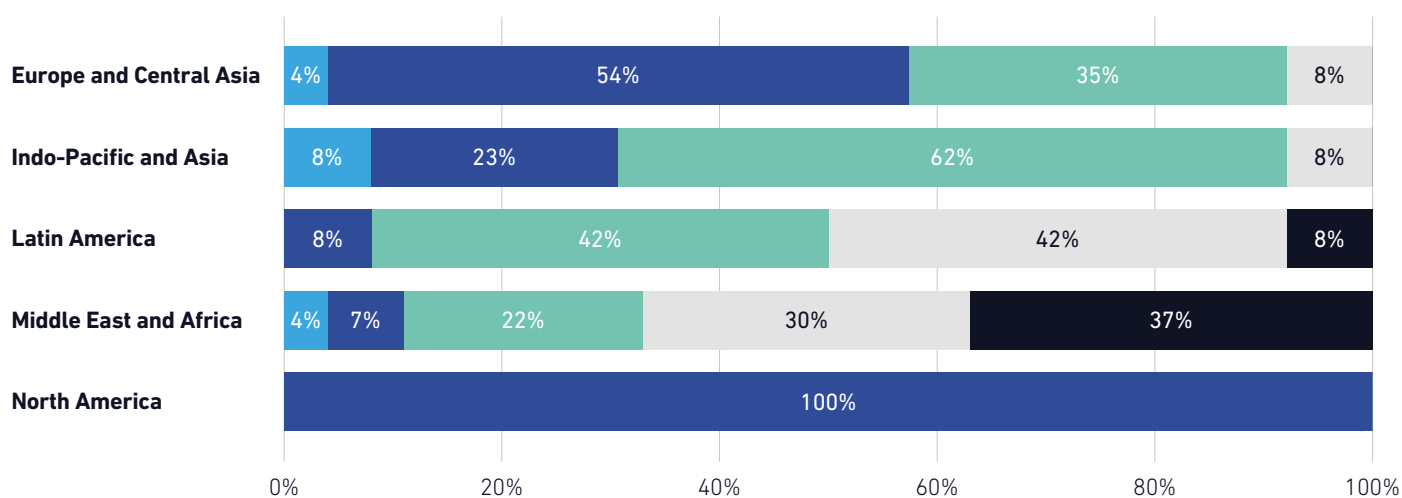
Generalist robots are likely to offer extensive opportunities in the health and education sectors (e.g., through assisted care for the elderly and personalized tutoring for special-needs students), countries should therefore begin establishing the conditions necessary for safe pilot testing in these sectors to ensure effective and rapid deployment when available.



Countries' preparedness for trend materialization

Aggregating DEN pillar scores for the five drivers identified as the most relevant for this emerging trend shows significant diversity in terms of preparedness across countries (Figure I.35). Only three countries across Europe and Central Asia, Indo-Pacific and Asia, and the Middle East and Africa are categorized as *leading* among the 80 countries covered by the DEN 2025. North America is the most prepared region for the materialization of this trend, with both the United States and Canada in the *evolving* grouping, underscoring their industrial automation capacity. Over half of Europe and Central Asia's economies are *evolving* (54%), with its advantage lying in safety protocols and sustained investment. Indo-Pacific and Asia has the highest share of *leading* (8%) with nearly another quarter (23%) *evolving*, while Latin America remains mostly *positioning* and *developing* (42% each). Middle East and Africa is primarily *experimenting* (37%) and *developing* (30%).

Figure I.34: The Rise of Generalist Robots: trend preparedness by region



Legend: ● Experimenting (<50) ● Developing (50–59.9) ● Positioning (60–69.9) ● Evolving (70–79.9) ● Leading (>80)

Source: DCO 2025 Digital Economy Trends Survey.

Q: At a global level, select the three key enabling factors countries need in order to benefit from the opportunities provided by the following digital economy trends.

Respondents: 272 CTOs and senior technologists working in large companies (+250 employees), 60 policymakers, and 74 digital economy and financial experts.

Open questions

An important aspect of integrating robots into physical environments is designing effective human-robot collaboration. How should governments and organizations design proactive transition programs that reskill workers and create new opportunities for human contribution in robot-augmented economies?

As robots gain autonomy, determining responsibility becomes more complex. Who should be held accountable when a system fails or causes unintended harm?

Successful integration depends on public trust and effective collaboration between humans and machines. How should institutions and organizations foster trust?

As robots are likely to enter the market at high cost and confer disproportionate benefits to early adopters, how can public policies ensure equitable access and prevent a widening of social and economic inequalities?

Asking AI

We asked a leading LLM: what are the potential benefits, challenges, and considerations for this trend over the next 3-5 years?

Please refer to the methodology annex to see the exact prompts used.

Prompt >_

| Deepseek response | | |
|--|--|---|
| Benefits | Challenges | Considerations |
| "Productivity and safety will rise as robots handle complex, repetitive, and hazardous tasks with consistent quality. Lower unit costs and 24/7 uptime can help smaller teams scale output across manufacturing, logistics, healthcare, and services." | "Job displacement and role redesign will create friction in labor markets and communities. Ensuring safety, reliability, cybersecurity, and predictable behavior in open, dynamic environments will remain a hard technical and governance problem." | "Clarify liability, auditability, and data rights through fit-for-purpose regulations and standards. Pair phased deployment with human-in-the-loop controls, workforce reskilling, and procurement that favors interoperability, secure updates, and access for SMEs and developing regions." |
| Note: these insights from LLMs are not data driven. They are provided as directional and sentimental and the LLMs have not had access to the survey data. | | |



While the public sector’s attention remains largely on agentic AI and its potential to streamline bureaucracy, the private sector is looking further ahead. It sees generalist robots as the next major source of transformation, enabling AI systems to interact with and act upon the physical world.

Florian Ramseger
Data scientist and tech-podcaster

Stakeholder recommendations

Private sector

To unlock productivity gains, improve workplace safety, and build a competitive edge in flexible automation, business leaders need to:

Establish cross-industry pilot consortia to deploy generalist robots in controlled, high-value settings

such as warehouses, assembly lines, and healthcare support, sharing safety protocols, liability frameworks, and lessons learned to accelerate responsible scaling.

Partner with governments and labor organizations to co-design transition programs that retrain displaced workers for robot supervision, maintenance, and exception handling roles, transforming workforce investment into a strategic competitive advantage.

Co-fund shared training for frontline teams on supervision, exception handling, and maintenance while jointly setting clear rules for human handoffs, safe spacing, stop procedures, and incident reporting.

Build human-robot collaborative environments through 'co-bot' redesign of industrial processes and workflows, integrating modular/swappable tools and codified safety measures before scaling deployment.

Public sector

To protect workers, ensure safe deployment, and capture economic benefits from generalist robots, policymakers and regulators need to:

Create clear liability frameworks assigning responsibility to manufacturers for design defects, deployers for safe configuration and monitoring, and operators for proper supervision and incident response, with easy-to-audit records and proportionate penalties.

Co-develop safety certification standards with industry covering emergency stops, human-robot spacing, and risk assessments, offering supervised trial zones and recognition for compliant deployments.

Co-fund pilot hubs in emerging economies to demonstrate affordable deployment and workforce transition pathways, ensuring that smaller firms and developing regions can participate in and benefit from automation advances.

Jointly fund large-scale reskilling and just transition programs for affected communities, prioritizing hands-on training in robot operations, supervision, instruction, and maintenance to prepare the workforce for emerging roles and to foster readiness and social cohesion before the large-scale deployment of robots.

IGOs, IOs, and others

To enable equitable access, build global trust, and prevent a widening automation divide, intergovernmental organizations, international organizations, civil society, and academia need to:

Establish a global robotics commons that publishes open reference models, shared simulation environments, and plain-language safety checklists as global public goods, lowering adoption costs for emerging economies.

Convene multi-stakeholder forums to harmonize liability principles, ethical guidelines, and interoperability standards, publishing open playbooks, case studies, and incident lessons across languages.

Develop an open-source robotics foundation model library and ethical deployment playbooks that democratize access to foundational automation tools and prevent technological stratification between developed and emerging markets.



EMPOWERED COMMUNITIES

● Current trend

2.1

Delivering Hyper-personalization

● Current trend

2.2

AI Accelerated Workforce Transformation

● Current trend

2.3

Safeguarding Digital Wellbeing

● Current trend

2.4

Embracing Immersive Hybrid Experiences

◆ Emerging trend

2.5

The Evolving Brain-Machine Interface

◆ Emerging trend

2.6

The AI Divide

Theme overview

The Empowered Communities theme explores how the digital economy can transform the lives of individuals, communities, and societies. It highlights the role of economic growth driven by technological innovation in boosting equitable, inclusive, and sustainable development. It highlights challenges that are critical to stakeholders, including policymakers, on tackling critical challenges such as skill gaps, financial inclusion, and cultural adaptation to shape a digital economy that can benefit everyone.

Evolution since 2025

As shown by Figure II.1, the Empowered Communities theme has evolved beyond the 2025 focus on ensuring access to digital technologies. While digital skills already featured in DET 2025, as highlighted by the trend Building Digital Skills and Continuous Learning, their importance has become much more prominent. In this edition, the skills dimension is embedded across multiple trends and the overall theme places greater emphasis on equipping people with the skills, resources, and capacity to actively use, shape, and create digital value. In the digital economy of 2026, empowerment requires not only access but also agency — the knowledge, confidence, and ability to make informed choices, influence outcomes, and create value in the digital world.

Access to opportunities through digital learning, financial participation, and entrepreneurship has evolved to include resilience and adaptation to the material impacts of digital technologies. This is particularly visible in the labor market, where generative AI is reshaping jobs, displacing tasks, and transforming career pathways. Continuous digital touchpoints are driving more personalized products and services, leading to new opportunities for interaction within physical-digital hybrid environments. At the same time, as technology becomes ever more woven into our daily lives, there is growing recognition that it is also impacting wellbeing and health aspects.

The next phase of empowerment will be shaped by deeper equity and ethical challenges. The widening global AI divide is a central concern: disparities in access to AI infrastructure, data, and expertise are amplifying inequality between nations, organizations, and communities. Advances in neurotechnology and brain-computer

interfaces are blurring the boundaries between humans and machines. While these advances create new opportunities, they also intensify concerns about data privacy, algorithmic fairness, and the governance of systems that increasingly shape everyday life.

Building truly empowered communities requires a new era of collaboration to realign the architecture of digital power: fostering alliances for open standards, aligning public investment with adaptive regulation, and forging global compacts that embed ethics and accountability into technology itself.

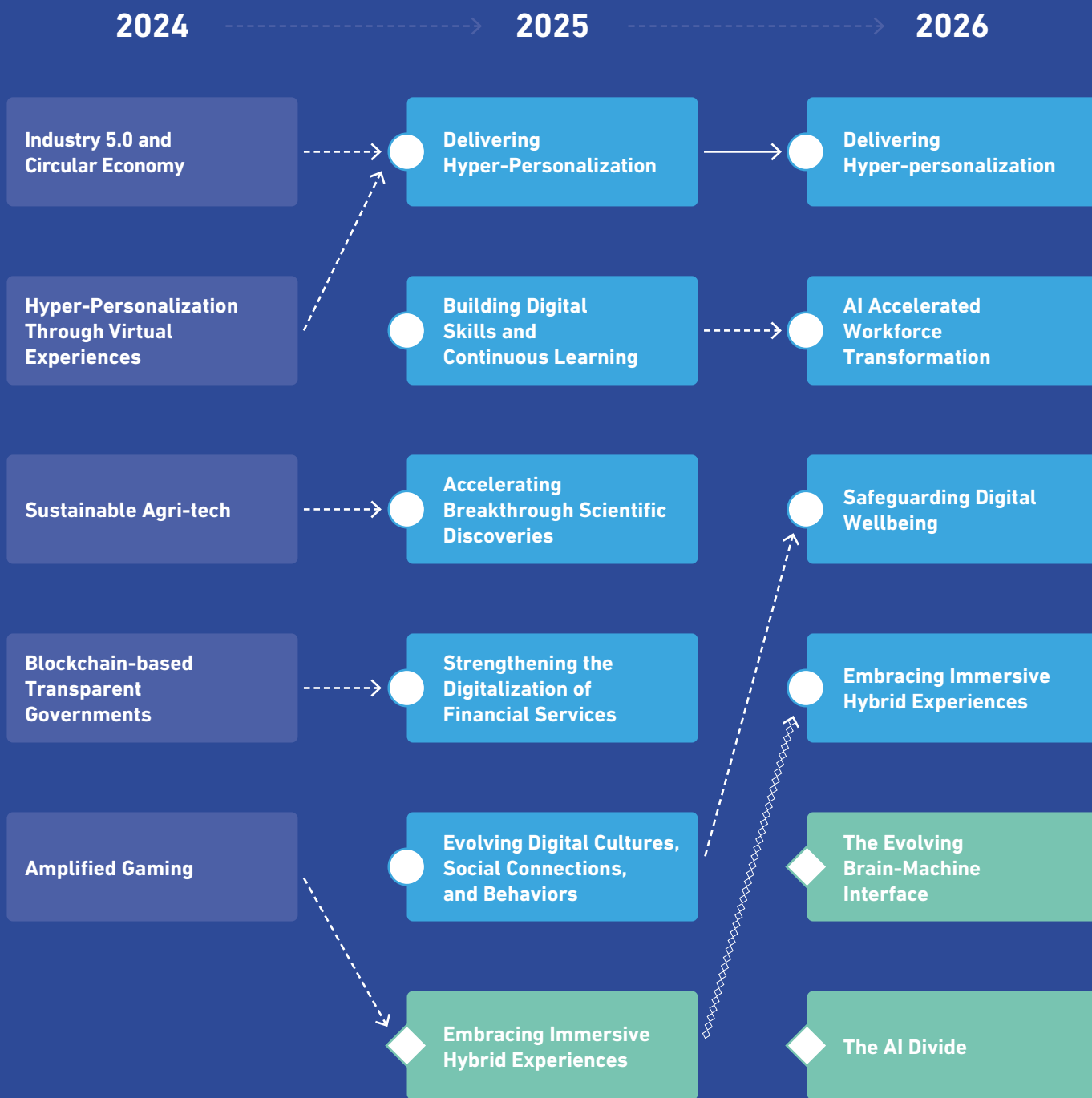
How to build Empowered Communities?

To capitalize on the opportunities presented by the digital economy trends in this theme, stakeholders should collaborate to ensure:

- › **Proactive and continuous upskilling and reskilling of the workforce** to prevent AI-driven displacement to ensure broad participation in the digital economy.
- › **Equitable and sustainable access to AI infrastructure, compute, and capabilities** to prevent a widening global AI divide and long-term technological stratification.
- › **Trustworthy digital ecosystems** that embed wellbeing protections, content authenticity, and ethical governance into hyper-personalized and immersive digital environments.



Figure II.1: **Empowered Communities: Evolution of Digital Economy Trends Across DET 2024–26**



Legend

Digital economy trends:

● Current ◆ Emerging

-----> Evolution —> Continuation

◆◆◆◆> Materialization: an emerging trend from previous reports has materialized as a current trend for this year

Source: DCO DET reports 2024–26

● **Current trend**

2.1

Delivering Hyper-Personalization

Continuation of DET 2025 trend: Delivering Hyper-Personalization

What does the trend encompass?

AI systems are creating a new 'learning loop' in which human interaction continuously refines algorithms, improving their ability to deliver experiences tailored to individual preferences and real-time contexts. What began as hyper-personalized retail experiences in 2025 has expanded across sectors including healthcare, education, and finance, enabling individualized solutions that touch the core domains of human development and professional growth. This evolution marks a shift from personalization as a consumer convenience to personalization as a driver of empowerment, wellbeing, and productivity.

Why is it important?

By enabling continuous adaptation to user behavior, these AI-driven systems can empower individuals, improve outcomes, and strengthen user engagement — although long-term success depends on maintaining user trust. Organizations will need to embed ethics, privacy, and responsible use of frontier technologies at the core of their business strategy to sustain public confidence and avoid user alienation.

Economic outlook

Value creation is driven primarily by consumer-facing sectors, such as manufacturing, wholesale, and retail trade, followed by mining and then transport, storage, and communications. Construction and other activities contribute moderately, while agriculture remains marginal. Similar positive growth in gross-value-added from this trend is expected in all regions, with Latin America and North America marginally ahead. To ensure the potential value of this trend is achieved, stakeholders should implement the measures outlined in the stakeholder recommendations section at the end of this trend profile.

Total potential economic value creation:

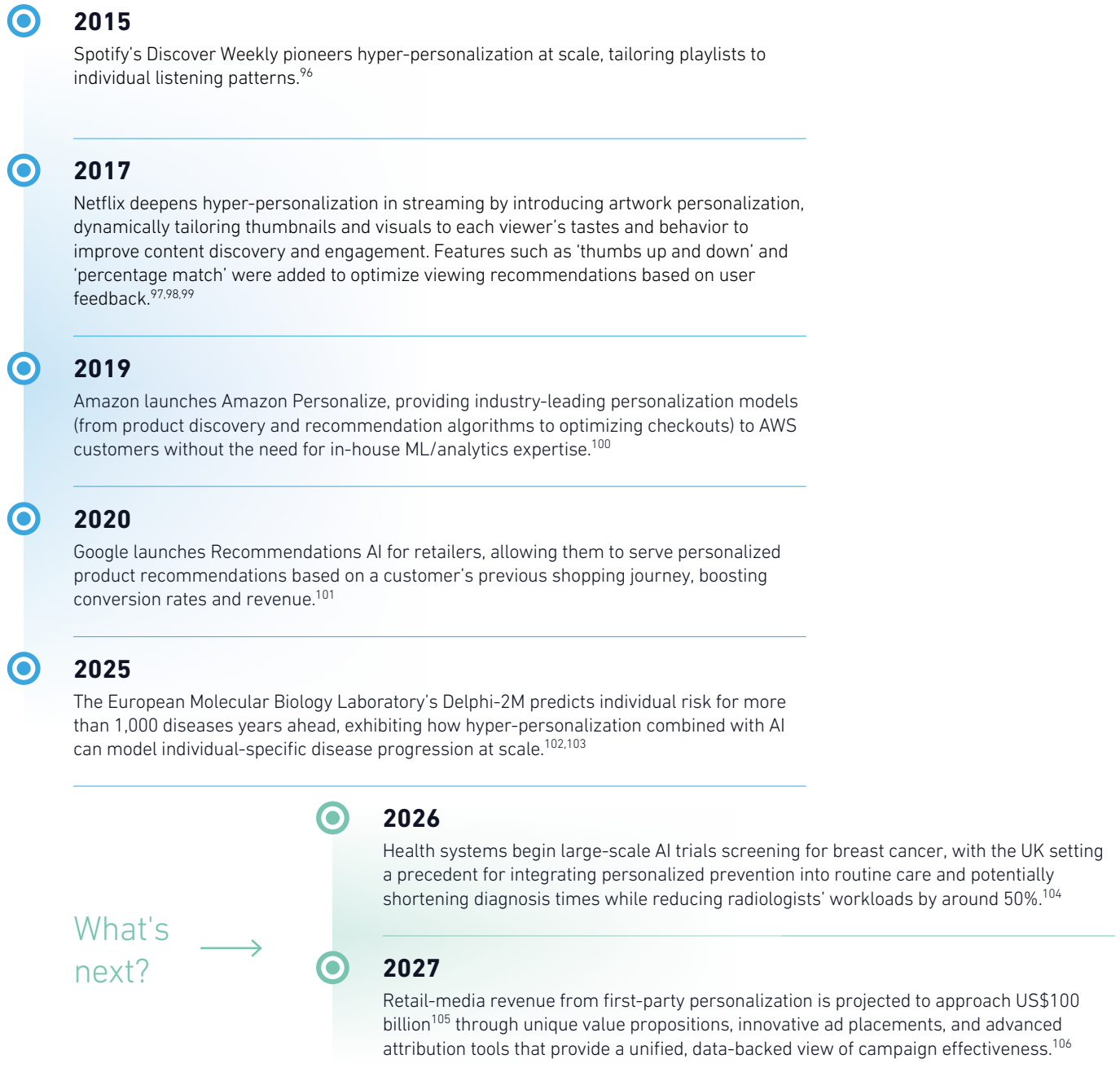
US\$2.97 trillion

Growth rate:

3.3%

Notable developments

Overview of past and likely future developments showcasing the evolution of Delivering Hyper-Personalization:



Enabling conditions and countries' readiness

Key drivers

According to DET Survey respondents, leveraging AI-powered hyper-personalization depends on:



Digital for Work and Training

Skills development in personal data identification, strategy, and governance are essential to uncover new use cases for digital personalization.



Digital for Social Inclusion

Fair access, inclusive datasets, multilingual interfaces, accessibility features, low-data modes, and community oversight are needed to prevent algorithmic bias and exclusion in hyper-personalized products and services.



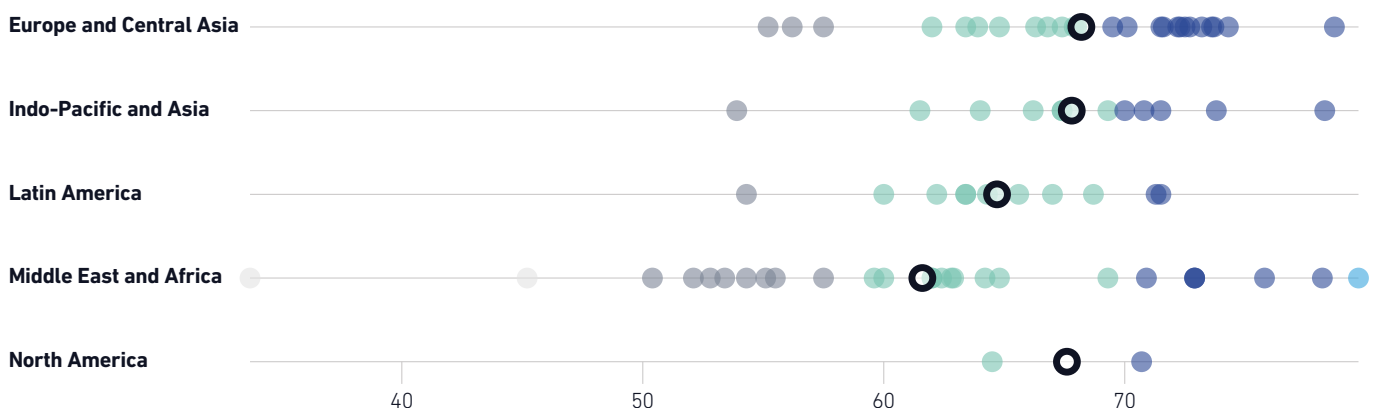
Digital Innovation

Low-code and no-code platforms enable non-technical users to develop new personalized products and services. Moreover, fostering experimentation and rapid prototyping in this space can yield significant competitive gains.

Countries' readiness for trend adoption

With an average readiness score of 65.4, readiness for hyper-personalization is considered *established* across countries. All regions have on average similar readiness. Europe and Central Asia (68.2), Indo-Pacific and Asia (67.8), and North America (67.6) lead, while Latin America (64.7) and the Middle East and Africa (61.6) are making rapid progress, as shown by Figure II.2. This trend also shows one of the smallest variations in readiness overall across countries, which have an equally similar capacity on average to capitalize on its opportunities.

Figure II.2: Delivering Hyper-Personalization: trend readiness by region



Legend: ● Foundational (<50) ● Functional (50-59.9) ● Established (60-69.9) ● Advanced (70-79.9) ● Pioneer (>80) ● Regional average

Source: Results from the DCO's 2025 Digital Economy Trends Survey combined with data from the DCO's Digital Economy Navigator 2025.

Q: At a global level, select the three key enabling factors countries need in order to benefit from the opportunities provided by the following digital economy trends?

Respondents: 272 CTOs and senior technologists working in large companies (+250 employees), 60 policymakers, and 74 digital economy experts.

How is the trend materializing

Construction

AI-driven analytics enable builders to match each buyer's preferences with specific home features and offers. For example, if a shopper browses energy-efficient models, the system can suggest virtual tours and information sheets highlighting green features. Sales teams can hyper-personalize incentives such as financing deals, upgrade discounts, and design options tailored to each profile, which significantly raises buyer engagement and conversion.¹⁰⁷

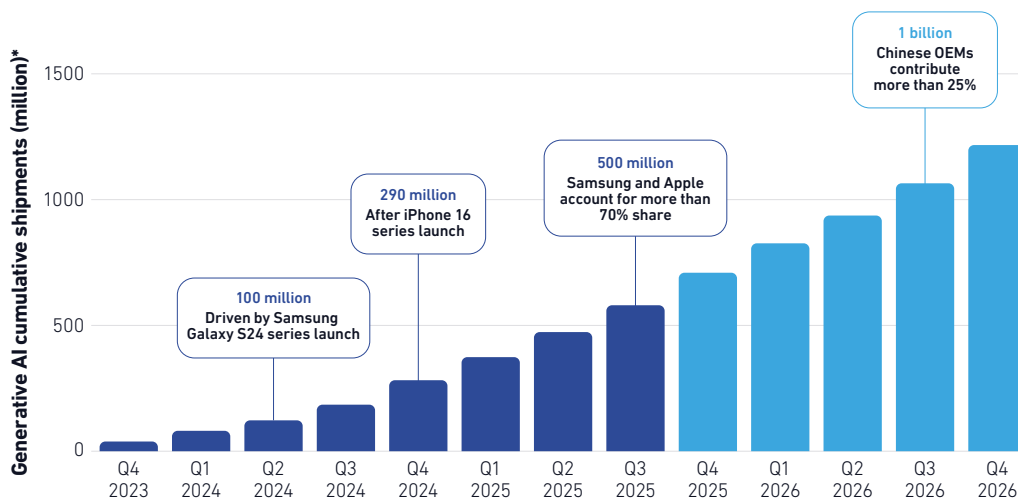
Technology, media and communications

Social media platforms are shifting to conversation-driven personalization. Meta will use users' AI-chat interactions to tailor feeds and ads across Facebook and Instagram, likely starting in December 2025.¹⁰⁸ TikTok introduced AI-powered ads that infer travel intent from videos and searches, then provide personalized hotel and flight offers in-feed.¹⁰⁹ Reddit has integrated contextually personalized ads in active conversation threads, using paid content to foster user interest and engagement with its platform.¹¹⁰

Personalized generative AI hardware

On-device AI is shifting personalization from servers to the user. Shipments of generative AI-capable smartphones surpassed 500 million units globally by the end of 2025 and are projected to exceed 1 billion units by 2026 (as shown in Figure II.3). Early adoption centered on premium smartphones, with broader growth now extending across mid- and high-tier devices. With AI models running locally, these devices can process personal context (history, sensors, and documents), respond instantly, and update from each interaction.^{111,112}

Figure II.3: Global generative AI smartphone shipments (cumulative; 2023-26)¹¹³



*Original equipment manufacturers

Legend: ● Actual ● Forecast

Source: Counterpoint Research's AI 360 Global GenAI-Capable Smartphone Shipments Forecast

Frontier use case

Khan Academy, a nonprofit learning platform, is scaling its personalized artificial intelligence tutor to allow students to upload images to be scored for math and science questions and tutoring in eight languages, including Arabic and Mandarin. These enhancements make it easier to adapt pacing for each learner and strengthen the feedback loop for individualized instruction.¹¹⁴

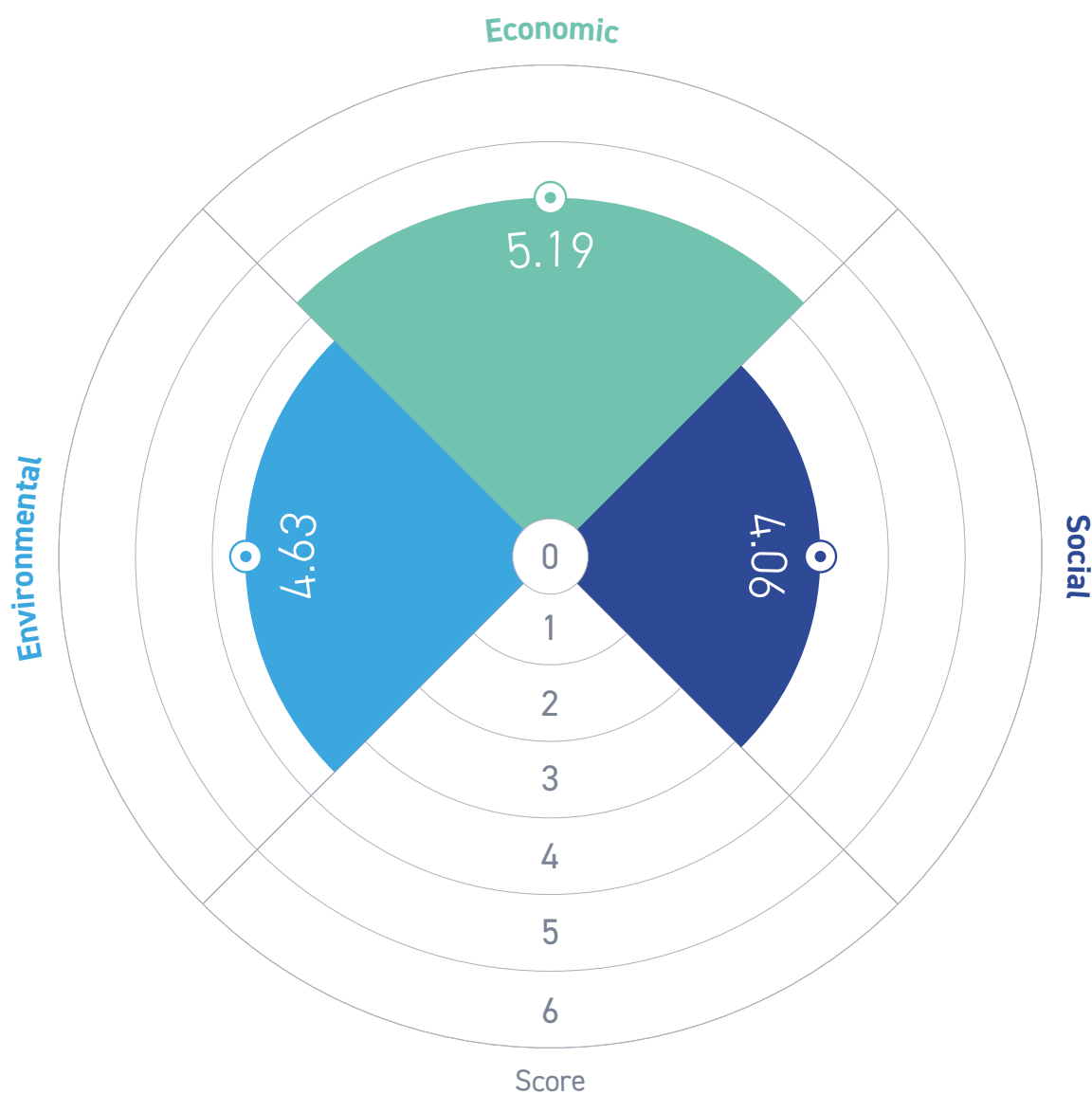
Country spotlight

Omantel's loyalty platform Makasib uses artificial intelligence to tailor rewards for 1.6 million telecoms customers in Oman across fuel, retail, travel, and health partners. As users browse, buy, and redeem, its models update profiles and push individualized offers, raising engagement and spending. The format scales hyper-personalization while keeping user controls in-app.^{115,116}

Economic, social, and environmental impact

This trend ranks among the top five for positive economic (5.19) and environmental (4.63) impacts, but it has a weaker social (4.06) impact, as shown in Figure II.4. Its strong economic impact is derived from the revenue growth from hyper-personalization driven sales. Latin America (5.70) ranks the highest for economic impact.

Figure II.4: Delivering Hyper-Personalization: expected positive impact



Legend: ● Average score per impact area

Source: DCO 2025 Digital Economy Trends Survey.

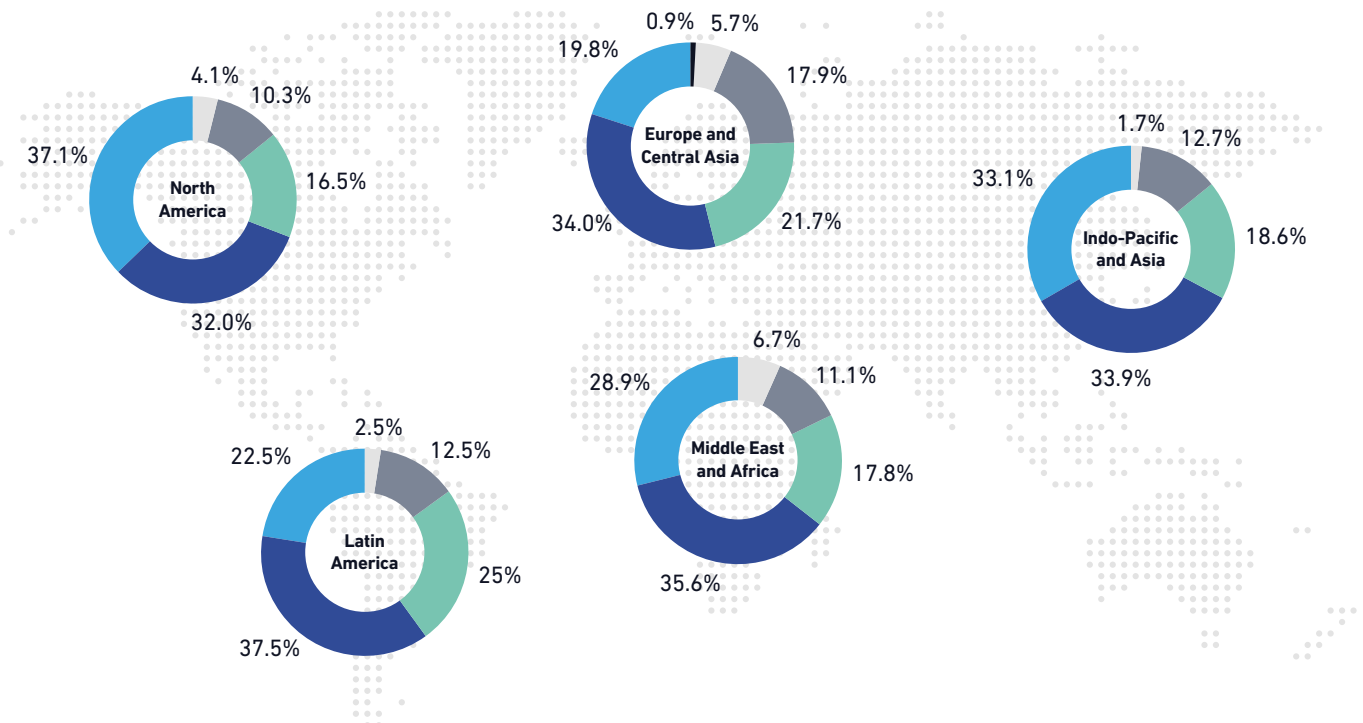
Q: In your country, how would you assess the economic/social/environmental impact of these current digital trends in the next 12-18 months?

Respondents: 272 CTOs and senior technologists working in large companies (+250 employees), 60 policymakers, and 74 digital economy and financial experts.

Pace of change

Overall 63.1% of respondents expect the trend to accelerate significantly or strongly. As shown by Figure II.5, optimism is strongest in North America (69.1%) and weakest in Europe and Central Asia (53.8%). Private-sector respondents (65.0%) remain more optimistic than public sector respondents (53.4%), signaling strong enterprise readiness.

Figure II.5: Delivering Hyper-Personalization: anticipated speed of change by region



Legend: ● Decelerate ● No change ● Somewhat accelerate ● Accelerate ● Accelerate significantly ● Strongly accelerate

Source: DCO 2025 Digital Economy Trends Survey.

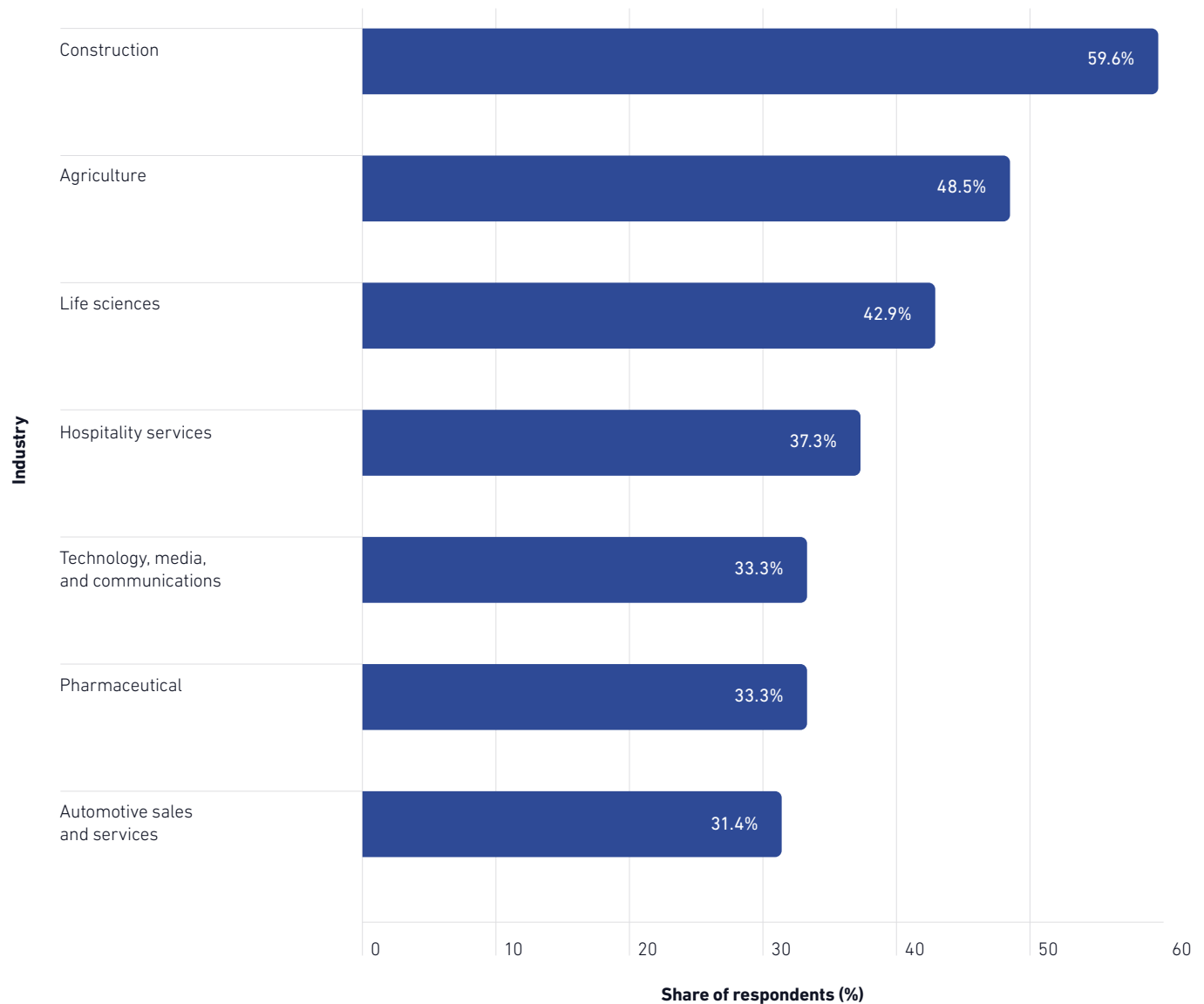
Q: In your country, how do you anticipate the speed at which the following digital economy trends will evolve in the next 12-18 months?

Respondents: 272 CTOs and senior technologists working in large companies (+250 employees), 60 policymakers, and 74 Digital Economy and financial experts.

Industry outlook

As shown by Figure II.6, respondents from the construction (59.6%) industry are most optimistic about this trend's potential impact in the next 12-18 months. As noted previously, hyper-personalization could transform construction by enabling fully tailored, data-driven, and customizable projects that adapt seamlessly to user needs and site conditions. Agriculture (48.5%) ranks second — as AI models could provide farmers with personalized advice on crop selection, input dosing, and pest control measures — followed by life sciences (42.9%).

Figure II.6: Delivering Hyper-Personalization: top industries for expected growth



Source: DCO 2025 Digital Economy Trends Survey.

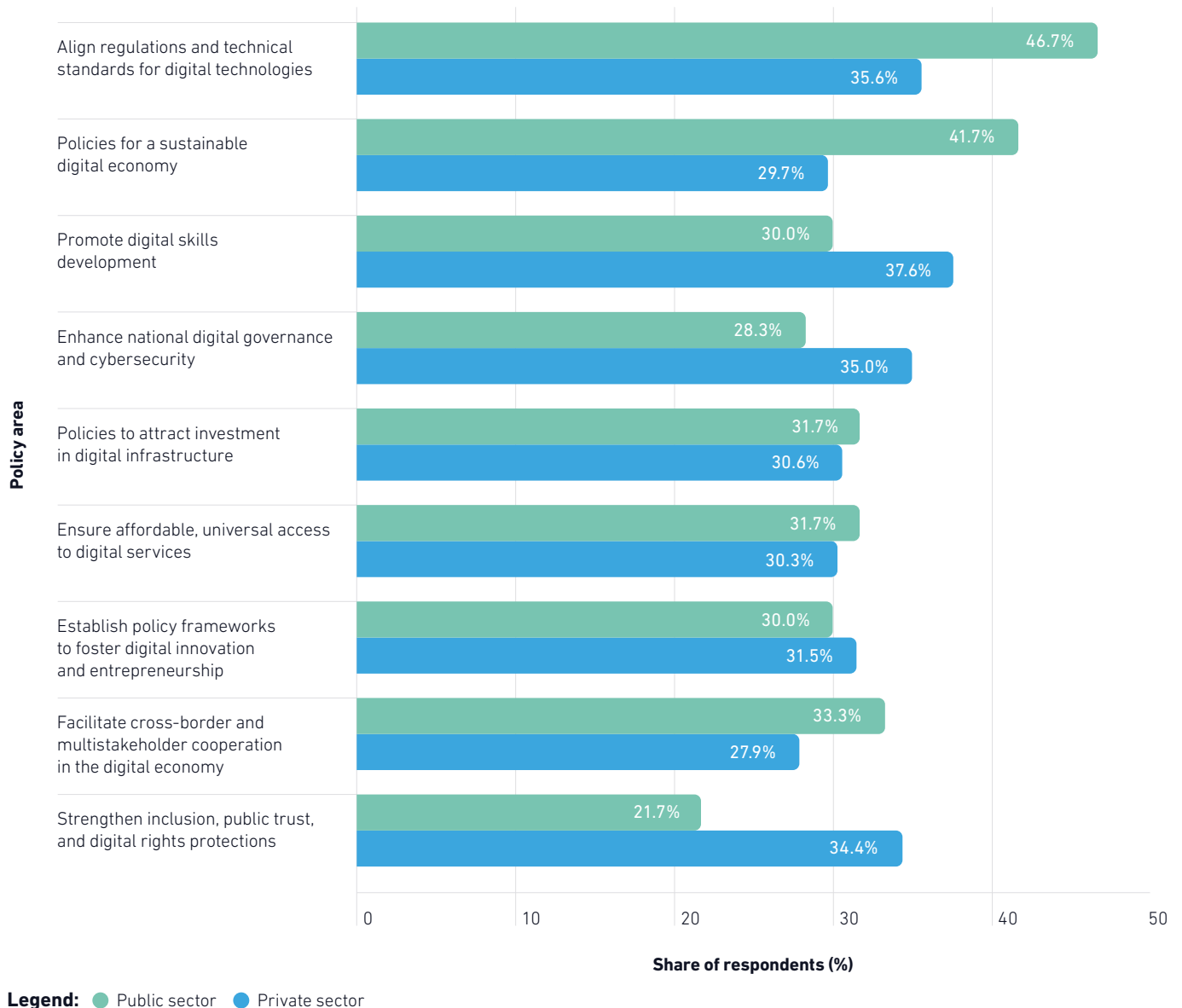
Q: In your industry, select the three digital economy trends, in order of importance, that you expect to create the most growth opportunities (e.g., new markets and customers or reducing operational costs) in the next 12-18 months.

Respondents: 272 CTOs and senior technologists working in large companies (+250 employees) and 74 digital economy and financial experts.

Policy actions

As shown in Figure II.7, 46.7% of public sector respondents find that Delivering Hyper-Personalization requires greater alignment on regulations and technical standards to allow AI models, data, and interfaces to interoperate compliantly and enable services that are consistent, secure, and trustworthy. For example, introducing harmonized data formats would enable healthcare systems to collaborate more effectively, providing a pathway to faster and more advanced personalized medicine. Private-sector respondents prioritize large-scale digital-skills development (37.6%), alignment with standards (35.6%), and enhanced digital governance and cybersecurity (35.0%).

Figure II.7: Delivering Hyper-Personalization: priority policy actions



Source: DCO 2025 Digital Economy Trends Survey.

Q: In your country, select the three most critical national policy actions needed for people, businesses, and states to benefit from each of the following current digital economy trends.

Respondents: 272 CTOs and senior technologists working in large companies (+250 employees), 60 policymakers, and 74 digital economy and financial experts.

Asking AI

We asked three leading LLMs (ChatGPT-5, Gemini 2.5 Flash, and DeepSeek-V3.2) to predict the likely impacts of this trend over the next 12-18 months.

Please refer to the methodology annex to see the exact prompts used.

Prompt >_



Economic impact

ChatGPT:

"Hyper-personalization will drive revenue in retail, finance, and digital services. Firms using AI insights will boost conversions and loyalty, while those that don't risk losing ground. Scaling personalization increases data infrastructure costs and reliance on advanced analytics, widening the gap between leaders and emerging players"



Social impact

Gemini:

"AI-driven, real-time personalization will boost customer satisfaction by delivering highly relevant, tailored experiences. Yet it relies on continuous user profiling, raising privacy and algorithmic risks. Lack of transparency in data use can erode autonomy and create filter bubbles, subtly threatening informed decision-making."



Environmental impact

DeepSeek:

"The environmental impact of hyper-personalization largely comes from the energy-hungry data centers powering real-time analytics. Continuous tracking and A/B testing consume substantial power. While demand prediction may reduce waste in sectors like fashion and food, overall energy use likely results in a net negative effect."

Note: these insights from LLMs are not data driven. They are provided as directional and sentimental and the LLMs have not had access to the survey data.



AI-powered personalization has infinite possibilities—and at the center of it all will need to be robust governance on how data is used to protect the most vulnerable.

Samuel Munyuwiny
Co-founder & Director African Institute
for Children Studies

Stakeholder recommendations

Private sector

To build sustainable competitive advantage, strengthen customer loyalty, and establish trust as a market differentiator in hyper-personalized experiences, business leaders need to:

Embed ‘trust-by-design’ principles in service offerings and business processes as a central risk management strategy.

Proactively align privacy-preserving learning processes with emerging global regulatory standards to mitigate compliance risks and associated costs.

Collectively fund independent third-party auditing agencies to certify personalization systems for bias, privacy risks, and manipulative practices.

Strengthen workforce capabilities in data ethics, AI literacy, and digital skills through continuous learning and partnerships with educational institutions, ensuring that hyper-personalized systems are designed and deployed responsibly and transparently across sectors.

Public sector

To protect consumer autonomy, prevent algorithmic manipulation, and enable beneficial innovation in personalized services, policymakers and regulators need to:

Launch regulatory sandboxes where companies can test hyper-personalization systems under supervised conditions with clear ethical guardrails before scaling.

Establish secure, state-backed ‘personal data utilities’, where citizens can store personal data and grant granular, time-bound access to services via standardized APIs, to transform consent from a one-time-only checkbox into a dynamic, trust-enabling, co-creative process.

Co-create comprehensive certification standards with industry and consumer groups as a part of broader policies for digital economy, mandating transparency in algorithmic decision-making, data usage, and personalized pricing practices to prevent pricing collusion and discriminatory outcomes.

IGOs, IOs, and others

To harmonize global ethical standards, prevent algorithmic harms, and ensure that hyper-personalization promotes equitable human development, intergovernmental organizations, international organizations, civil society, and academia need to:

Support ongoing convening efforts of governments, industry, international organizations, and civil society to co-develop interoperable frameworks for consent, trustworthy AI systems, data portability, and bias mitigation that enable cross-border and cross-sectoral personalization while safeguarding individual digital rights

Establish an independent algorithmic incident reporting center, modeled on transportation safety boards, to confidentially investigate, publish anonymized digital harms, and promote best practice on hyper-personalization best practices.

Launch shared testbeds and benchmarks evaluating on-device personalization, federated learning, and fairness across languages and contexts, accompanied by country scorecards tracking progress on the implementation of inclusive personalization practices.

● **Current trend**

2.2

AI Accelerated Workforce Transformation

Evolution of DET 2025 trend: Building Digital Skills and Continuous Learning

What does the trend encompass?

AI is catalyzing the fastest workforce transformation in history, creating both productivity gains and profound structural pressures on employment. While AI delivers automation and efficiency improvements that make job displacement economically attractive, it also demands new skill sets — such as AI and data literacy and digital collaboration — that require sustained investment in workplace development. This trend builds on 2025's emphasis on developing high-level skills to enhance accessibility to emerging digital technologies, including AI. It calls on organizations to manage workforce transitions strategically, creating opportunities and fostering inclusion rather than widening economic divides through job displacement.

Why is it important?

In 2019, it was projected that over 1 billion people would need reskilling to avoid skills gaps that hinder inclusive economic growth due to the digital transition.¹¹⁷ Today, the unfolding of workforce transformation is evident. Implementing proactive upskilling and reskilling programs is essential to ensure that human–digital collaboration in the workplace is effective and that its benefits are shared broadly rather than concentrated among the few.

Economic outlook

This trend provides the second-highest opportunities for value creation of the trends in this report, notably in mining and utilities and the service industries. All regions are expected to record growth in gross-value-added above 5% , with expansion projected to be strongest in the Middle East and Africa. To unlock this economic value, stakeholders will need to attend to the measures outlined in the stakeholder recommendations section at the end of this trend profile.

Total potential economic value creation:

US\$ 4.91 trillion

Growth rate:

5.5%

Notable developments

Overview of past and likely future developments shaping the AI Accelerated Workforce Transformation theme:



Enabling conditions and countries' readiness

Key drivers

According to DET Survey respondents, creating a digitally capable and secure workforce depends on:



Digital for Work and Training

Workforce upskilling and re-skilling are needed to facilitate a smooth transition toward a hybrid human-machine workforce, minimizing job displacement while promoting a more inclusive and equitable transformation.



Industry Digital Transformation

Industry-wide uptake of AI tools in core processes would make task changes and new roles clearer, creating pathways to an AI-complemented work environment that redeploys staff instead of reducing them.



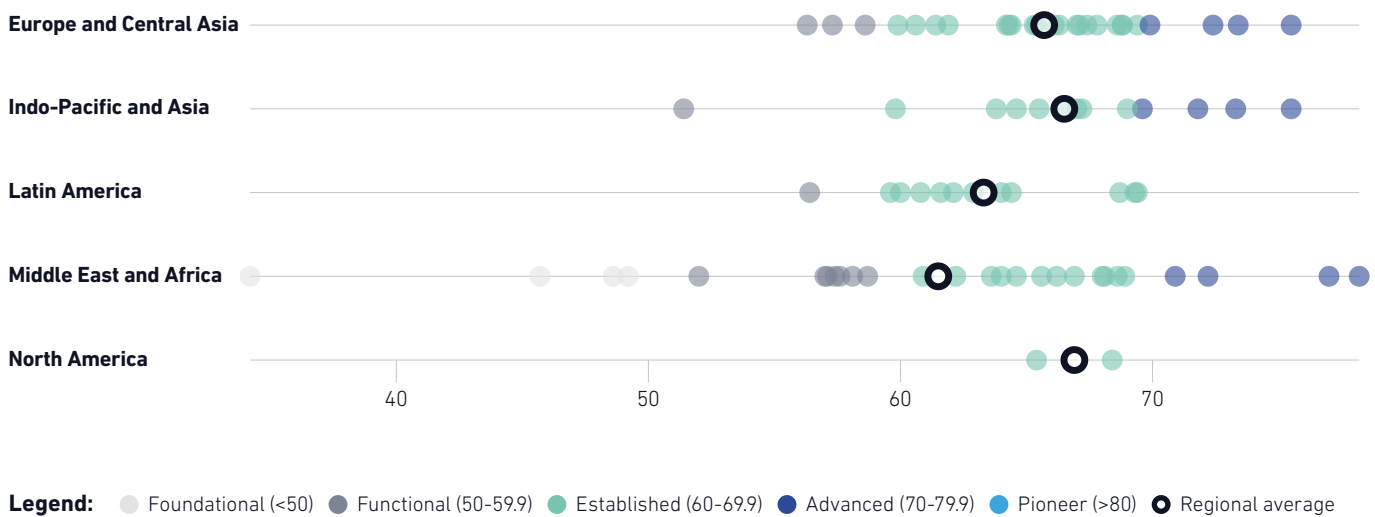
Digital Capabilities

Baseline digital and AI literacy, combined with privacy and cybersecurity competence, will drive AI-workforce transformations to raise productivity without widening exclusion.

Countries' readiness for trend adoption

Readiness for this trend, when considering these key drivers, shows that no country is yet a *pioneer* when it comes to readiness to capitalize on opportunities emerging from AI Accelerated Workforce Transformation. Indeed, using the related data from the DEN, countries are on average considered *established* (64.1 out of 100) with broadly similar levels of readiness across regions, as shown in Figure II.8. The lowest regional average, for the Middle East and Africa (61.5), remains relatively close to the highest, recorded in North America (66.9). This suggests that overall performance and adoption levels are converging despite regional differences, reflecting the presence of shared underlying trends.

Figure II.8: AI Accelerated Workforce Transformation: trend readiness by region



Source: Results from the DCO's 2025 Digital Economy Trends Survey combined with data from the DCO's Digital Economy Navigator 2025.

Q: At a global level, select the three key enabling factors countries need in order to benefit from the opportunities provided by the following digital economy trends?

Respondents: 272 CTOs and senior technologists working in large companies (+250 employees), 60 policymakers, and 74 digital economy experts.

How is the trend materializing

Healthcare services

The integration of AI into healthcare services is not only improving operations but also reducing the care burden in hospitals. In China, a closed-loop system powered by the DeepSeek AI model was deployed in tertiary hospitals in January 2025 to enhance diagnostic accuracy and streamline clinical workflows. By supporting image analysis and decision-making, it reduces the cognitive burden on healthcare professionals. Nurses express satisfaction with this AI-accelerated workforce transformation, which has dramatically cut error rates and reduced time spent on quality control.^{131,132}

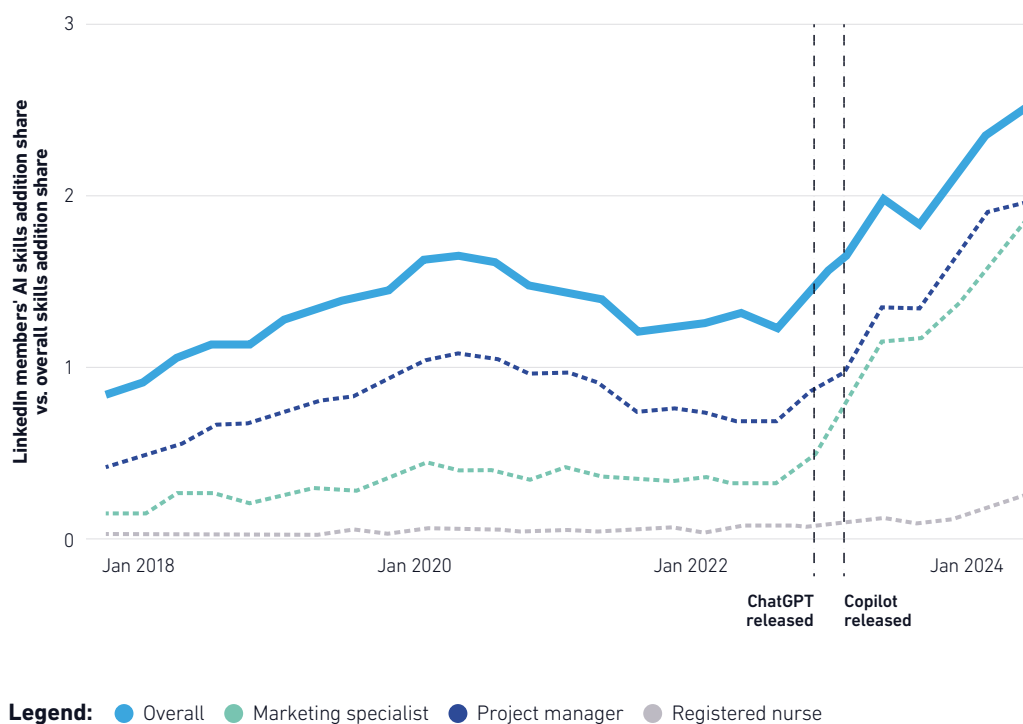
Public institutions

In March 2025, Italy's Fastweb Digital Academy launched an AI course for civil servants, mainstreaming foundational skills in public administration.¹³³ More recently, the United Arab Emirates created a fellowship with Oxford and MIT to train government leaders in AI and economic strategy via specialized master's tracks.¹³⁴ These programs signal continuous learning as a core capability for state capacity.

Workforce skills

Across industries, the proportion of people adding AI skills to their profiles has more than doubled since 2018 — with up to a sevenfold rise in some occupations, as shown by Figure II.9. This development reflects the heightened transformation in the labor force, with new skills related to digital technologies becoming increasingly important for employability and success in the modern workplace.

Figure II.9: Rate of LinkedIn members adding AI skills, 2018-24¹³⁵



Source: LinkedIn's Work Change Report (2025)

Spotlight initiative

The Digital Cooperation Organization has developed the AI-REAL (AI Readiness to Empowerment, Adoption, and Leadership) Toolkit. It offers a qualitative, diagnostic assessment that helps nations ensure effective AI adoption and integration across public and private sectors by identifying strengths, gaps, and key strategic areas of improvement.¹³⁶

Country spotlight

Jordan's Youth, Technology, and Jobs Project has introduced digital skills to almost half a million grade 7-12 students (aged 12-18) since 2020. Run by the Ministry of Digital Economy with a US\$200 million World Bank grant, the program also links universities to digital firms through market-driven training programs and freelancing hubs.^{137,138}

Economic, social, and environmental impact

This trend ranks in the middle-lower range across positive economic (4.95), social (4.07), and environmental (4.07) impacts, as shown by Figure II.10. This reflects how automation enhances productivity, but slow reskilling and job displacement could limit economic and social outcomes, and high energy use offsets potential sustainability gains.

Figure II.10: AI Accelerated Workforce Transformation: expected positive impact



Legend: ● Average score per impact area

Source: DCO 2025 Digital Economy Trends Survey.

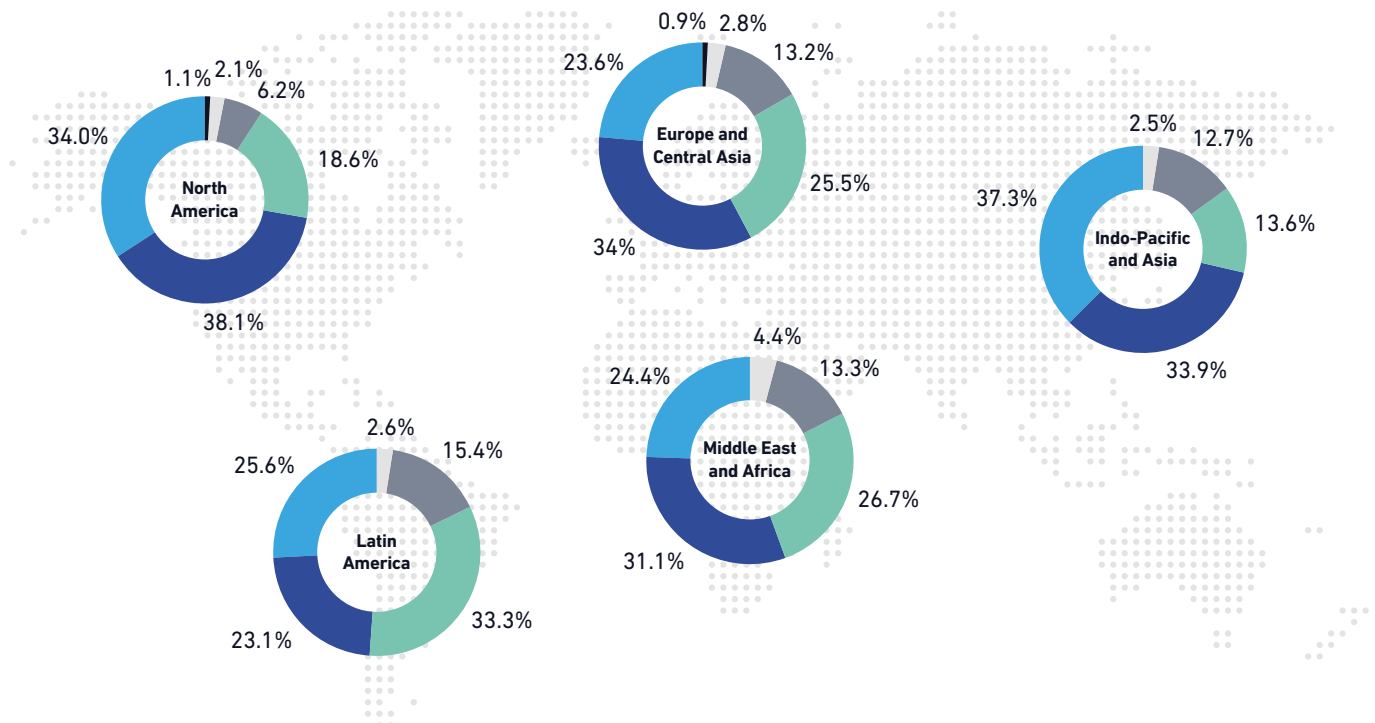
Q: In your country, how would you assess the economic/social/environmental impact of these current digital trends in the next 12-18 months?

Respondents: 272 CTOs and senior technologists working in large companies (+250 employees), 60 policymakers, and 74 digital economy and financial experts.

Pace of change

Confidence in the accelerating impact of this trend is very strong, with around 64% of respondents expecting significant or stronger acceleration — more in North America (72.1%) and less in Latin America (48.7%), as shown by Figure II.11. Private-sector respondents (67.2%) are more confident than their government counterparts (48.3%).

Figure II.11: AI Accelerated Workforce Transformation: anticipated speed of change by region



Legend: ● Decelerate ● No change ● Somewhat accelerate ● Accelerate ● Accelerate significantly ● Strongly accelerate

Source: DCO 2025 Digital Economy Trends Survey.

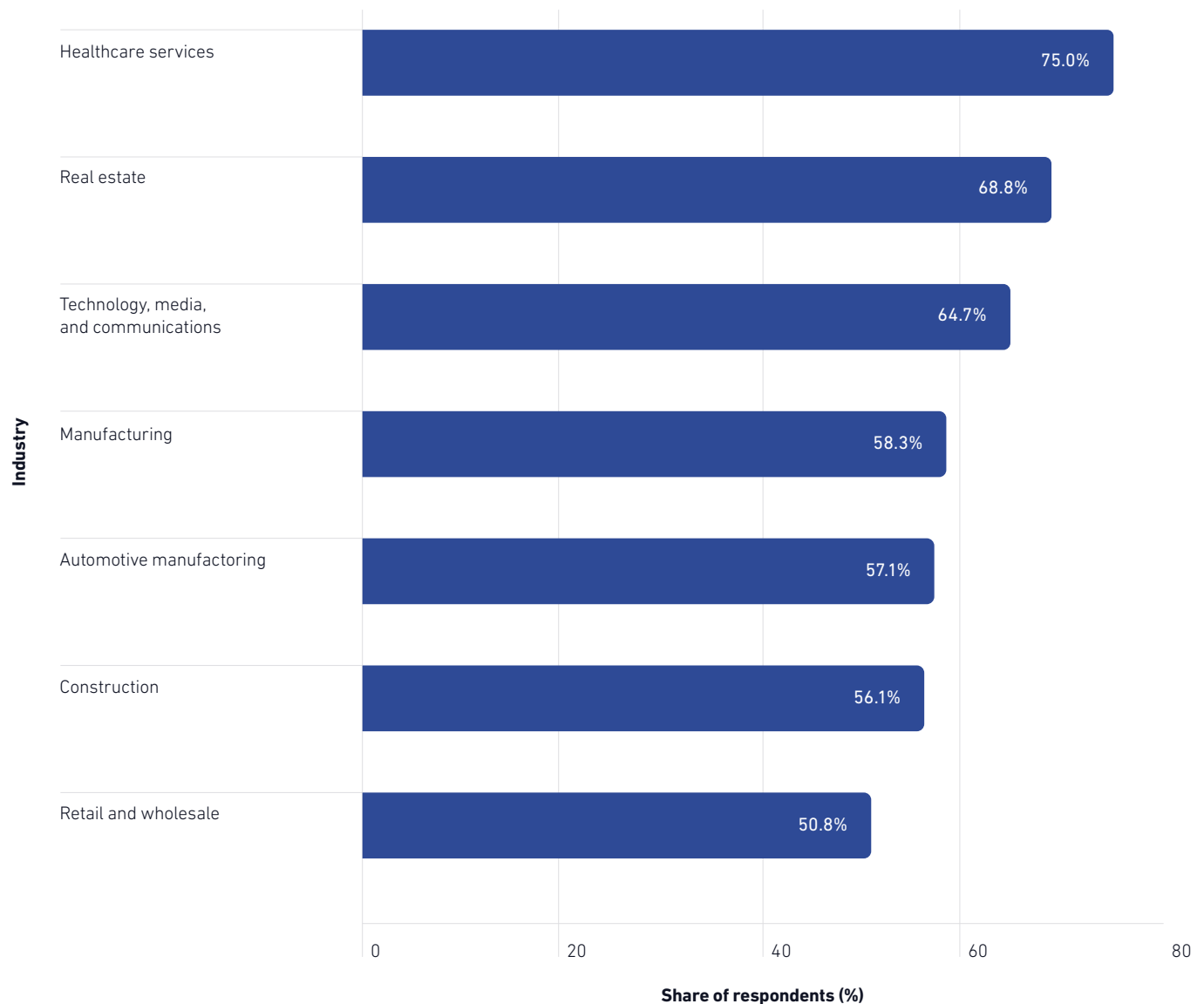
Q: In your country, how do you anticipate the speed at which the following digital economy trends will evolve in the next 12-18 months?

Respondents: 272 CTOs and senior technologists working in large companies (+250 employees), 60 policymakers, and 74 digital economy and financial experts.

Industry outlook

As shown in Figure II.12, respondents expect workforce impacts to be highest in healthcare services (75.0%), where technologies such as ambient AI scribes, diagnostic assistants, and automated triage are already shifting task distribution and reducing administrative load. Real estate (68.8%) ranks second, driven by AI tools for valuations, property management automation, and digital twin-based inspections that change skill requirements across the sector. Technology, media and communications (64.7%) follows, reflecting how generative AI is reshaping content production, customer support, and routine digital workflows.

Figure II.12: AI Accelerated Workforce Transformation: top industries for expected growth



Source: DCO 2025 Digital Economy Trends Survey.

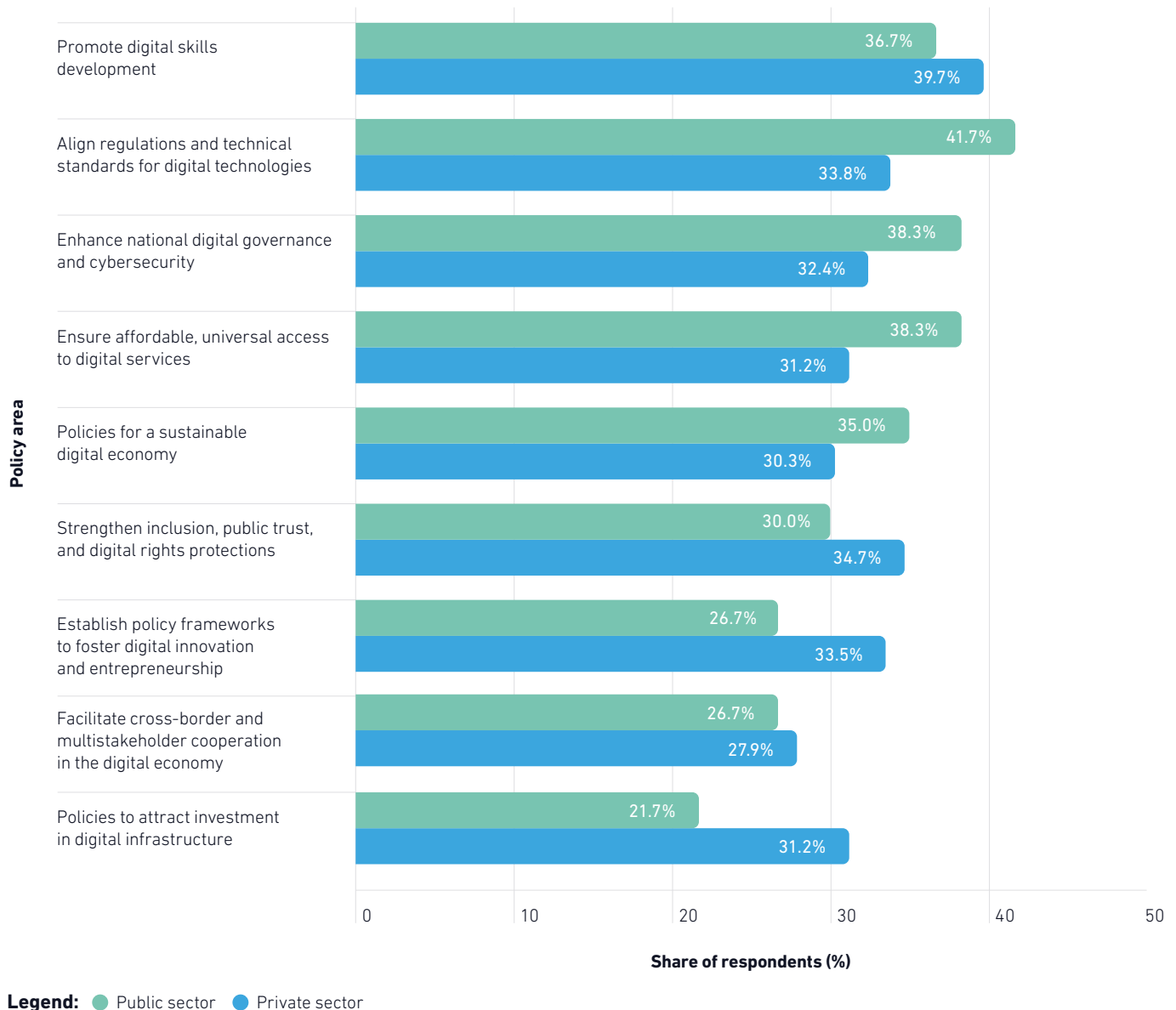
Q: In your industry, select the three digital economy trends, in order of importance, that you expect to create the most growth opportunities (e.g., new markets and customers or reducing operational costs) in the next 12-18 months.

Respondents: 272 CTOs and senior technologists working in large companies (+250 employees) and 74 digital economy and financial experts.

Policy actions

As shown by Figure II.13, government respondents want policies to focus on aligning regulations and technical standards (41.7%), for instance to authenticate and certify AI tools for workplaces. For the private sector, promoting digital skills development (39.7%) is paramount to upskilling and reskilling teams. It is particularly important for digital-skills initiatives to reach all segments of the population, including women, senior citizens, and those from lower socio-economic backgrounds. In today's digital societies, such initiatives function not merely as tools for learning, but as pathways to empowerment, independence, and social inclusion.

Figure II.13: AI Accelerated Workforce Transformation: priority policy actions



Source: DCO 2025 Digital Economy Trends Survey.

Q: In your country, select the three most critical national policy actions needed for people, businesses, and states to benefit from each of the following current digital economy trends.

Respondents: 272 CTOs and senior technologists working in large companies (+250 employees), 60 policymakers, and 74 digital economy and financial experts.

Asking AI

We asked three leading LLMs (ChatGPT-5, Gemini 2.5 Flash, and DeepSeek-V3.2) to predict the likely impacts of this trend over the next 12-18 months.

Please refer to the methodology annex to see the exact prompts used.

Prompt >



Economic impact

ChatGPT:

"investment in digital upskilling will become central to economic resilience. Companies will prioritize workforce retraining in AI, data, and cybersecurity to stay competitive. Economies that scale lifelong learning systems will see higher productivity, while those that don't risk widening labor market mismatches."



Social impact

Gemini:

"the digital learning revolution will empower individuals to adapt to fast-changing job markets and access global employment opportunities. However, uneven access to digital education tools and broadband connectivity could deepen existing inequalities, especially in rural and low-income communities."

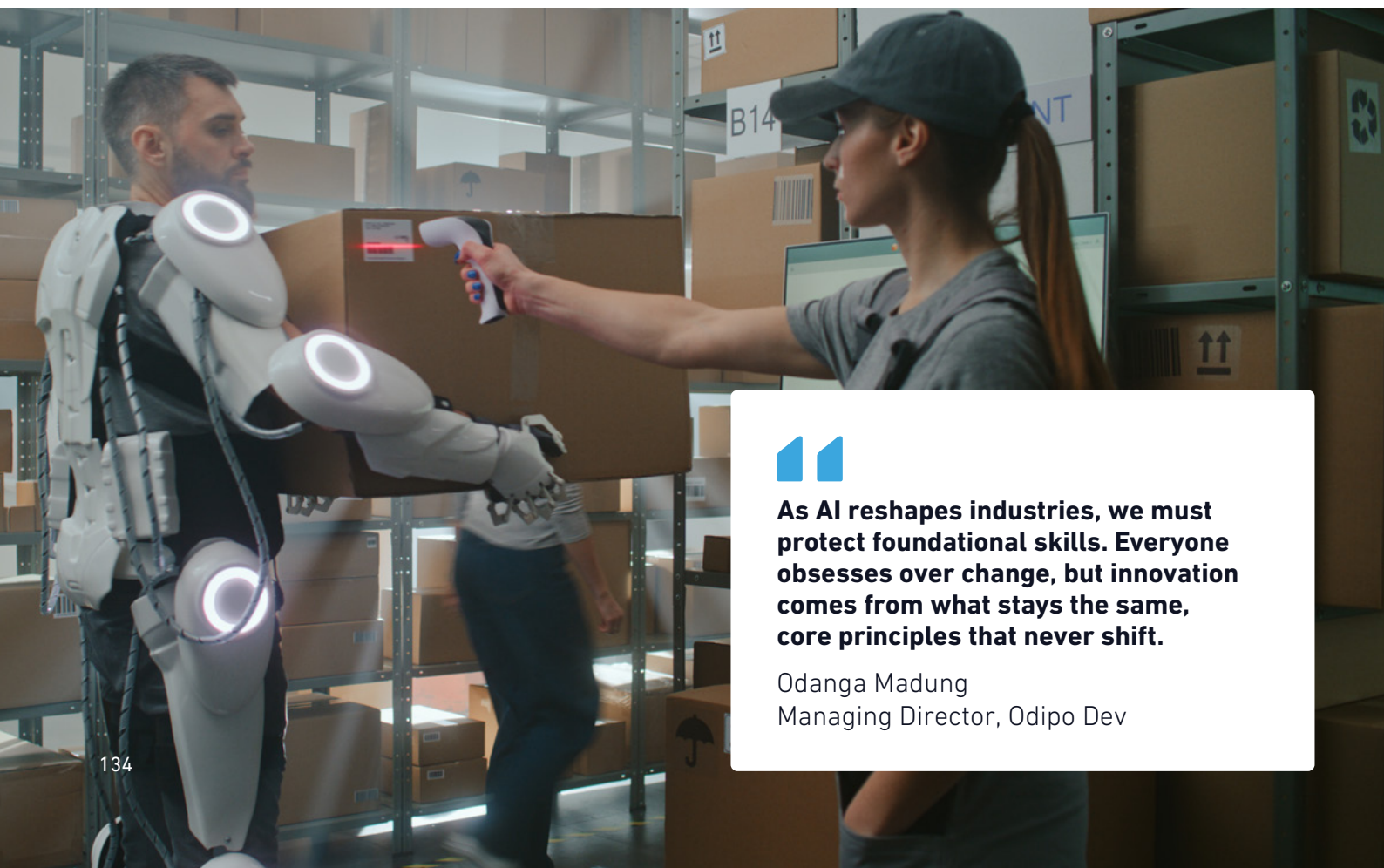


Environmental impact

DeepSeek:

"the shift toward digital learning and remote upskilling will have net positive environmental effects by reducing the need for physical commuting and training facilities. However, this benefit will be partially offset by the increased energy consumption from data centers powering online learning platforms and the constant use of digital devices for continuous education."

Note: these insights from LLMs are not data driven. They are provided as directional and sentimental and the LLMs have not had access to the survey data.



As AI reshapes industries, we must protect foundational skills. Everyone obsesses over change, but innovation comes from what stays the same, core principles that never shift.

Odanga Madung
Managing Director, Odipo Dev

Stakeholder recommendations

Private sector

To build competitive advantage, retain institutional knowledge, and ensure broad workforce participation in AI-driven growth, business leaders need to:

Establish enterprise-wide AI transition programs that treat reskilling as a strategic investment, co-developing role-specific learning pathways with technology partners and educational institutions.

Adopt skills-based, continuous learning within high impact sectors such as healthcare and manufacturing with a focus on data, AI, and cybersecurity competencies.

Use verifiable and transferable micro-credentials that are recognized across the industry (not just within a single company) to validate competencies, expand talent pools, and promote career mobility.

Public sector

To prevent massive workforce displacement, reduce skills gaps, and ensure AI benefits are shared broadly across demographics and regions, policymakers and regulators need to:

Co-create verifiable micro-credential standards with technology and professional services industries and higher education to validate AI, data, and cybersecurity competencies and enable skills-based hiring.

Establish public-private reskilling funds through tax incentives and matching grants for employer-led training, providing wage insurance and transition support for displaced workers to ensure market relevance and proactive workforce readiness.

Mandate that public procurement for service contracts recognize verifiable, cross-border micro-credentials to catalyze market adoption.

Launch market-driven, multi-lingual training hubs offering short courses, on-the-job learning credits and assessment centers, especially in remote, rural, and low-income communities.

IGOs, IOs, and others

To scale equitable workforce transformation globally and prevent a widening skills divide between developed and emerging economies, intergovernmental organizations, international organizations, civil society, and academia need to:

Co-develop shared competency standards for AI and digital workplace skills with governments, businesses, and educators. Use those standards to create cross-border learning credentials that ensure workers' skills are valued regardless of where they were learned.

Create public e-learning platforms and training hubs that match job demand with available learning resources. Co-design training with local employers to deliver practical, market-relevant skills that lead to real employment.

Create transparent benchmarking tools and national AI workforce readiness assessments that track countries' progress toward their stated reskilling targets. Use shared and agreed-upon indicators to generate actionable gap analyses and cross-country assessments.

Support capacity-building for local educators, civil servants, and community business leaders to help them lead local workforce transformation initiatives in regions facing acute displacement challenges.

● Current trend

2.3

Safeguarding Digital Wellbeing

Evolution of DET 2025 trend: Evolving Digital Cultures, Social Connections, and Behaviors

What does the trend encompass?

The ubiquitous use of digital technologies and the rise of constant connectivity are transforming cultures and societies, reshaping how individuals interact, communicate, and access information. Concern is growing about unhealthy digital habits, mental health issues, and anti-social behavior, particularly among youth. AI systems are accelerating the spread of misinformation, undermining social cohesion. Governments and organizations are adopting stronger policies on digital wellbeing, fact-checking, and digital media literacy and integrating mental health and digital-ethics considerations into AI strategies and work practices. There is a pressing need for digital technologies and practices that actively support wellbeing and healthy, balanced, and responsible use of technology.

Why is it important?

Protecting mental wellbeing and combatting misinformation — especially among vulnerable users such as children — is vital to preserving trust, social cohesion, and informed public discourse in the digital age. Safeguarding digital wellbeing is also integral to building a sustainable digital economy, requiring trustworthy AI systems, widespread media literacy, and effective governance frameworks for emotional data and AI-generated content.

Economic outlook

This trend has the smallest potential for value creation over the next 18 months among the 12 trends, yet its outlook remains positive at 3.0%. Growth opportunities are driven by service industries such as media, professional work, and education, and are most significant in the Middle East and Africa. To fully realize the potential value of this trend, stakeholders are encouraged to put into action the measures detailed in the stakeholder recommendations section below.

Country spotlight

In **Pakistan**, policymakers, regulators, educators, and UNESCO co-developed the National Media and Information Literacy strategy. It embeds fact-checking and artificial intelligence content detection in schools and campaigns, proposes a parliamentary working group, and ties digital citizenship to national objectives of connectivity, up-skilling, and innovation, strengthening resilience against misinformation and unhealthy online behaviors.¹³⁹

Total potential economic value creation:

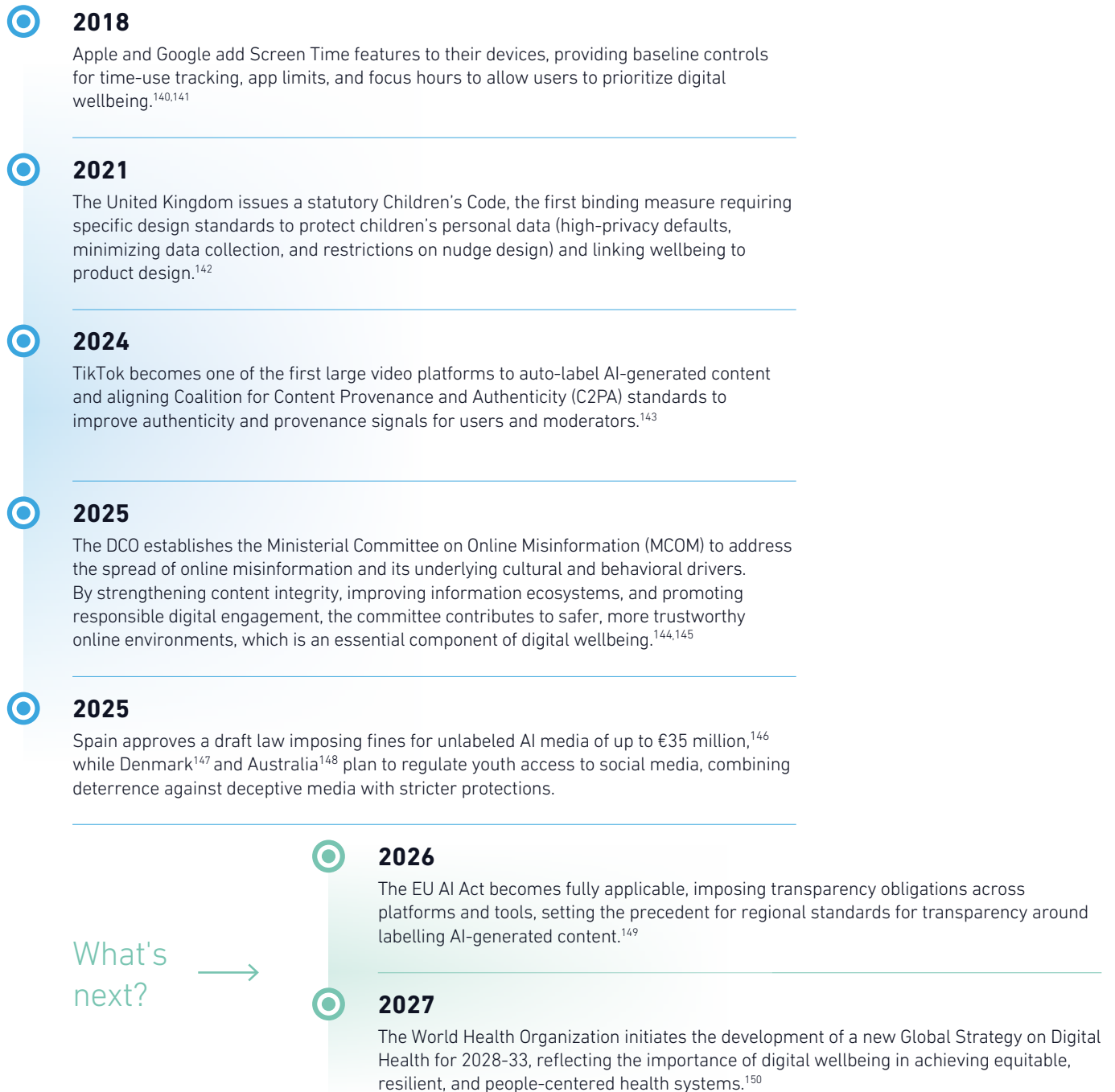
US\$ 2.63 trillion

Growth rate:

3.0%

Notable developments

Overview of past and likely future developments in Safeguarding Digital Wellbeing:



Enabling conditions and countries' readiness

Key drivers

As identified by DET Survey respondents, Safeguarding Digital Wellbeing rests on advances in:



Digital for Health and Education

Age-appropriate design standards, digital services, the inclusion of digital media literacy in school curricula, and the expansion of mental health services can drive wellbeing and sustain trust in digital environments.



Digital for Sustainability

Sustainability-first digital ecosystems that minimize energy use and materials consumption by prioritizing sufficiency over engagement maximization, thereby reducing attention pressure and stress and improving digital wellbeing.



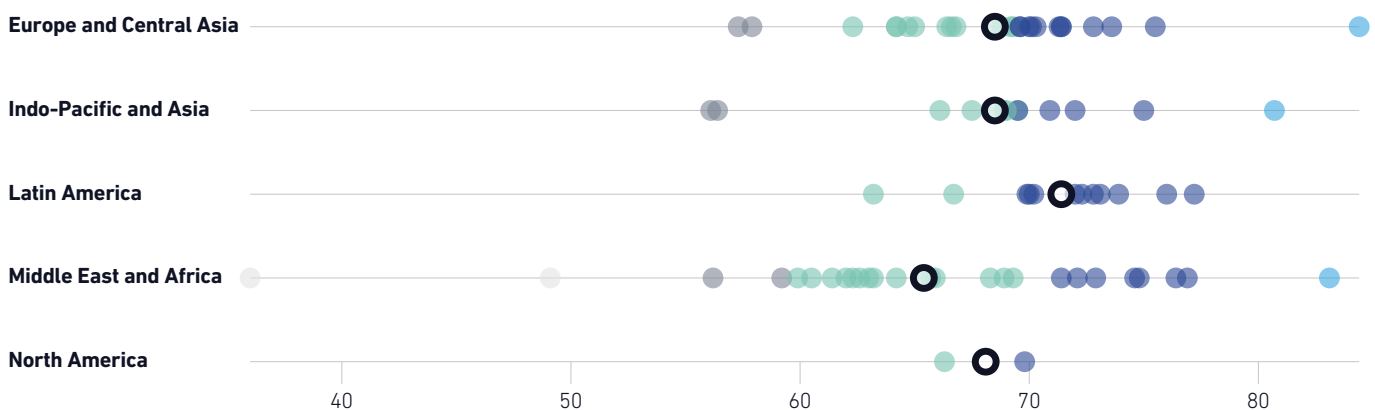
Digital for Social Inclusion

To safeguard digital wellbeing, provenance labels, community oversight, and multilingual interfaces can prevent exclusion or targeted manipulation.

Countries' readiness for trend adoption

When considering these key drivers, global readiness for this trend is shown to be converging. As demonstrated by Figure II.14, Latin America (71.4) leads, driven by strong policy attention to online safety, misinformation, and digital inclusion. Europe and Central Asia (68.5), Indo-Pacific and Asia (68.5), and North America (68.1) follow closely.

Figure II.14: Safeguarding Digital Wellbeing: trend readiness by region



Legend: ● Foundational (<50) ● Functional (50-59.9) ● Established (60-69.9) ● Advanced (70-79.9) ● Pioneer (>80) ● Regional average

Source: Results from the DCO's 2025 Digital Economy Trends Survey combined with data from the DCO's Digital Economy Navigator 2025.

Q: At a global level, select the three key enabling factors countries need in order to benefit from the opportunities provided by the following digital economy trends?

Respondents: 272 CTOs and senior technologists working in large companies (+250 employees), 60 policymakers, and 74 digital economy experts.

How is the trend materializing

Digital lifestyle and wellness

Digital technologies are empowering users with evidence-based guidance on healthier lifestyle choices such as adopting a more balanced diet. For example, an AI-powered app was found to have significantly improved the gut microbiota of 29 adults by guiding them through a six-week personalized nutrition program. The study shows the potential for AI apps to provide trustworthy advice in personal health and wellbeing, an area where online misinformation is prevalent.¹⁵¹

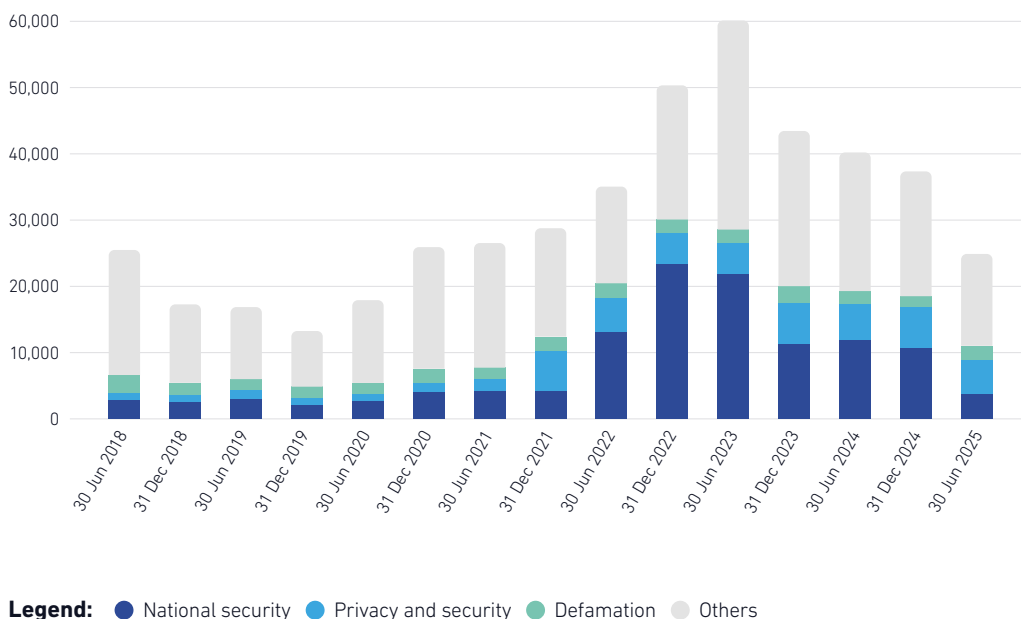
Media and content authenticity

Digital wellbeing increasingly depends on people's ability to trust the content they encounter online. New tools in the media and creative industries are helping users verify whether images and videos are genuine or altered, reducing the spread of manipulated content that can harm mental wellbeing, distort public understanding, and fuel harmful online behaviors. For example, Sony has introduced in-camera authentication for newsroom workflows,¹⁵² while Adobe and Cloudflare are piloting features that attach and verify content credentials.^{153,154}

Content governance

Governments and platforms are increasingly prioritizing content governance measures that balance safety, rights, and digital wellbeing. For instance, Google's Transparency reports (Figure II.15) show that the volume of content removed following government requests has increased nearly threefold since 2018, reflecting growing policy attention to the integrity of online information spaces. At the same time, regulatory efforts are expanding to include media literacy, provenance labeling, and accountability standards that protect users and reinforce trust across digital ecosystems.^{155,156,157}

Figure II.15: Google content removal by reason¹⁵⁸



Legend: ● National security ● Privacy and security ● Defamation ● Others

Source: Google's Transparency report

Frontier use cases

The app Opal for Kids, launched in March 2025, introduces a behavior-change model for children aged 8-12 that combines focus sessions, reward points, and parental scheduling to reduce screen time and improve self-regulation. Evidence from the company's internal survey shows 94% of users report lower distraction.¹⁵⁹

MindGuard AI is pioneering adaptive emotional analytics to support adolescents at risk of serious psychological distress from their social media use. It uses mobile sensors and behavioral pattern recognition to deliver real-time, personalized wellbeing interventions that help mitigate digital overload and emotional fatigue before distress escalates.^{160,161}

Economic, social, and environmental impact

This trend has a relatively low positive economic impact (4.25) but ranks in the top two for social (5.39) and environmental (5.22) impacts, as shown by Figure II.16. A safer digital world does not necessarily translate into greater profits, but improves societal cohesion and reduces negative externalities.

Figure II.16: Safeguarding Digital Wellbeing: expected positive impacts



Legend: ● Average score per impact area

Source: DCO 2025 Digital Economy Trends Survey.

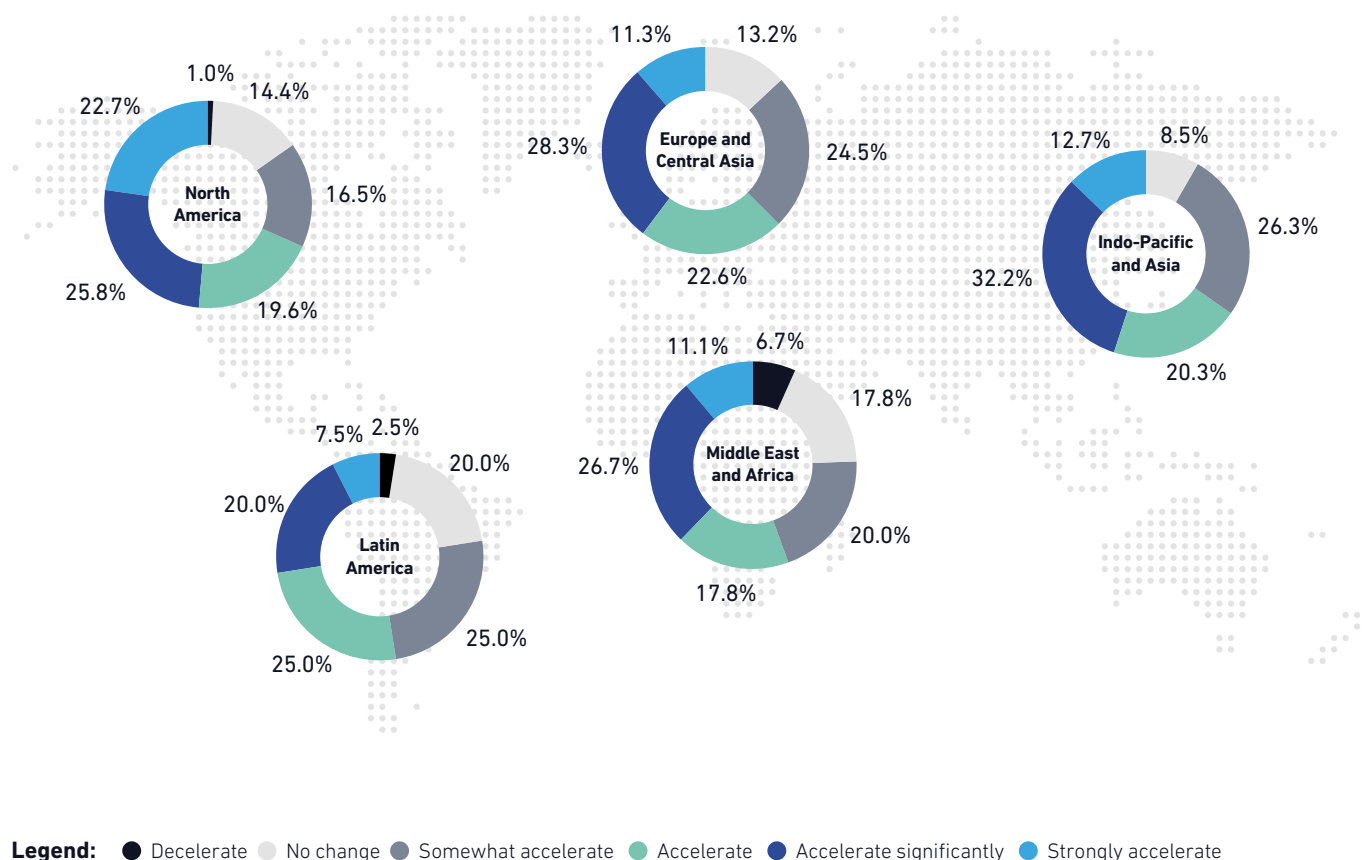
Q: In your country, how would you assess the economic/social/environmental impact of these current digital trends in the next 12-18 months?

Respondents: 272 CTOs and senior technologists working in large companies (+250 employees), 60 policymakers, and 74 digital economy and financial experts.

Pace of change

Around 42% of respondents anticipate this trend to accelerate significantly or strongly, with these expectations the highest in North America (48.5%) and Indo-Pacific and Asia (44.9%). Government respondents (33.3%) remain notably more cautious than their counterparts in the private sector (44.1%).

Figure II.17: Safeguarding Digital Wellbeing: anticipated speed of change by region



Source: DCO 2025 Digital Economy Trends Survey.

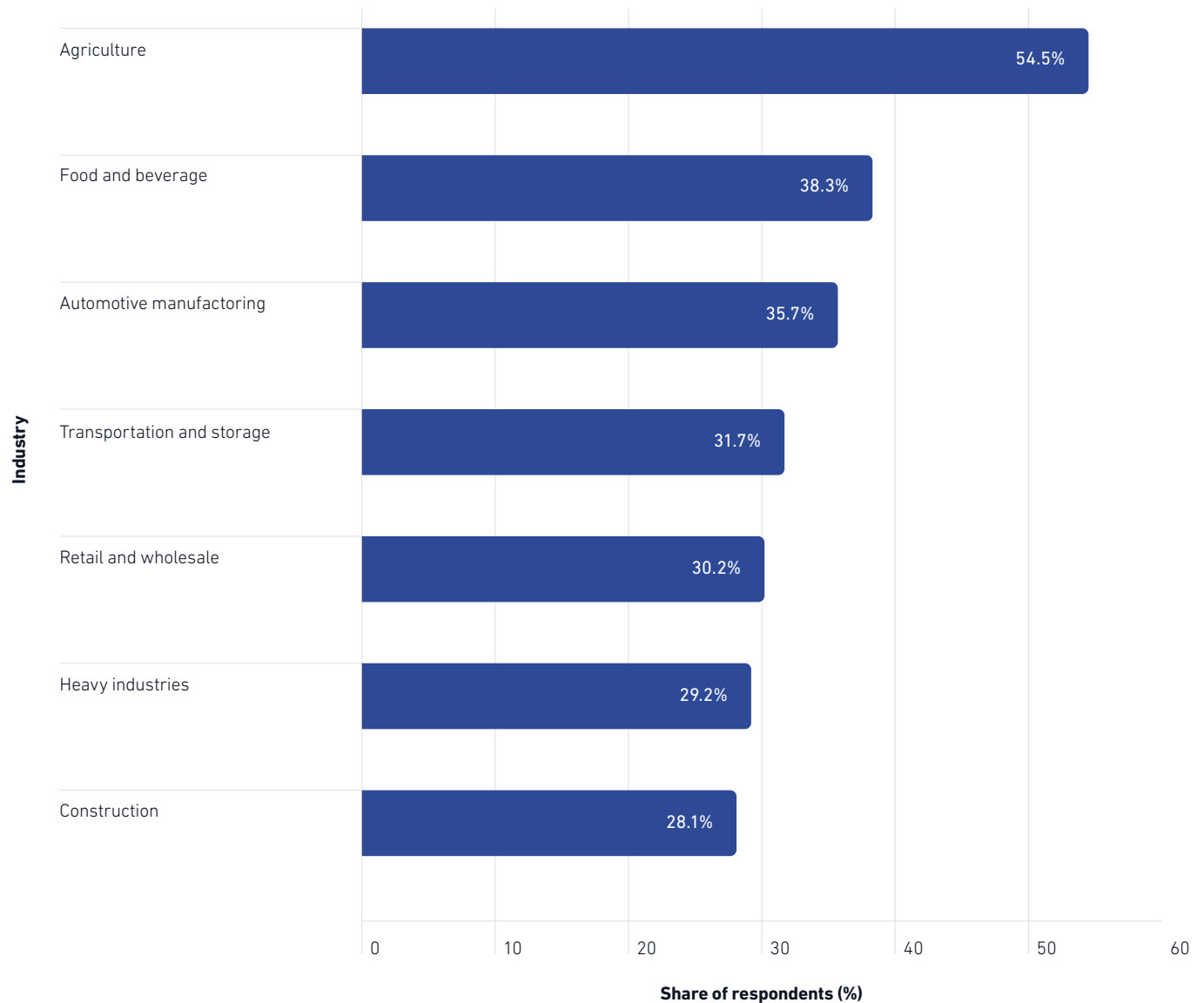
Q: In your country, how do you anticipate the speed at which the following digital economy trends will evolve in the next 12-18 months?

Respondents: 272 CTOs and senior technologists working in large companies (+250 employees), 60 policymakers, and 74 Digital Economy and financial experts.

Industry outlook

As shown by Figure II.18, DET respondents from the agriculture (54.5%) and food and beverage (38.3%) industries are the most optimistic about the potential impact of this trend on their sectors. This optimism likely stems from the holistic nature of wellbeing and the growing awareness of how our physical and mental health is influenced by our online and offline choices. Consumers' decisions on healthy, sustainable, and environmentally-friendly food sources impact both the agriculture industry and food and beverage industries. The growing focus on digital wellbeing is driving a surge in mobile applications that promote healthier lifestyles, integrating features related to physical activity, mindfulness, and nutritious eating.

Figure II.18: Safeguarding Digital Wellbeing: top industries for expected growth



Source: DCO 2025 Digital Economy Trends Survey.

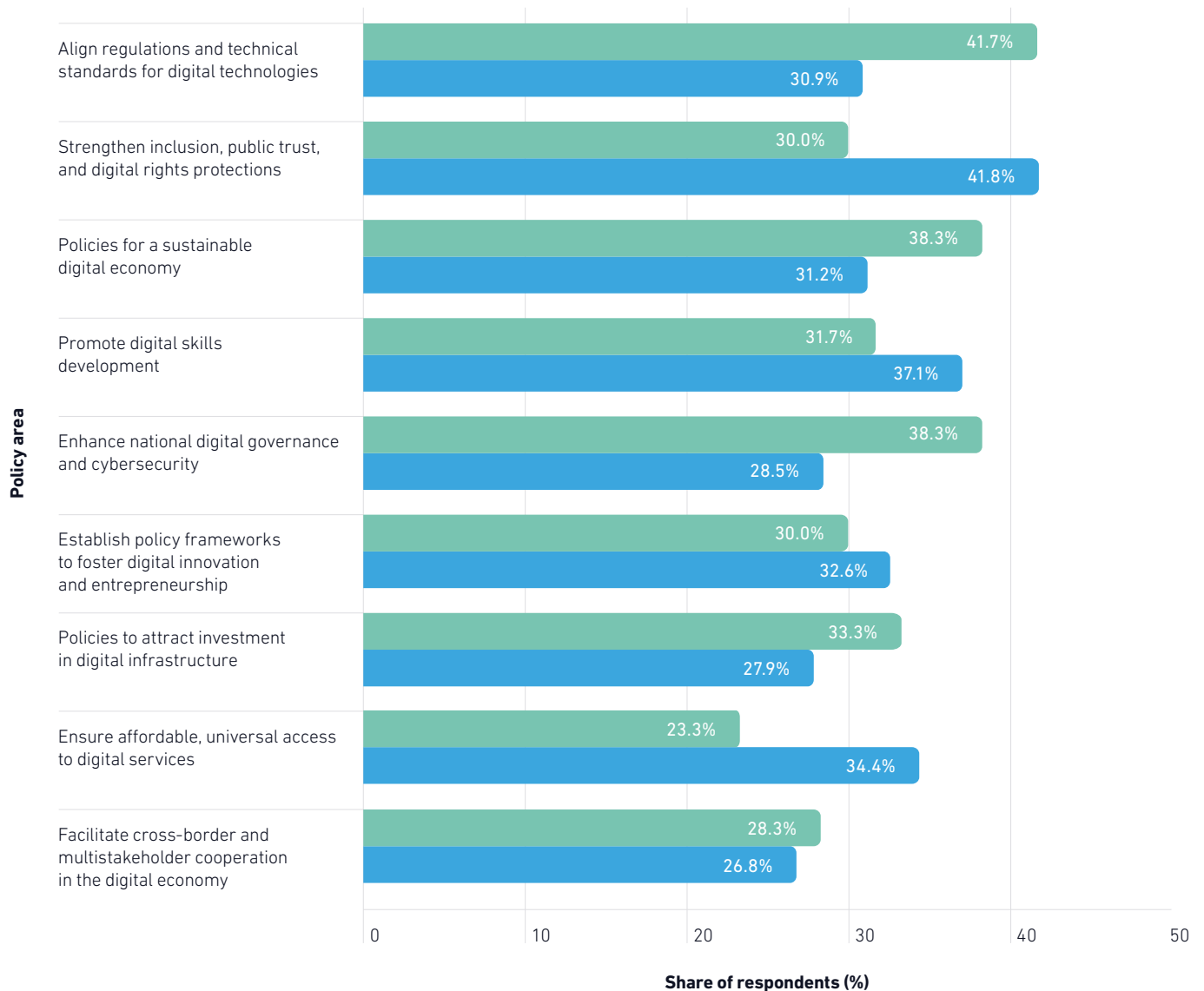
Q: In your industry, select the three digital economy trends, in order of importance, that you expect to create the most growth opportunities (e.g., new markets and customers or reducing operational costs) in the next 12-18 months.

Respondents: 272 CTOs and senior technologists working in large companies (+250 employees) and 74 digital economy and financial experts.

Policy actions

Government respondents favor action to align regulations and technical standards (41.7%) so digital platforms prioritize safety, age-appropriate design, and algorithmic transparency. Private sector respondents focus on strengthening inclusion, public trust, and digital-rights protections (41.8%) and expanding digital skills development (37.1%), as shown by Figure II.19. As digital wellbeing becomes an integral part of health, data privacy is likely to see accelerated regulatory developments. New products and services should integrate privacy considerations from the outset, in particular those targeted at youth.

Figure II.19: Safeguarding Digital Wellbeing: priority policy actions



Legend: ● Public sector ● Private sector

Source: DCO 2025 Digital Economy Trends Survey.

Q: In your country, select the three most critical national policy actions needed for people, businesses, and states to benefit from each of the following current digital economy trends.

Respondents: 272 CTOs and senior technologists working in large companies (+250 employees), 60 policymakers, and 74 digital economy and financial experts.

Asking AI

We asked three leading LLMs (ChatGPT-5, Gemini 2.5 Flash, and DeepSeek-V3.2) to predict the likely impacts of this trend over the next 12-18 months.

Please refer to the methodology annex to see the exact prompts used.

Prompt >_



Economic impact

ChatGPT:

"digital wellbeing will emerge as a measurable business factor. Companies that prioritize healthier online engagement — through mindful app design and balanced digital ecosystems — will gain user trust and retention. By contrast, platforms that ignore wellbeing risks could face regulatory scrutiny and reputational damage, pushing 'responsible design' to become a new competitive standard."



Social impact

Gemini:

"digital interactions are shaping identity, relationships, and mental health at an unprecedented scale. As screen time and AI-driven feeds dominate, people are seeking more authentic, balanced digital experiences. The coming year will likely see a rise in 'digital detox' movements, stricter parental controls, and demand for tools that help users manage attention and emotional wellbeing online."



Environmental impact

DeepSeek:

"promoting digital wellbeing, such as reducing unnecessary streaming and cloud storage, can lead to a net reduction in energy consumption from data centers and devices. A reduced 'always-on' culture could slightly lower the constant energy demand of the digital ecosystem, contributing to a marginal positive environmental effect."

Note: these insights from LLMs are not data driven. They are provided as directional and sentimental and the LLMs have not had access to the survey data.



While the information age has brought major economic and personal benefits, many now feel that constant screen exposure and information overload are harming their well-being. A small but growing countertrend is emerging, with people turning to analogue devices and digital-detox experiences to reclaim balance.

Florian Ramseger
Data scientist and tech-podcaster

Stakeholder recommendations

Private sector

To build user trust, mitigate regulatory risk, and establish digital wellbeing as a competitive advantage, business leaders need to:

Establish cross-industry alliances to co-develop baseline standards for wellbeing-by-design, including age-appropriate controls, attention safeguards, and content provenance labels (such as C2PA) that restore trust in digital content.

Embed 'health-by-design' incentives and metrics into the architecture of digital platforms, such as social media apps and online marketplaces, as a core business risk management strategy prioritizing user wellbeing and engagement.

Collaborate with schools and health providers to offer digital media literacy resources and mental health support, positioning responsible design as a market differentiator that drives sustained user loyalty.

Public sector

To protect vulnerable users, strengthen social cohesion, and build a trustworthy digital ecosystem, policymakers and regulators need to:

Co-create unified, accountable, and open digital safety standards through multilateral cooperation for algorithmic transparency, provenance labeling, and age-appropriate design.

Create sustainable funding mechanisms for digital wellbeing that support media literacy, outcome-based auditing, and regulatory sandboxes, ensuring safer, more inclusive, and trustworthy online environments.

Invest in multilingual curricula deployed through schools, libraries, and community centers to ensure that digital wellbeing protections reach all users, with country readiness scorecards tracking progress.

IGOs, IOs, and others

To democratize digital wellbeing protections, combat misinformation at scale, and ensure no user is left behind, international organizations, civil society, and academia need to:

Convene international public-private coalitions to establish universal principles for digital wellbeing, digital content integrity and authenticity, and equitable access.

Publish evidence-based policy guidance and actionable research on the mental health impacts of immersive technologies, personal assistants, and AI-generated content.

Fund capacity-building initiatives in emerging markets integrating media literacy with community oversight to ensure vulnerable populations receive sufficient support.

Launch a coordinated global program to combat online misinformation, raising public awareness, promoting fact-checking, and amplifying trustworthy sources across digital channels.

● **Current trend**

2.4

Embracing Immersive Hybrid Experiences

Materialization of DET 2025 trend from emerging to current: Embracing Immersive Hybrid Experiences

What does the trend encompass?

The boundaries between physical and virtual worlds are increasingly blurred, as immersive hybrid experiences transform industries and reshape how we live and work. This trend represents a continuum of innovation: from digital twins, as virtual replicas of physical systems enabling real-time monitoring and simulation; to virtual reality (VR), providing immersive simulations of physical environments; and eventually to spatial computing, which seamlessly blends digital information with the physical world.

Why is it important?

Spatial computing, digital twins, and immersive reality can unlock operational efficiency and learning for complex operations and environments. Real-time monitoring and predictive simulations enable proactive failure prediction and system optimization at scale. However, the widespread adoption of these technologies depends on resolving barriers around privacy concerns, cost, usability, and data and operational governance.

Economic outlook

At 4.7%, the potential for value generation over the next 18 months is higher than the average of the digital economy trends featured in this report (4.0%). The outlook is similar across sectors and regions, with the highest growth in gross value-added expected in the Middle East and Africa and North America. Stakeholders can achieve the full value of this trend by following the measures outlined in the stakeholder recommendations section that can be found at the end of this trend profile.

Total potential economic value creation:

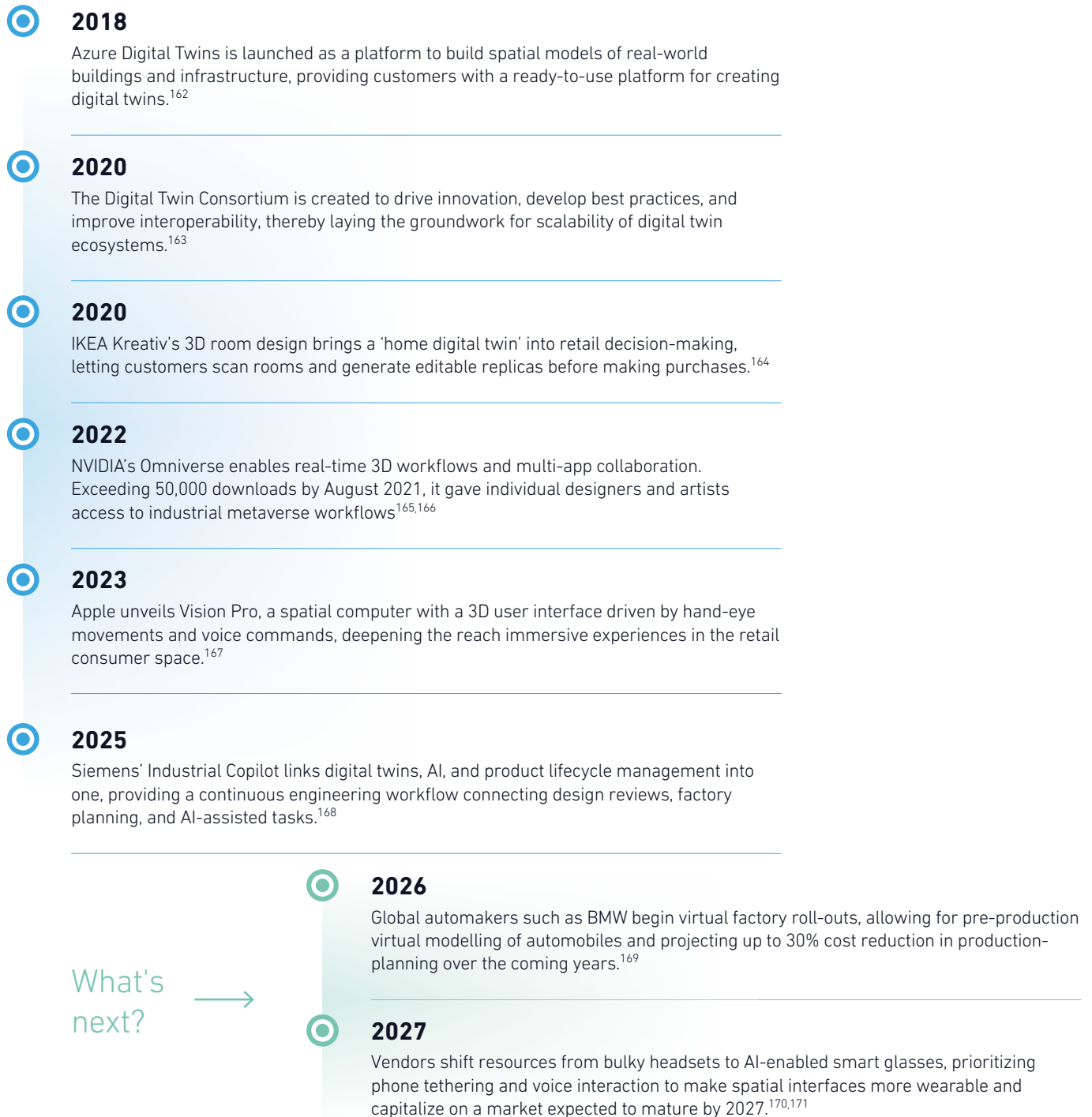
US\$ 4.14 trillion

Growth rate:

4.7%

Notable developments

Overview of past and likely future developments shaping the evolution of Immersive Hybrid Experiences:



Enabling conditions and countries' readiness

Key drivers

According to DET Survey respondents, realizing the potential of Immersive Hybrid Experiences depends on:



Digital Infrastructure

High-speed, low-latency networks with edge compute and 5G and fiberoptic capabilities are central to effectively delivering seamless, real-time hybrid experiences.



Industry Digital Transformation

Accelerating the industrial adoption of hybrid experiences requires redesigning workflows that place spatial interfaces and digital twins within core production and service processes.



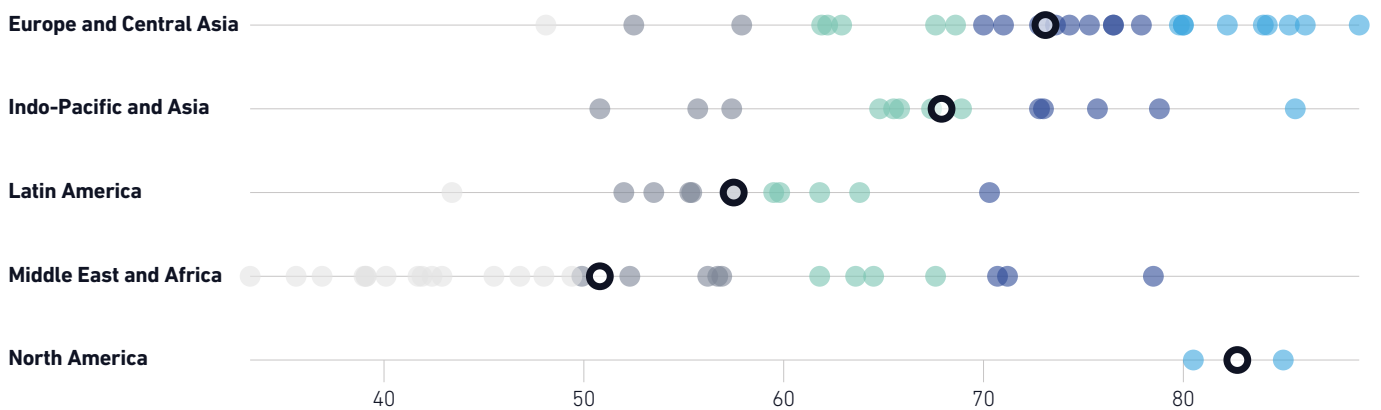
Digital Innovation

Innovation around interoperable 3D software, domain data, and provenance standards with modular tools will allow immersive hybrid experiences to function across vendors, devices, and environments.

Countries' readiness for trend adoption

Based on trend readiness scores for these drivers, as shown by Figure II.20, North America (82.7) leads in readiness with its large-scale enterprise deployment, followed by Europe and Central Asia (73.1), where industrial and training uses dominate. In Indo-Pacific and Asia (67.9), China and Singapore drive innovation-led growth.

Figure II.20: Embracing Immersive Hybrid Experiences: trend readiness by region



Legend: ● Foundational (<50) ● Functional (50-59.9) ● Established (60-69.9) ● Advanced (70-79.9) ● Pioneer (>80) ● Regional average

Source: Results from the DCO's 2025 Digital Economy Trends Survey combined with data from the DCO's Digital Economy Navigator 2025.

Q: At a global level, select the three key enabling factors countries need in order to benefit from the opportunities provided by the following digital economy trends?

Respondents: 272 CTOs and senior technologists working in large companies (+250 employees), 60 policymakers, and 74 digital economy experts.

How is the trend materializing

Healthcare and life sciences

Hospitals are operationalizing spatial guidance and flow twins for operations. For example, Medivis gained FDA approval for augmented reality (AR) spine navigation, empowering surgeons with holographic navigation across spine procedures.¹⁷² In addition, GE HealthCare is using digital twins for surge planning and discharge bottlenecks in children's hospitals in the United States.¹⁷³

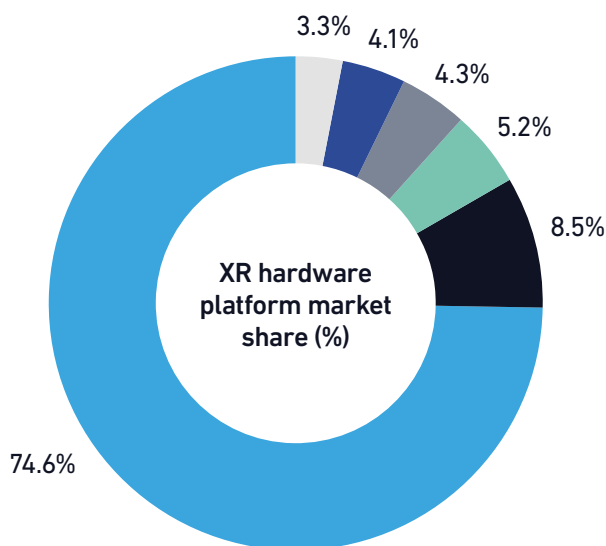
Retail and wholesale

Warehouse and delivery organizations are rolling out AR smart glasses to help employees identify hazards, undertake real-time navigation, and improve delivery processes. Amazon is among the latest to introduce smart glasses that leverage advanced sensing capabilities and computer vision along with cameras to create a heads-up display that includes information on navigation paths and delivery tasks while capturing proof of delivery.¹⁷⁴

Underlying technology

A key requirement for embracing immersive hybrid experiences at scale is the availability of low-latency, affordable, and accessible high-speed 5G networks. There is a clear growth trajectory, with 5G subscriptions growing from 2.3 billion at the end of 2024 projected to reach 2.9 billion by the end of 2025 — making up around a third of all mobile subscriptions.¹⁷⁵ However, there also needs to be an increase in consumer choice in AR headsets. Currently, the market is dominated by one player: Meta held a 74.6% market share in 2024, as shown by Figure II.21, well ahead of Apple (5.2%) with the Vision Pro and Sony (4.3%) with PlayStation VR2. As the market matures, a greater range of devices should become available for both work (video calls and meetings) and creative endeavors (gameplay and design).

Figure II.21: XR hardware platform market share, 2024¹⁷⁶



Legend: ● Meta Platforms ● Apple ● Sony Corporation ● ByteDance ● XREAL ● Others

Source: Treeview's AR, VR, XR, MR, Metaverse and Spatial Computing industry report (2025)

Frontier use case

A digital twin for traffic orchestration creates a cloud-based replica of physical entities such as humans, vehicles, and infrastructure. This technology lets one undertake monitoring, synchronization, and performance enhancement through features such as driver type classification, traffic flow monitoring, variable speed limits, and advanced driver-assistance systems.¹⁷⁷

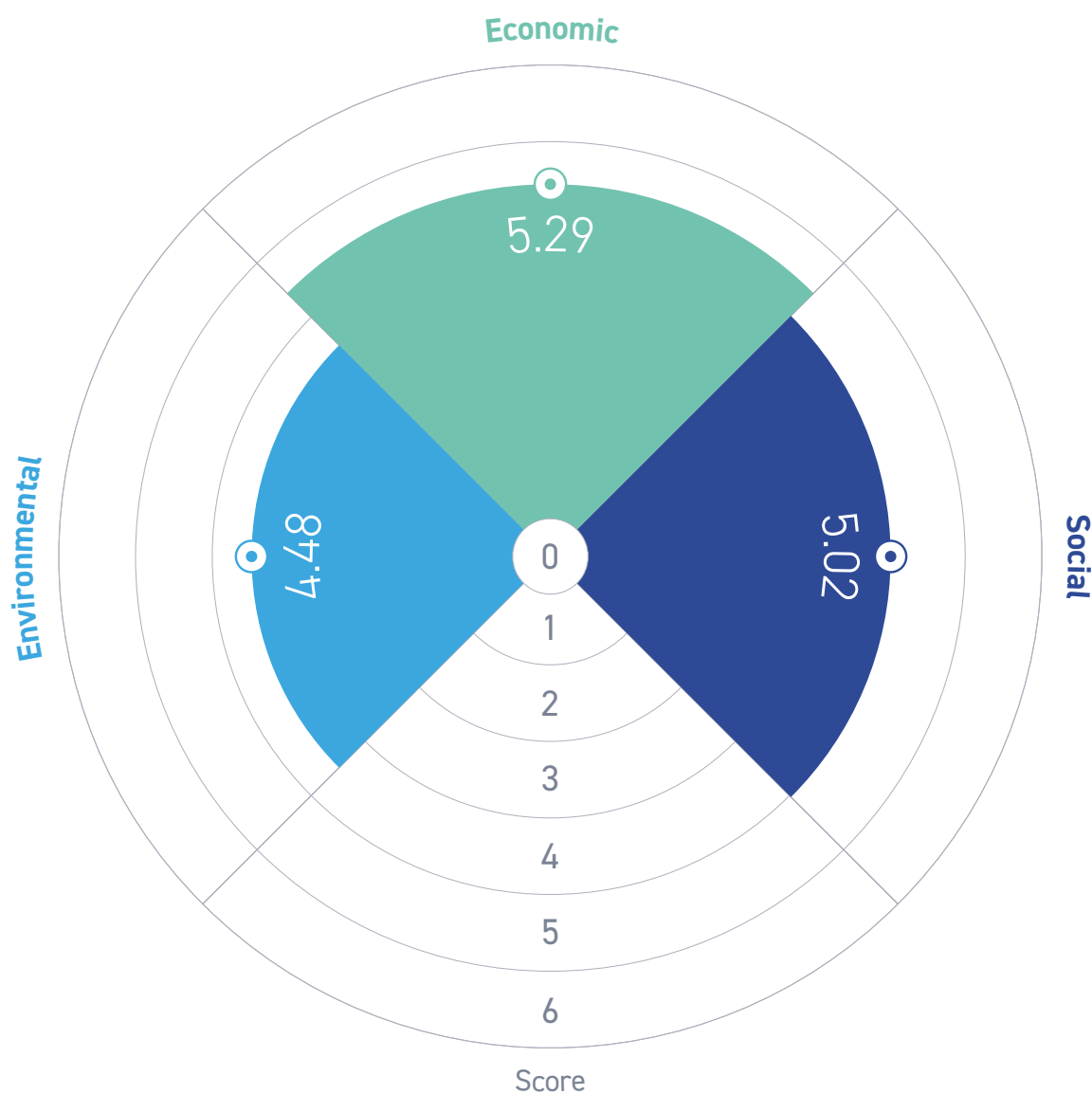
Country spotlight

Bahrain's Information & eGovernment Authority's digital-twin program allows public services to test changes in software before rollout — for example, health apps that manage records, bookings, and insurance — then monitor impact in real time, to improve decisions and reduce service risk.¹⁷⁸

Economic, social, and environmental impact

This trend has strong positive economic (5.29) and social (5.02) impacts, as shown by Figure II.22. Immersive hybrid experiences can enhance engagement, production techniques, and service delivery. High energy requirements help to explain its weaker environmental impact (4.48). The economic impact is highest in North America (5.98).

Figure II.22: Embracing Immersive Hybrid Experiences: expected positive impact



Legend: ● Average score per impact area

Source: DCO 2025 Digital Economy Trends Survey.

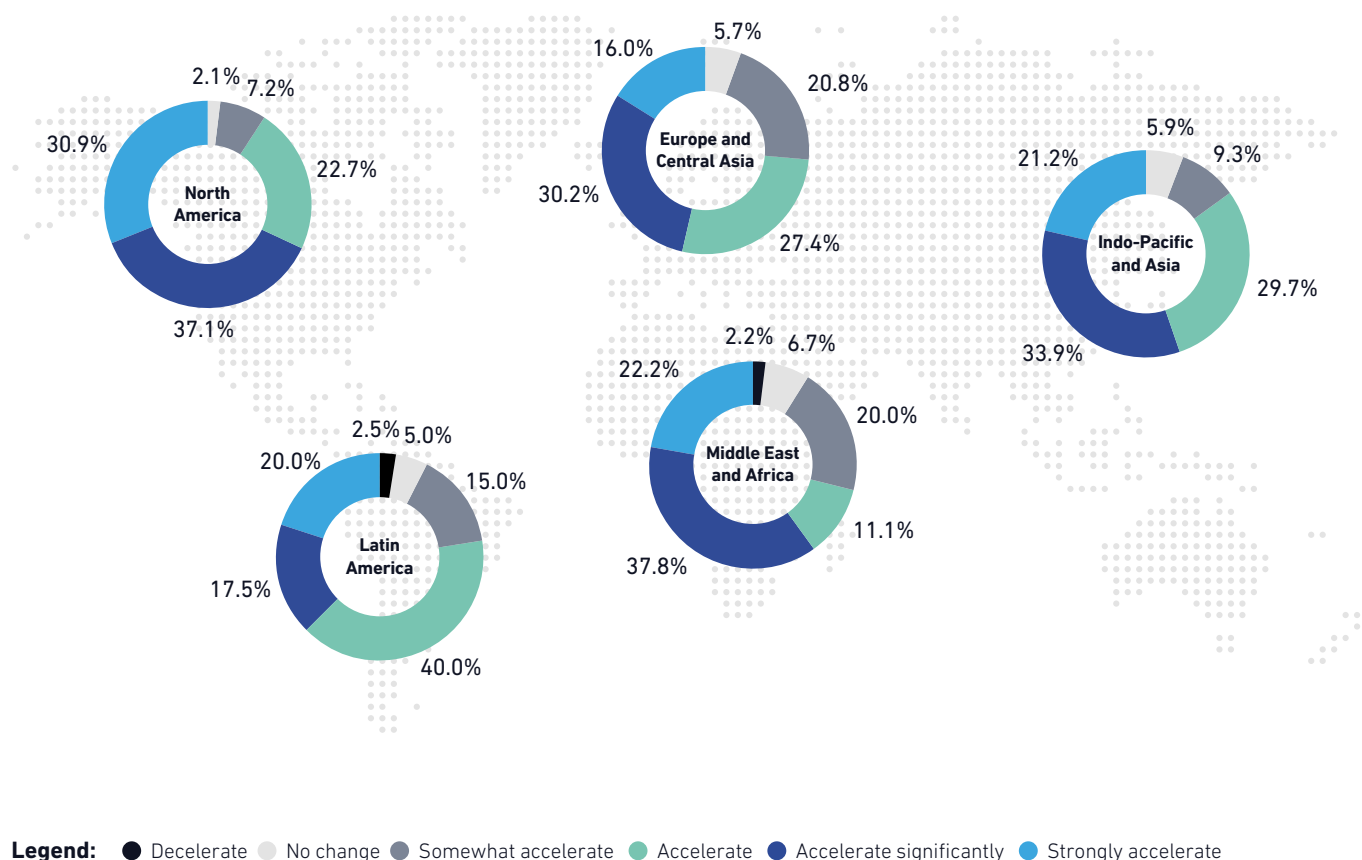
Q: In your country, how would you assess the economic/social/environmental impact of these current digital trends in the next 12-18 months?

Respondents: 272 CTOs and senior technologists working in large companies (+250 employees), 60 policymakers, and 74 digital economy and financial experts.

Pace of change

Expectation of significant or strong acceleration is highest in North America (68%), with Europe and Central Asia (46%) displaying more caution, as shown by Figure II.23. Private sector respondents (58%) are significantly more optimistic than those from government (38%), signaling a need for greater alignment.

Figure II.23: Embracing Immersive Hybrid Experiences: anticipated speed of change by region



Source: DCO 2025 Digital Economy Trends Survey.

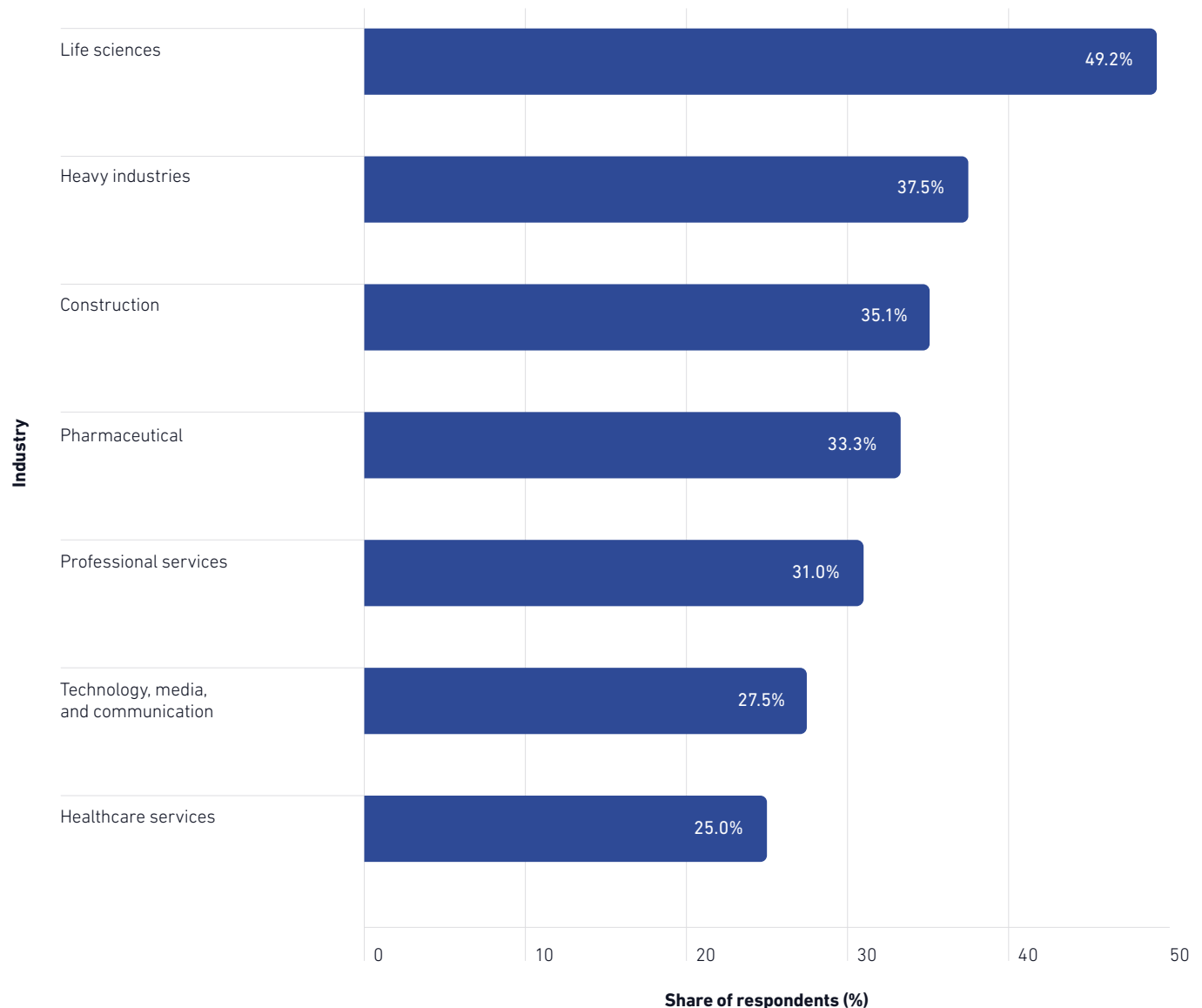
Q: In your country, how do you anticipate the speed at which the following digital economy trends will evolve in the next 12-18 months?

Respondents: 272 CTOs and senior technologists working in large companies (+250 employees), 60 policymakers, and 74 Digital Economy and financial experts.

Industry outlook

Immersive technologies enhance the safety and effectiveness of workers dealing with complex or hazardous physical tasks. Consistent with this observation, DET respondents expect the strongest impact in life sciences (49.2%), as shown by Figure II.24, as immersive simulations and visualizations improve collaboration in design, training, and knowledge creation and transfer. Heavy industries (37.5%) ranks second, as digital twins, remote inspections, and AR-driven maintenance reduce downtime and improve safety. As already noted in the DET 2025, digital twins present unique opportunities for urban planning and construction (35.1%), as city level virtual models enable authorities to test and optimize public service delivery and simulate with unique precision the effects of various possible disasters.

Figure II.24: Embracing Immersive Hybrid Experiences: top industries for expected growth



Source: DCO 2025 Digital Economy Trends Survey.

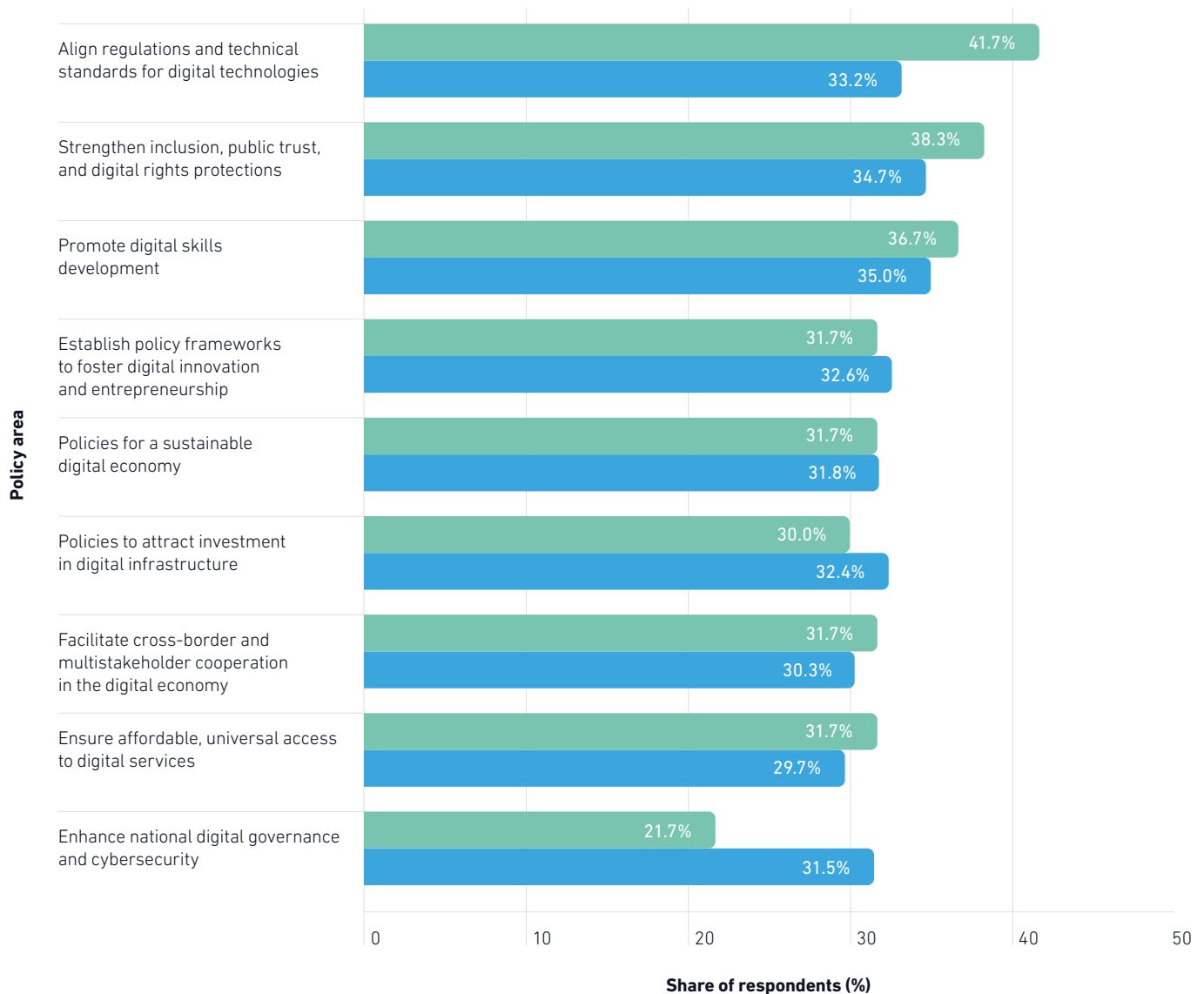
Q: In your industry, select the three digital economy trends, in order of importance, that you expect to create the most growth opportunities (e.g., new markets and customers or reducing operational costs) in the next 12-18 months.

Respondents: 272 CTOs and senior technologists working in large companies (+250 employees) and 74 digital economy and financial experts.

Policy actions

As shown by Figure II.25, the top policy priority for government respondents is aligning regulations and technical standards (41.7%) to ensure safety, interoperability, and reliability across devices, platforms, and venues that enable immersive hybrid experiences. Industry leaders are making significant progress: the Metaverse Standards Forum and International Symposium on Emerging Metaverse are promoting open standards for cross-platform interoperability, while Khronos Group's OpenXR 1.1 is standardizing device inputs.^{179,180} Private sector respondents consider promoting digital skills development (35.0%) and strengthening inclusion (34.7%) to be the most important policy priorities for embracing immersive hybrid experiences.

Figure II.25: Embracing Immersive Hybrid Experiences: priority policy actions



Legend: ● Public sector ● Private sector

Source: DCO 2025 Digital Economy Trends Survey.

Q: In your country, select the three most critical national policy actions needed for people, businesses, and states to benefit from each of the following current digital economy trends.

Respondents: 272 CTOs and senior technologists working in large companies (+250 employees), 60 policymakers, and 74 digital economy and financial experts.

Asking AI

We asked three leading LLMs (ChatGPT-5, Gemini 2.5 Flash, and DeepSeek-V3.2) to predict the likely impacts of this trend over the next 12-18 months.

Please refer to the methodology annex to see the exact prompts used.

Prompt >_



Economic impact

ChatGPT:

"Immersive hybrid technologies will move from pilots to productivity tools in logistics, retail, and manufacturing. Firms adopting digital twins and real-time analytics will reduce costs 5–10% through predictive maintenance and optimized workflows. Uneven adoption will widen competitiveness gaps, potentially accelerating consolidation in tech-intensive sectors."



Social impact

Gemini:

"Immersive hybrid experiences will deliver both greater relational presence and sharper digital divides over the next 12–18 months. Real-time data in virtual spaces will enhance global accessibility and connection, but reliance on continuous biometric and behavioral data will heighten privacy and surveillance concerns."

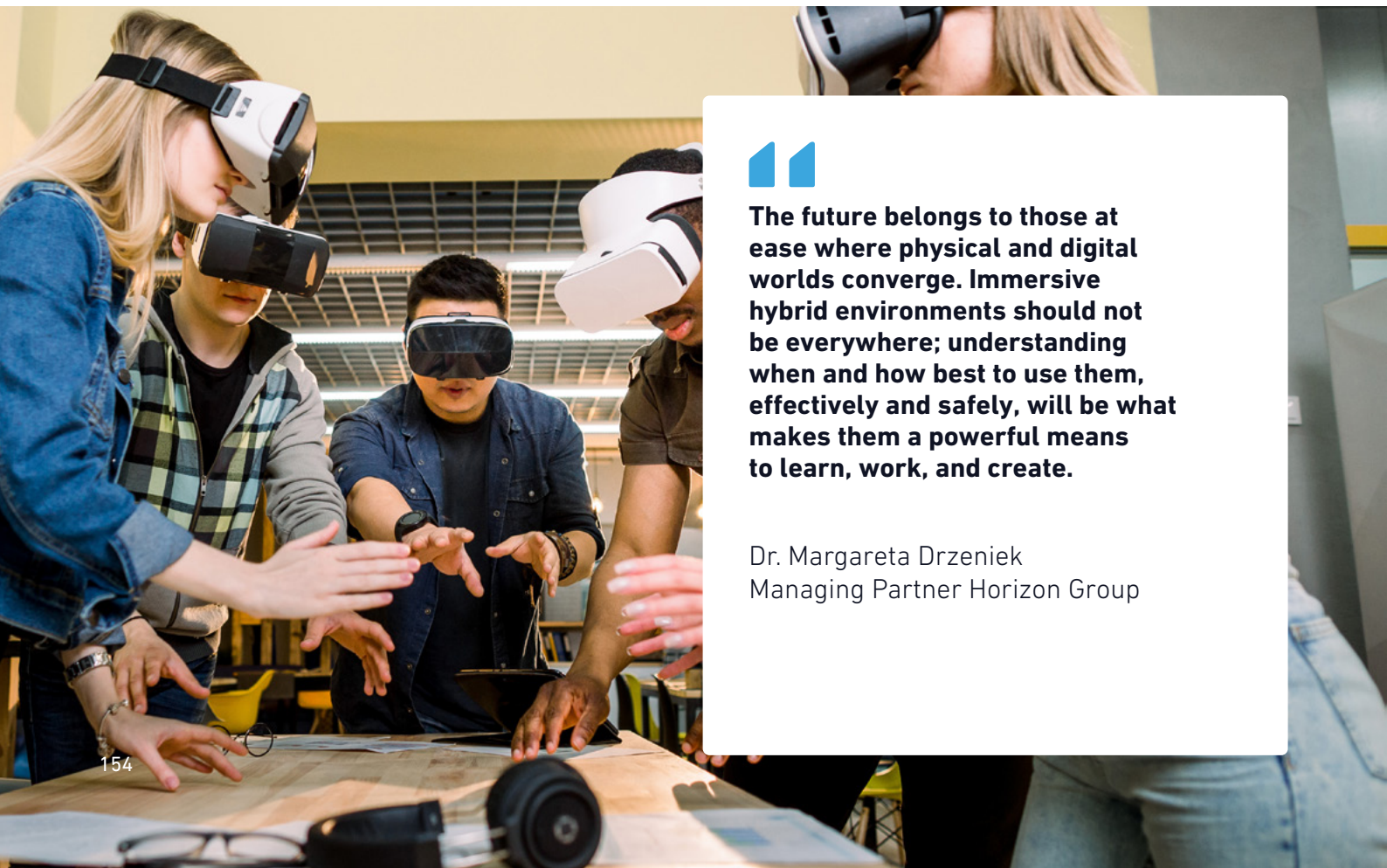


Environmental impact

DeepSeek:

"The environmental impact of immersive hybrid technologies will be double-edged. Digital twins and simulations will optimize energy use and reduce emissions, but powering data centers for real-time rendering will consume substantial energy. Net benefits will depend on industries adopting renewable energy for infrastructure."

Note: these insights from LLMs are not data driven. They are provided as directional and sentimental and the LLMs have not had access to the survey data.



The future belongs to those at ease where physical and digital worlds converge. Immersive hybrid environments should not be everywhere; understanding when and how best to use them, effectively and safely, will be what makes them a powerful means to learn, work, and create.

Dr. Margareta Drzeniek
Managing Partner Horizon Group

Stakeholder recommendations

Private sector

To unlock enterprise-wide optimization, reduce downtime, and build competitive advantage through real-time physical–digital integration, business leaders need to:

Co-develop cross-sectoral alliances to prevent vendor lock-in by establishing pre-competitive, open, and interoperable standards for the foundational plumbing of digital twins, spatial computing, and extended reality (XR) systems.

Align on common and shared disclosure metrics of hybrid-experience use cases to unlock investment by reporting on cost savings, safety improvements, and accessibility gains benchmarked against traditional performance indicators.

Accelerate innovation and manage risk by establishing industrial metaverse sandboxes that create shared reference architectures for federated data-sharing to collaboratively train AI models on privacy-preserved data that does not provide access to proprietary information.

Invest in workforce upskilling programs that build practical expertise in XR design, spatial data management, and digital twin operation, ensuring employees can effectively create, maintain, and optimize immersive hybrid environments.

Public sector

To enable safe, inclusive deployment while building national resilience and catalyzing private sector innovation, policymakers and regulators need to:

Champion interoperable policy frameworks that designate virtual replicas of critical public systems — for example, energy grids, transportation networks, and healthcare facilities — as essential public goods.

Co-create open and auditable standards for AI and data sovereignty, user consent, and meaningful algorithmic transparency for devices, platforms, and use cases that balance innovation with privacy, safety, and accessibility requirements.

Leverage public procurement to catalyze trustworthy solutions in priority sectors such as healthcare, energy, urban transport, and natural disaster readiness.

Establish enforceable digital rights for individuals in hybrid environments that explicitly address the risks of continuous biometric and behavioral data collection, especially in public and/or youth-focused contexts.

IGOs, IOs, and others

To safeguard digital rights, bridge the digital divide, and ensure the equitable global adoption of immersive technologies, intergovernmental organizations, international organizations, civil society, and academia need to:

Advance the adoption of a shared set of global norms for data ownership, user consent, and responsible AI governance in the merging of physical and virtual worlds.

Convene governments, industry, researchers, and civil society to co-design model policies and technical benchmarks that can be adopted by states and communities to address privacy and surveillance risks from continuous biometric and behavioral data collection in virtual/physical worlds.

Fund training networks and technology transfer programs for emerging economies focusing on healthcare, infrastructure, and climate resilience to ensure widespread capacity building and avoid deepening the digital divide.

Establish international standards and certification frameworks for immersive technologies to ensure interoperability, user safety, ethical use, and equitable access across borders, fostering trust and enabling scalable, responsible adoption of hybrid physical–virtual experiences.

◆ Emerging trend

2.5

The AI Divide

Evolution of DET 2025 trend: Evolving Digital Cultures, Social Connections, and Behaviors

What does the trend encompass?

The gap is growing between those with access to advanced AI capabilities and those without. AI's transformative benefits are unevenly distributed, concentrated among a few large technology companies and regions. This is amplifying existing inequalities in digital capabilities and cyber resilience between large and small organizations and developed and emerging economies. This growing AI divide challenges leaders to implement targeted interventions that promote equitable outcomes and prevent lasting technological stratification.

Why is it important?

The concentrated nature of AI capacity — in data, compute, and expertise — could amplify global inequality and create systemic vulnerabilities, as under-resourced organizations become weak points in interconnected systems. The AI divide poses threats to economic stability, social cohesion, and security by entrenching technological dependence and uneven competitiveness. International cooperation, technology transfer, and equitable access strategies are essential to ensure that AI-driven progress strengthens resilience rather than deepening divides.

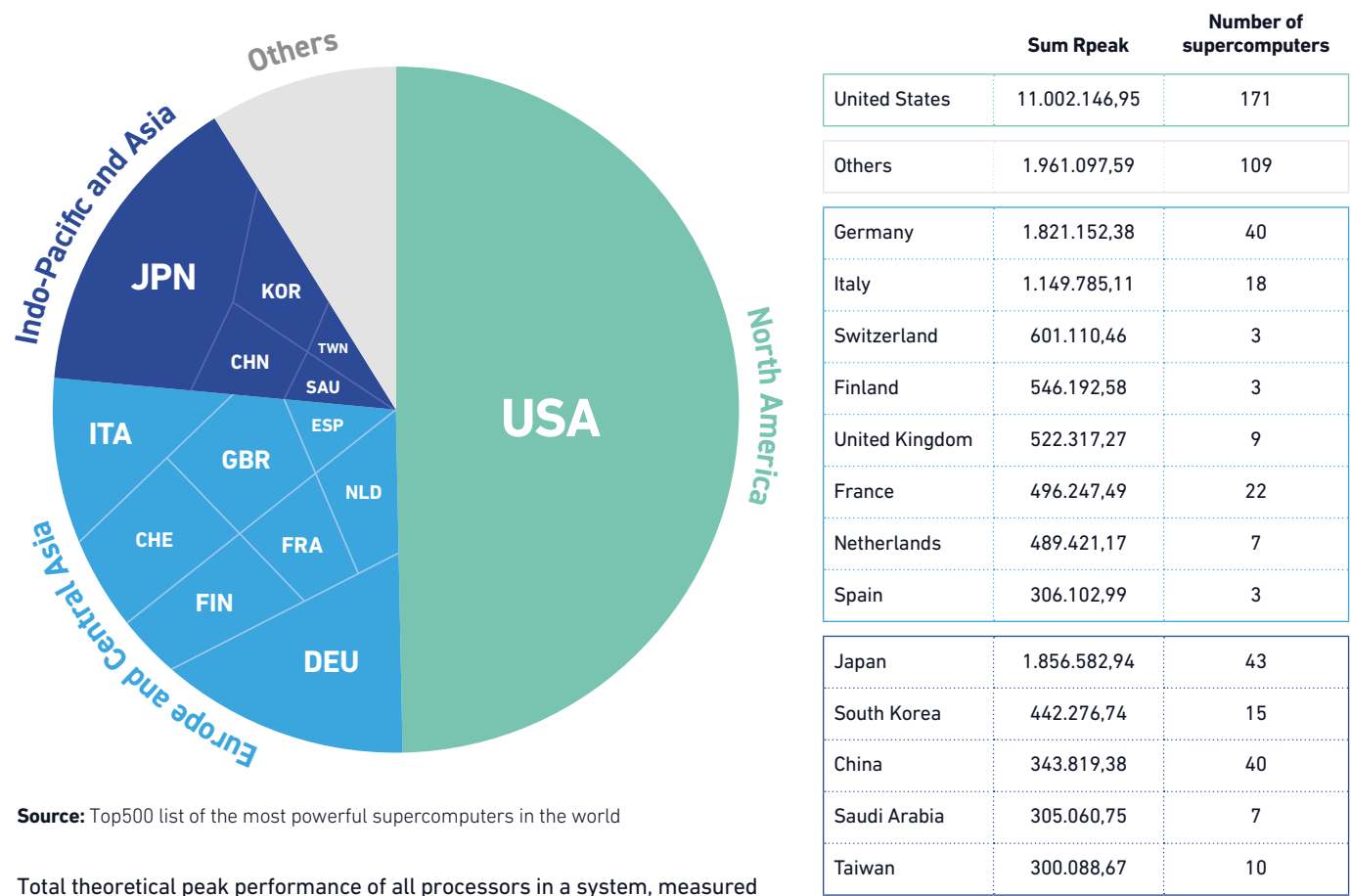
Impacts on the horizon

Over the next 3-5 years, AI gains could continue to centralize in a few providers and countries, raising costs and skills barriers elsewhere, and pushing smaller firms and public services to the margins. Current trends in AI-related infrastructure and investments could lead to high-income nations capturing the high-value stages of the AI chain, compounding existing global inequalities. For example, data centers, advanced hardware setups for AI workloads, are highly concentrated with the US having more than ten times as many as any other country. The US also clearly dominates in terms of computing power with 50% of the combined maximum achievable performance of the world's top 500 supercomputers, as shown in Figure II.26. A similar pattern is visible for private investment in AI: in 2024 the US invested nearly 12 times more than China and five times more than Europe (Figure II.27). Effectively countering this would require shared national compute, local-language datasets, and cheaper open-source models for wider accessibility.

Spotlight

A new class of low-cost phones enables real-time, on-device speech translation, mitigating cloud cost and connectivity challenges. Featuring multiple languages, which are compressed for space optimization, these devices are ideal for offline and low-resource settings — a practical example of cost-effective AI at the edge for users without reliable or cheap data.¹⁸¹

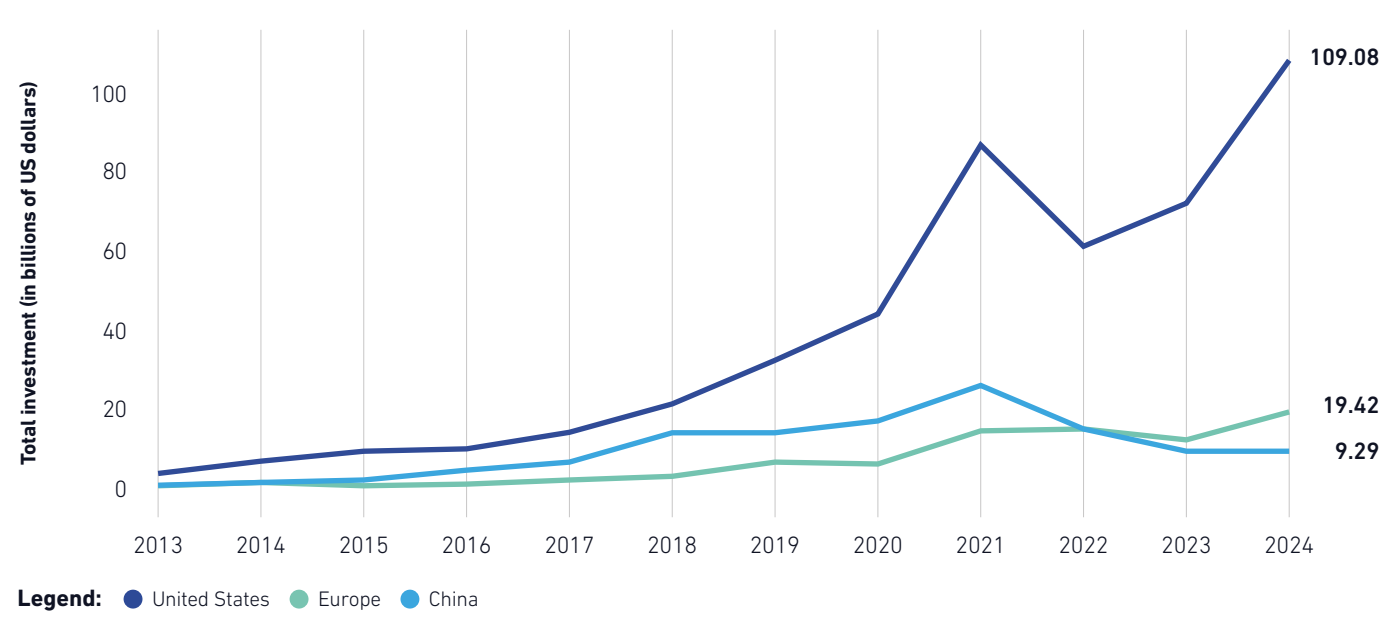
Figure II.26: Top countries by computing power, November 2025¹⁸²



Source: Top500 list of the most powerful supercomputers in the world

Total theoretical peak performance of all processors in a system, measured in FLOPS.

Figure II.27: Global private investment in AI in US, Europe and China, 2013-24¹⁸³



Source: Stanford University's AI Index report (2025)

Potential developments

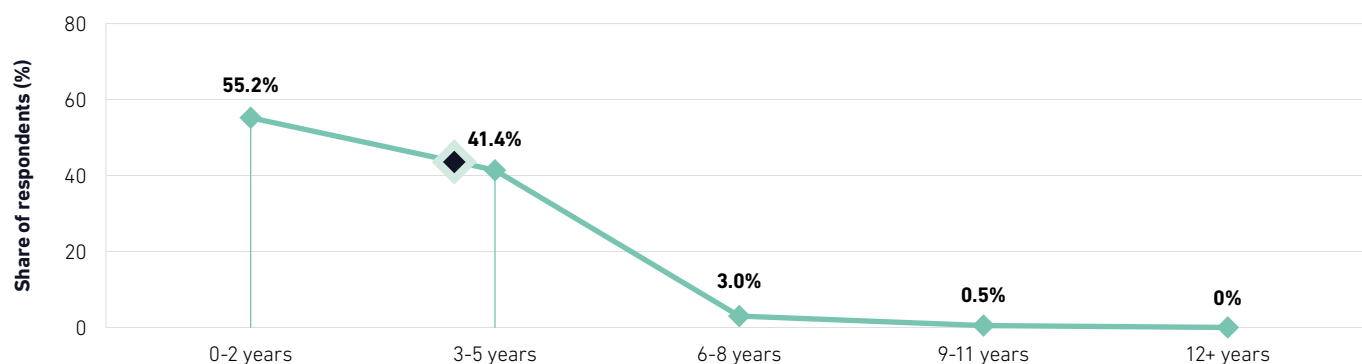
Prospective future turning points that could catalyze this trend into rapid, widespread materialization:

- 2026**
 Shared national compute expands access as programs such as the India AI Mission, EU's EuroHPC AI Factories, and US National Artificial Intelligence Research Resource provide subsidized access to GPU compute, data, and models for startups, SMEs, and researchers.^{184,185,186}
- 2027**
 AI capacity expands in Latin America with Google investing in Chile's trans-Pacific undersea cable and Microsoft's 3 year 14.7 billion Reais investment in Brazil, which includes AI upskilling for 5 million people, combining AI human capital, and cloud computing capacity with a low-latency data gateway to Asia-Pacific.^{187,188}
- 2030**
 The African Union's Continental AI Strategy completes its 2025-30 cycle, which is projected to deliver shared data infrastructure, vertical AI integration, and upskilling programs, decreasing the compute, data, and talent gaps that drive the AI divide.¹⁸⁹

When will this trend materialize?

Most DET 2026 survey respondents (55.2%) expect this trend to materialize within the next 2 years, as shown by Figure II.28, and more than 90% in the next 4 years. Those in North America expect the quickest materialization. Private sector and government respondents are aligned.

Figure II.28: The AI Divide: likely materialization timeline



Legend: ◆ Expected number of years until materialization (average)

Source: DCO 2025 Digital Economy Trends Survey.

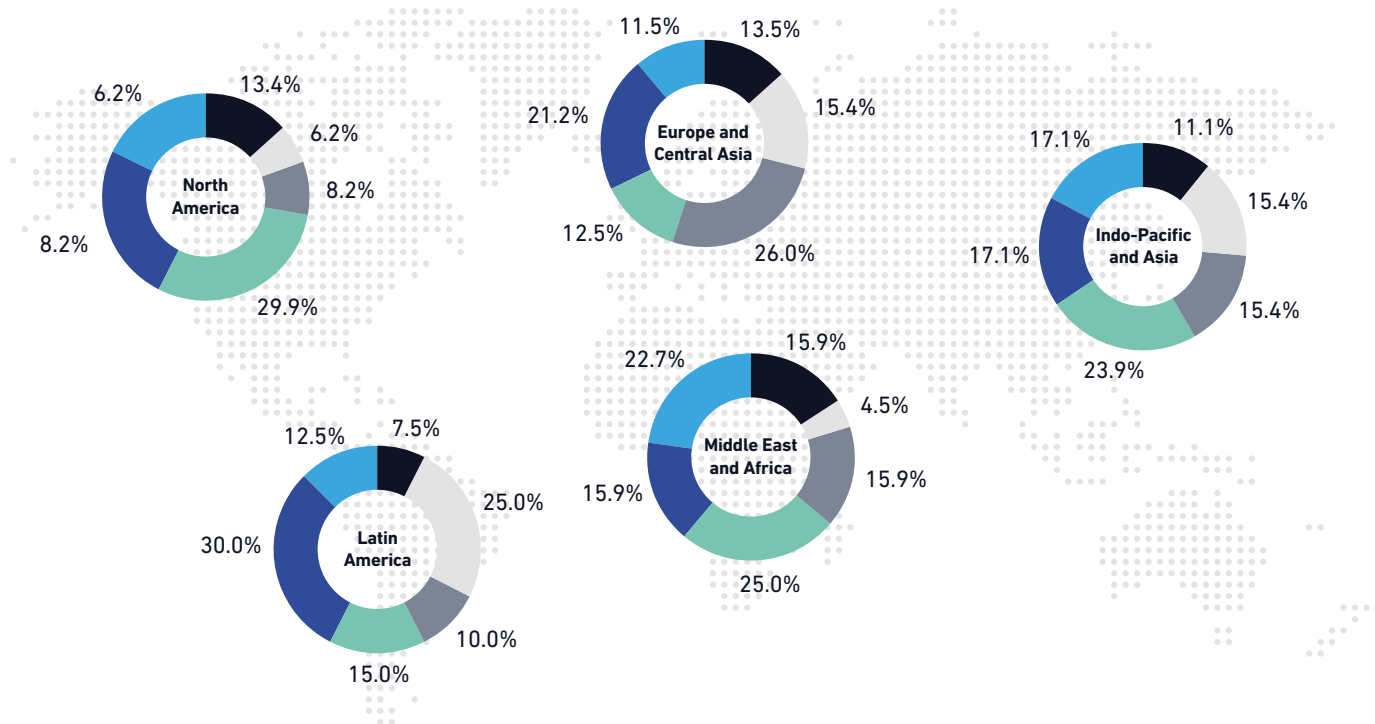
Q: In your country, when do you expect the following emerging digital economy trends to affect businesses and societies?

Respondents: 272 CTOs and senior technologists working in large companies (+250 employees), 60 policymakers, and 74 digital economy and financial experts.

Expected socio-economic impact in 3-5 years

Respondents overall expect this trend to have a positive socio-economic impact, although Figure II.29 shows that views are mixed: those in the Middle East and Africa are the most likely to foresee either extremely positive (22.7%) or negative (15.9%) impacts. Government and private sector respondents differ only marginally.

Figure II.29: The AI Divide: expected socio-economic impact by region



Legend: ● Negative ● No impact ● Somewhat positive ● Positive ● Very positive ● Extremely positive

Source: DCO 2025 Digital Economy Trends Survey.

Q: In your country, to what extent do you believe the following emerging trends will have a net positive or negative socio-economic impact in the next 3-5 years?

Respondents: 272 CTOs and senior technologists working in large companies (+250 employees), 60 policymakers, and 74 digital economy and financial experts.

How can stakeholders prepare?

DET Survey respondents identified the following key drivers as critical to avoid widening the AI Divide:



Digital Infrastructure

Addressing the AI divide starts with improving affordability and expanding the reach of digital connectivity to currently underserved populations across regions. Everyone, everywhere should have access to digital connectivity at low cost and latency.



Digital Innovation

Scaling open-source AI models and interoperable frameworks will support different economies and innovators to customize solutions efficiently, fostering a more balanced global AI landscape.



Digital Capabilities

Beyond access to AI, people need the knowledge and know-how to deploy and maximize its use. Universal access to AI literacy and digital skills are at the core of addressing the growing AI divide between and within countries.



Industry Digital Transformation

How industries integrate AI will shape how widely its benefits are shared. Adapting AI to economic, social, or organizational contexts, sharing knowledge and best practices from early adopters, and maintaining fair competition can help narrow the AI divide.



Digital for Work and Training

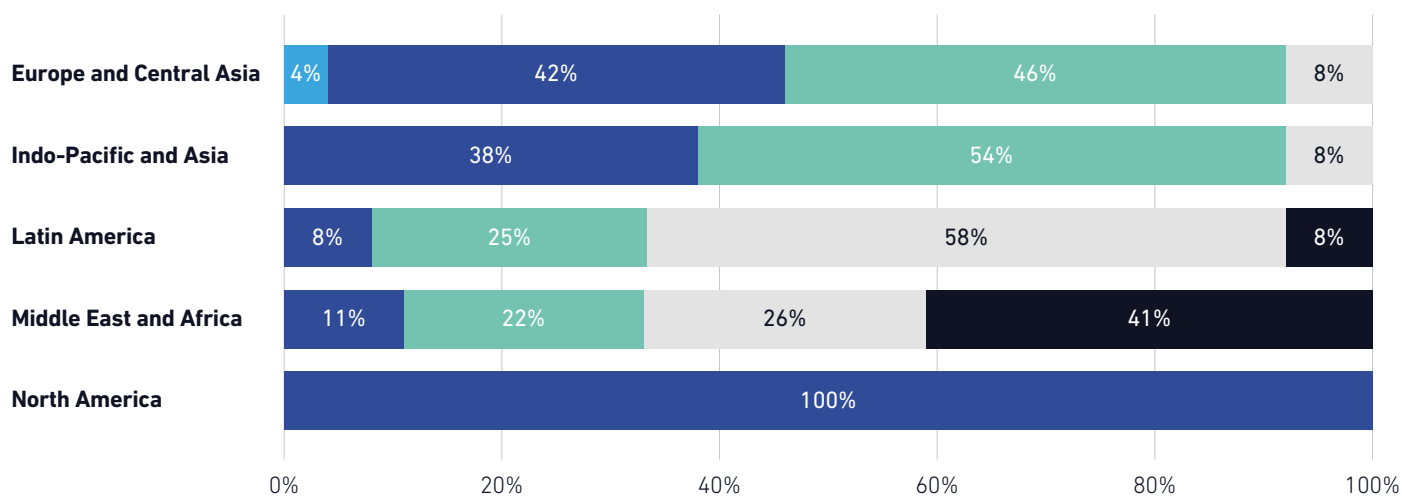
AI adoption is transforming skill requirements, creating new demands for work-based learning pathways and micro-credentials tied to AI-related tasks to broaden participation and ensure an equitable distribution of skills.



Countries' preparedness for trend materialization

Aggregating DEN scores for these key drivers, only one economy — in Europe — has *leading* preparedness for this trend. Both economies in North America are *evolving*, reflecting the region's lead in compute, data platforms, and enterprise deployment. Economies in Europe and Central Asia are mostly split between *evolving* (42%) and *positioning* (46%), revealing uneven AI diffusion. Indo-Pacific and Asia skews toward *positioning* (54%) with a substantial subset in the *evolving* (38%) stage, while Latin America is primarily *developing* (58%). Meanwhile, the Middle East and Africa is largely *experimenting* (41%) with some *evolving* (11%) countries in the Gulf region. How these divides evolve depends on affordable compute, data governance frameworks, and specialist talent pipelines.

Figure II.29: The AI Divide: trend preparedness by region



Legend: ● Experimenting (<50) ● Developing (50–59.9) ● Positioning (60–69.9) ● Evolving (70–79.9) ● Leading (>80)

Source: DCO 2025 Digital Economy Trends Survey.

Q: At a global level, select the three key enabling factors countries need in order to benefit from the opportunities provided by the following digital economy trends.

Respondents: 272 CTOs and senior technologists working in large companies (+250 employees), 60 policymakers, and 74 digital economy and financial experts.

Open questions

As AI capacity increasingly concentrates among a few providers and regions, how can AI education, talent development, and knowledge transfer programs be structured to build local expertise in underrepresented regions, enabling sustainable participation in AI-driven economic growth?

Expanding local-language datasets and open-source models raises privacy, IP, and safety risks. What rights-preserving frameworks would enable data sharing, evaluation, and redress in low-resource contexts?

Global or regional progress can mask widening gaps between countries. What frameworks, metrics, or audit structures would detect early exclusion of low-resource countries, SMEs and public services and trigger corrective resource reallocation?

Asking AI

We asked a leading LLM: what are the potential benefits, challenges, and considerations for this trend over the next 3-5 years?

Please refer to the methodology annex to see the exact prompts used.

Prompt >_

ChatGPT response

Potential benefits

"Building a digitally safe and inclusive world can ensure that the benefits of AI reach everyone, not just advanced economies or large corporations. Inclusive AI strategies can expand access to education, healthcare, and financial services for underserved communities. By embedding safety, transparency, and fairness in AI design, societies can foster innovation while protecting citizens from bias, misinformation, and harm — strengthening both trust and participation in the digital economy."

Key challenges

"A widening AI divide threatens to deepen inequality between and within countries. Advanced economies are capturing most AI talent, infrastructure, and data, while many regions lack digital literacy and connectivity. Without strong governance, AI systems can amplify social bias, exploit personal data, and spread disinformation. The absence of shared safety standards also leaves citizens and small businesses vulnerable to manipulation and exclusion."

Strategic considerations

"Governments, tech firms, and global institutions must work together to ensure equitable access to AI tools, data, and education. Investments in digital infrastructure, AI ethics training, and open-source technologies can help bridge the gap. International cooperation on safety standards and algorithmic accountability is essential to create a secure, human-centered AI ecosystem where no region or community is left behind."

Note: these insights from LLMs are not data driven. They are provided as directional and sentimental and the LLMs have not had access to the survey data.



Digital strategies must reflect a country's level of development. While AI is often highlighted, foundational digital skills, technical capabilities, and robust data governance are equally important to ensure sustainable progress.

Dr. Antonio Zaballos
Director, Digital Sector Office, Asian Development Bank

Stakeholder recommendations

Private sector

To extend the benefits of the AI era to developing countries, small businesses, and public services, and mitigate risks from a concentrated AI market, business leaders should:

Co-develop AI access compacts with governments and development partners to provide affordable computing power, sector-specific tools, and training for SMEs.

Design products with portability and open APIs to lower switching costs and empower smaller competitors to innovate, creating competitive advantage by enabling ecosystem resilience rather than vendor lock-in.

Form cross-industry consortia to share open-source models, co-develop local-language datasets, and establish shared infrastructure for AI experimentation and deployment.

Publish transparent metrics, verified by independent audits, to confirm that these resources are reaching underserved communities.

Collaborate with development banks to create financing models for AI adoption in emerging markets, sharing both risks and rewards. Co-develop flexible training programs that build local skills and keep pace with technological advancements.

Public sector

To ensure that AI infrastructure serves the public good and strengthens national resilience across all sectors, policymakers and regulators need to:

Establish nationally pooled and environmentally sustainable compute infrastructure with dedicated credits for startups, researchers, and public services. Co-fund with industry and development partners to reach SMEs and underserved regions.

Mandate open standards, API portability, and rights-preserving data-sharing frameworks enabling local-language datasets and safe model fine-tuning.

Strategically leverage public procurement for major technology contracts to include vendor co-investment in local talent development and partnerships with domestic SMEs. Turn government spending into a catalyst for ecosystem growth.

Invest in role-specific AI literacy programs for educators, civil servants, and entrepreneurs, ensuring market-relevant skills reach all levels of government through portable micro-credentials, apprenticeships, and sector-specific training.

IGOs, IOs, and others

To ensure that AI benefits are distributed equitably across regions and sectors while building trust and preventing fragmentation, intergovernmental organizations, international organizations, civil society, and academia need to:

Convene multilateral coalitions to develop a globally recognized AI readiness index measuring national capabilities. Focus on the needs of low-resource countries, small businesses, and public services to guide and incentivize investment rather than punish underperformance.

Coordinate technology transfer programs pairing advanced institutions with emerging-market universities to co-create open-source models through global networks, providing neutral guidance for privacy-preserving data sharing in diverse regulatory contexts.

Champion global affordability standards while developing frameworks for data sharing and accountability that balance openness with safety protections for vulnerable populations.

Promote inclusive AI governance by supporting cross-regional policy dialogues and capacity-building to ensure equitable access and locally relevant AI deployment.

◆ Emerging trend

2.6

The Evolving Brain–Machine Interface

New trend in DET 2026

What does the trend encompass?

Recent advances have greatly improved the speed, accuracy, and reliability of brain–machine interfaces, which were once considered science fiction. Successful use cases for patients with neurological conditions include a man with ALS (amyotrophic lateral sclerosis) communicating through real-time decoding of his brain signals into speech.¹⁹⁰ Restored communication between the brain and spinal cord has also allowed a man with chronic tetraplegia to stand, walk, climb stairs, and even navigate complex terrains naturally.¹⁹¹

The wider adoption of technologies to enhance human cognitive and physical abilities creates unprecedented potential for societal change, from improvements in workplace safety and performance to revolutionary forms of communication and interaction.

Why is it important?

Technologies that directly interface with the brain have the potential to deliver transformative gains in safety, accessibility, and human capability. However, left unchecked they could drive new and more severe forms of inequality. Those with financial access to brain–machine interfaces could gain improved knowledge, memory, attention, or even physical abilities. Developing robust ethical guardrails now is vital to ensure these transformative tools benefit all and do not create a permanent underclass.

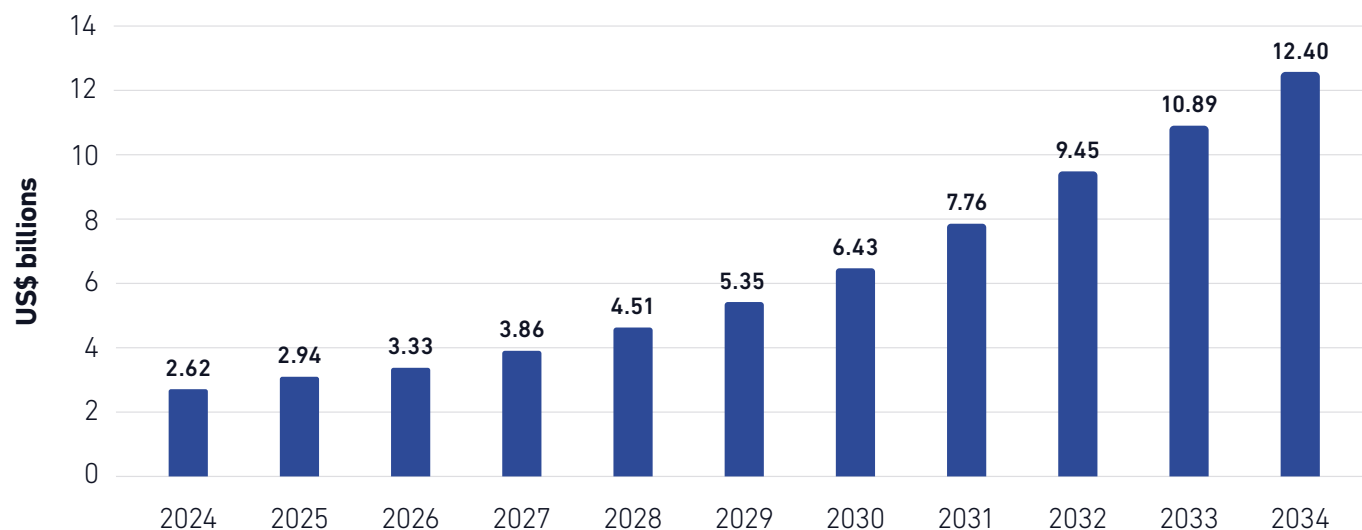
Impacts on the horizon

Investment in neuroscience startups is rapidly expanding, as recent applications show the potential for growth in the brain–machine interface market in the health industry and beyond. As shown in Figure II.31, funding for neuroscience startups is on track to reach US\$1.4 billion in 2025, with an increasing amount raised per deal. Within 3–5 years, non-invasive implants or wearables could restore movement or speech to those with disabilities, improving societal inclusivity, equity, and access to economic opportunities for affected sections of the population. In the next decade, workers could use these implants to improve safety by monitoring fatigue or unlock new forms of collaboration.^{192,193,194} The global brain–machine interface market is projected to increase from US\$2.94 billion in 2025 to US\$12.4 billion by 2034, a compound annual growth rate of 17.4%, as shown in Figure II.30.

**Frontier
use case**

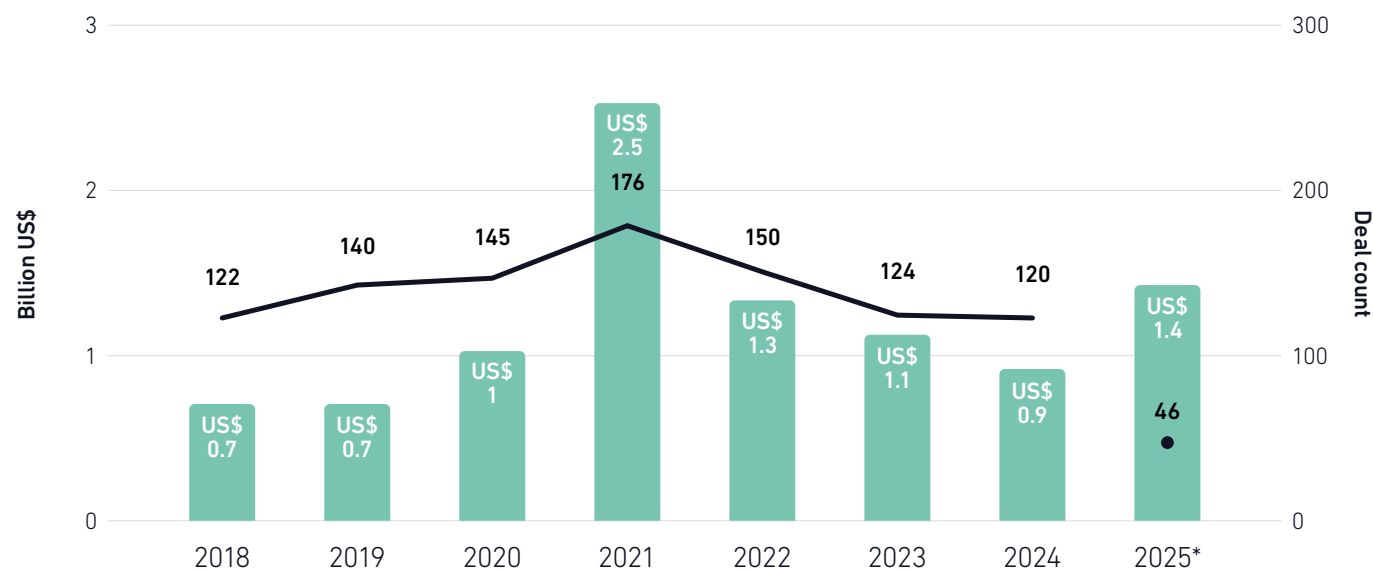
Synchron's endovascular brain–machine interface pairs with Nvidia Holoscan artificial intelligence and Apple Vision Pro to let patients with motor neuron disease (MND) control lights, speakers, and appliances. Devices like these would avoid the need for open-brain surgery, giving MND patients more independence and autonomy and allowing them to live longer, more fulfilling lives.^{195,196}

Figure II.30: brain-machine interface market size, 2024-34¹⁹⁷



Source: Precedence Research's report on Brain Computer Interface Market Size, Share and Trends (2025)

Figure II.31: Global funding to neuroscience companies, 2018 to May 2025¹⁹⁸



*Up to 30 June

Legend: ● Deal value (US\$ billion) ● Deal count

Source: Crunchbase News' article on braintech funding booms (2025)

Potential developments

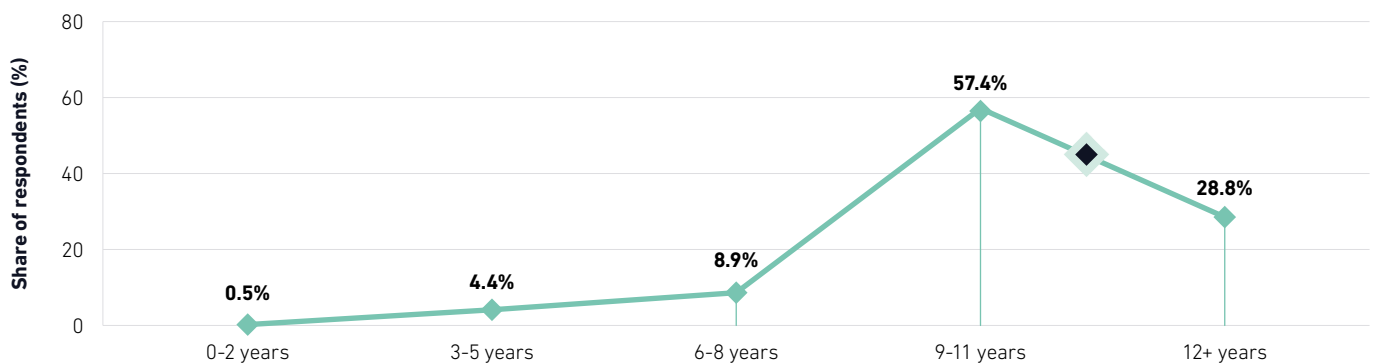
Prospective turning points that could catalyze this trend into rapid, widespread materialization:

- 2026**
 UNESCO adopts a global neurotechnology ethics standard, defining 'neural data' and providing governments a policy blueprint with recommendations on privacy, consent, and misuse.¹⁹⁹
- 2027/2028**
 The EU and the United States issue guidelines for neural-implant medical devices that use AI — including documentation, lifecycle control, and safety protocols — to enable the safe scaling of brain-machine interfaces through regulated pathways.^{200,201}
- 2030**
 China plans for a competitive brain-machine interface industry by 2030, with a 17-step roadmap to achieve technology breakthroughs by 2027, followed by standardizing brain-machine interface technologies and establishing mass-manufacturing capabilities.²⁰²

When will this trend materialize?

This trend is expected to take the longest to materialize among DET 2026 trends, with survey respondents expecting an average timeline of just over 10 years, as shown in Figure II.32. Respondents from North America, Europe and Central Asia, and the private sector expect the quickest materialization.

Figure II.32: The Evolving Brain–Machine Interface: likely materialization timeline



Legend: ◆ Expected number of years until materialization (average)

Source: DCO 2025 Digital Economy Trends Survey.

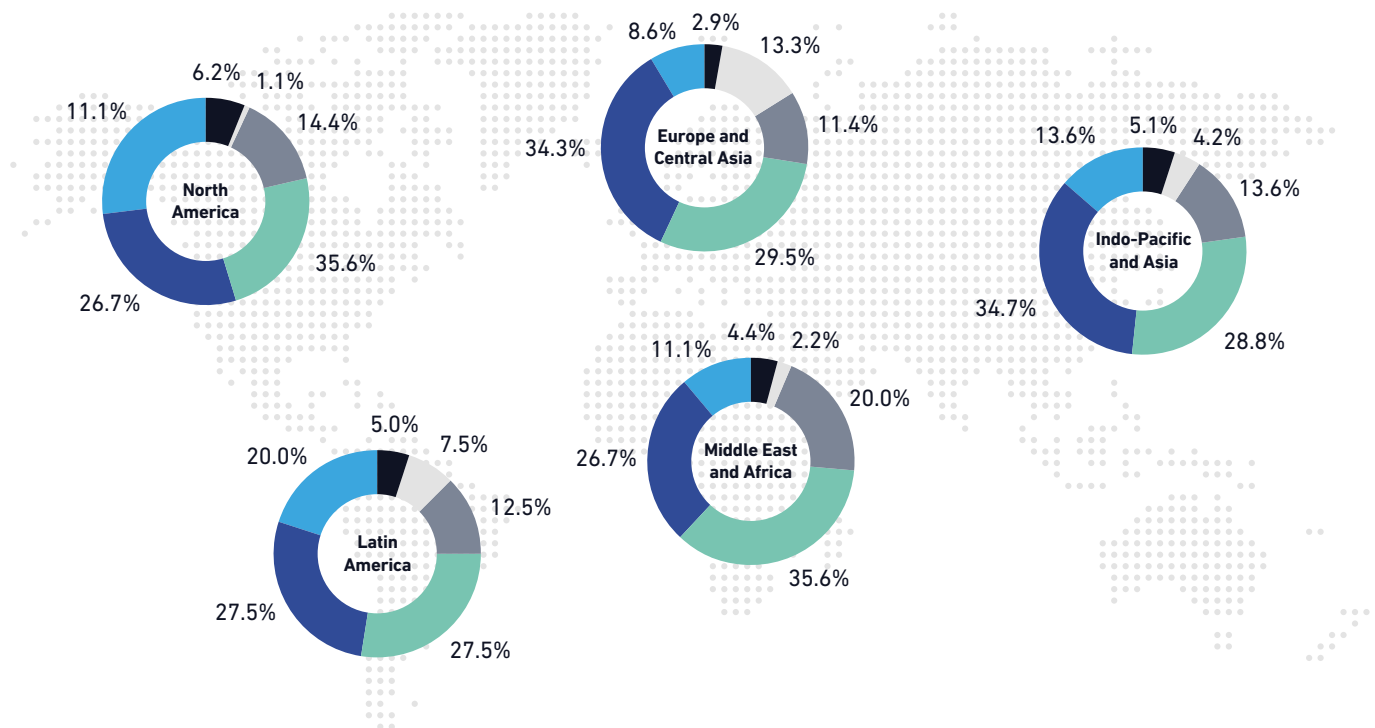
Q: In your country, when do you expect the following emerging digital economy trends to affect businesses and societies?

Respondents: 272 CTOs and senior technologists working in large companies (+250 employees), 60 policymakers, and 74 digital economy and financial experts.

Expected socio-economic impact in 3-5 years

On average, respondents expect this trend to have a moderately positive socio-economic impact. Those in North America are the most divided, as shown by Figure II.33, with the highest share of both extremely positive (26.8%) and negative (6.2%) expectations. In addition, government is more optimistic than the private sector.

Figure II.33: The Evolving Brain–Machine Interface: expected socio-economic impact by region



Legend: ● Negative ● No impact ● Somewhat positive ● Positive ● Very positive ● Extremely positive

Source: DCO 2025 Digital Economy Trends Survey.

Q: In your country, to what extent do you believe the following emerging trends will have a net positive or negative socio-economic impact in the next 3-5 years?

Respondents: 272 CTOs and senior technologists working in large companies (+250 employees), 60 policymakers, and 74 digital economy and financial experts.

How can stakeholders prepare?

DET Survey respondents identified the following key drivers as critical for the realization of this trend:



Digital Innovation

A major area of R&D to achieve the adoption of brain-machine interfaces is improving the physical and functional connection between the brain and external systems. Key areas of potential innovation include developing bidirectional and minimally invasive interfaces designed for long-term, durable use.



Digital Infrastructure

Robust digital identities and secure data pipelines are essential for managing sensitive neural data, while scalable cloud infrastructure and cross-platform interoperability are critical to ensure seamless brain-machine interface connectivity.



Digital Capabilities

Workforce competencies in neural data analysis, safety, and evaluation across clinicians, engineers, and regulators are essential for safe and informed deployment.



Industry Digital Transformation

Brain-machine interfaces could bring significant potential benefits in high-risk sectors for fatigue detection and assistive control. To this end, companies should put in place the necessary workflows and certifications to prioritize safety for brain-machine interface pilots in industries.



Digital for Health and Education

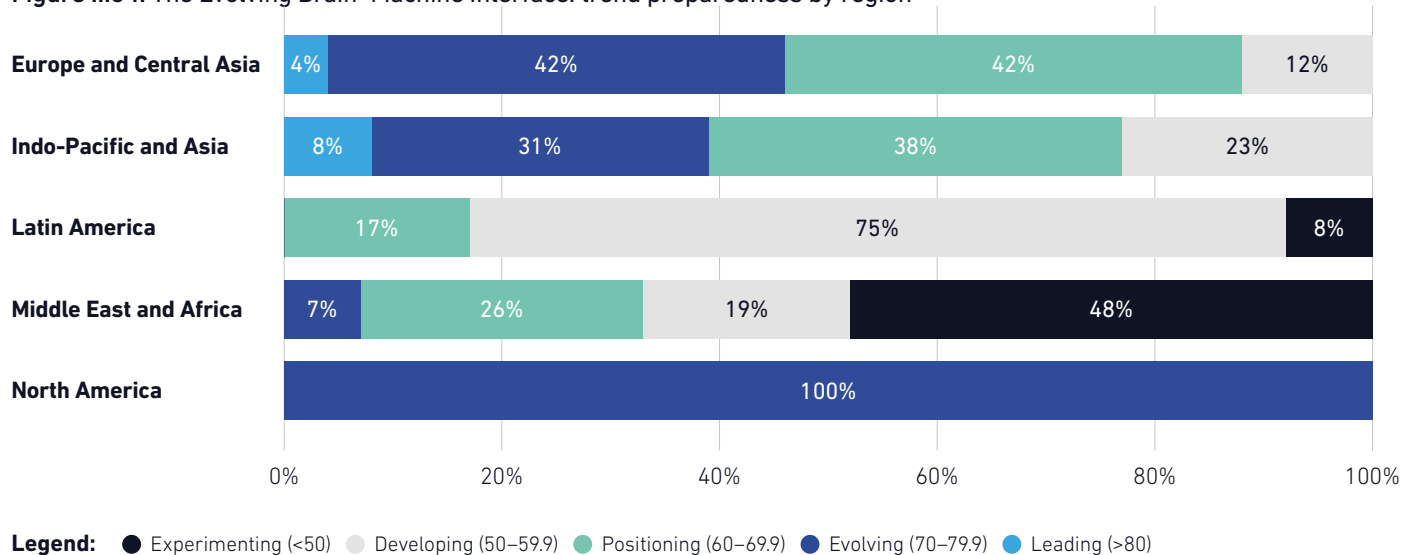
Care and learning plans that integrate neural technology literacy and awareness are needed to create the ethical and institutional foundations that accelerate the safe and trusted adoption of brain-machine interfaces.



Countries' preparedness for trend materialization

Aggregating DEN pillar scores for the five drivers identified as the most relevant for this emerging trend shows significant diversity in terms of preparedness, as shown in Figure II.34. Both North American economies are in the *evolving* category, while almost half of Europe and Central Asia's economies are either *evolving* or *leading*. These regions currently dominate neurotechnology R&D. Even so, Indo-Pacific and Asia has the highest percentage of *leading* countries (8%): China, Japan, and South Korea have national programs and public-private partnerships. Most countries in Latin America are *developing*, and almost half of those in the Middle East and Africa are *experimenting*. These results highlight geographical divides between cores of innovation and regions still assembling the foundational ecosystems required to join the next frontier of human-machine interaction.

Figure II.34: The Evolving Brain-Machine Interface: trend preparedness by region



Source: DCO 2025 Digital Economy Trends Survey.

Q: At a global level, select the three key enabling factors countries need in order to benefit from the opportunities provided by the following digital economy trends.

Respondents: 272 CTOs and senior technologists working in large companies (+250 employees), 60 policymakers, and 74 digital economy and financial experts.

Open questions

Brain-machine interfaces tend to continuously update via AI models and firmware. What types of post-market certifications and incident-response routines will need to be in place so that innovation is balanced with safety, sustainability, and privacy?

Neural data means access to personal information such as identity, intent, and health, which could result in biased or unfair decisions if misused. How can society ensure that the adoption of brain-machine interfaces drives inclusive economic growth and innovation while preventing new forms of inequality or ethical risks?

Access to this technology can be life-changing but also prohibitively expensive. What type of financing models and technology/IP-sharing rules will ensure equitable access for disabled users in low-resource settings?

Asking AI

We asked a leading LLM: what are the potential benefits, challenges, and considerations for this trend over the next 3-5 years?

Please refer to the methodology annex to see the exact prompts used.

Prompt >_

ChatGPT response

Potential benefits

Brain-machine interfaces could transform healthcare, communication, and human productivity. In medicine, they can restore mobility to patients with paralysis and help treat neurological disorders. Beyond health, brain-machine interfaces could enable the direct control of digital devices or machinery through thought, creating new possibilities for education, work, and human-AI collaboration. As this technology matures, it may also drive growth in neurotechnology industries and attract major investment in research, design, and data analytics.

Key challenges

The technology raises serious ethical and privacy issues, as brain data is deeply personal and vulnerable to misuse. The hardware remains expensive and invasive, limiting access and slowing adoption. There are also regulatory gaps — no global standards yet govern how neural data should be collected, stored, or shared — creating risks of exploitation and inequality between those who can afford enhancement technologies and those who cannot.

Strategic considerations

Governments and firms need to act early to establish ethical and safety standards for brain-machine interfaces, especially around data protection and consent. Public and private investment should focus on non-invasive, affordable technologies to ensure equitable access and reduce medical risks. International collaboration will be key to setting research norms, ensuring responsible innovation and preventing a divide between 'neuro-rich' and 'neuro-poor' societies as this frontier evolves.

Note: these insights from LLMs are not data driven. They are provided as directional and sentimental and the LLMs have not had access to the survey data.



Brain-Machine Interface research could revolutionize neurotechnology, miniaturization, bio-electronics, education and assistive systems for ageing but it won't happen overnight. Governments and technologists should start collaborating today to make tomorrow's BMIs ethical and beneficial to all.

Sheana Tambourgi
Senior Advisor, Horizon Group

Stakeholder recommendations

Private sector

To ensure brain–machine interfaces drive inclusive, affordable, and ethical access, build public trust, and prevent a permanent ‘neuro-divide’, business leaders need to:

Establish a neuro-innovation alliance with regulators, health experts, and civil society to co-develop open, auditable brain–machine interface protocols and interoperability standards that ensure safety, prevent vendor lock-in, and embed trustworthy neuro-ethical principles.

Co-invest in inclusive, ethical, and affordable clinical trials, along with continuous post-market monitoring to track safety, efficacy, and unintended consequences across diverse populations.

Establish transparent governance frameworks for neural data ownership, informed consent, and privacy protection.

Partner with public healthcare systems to develop tiered pricing, technology licensing models, and pooled funding mechanisms to subsidize therapeutic brain–machine interface access in low-resource settings.

Public sector

To ensure that brain–machine interfaces enhance human capability equitably while safeguarding mental privacy, policymakers and regulators need to:

Leverage public procurement to promote inclusivity and open standards: require therapeutic brain–machine interface devices receiving public funding to adhere to open, interoperable standards and provide public-interest licenses for low-cost devices serving disabled users.

Co-create regulatory market approval sandboxes focused on safety standards and certification pathways for manufacturers to prove their systems can be safely disabled or rolled back in the event of malfunction or malicious attack.

Develop clear legal definitions for neural data rights ownership and privacy that recognize brain data as a fundamental extension of an individual’s identity. Impose significant penalties for unauthorized access, manipulation, or sale of neural data.

Strategically use public procurement and R&D grants to incentivize the development of affordable, assistive neurotechnology. Prioritize universal access to these technologies in emerging economies through subsidies and technology transfer mechanisms.

IGOs, IOs, and others

To ensure that brain–machine interfaces serve humanity equitably and embed dignity into the neuro-technological age, intergovernmental organizations, international organizations, civil society, and academia need to:

Co-design enforceable, universal frameworks on cognitive liberty, neural data privacy, meaningful consent and defined protections against cognitive manipulation through a coalition of international organizations, governments, industry, bioethicists, and human rights organizations.

Launch a secure, anonymized repository, governed by multi-stakeholder coalitions, to advocate for IP sharing and the provision of tools and resources to accelerate equitable therapeutic brain–machine interface breakthroughs, particularly in low-resource settings.

Establish shared knowledge platforms and capacity-building programs to empower emerging economies to participate meaningfully in brain–machine interface development and governance.

Develop international monitoring and accountability mechanisms to track the societal, economic, and ethical impacts of brain–machine interface deployment, ensuring transparency, early identification of risks, and coordinated responses to prevent misuse or exacerbation of inequality.



TRUST AND SECURITY

● Current trend

3.1

Strengthening of End-to-End Cybersecurity

● Current trend

3.2

The Spread of Digital Sovereignty Strategies

● Current trend

3.3

Emergence of Competing Technology Blocs

● Current trend

3.4

The Holistic Digital Trade Revolution

◆ Emerging trend

3.5

Preparing for the Quantum Era

◆ Emerging trend

3.6

Converging Frontier Technologies

Theme overview

The Trust and Security theme recognizes that the digital economy can reach its full potential when individuals and businesses have confidence in their ability to interact and transact securely online. The major challenges include generative AI introducing new vectors for misinformation and automated cyber-attacks, quantum computing undermining cryptographic techniques, and exploitative business models.

Evolution since 2025

The narrative around Trust and Security has evolved significantly over the past two DCO DET reports. Where previously the focus was on tackling isolated technological risks, such as securing IoT devices in the DET 2024, the conversation has now matured to become more systemic and geopolitical. Technology is no longer just a tool; it is a central pillar of competitiveness, economic supremacy, and national security. Distinct visions for a global digital order are emerging, with the emergence of competing technology blocs.

The six trends within this theme, shown in Figure III.1, reflect a shift toward managing complex, dynamic, long-term challenges in a deeply interconnected global digital economy. Since the DET 2025 was published, the focus has broadened from operational security to strategic resilience, underscored by the rise of national industrial policies, digital sovereignty strategies, and the deepening interplay between technological competition and geopolitics. Defending entire interconnected digital ecosystems demands more holistic digital trade rules and increased resources for strengthening end-to-end cybersecurity — all central to strengthening trust and security in the digital era.

The discourse is also becoming more forward-looking, with an urgent focus on preparing for the convergence of multiple frontier digital technologies. These include the paradigm shift of quantum computing's threat to undermine existing cryptographic techniques, the rapid advancement of generative AI, and the rise of business models with incentive structures that may not align with user safety and digital trust. Their convergence underscores the urgent need to reassess how trust is maintained in the digital economy.

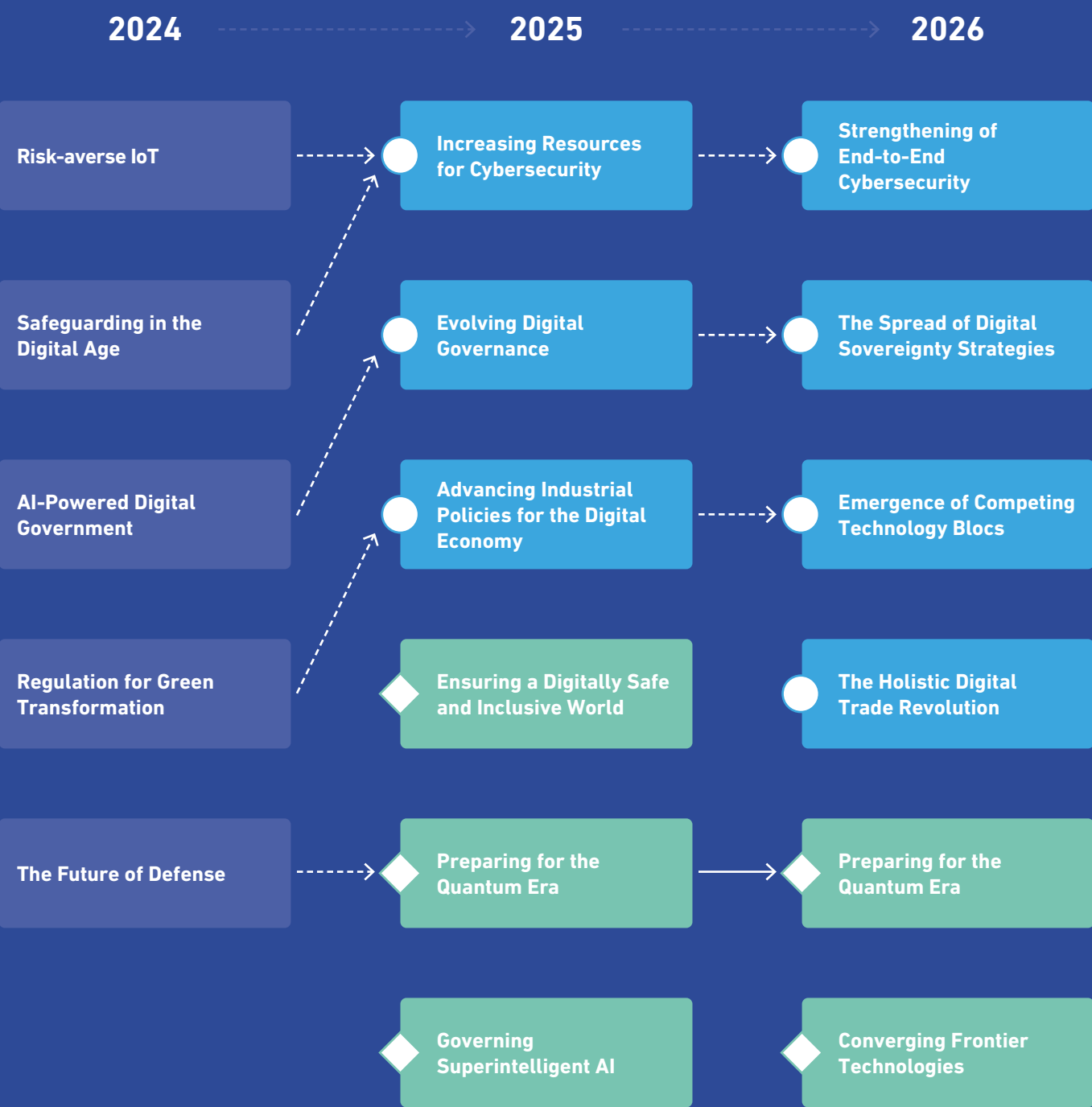
How to build Trust and Security?

To capitalize on the opportunities presented by the digital economy trends in this theme, stakeholders should collaborate by:

- › **Harmonizing global standards and regulatory frameworks** to balance sovereignty with innovation and interoperability.
- › **Building shared, secure, and sustainable infrastructure** for ecosystem-wide digital resilience.
- › **Investing in targeted skills programs and technology transfer** to close the global talent gap.



Figure III.1: **Trust and Security: Evolution of Digital Economy Trends Across DET 2024–2026**



Legend

Digital economy trends:

○ Current ◇ Emerging

-----> Evolution ———> Continuation

Source: DCO Digital Economy Trends (DET) report 2024-26

● Current trend

3.1

Strengthening of End-to-End Cybersecurity

Evolution of DET 2025 trend: Increasing Resources for Cybersecurity

What does the trend encompass?

The growing complexity and interconnectedness of digital ecosystems — spanning cloud platforms, AI tools, software supply chains, and connected ambient devices — has widened the attack surface across modern digital ecosystems. As a result, traditional security approaches are rendered inadequate and trust becomes harder to maintain. This requires a shift from static defense mechanisms to resilient, adaptive digital infrastructure that can autonomously detect, respond to, and recover from sophisticated threats without human intervention. The need for new approaches that protect entire digital ecosystems raises questions about extending cyber resilience and data protection to smaller, more vulnerable organizations throughout complex supply chains. A collective and shared approach to cyber defense is essential to mitigate systemic cybersecurity risks and strengthen a more resilient, secure, and trusted digital economy.

End-to-end cybersecurity definition

End-to-end cybersecurity refers to keeping information hidden from third parties as it is transferred from its origin to its destination, using methods such as encryption, access control, and identity and access management.^{203,204,205}

Why is it important?

In today's hyper-connected digital economy, a single vulnerable organization or firm in the supply chain can expose the entire digital system to failure. Smaller organizations often have less resources to keep pace with growing AI-powered threats such as advanced phishing campaigns, deepfake-enabled fraud, and adaptive malware. This creates points of vulnerability that can affect trust and security throughout the broader digital ecosystem. Rising tensions around digital interdependence and critical infrastructure have further complicated cybersecurity strategies across public and private sectors. Strengthening end-to-end cybersecurity is essential not only to protect data and operations, but also to sustain trust, resilience, and economic stability across the global digital ecosystem.

Economic outlook

This trend is expected to average global growth in gross-value-added of 3.5% over the next 18 months, primarily driven by the community, maintenance, and personal support services and manufacturing sectors. The Middle East and Africa leads with projected growth of 4.6%, followed closely by Latin America, at 4.2%. For this economic value to be fully unlocked, the recommendations for stakeholders at the end of this trend profile will need to be implemented.

Total potential economic value creation:

US\$3.13 trillion

Growth rate:

3.5%

Notable developments

Overview of past and likely future developments illustrating the need to strengthen end-to-end cybersecurity.

2017

NotPetya attacks an accounting software used by firms in Ukraine, crippling the operations of multinationals including Maersk and Merck and costing approximately US\$10 billion in losses; this incident demonstrated how a single point of weakness can affect entire ecosystems.^{206,207}

2020

SolarWinds, a network-management platform used by US federal agencies, is compromised and distributes a malicious software update targeting high-value actors. This underscores the need to adopt zero trust architectures and least-privilege access mechanisms to ensure continuous verification and restrict system entry to authorized users.^{208,209}

2024

CrowdStrike, a major cybersecurity company, releases a faulty sensor update that temporarily disables roughly 8.5 million Windows devices. Disrupting the air travel, finance, and healthcare industries, the outage reinforced the importance of resilience across interconnected cybersecurity ecosystems.^{210,211}

2025

Global surveys indicate that supply-chain vulnerabilities have become the leading concern (54%) for cybersecurity leaders, underscoring shared anxiety over end-to-end protection across firms.²¹²

2025

Sixty-five nations sign the United Nations Convention against Cybercrime, a landmark treaty establishing the first universal framework for investigating and prosecuting offences committed online.^{213,214}

What's
next? →

2026

The use of AI in cyber operations is expected to shift from an exception to the norm. This will enable attackers to escalate the speed, scope, and precision of their attacks, while simultaneously empowering defenders to strengthen detection, response, and resilience by deploying AI agents.^{215,216}

2027

A divide emerges between organizations that keep pace with AI-enabled threats to improve resilience and others being more vulnerable, underscoring the need for end-to-end cybersecurity across the entire digital ecosystem.²¹⁷

Enabling conditions and countries' readiness

Key drivers

DET Survey respondents selected these drivers as critical for this trend:



Digital Infrastructure

Adaptive identity management and access infrastructure that can autonomously detect, respond to, and recover from attacks is critical for building trust in cybersecurity capabilities at the national level, which is particularly important for citizens and SMEs.



Digital Policy and Governance

Cross-sectoral regulations that set minimum security requirements and incident reporting, supported by public administration overseeing compliance and providing targeted support to SMEs, create the foundation for effective end-to-end cybersecurity.



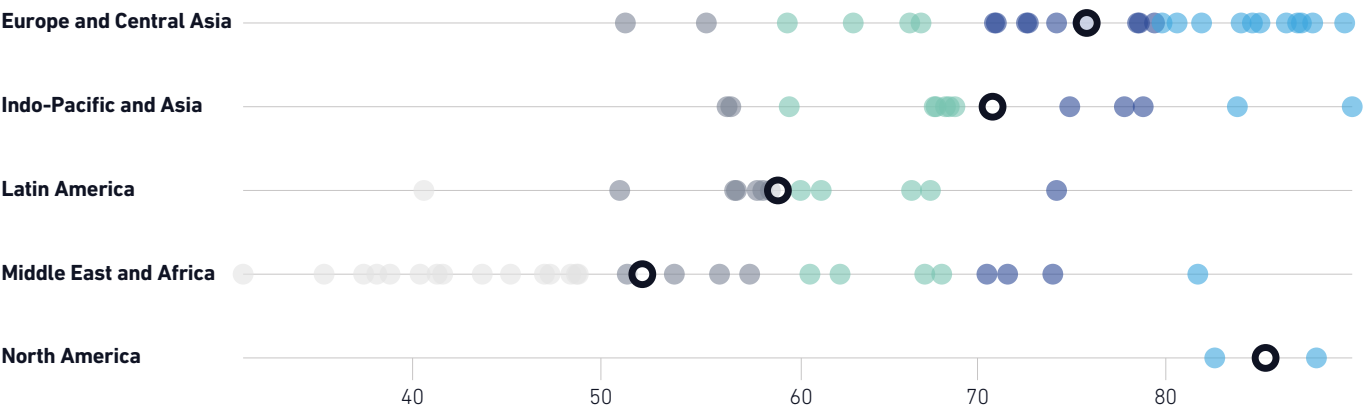
Digital Innovation

A collaborative R&D ecosystem with shared threat knowledge, interoperable tools, and safe testing environments enables earlier detection and faster responses to cyber-threats.

Countries' readiness for trend adoption

Global readiness for cybersecurity has among the widest gaps of all trends: North America (85.3) has a commanding lead, as shown in Figure III.2, with Latin America (59.4) and the Middle East and Africa (52.2) needing to catch up on critical infrastructure protection and incident response capabilities. Sixteen countries achieve *pioneer* level, making it one of the trends with the highest number of countries in this category. This reflects countries' growing recognition of this evolving area, which has been featured in the DET since its first edition.

Figure III.2: Strengthening of End-to-End Cybersecurity: trend readiness by region



Legend: ● Foundational (<50) ● Functional (50-59.9) ● Established (60-69.9) ● Advanced (70-79.9) ● Pioneer (>80) ● Regional average

Source: Results from the DCO's 2025 Digital Economy Trends Survey combined with data from the DCO's Digital Economy Navigator 2025.

Q: At a global level, select the three key enabling factors countries need in order to benefit from the opportunities provided by the following digital economy trends?

Respondents: 272 CTOs and senior technologists working in large companies (+250 employees), 60 policymakers, and 74 digital economy experts.

How is the trend materializing

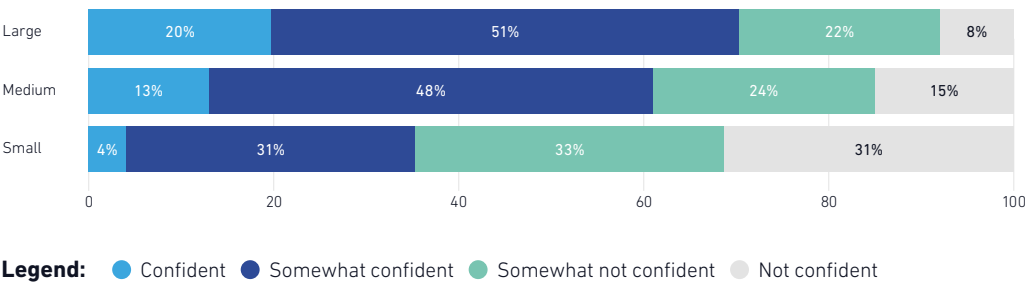
Payments and retail

The Payment Card Industry Data Security Standard (PCI DDS) is continuously updated to ensure that all stakeholders use the latest best practices in data security, enhancing cybersecurity and minimizing common breach paths. The v4.0 update, which became mandatory on 31 March 2025, introduced 51 new requirements for merchants, gateways, and acquirers to implement stronger authentication protocols, enhanced network segmentation, and updated security policies.²¹⁸

Cyber insurance

Cybersecurity incidents are increasing but cyber insurance coverage remains uneven. In the last year, over 40% of UK businesses experienced cyber-attacks, costing around 0.5% of GDP, and over 200 incidents were classified as nationally significant. In response, insurers have been increasing premiums and scrutiny of clients' cyber-risk controls, leaving smaller organizations less able to maintain coverage.^{219,220,221,222} As shown in Figure III.3, just 35% of smaller organizations report confidence that their cyber insurance policies would adequately cover losses, compared with 71% of large firms.

Figure III.3: Confidence in cyber insurance by company size²²³



Source: World Economic Forum and Accenture's Global Cybersecurity Outlook report (2025)

Hospitality services

In 2025, the Langham Hospitality Group deployed Check Point's Harmony Email & Collaboration Security Suite across its global hotel network to secure communications, guest-service platforms, and corporate systems. This comprehensive end-to-end implementation spanned all critical digital touchpoints, integrating advanced phishing detection, real-time threat prevention, and centralized incident response, thereby significantly improving digital resilience and compliance across both guest-facing and internal operations.²²⁴

Healthcare services

Healthcare organizations are increasingly embedding AI-driven detection and behavioral analytics throughout their security infrastructure. Security operations centers now use ML to filter data for real-time threat analysis, countering adversaries using generative AI for sophisticated attacks. Vendors are also beginning to integrate transparent data pipelines and AI-assisted reasoning tools to enhance proactive defense strategies and increase compliance visibility.²²⁵

Encryption

Encryption is deepening across infrastructure layers. Over 95% of global web traffic now uses HTTPS, the secure version of the standard HTTP protocol.²²⁶ The EU's Cyber Resilience Act²²⁷ and NIST's Post-Quantum Cryptography (PQC) standards²²⁸ from the United States are driving upgrades to post-quantum-ready encryption. Enterprises are replacing static keys with automated rotation and zero-trust key-management systems, creating ecosystem protection aligned with emerging encryption and data-sovereignty requirements.²²⁹

Country spotlight

Qatar's National Cyber Security Agency (NCSA) adopted the ISASecure certification in October 2025, allowing vendors and local operators to test devices against known attack patterns, publish assurance reports, and fix gaps before deployment. In parallel, the NCSA runs a program focused on supporting small and medium-sized enterprises.^{230,231}

Kuwait's oil sector has adopted an end-to-end cybersecurity framework to protect critical energy infrastructure amid rising digital threats. Led by Kuwait Petroleum Corporation, the approach integrates governance, real-time monitoring, AI-driven detection, and strong coordination between IT and operational systems. Enhanced training and cross-sector cooperation strengthen preparedness and response, ensuring operational continuity and reinforcing national energy security.²³²

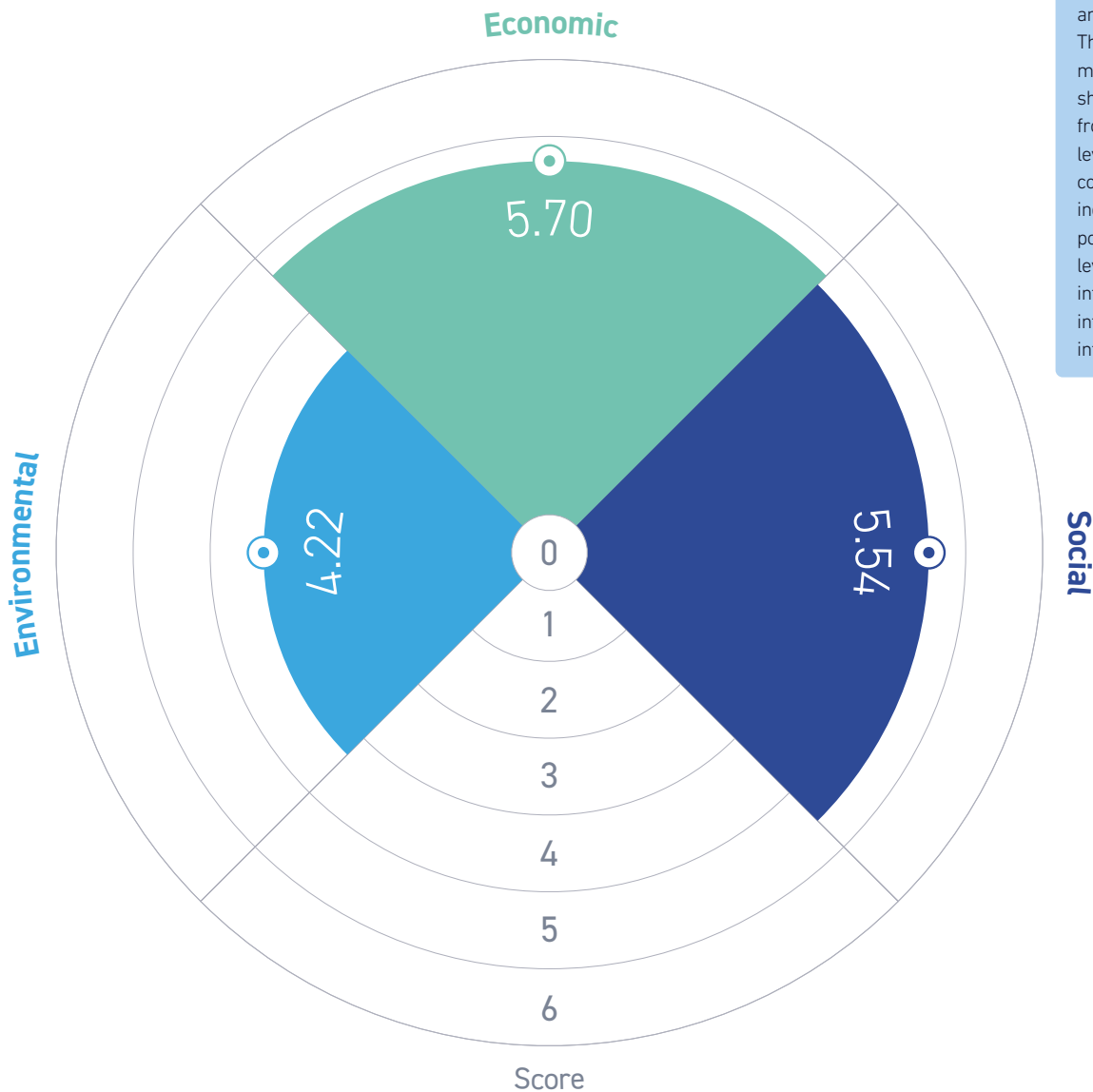
Economic, social, and environmental impact

This trend ranks first in positive economic (5.70) and social (5.54) impacts, through reducing risk exposure and enhancing trust and resilience, with lower environmental impact (4.22), as shown in Figure III.4. Government and private sector respondents hold similar views. Latin America ranks highest for both economic and social impacts.

Frontier use case

In 2025, Fortinet's Fabric-Ready Alliance surpassed 3,000 integrations and 400 partners, forming a shared-defense network across cloud, the Internet of Things, and telecom systems. This ecosystem model is notable for shifting cybersecurity from isolated firm-level protection to collaborative, cross-industry resilience, pooling resources and leveraging real-time intelligence to safeguard interconnected digital infrastructures.²³³

Figure III.4: Strengthening of End-to-End Cybersecurity: expected positive impact



Legend: ● Average score per impact area

Source: DCO 2025 Digital Economy Trends Survey.

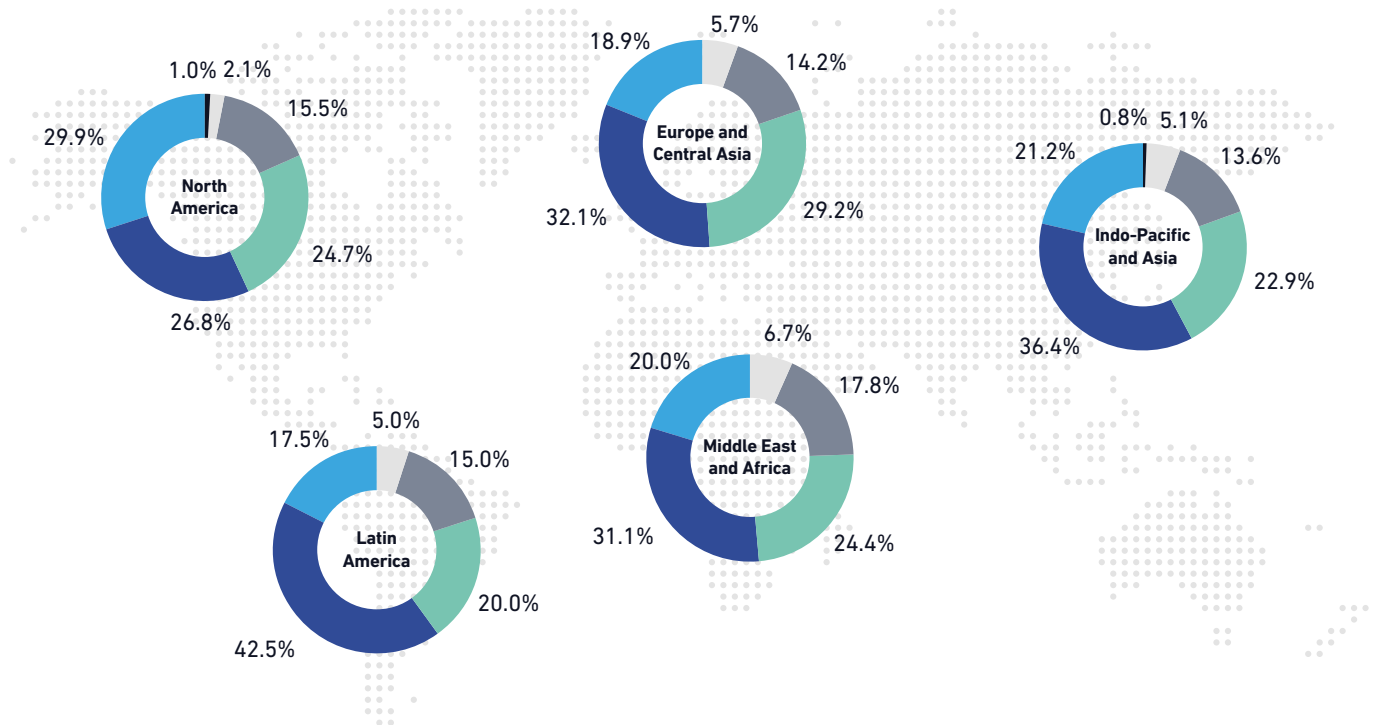
Q: In your country, how would you assess the economic/social/environmental impact of these current digital trends in the next 12-18 months?

Respondents: 272 CTOs and senior technologists working in large companies (+250 employees), 60 policymakers, and 74 digital economy and financial experts.

Pace of change

Around 55% of respondents believe this trend will accelerate significantly or strongly, with Figure III.5 showing a relatively even spread across regions — from Latin America (60.0%) to Europe and Central Asia (51.0%). Private sector (56.2%) and government (51.7%) respondents also have similar expectations.

Figure III.5: Strengthening of End-to-End Cybersecurity: anticipated speed of change by region



Legend: ● Decelerate ● No change ● Somewhat accelerate ● Accelerate ● Accelerate significantly ● Strongly accelerate

Source: DCO 2025 Digital Economy Trends Survey.

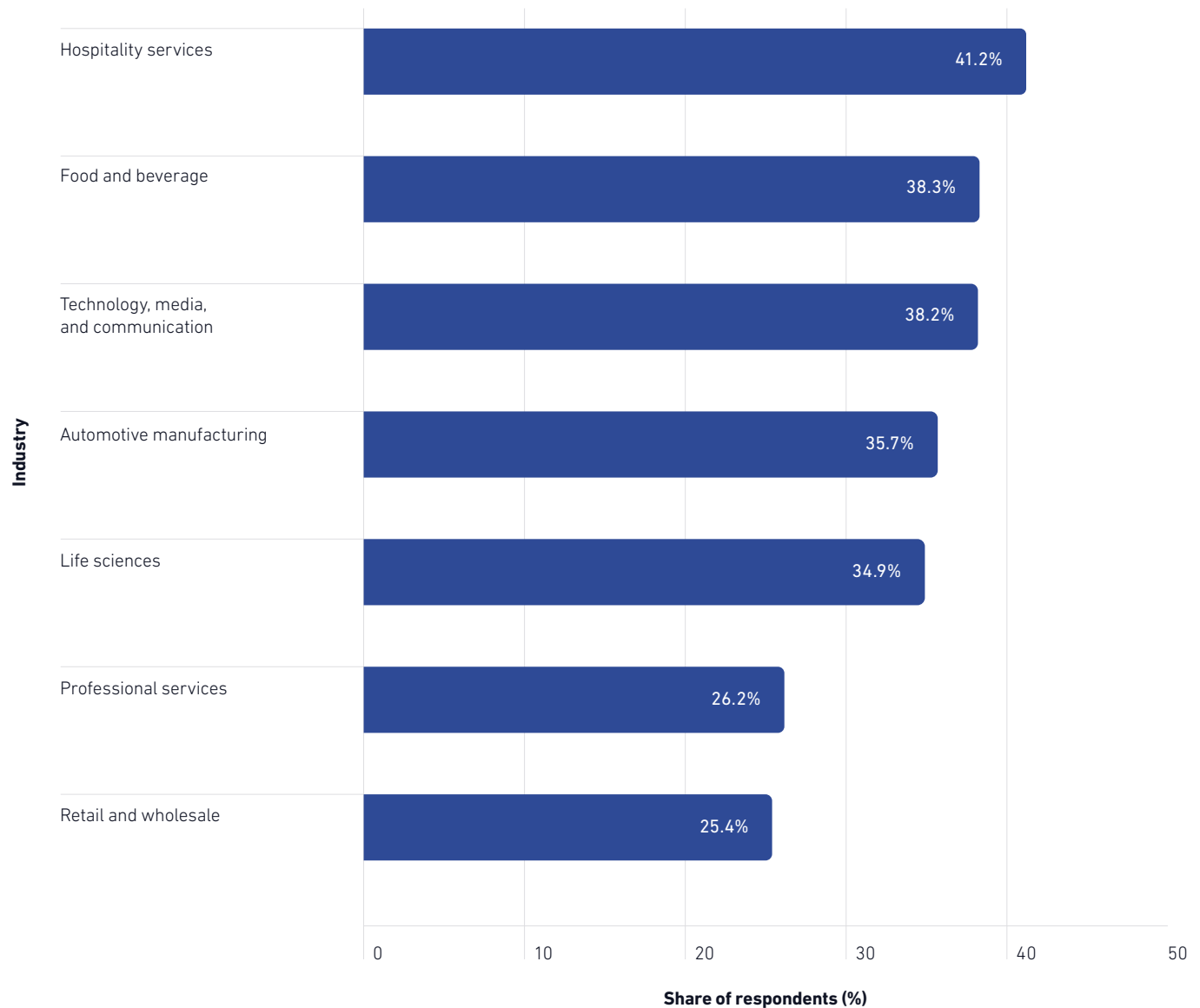
Q: In your country, how do you anticipate the speed at which the following digital economy trends will evolve in the next 12-18 months?

Respondents: 272 CTOs and senior technologists working in large companies (+250 employees), 60 policymakers, and 74 digital economy and financial experts.

Industry outlook

Hospitality respondents (41.2%) are the most optimistic about the growth opportunities associated with this trend, as shown in Figure III.6. The industry's expansion model increasingly depends on the digitalization of guest experiences, which in turn requires highly secure systems due to the use of sensitive personal information. The food and beverage sector follows (38.3%), as business growth is closely tied to reliable, timely supply chains where cybersecurity is essential for safeguarding operations. In technology, media, and communications (38.2%), strengthening cybersecurity remains a priority to ensure service continuity and maintain subscriber trust.

Figure III.6: Strengthening of End-to-End Cybersecurity: top industries for expected growth



Source: DCO 2025 Digital Economy Trends Survey.

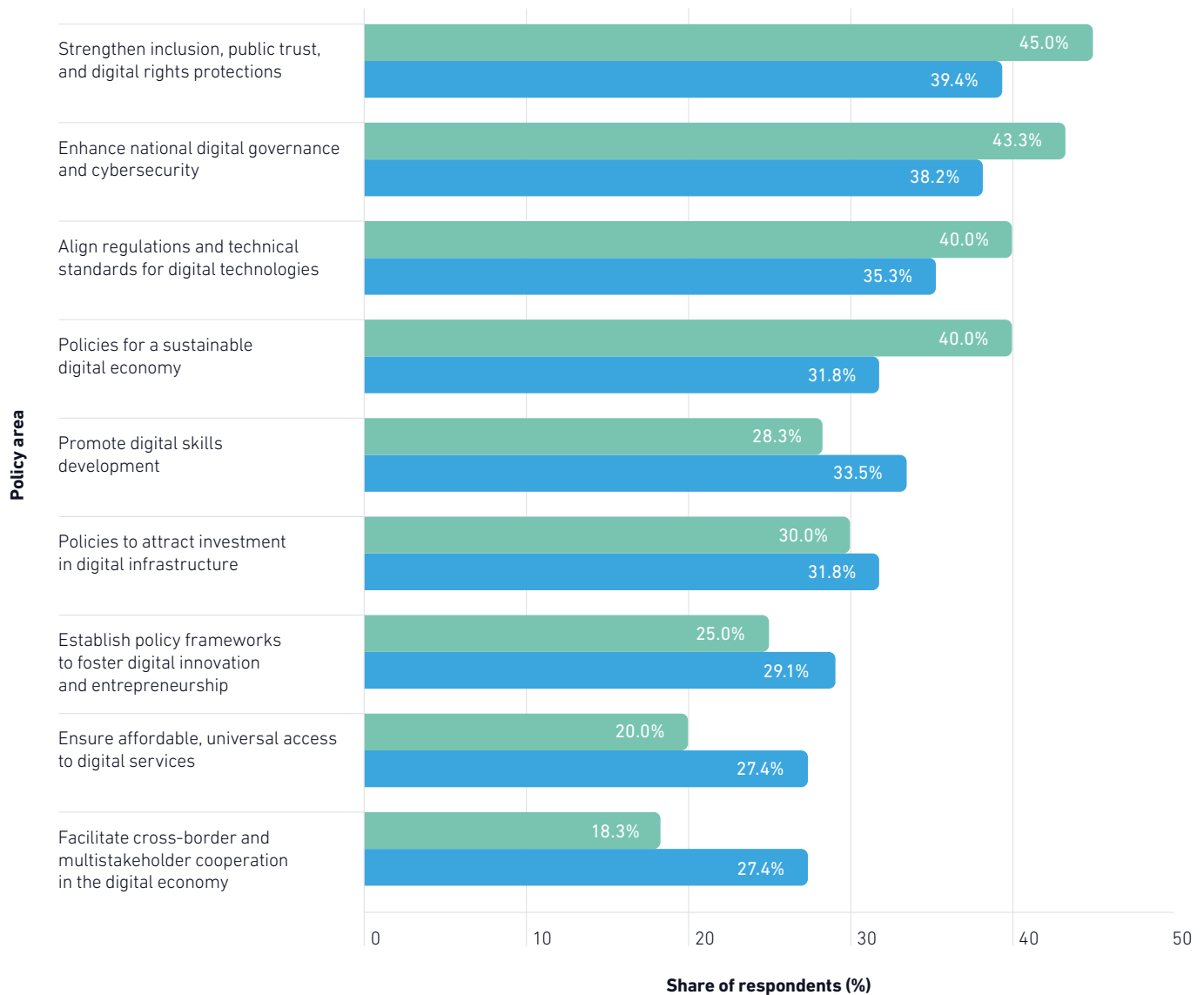
Q: In your industry, select the three digital economy trends, in order of importance, that you expect to create the most growth opportunities (e.g., new markets and customers or reducing operational costs) in the next 12-18 months.

Respondents: 272 CTOs and senior technologists working in large companies (+250 employees) and 74 digital economy and financial experts.

Policy actions

Government respondents prioritize strengthening inclusion and digital-rights protections (45.0%) to safeguard users in critical sectors like healthcare, finance, and public-service datasets. Private sector respondents prioritize inclusion, trust, and rights (39.4%) alongside enhanced national digital governance and cybersecurity (38.2%) to sustain user confidence and contain risks, as shown in Figure III.7. This emphasis aligns with global developments, notably the adoption by the United Nations General Assembly in December 2024 of the UN Convention against Cybercrime. The convention establishes the first universal framework for investigating and prosecuting online offences, including ransomware and financial fraud.¹⁸

Figure III.7: Strengthening of End-to-End Cybersecurity: priority policy actions



Legend: ● Public sector ● Private sector

Source: DCO 2025 Digital Economy Trends Survey.

Q: In your country, select the three most critical national policy actions needed for people, businesses, and states to benefit from each of the following current digital economy trends.




Respondents: 272 CTOs and senior technologists working in large companies (+250 employees), 60 policymakers, and 74 digital economy and financial experts.

Asking AI

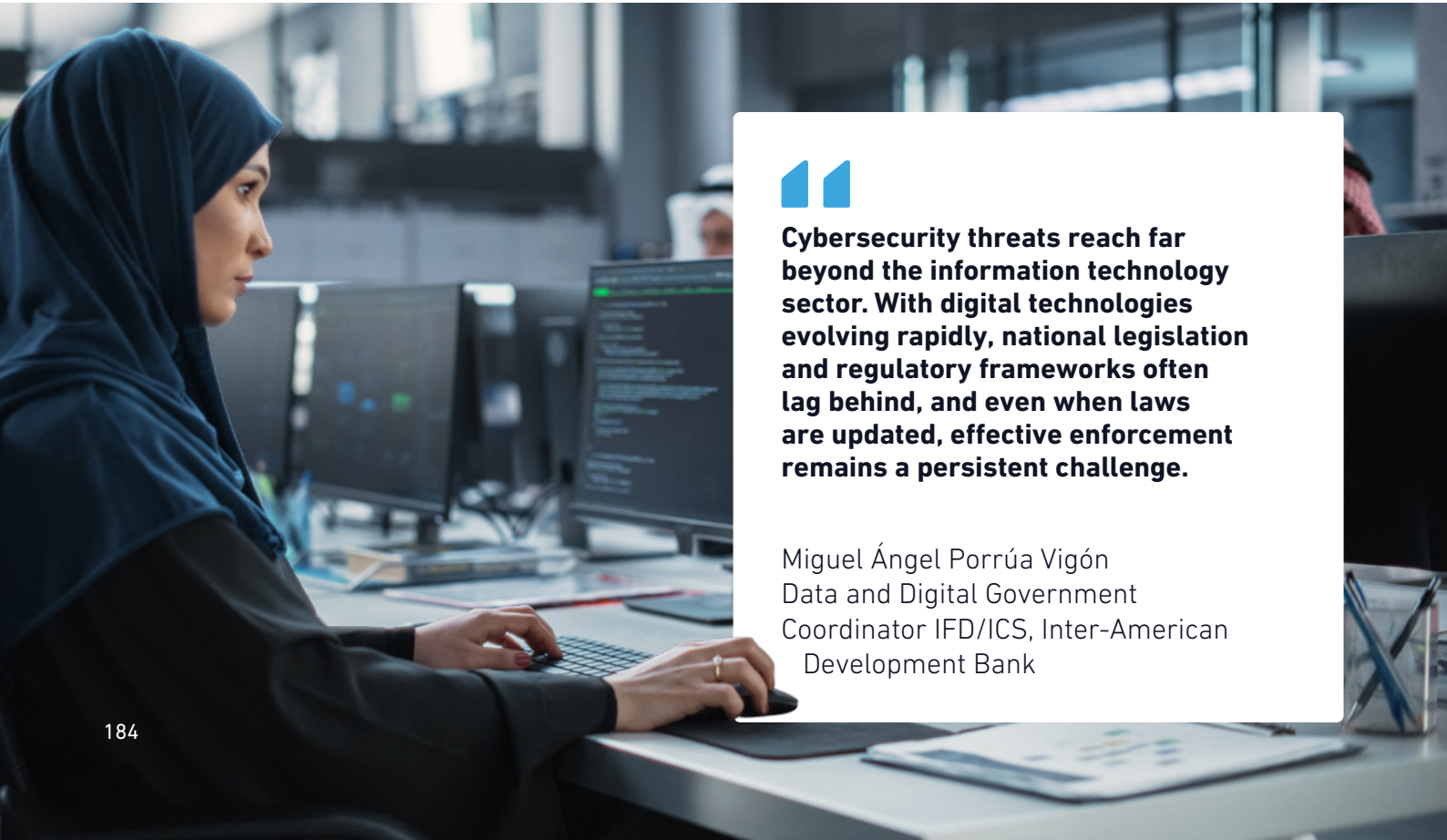
We asked three leading LLMs (ChatGPT-5, Gemini 2.5 Flash, and DeepSeek-V3.2) to predict the likely impacts of this trend over the next 12-18 months.

Please refer to the methodology annex to see the exact prompts used.

Prompt >_

|  Economic impact |  Social impact |  Environmental impact |
|--|---|--|
| <p>ChatGPT:</p> <p>“Cybersecurity spending will surge as digital ecosystems become more interlinked and vulnerable. Industries from finance to healthcare will prioritize security investments to protect data integrity and operational continuity. While this will boost the cybersecurity market, smaller firms may struggle with rising compliance costs and talent shortages.”</p> | <p>Gemini:</p> <p>“This heightened focus will make digital security a fundamental aspect of daily life, normalizing multi-factor authentication and security protocols. However, it may also create a ‘trust paradox’ where increased security measures breed more anxiety about digital threats, potentially limiting participation in digital ecosystems among privacy-conscious users.”</p> | <p>DeepSeek:</p> <p>“The environmental cost lies in the substantial energy required to power advanced cybersecurity systems, particularly those using blockchain and AI for continuous monitoring. While crucial for protecting critical infrastructure, the computing-intensive nature of modern cyberdefense contributes significantly to data center energy consumption and carbon emissions.”</p> |

Note: these insights from LLMs are not data driven. They are provided as directional and sentimental and the LLMs have not had access to the survey data.



Cybersecurity threats reach far beyond the information technology sector. With digital technologies evolving rapidly, national legislation and regulatory frameworks often lag behind, and even when laws are updated, effective enforcement remains a persistent challenge.

Miguel Ángel Porrúa Vigón
Data and Digital Government
Coordinator IFD/ICS, Inter-American
Development Bank

Stakeholder recommendations

Private sector

To ensure ecosystem-wide resilience that protects revenue, strengthens partnerships, prioritizes digital rights protections, and creates competitive advantage in an interconnected economy, business leaders need to:

Treat cybersecurity as a shared responsibility by partnering across supply chains to establish mutual security standards, real-time threat intelligence sharing, and coordinated incident response protocols.

Co-develop and implement baseline controls, supply chain transparency practices, and zero-trust architectures with suppliers, service providers, and insurers while jointly funding pooled security utilities for SMEs covering managed detection and response.

Extend security capabilities downstream to vulnerable partners through subsidized tools, training, and managed services that raise the collective defense posture across the entire value network.

Run continuous security testing exercises and coordinated response drills with partners, publishing measurable resilience metrics including time-to-detect, time-to-recover, and time-to-patch.

Public sector

To ensure a defensible digital economy that raises the national security floor, limits systemic cybersecurity risk, and protects essential services without stifling innovation, policymakers and regulators need to:

Stand up comprehensive cyber resilience frameworks that blend policy, technical standards, and shared services, co-developing interoperable rules for digital identity, incident reporting, and supply chain transparency with industry and standards bodies.

Mandate minimum security controls for critical vendors while offering subsidized shared security services — managed threat detection, identity verification, and incident response — as public utilities accessible to SMEs and critical sectors.

Establish digital governance, regulatory sandboxes and joint testbeds for emerging security technologies including zero-trust models, next-generation encryption, and automated response systems, while aligning procurement requirements to these baselines to signal market demand.

Build regional security operations centers that pool threat intelligence and coordinate responses across jurisdictions, treating cyber defense as critical public infrastructure.

Promote adherence to international cybersecurity frameworks, including participation in the United Nations Convention against Cybercrime, a universal framework for preventing, investigating, and prosecuting cyber offences globally.²³⁴

IGOs, IOs, and others

To ensure the digital economy's foundation remains secure for all participants through coordinated capacity building and knowledge transfer, intergovernmental organizations, international organizations, civil society, and academia need to:

Strengthen global cooperation in preventing, investigating, and prosecuting cyber offences by, for example, supporting the implementation and review process of the UN Convention against Cybercrime.

Deploy practical, field-tested security toolkits tailored for resource-constrained environments, moving beyond policy frameworks to operational implementation that organizations can adopt immediately.

Establish regional cyber resilience hubs that provide hands-on training, threat simulation exercises, and peer-to-peer learning networks for both public and private sector defenders across all maturity levels.

Advocate for cross-country cybersecurity resilience through coordinated regional frameworks such as the EU's NIS2 Directive.²³⁵

● **Current trend**

3.2

The Spread of Digital Sovereignty Strategies

Evolution of DET 2025 trend: Evolving Digital Governance

What does the trend encompass?

Nations are increasingly pursuing digital sovereignty by building national AI capabilities, data platforms, and sovereign cloud infrastructures to reduce dependence on foreign technologies. These efforts aim to safeguard strategic autonomy and ensure that digital assets comply with domestic values, laws, and security priorities. As trust, transparency, and accountability emerge as key constraints for the adoption of AI systems, the creation of robust governance frameworks, ethical standards, and cross-border cooperation are central to ensuring that digital sovereignty supports rather than fragments global digital development.

Why is it important?

The drive for national autonomy is challenging the global digital ecosystem. Countries are aiming to protect their citizens' data, ensure the security of their critical infrastructure, and foster the growth of their technology sectors. However, these measures increase the risk of protectionism and fragmentation resulting in a disjointed global digital economy. Differing regulatory regimes can create isolated data ecosystems and hinder seamless cross-border data flows. This makes it essential to develop interoperability standards and balanced governance frameworks that maintain accountability and trust across different regulatory regimes and jurisdictions.

Economic outlook

This trend's potential for value creation is relatively moderate, averaging 3.1% over the next 18 months, with notable opportunities in the manufacturing sector. Growth in gross-value-added is projected to be highest in the Middle East and Africa (3.9%). Realizing the potential impact of this trend depends on stakeholders implementing the measures specified in the stakeholder recommendations section at the conclusion of this profile.

Total potential economic value creation:

US\$2.78 trillion

Growth rate:

3.1%

Notable developments

Overview of past and likely future developments illustrating how digital sovereignty strategies are spreading:



Enabling conditions and countries' readiness

Key drivers

The following three drivers were identified by DET Survey respondents as the most critical factors driving the adoption of digital sovereignty strategies:



Digital Infrastructure

Regional or national clouds and data centers with strong encryption and monitored data pathways provide national control while still allowing necessary cross-border data flows.



Digital Innovation

Sovereign, localized AI models and tools that include verifiable transparency and audit trails to enable national control over systems while preserving trust and interoperability beyond the origin country.



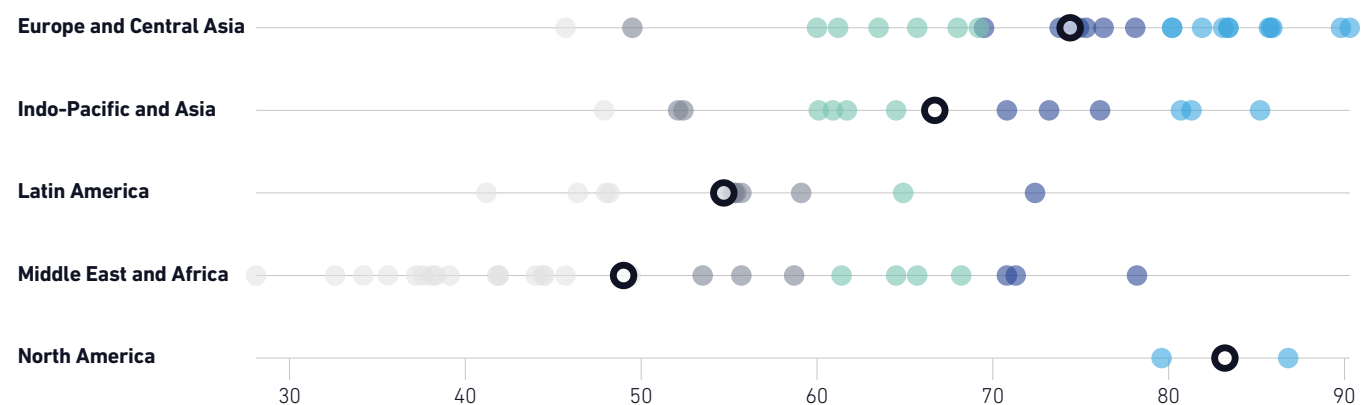
Digital Finance

Scaled digital financial systems that enable domestic capital formation, support local technology firms, and expand access to the financial services required for the growth of sovereign cloud and AI ecosystems.

Countries' readiness for trend adoption

Readiness for digital sovereignty strategies shows the widest variation across countries, with scores ranging from 28.1 to 90.3 out of 100. North America, categorized as a *pioneer*, is the leading region and benefits from its specialized cloud operations. Europe and Central Asia is categorized as *advanced*, supported by the EU's coherent regulatory framework. As shown in Figure III.8, the Indo-Pacific and Asia region is considered *established*, Latin America is *functional*, and the Middle East and Africa is *foundational* despite the presence of security mandates in several Gulf countries. These differences illustrate that each region achieves a distinct level of readiness, underscoring the need for tailored strategies to capitalize on the opportunities presented by this trend.

Figure III.8: The Spread of Digital Sovereignty Strategies: trend readiness by region



Legend: ● Foundational (<50) ● Functional (50-59.9) ● Established (60-69.9) ● Advanced (70-79.9) ● Pioneer (>80) ● Regional average

Source: Results from the DCO's 2025 Digital Economy Trends Survey combined with data from the DCO's Digital Economy Navigator 2025.

Q: At a global level, select the three key enabling factors countries need in order to benefit from the opportunities provided by the following digital economy trends?

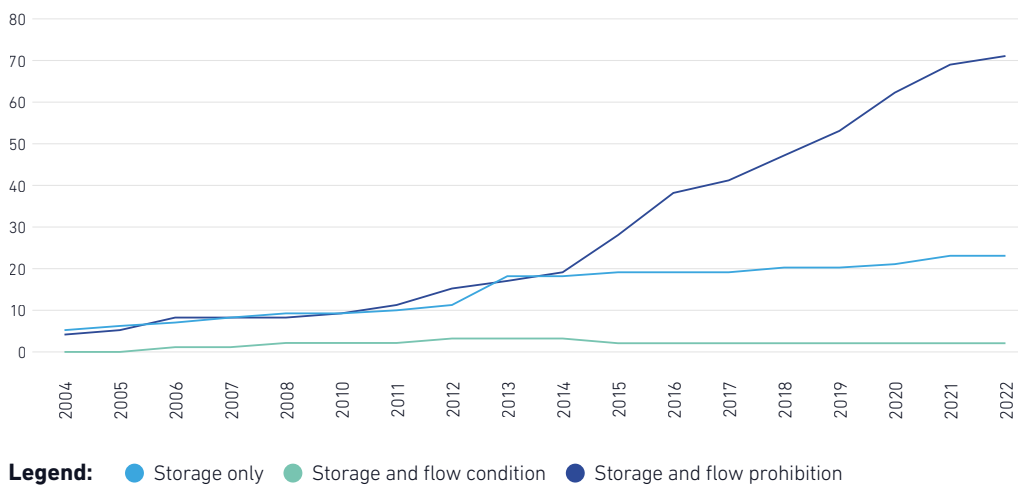
Respondents: 272 CTOs and senior technologists working in large companies (+250 employees), 60 policymakers, and 74 digital economy experts.

How is the trend materializing

Cloud infrastructure

Digital sovereignty objectives are increasingly driving governments to require that data be stored and processed within their borders. As shown in Figure III.9, such data localization measures are increasing, with more than half of these emerging in the last decade and more than two-thirds involving the combination of a storage requirement with a flow prohibition. These measures, in turn, are accelerating the development of sovereign cloud infrastructure, for example, Tata Consultancy Services, Sybyl, and iXAfrica are partnering to establish sovereign cloud infrastructure in East Africa;²⁵⁴ Microsoft has announced in-country processing for 365 Copilot in the United Arab Emirates; Turkcell and Google Cloud are collaborating to launch a new cloud region in Türkiye;^{255,256,257} and Bahrain is deploying an AI-ready Sovereign HyperCloud.^{258,259} Together, these initiatives illustrate how efforts to reinforce digital sovereignty are directly reshaping global cloud architectures.

Figure III.9: Data localization measures, 2004-2022²⁶⁰



Source: OECD compilation through the Digital Trade Alert, the OECD Digital STRI, and Cory and Dascolia (2021)

Public sector procurement

Across regions, the public sector is utilizing procurement procedures to embed sovereignty strategies into cloud contracts. The European Commission opened a €180 million tender to buy 'sovereign cloud' for EU institutions, requiring data to be kept in the EU and services run under EU law. In Saudi Arabia, the SAP Business Network solutions used by the public sector are hosted on Google Cloud infrastructure located within the Kingdom, ensuring complete data residency inside national borders, while maintaining seamless integration with the global SAP Business Network.^{261,262}

Agriculture sector

In July 2025, members of the Pan-African Parliament advocated for the development of local, offline AI systems on farms to protect farmers' data, contributing to efforts that promote data sovereignty for the African continent. As a part of this effort, AgridroneAfrica is piloting the use of drones connected to on-site AI, which is solar-powered and does not rely on internet connectivity.^{263,264}

Underlying technology

Sovereignty increasingly depends on jurisdictional control of cryptographic keys. In 2025, cloud providers expanded options for customer-held keys and external key management so agencies can keep keys, and therefore access decisions, inside their regions. Paired with confidential computing, this limits information access and visibility for support teams operating externally. Agencies also began post-quantum upgrades based on 2024 NIST standards, which force key inventories, rotations, and tighter access logs.^{265,266}

Country spotlight

In early 2025, **Nigeria's** technology agency NITDA mandated that certain categories of data must be hosted inside Nigeria and that public institutions must adopt cloud storage. By encouraging investment in local data centers, this strategy is reducing Nigeria's reliance on foreign providers and enhancing national data governance and digital sovereignty.^{267,268}

Luxembourg's €100 million Accelerating Digital Sovereignty 2030 initiative takes a whole-of-government approach to data governance, artificial intelligence (AI) and quantum infrastructure, and foreign technology independence. It includes leveraging the MeluXina supercomputer for AI and quantum capabilities, implementing AI regulatory sandboxes, and developing a national quantum distribution network.²⁶⁹

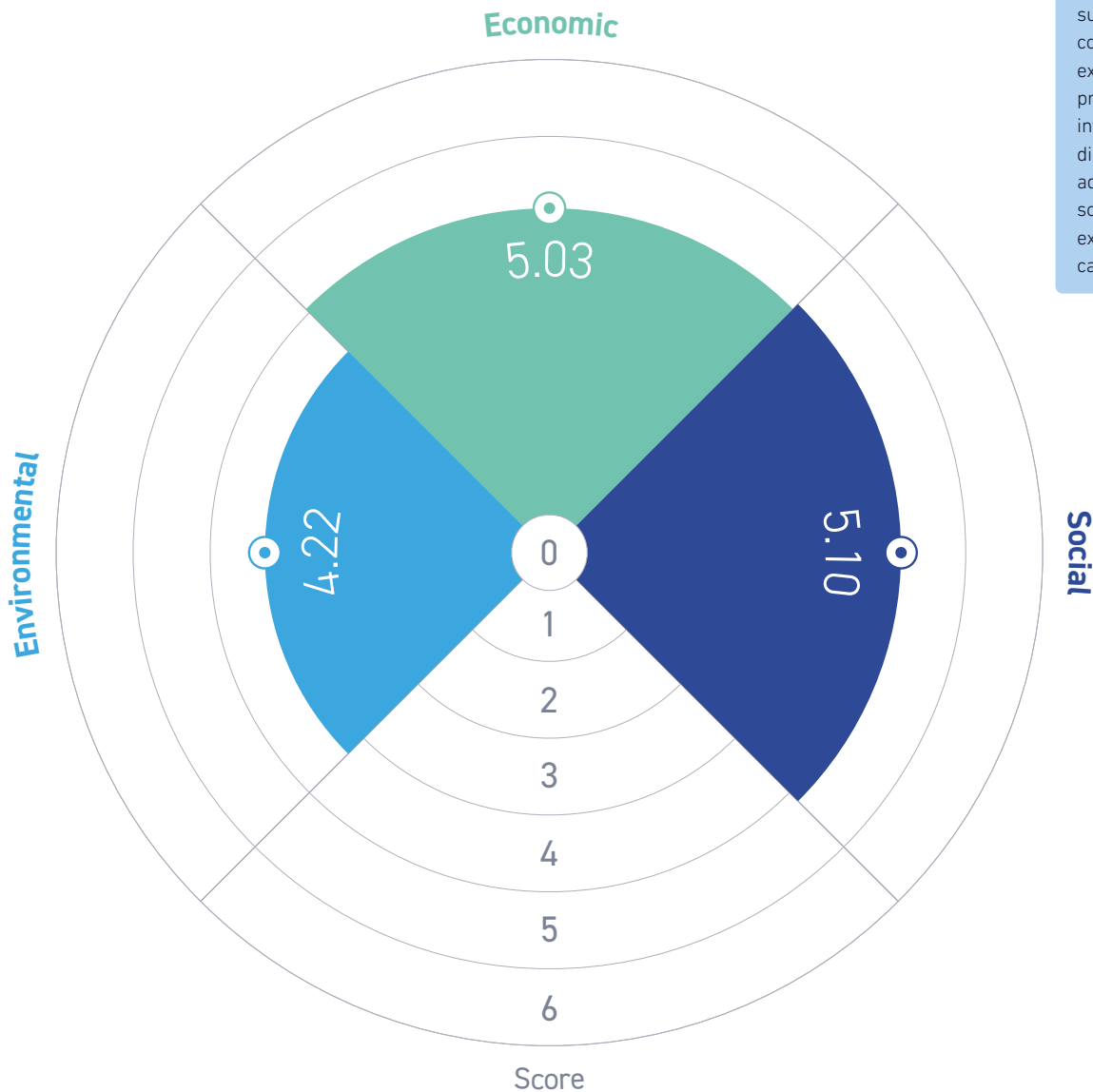
Economic, social, and environmental impact

This trend has a relatively higher positive social impact (5.10, ranking 4th overall), stemming from greater accountability and trust in data ownership. As shown in Figure III.10, its economic (5.03) and environmental (4.22) impacts remain mixed, as regulatory fragmentation can offset gains. Private sector respondents are marginally more optimistic than government.

Industry spotlight

Visa opened its first African data center, in Johannesburg, South Africa, to process regional transactions locally with the aim of reducing latency and outage risk while supporting data compliance. This is an example of employing private-sector investment in public digital infrastructure to advance national data sovereignty goals while expanding digital trade capacity.^{270,271}

Figure III.10: The Spread of Digital Sovereignty Strategies: expected positive impact



Legend: ● Average score per impact area

Source: DCO 2025 Digital Economy Trends Survey.

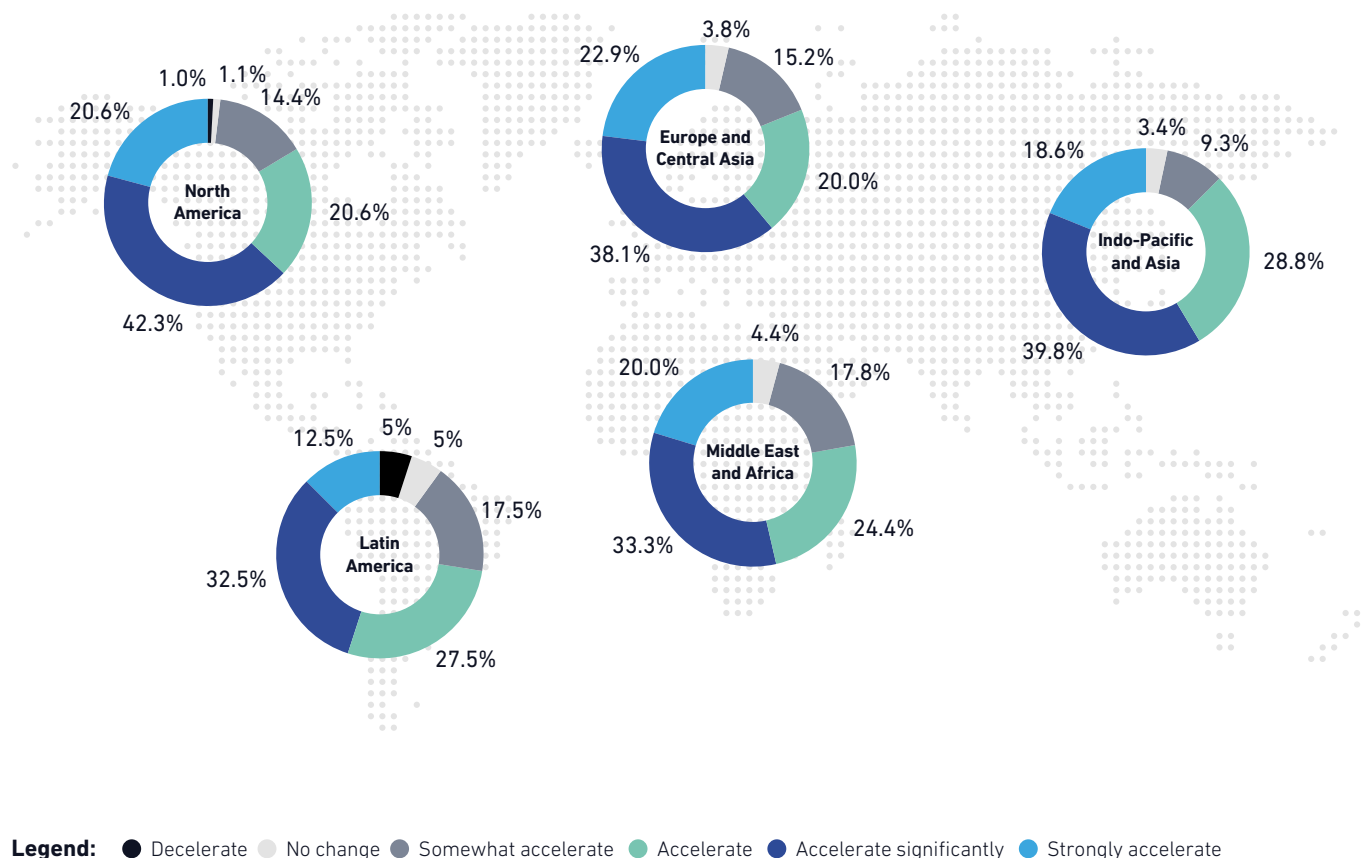
Q: In your country, how would you assess the economic/social/environmental impact of these current digital trends in the next 12-18 months?

Respondents: 272 CTOs and senior technologists working in large companies (+250 employees), 60 policymakers, and 74 digital economy and financial experts.

Pace of change

About 58% of respondents expect the trend to accelerate significantly or strongly, with this sentiment felt more in North America (62.9%) and less in Latin America (45.0%), as shown in Figure III.11. Private-sector respondents (60.1%) are more confident than government (48.3%), underscoring industry-driven incentives in implementing sovereign digital frameworks.

Figure III.11: The Spread of Digital Sovereignty Strategies: anticipated speed of change by region



Source: DCO 2025 Digital Economy Trends Survey.

Q: In your country, how do you anticipate the speed at which the following digital economy trends will evolve in the next 12-18 months?

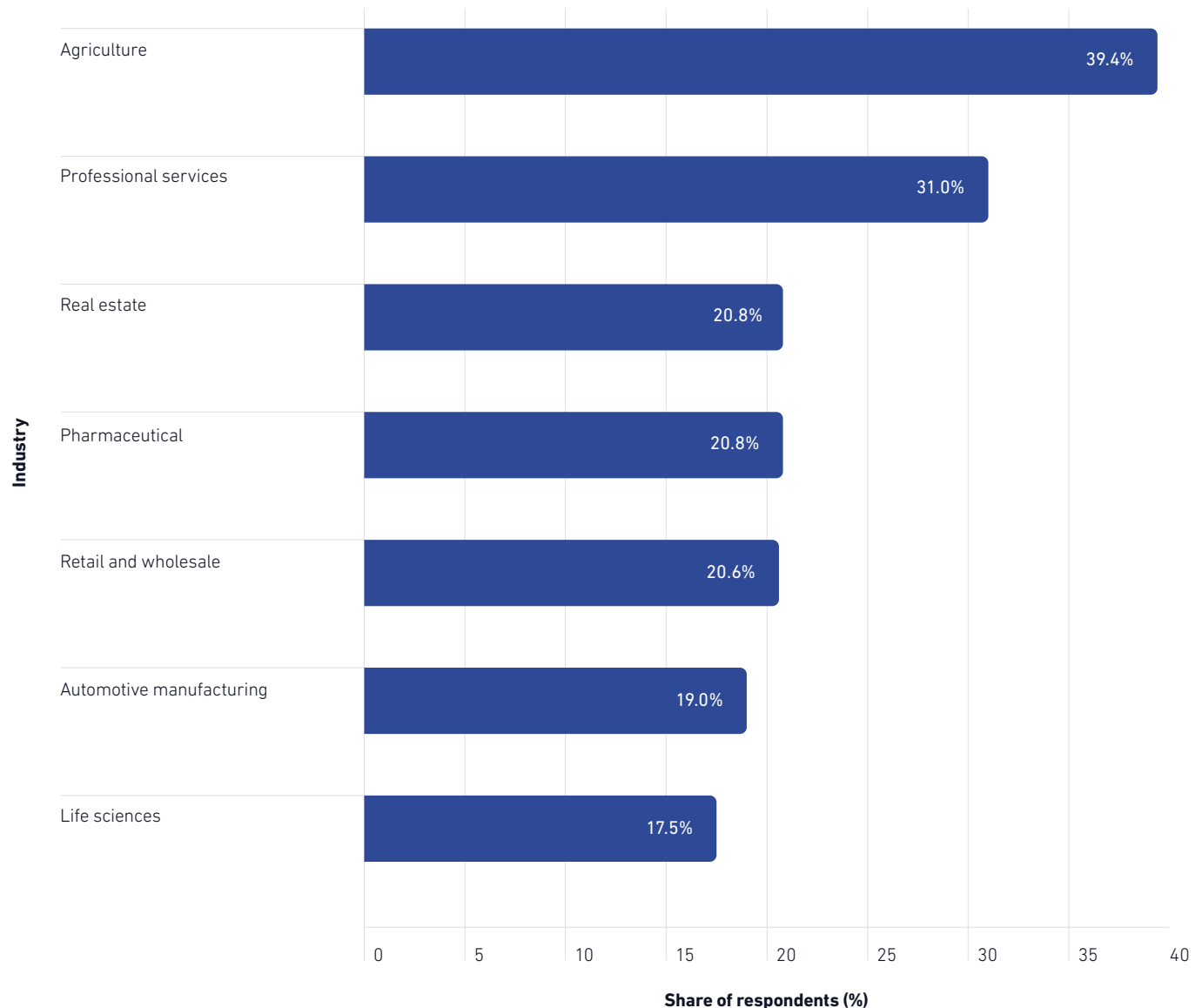
Respondents: 272 CTOs and senior technologists working in large companies (+250 employees), 60 policymakers, and 74 digital economy and financial experts.

Industry outlook

Respondents in agriculture (39.4%) are the most optimistic about the opportunities emerging from this trend, as shown in Figure III.12. Farmers increasingly recognize the commercial value of their data — such as yield maps, soil health metrics, and livestock genomics — and the need for sovereignty over it.

Professional services (31.0%) also anticipate significant opportunities from rising demand for audits, compliance, legal advisory, and contract management related to data localization, cross-border transfers, and vendor relationships. This illustrates the point made in the 'Why is it important' section above, that the pursuit of national autonomy tends to add complexity to the global digital ecosystem.

Figure III.12: The Spread of Digital Sovereignty Strategies: top industries for expected growth



Source: DCO 2025 Digital Economy Trends Survey.

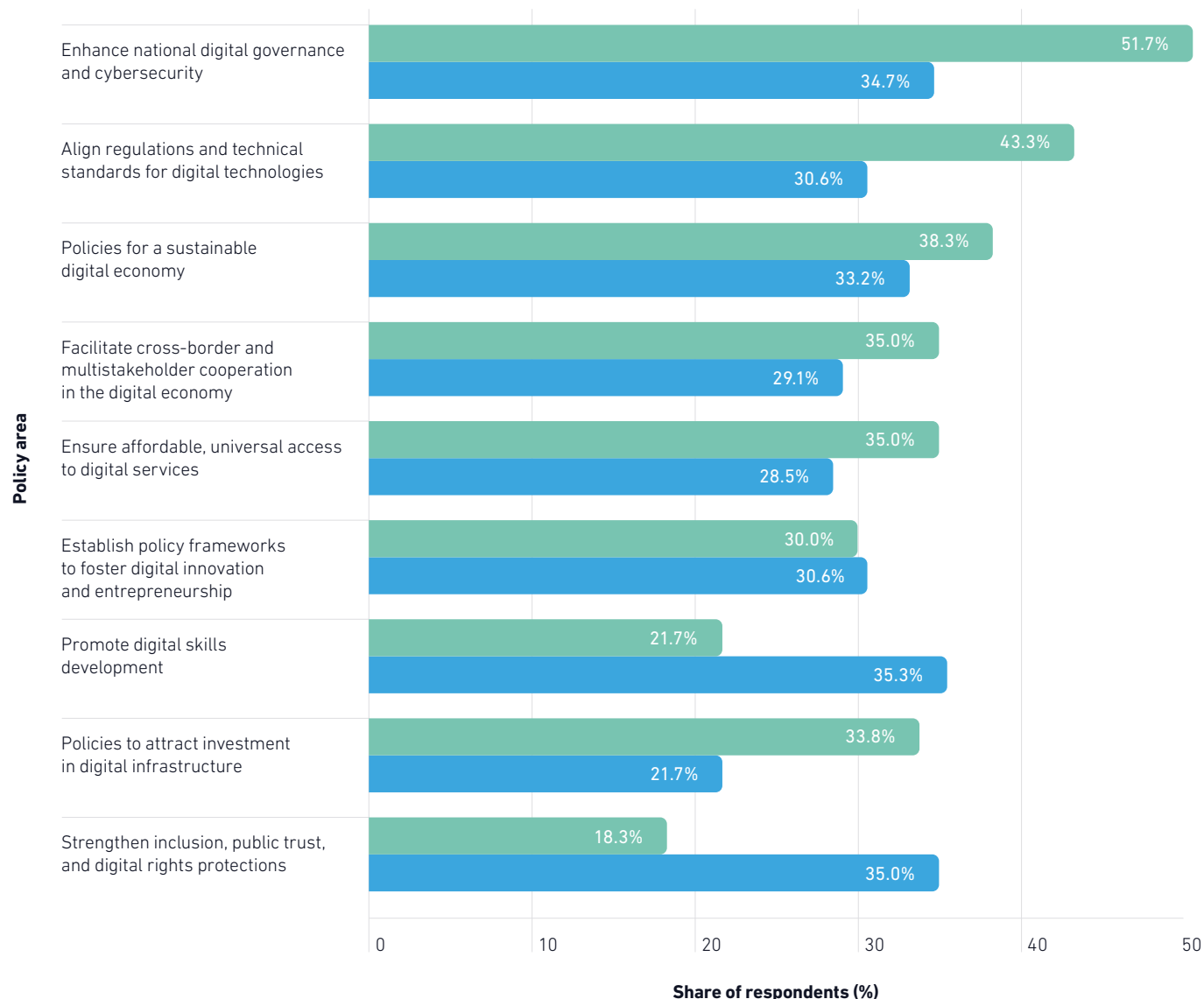
Q: In your industry, select the three digital economy trends, in order of importance, that you expect to create the most growth opportunities (e.g., new markets and customers or reducing operational costs) in the next 12-18 months.

Respondents: 272 CTOs and senior technologists working in large companies (+250 employees) and 74 digital economy and financial experts.

Policy actions

Government respondents prioritize enhancing national digital governance and cybersecurity (51.7%) to raise the security floor and aligning regulations and technical standards (43.3%) for greater interoperability, as shown in Figure III.13. This aligns with the EU's Network and Information Security (NIS2) Directive, which highlights cybersecurity as a core component of effective digital governance.²⁷² The private sector focuses on expanding digital skills development (35.3%) to meet rising localized demand.

Figure III.13: The Spread of Digital Sovereignty Strategies: priority policy actions



Legend: ● Public sector ● Private sector

Source: DCO 2025 Digital Economy Trends Survey.

Q: In your country, select the three most critical national policy actions needed for people, businesses, and states to benefit from each of the following current digital economy trends.




Respondents: 272 CTOs and senior technologists working in large companies (+250 employees), 60 policymakers, and 74 digital economy and financial experts.

Asking AI

We asked three leading LLMs (ChatGPT-5, Gemini 2.5 Flash, and DeepSeek-V3.2) to predict the likely impacts of this trend over the next 12-18 months.

Please refer to the methodology annex to see the exact prompts used.

Prompt >

|  Economic impact |  Social impact |  Environmental impact |
|---|--|--|
| <p>ChatGPT:</p> <p>"More countries will adopt digital sovereignty policies to control data flows, cloud storage, and AI infrastructure. This will boost local tech ecosystems and public-private investment in national data centers. However, stricter localization rules could raise operating costs for global firms and fragment digital markets."</p> | <p>Gemini:</p> <p>"Digital sovereignty will strengthen citizens' sense of control over personal data and online identity. Governments promoting transparency and privacy protections will build greater public trust in digital systems. Yet excessive control risks limiting information access and stifling innovation if not balanced with openness and cross-border collaboration."</p> | <p>DeepSeek:</p> <p>"Digital sovereignty strategies will have a significantly negative environmental impact. The push for local data storage and redundant infrastructure within national orders leads to massive inefficiency, multiplying data centers and energy consumption unnecessarily. This duplication of resources represents a major step back in optimizing the global digital ecosystem's carbon footprint."</p> |

Note: these insights from LLMs are not data driven. They are provided as directional and sentimental and the LLMs have not had access to the survey data.



Digital governance is no longer just about accountability or sovereignty strategies — it is becoming part of trade agreements and the geopolitics of how data regulations are negotiated.

Emrys Schoemaker
Senior Director, Policy & Advisory, Caribou

Stakeholder recommendations

Private sector

To ensure competitive advantage in an era of digital sovereignty where nations demand local control over data and AI infrastructure while maintaining the global interoperability essential for cross-border business continuity, business leaders need to:

Deploy efficient sovereignty-compliant architectures that balance data residency requirements with operational efficiency by leveraging regional cloud hubs, customer-managed encryption, and transparent AI governance frameworks that meet sovereignty goals without requiring full infrastructure duplication in every jurisdiction.

Invest in sovereignty solutions, which reduce costs and environmental footprints along with offering the capacity to leverage interoperable APIs and open weight AI models.

Support cross-border industry consortia that enable diverse national compliance requirements through flexible deployment models rather than rigidly defined and siloed technology stacks.

Prioritize workforce transformation through reskilling programs that integrate AI knowledge and skills into professional development. Focus on underserved populations, SMEs, and rural communities to ensure local capabilities align with sovereign digital strategies.

Public sector

To achieve national digital sovereignty that protects citizens' data and reduces foreign dependencies while preventing the global digital economy from fragmenting into incompatible blocs that deepen inequality and environmental harm, policymakers and regulators need to:

Design efficient sovereignty frameworks that achieve data residency and security goals through regional cooperation and shared infrastructure rather than strict national localization mandates that drive up costs, fragment markets, and create unnecessary energy consumption through redundant infrastructure.

Balance sovereignty with sustainability by incentivizing energy-efficient regional data center hubs that serve multiple nearby jurisdictions and reduce carbon footprints while meeting legitimate data governance requirements without requiring every nation to build duplicate infrastructure.

Establish regulatory sandboxes for digital sovereignty innovation to harmonize regulatory requirements for data residency, encryption control, and AI transparency.

Convene multi-stakeholder working groups within existing international bodies to develop digital sovereignty implementation roadmaps that accommodate different digital maturity levels and implementation capacities.

IGOs, IOs, and others

To ensure that digital sovereignty strategies serve the collective good, protect vulnerable populations and prevent technology from deepening existing inequalities, intergovernmental organizations, international organizations, civil society, and academia need to:

Convene multilateral coalitions to harmonize digital sovereignty approaches, developing interoperable frameworks that respect national autonomy while enabling trusted global digital collaboration.

Create reference architectures, certification schemes, and mutual-recognition standards to ensure local and regional cloud and AI providers can compete in the delivery of sovereign cloud infrastructure and services that emerging economies can adopt efficiently and cost effectively.

Build sovereign digital capacities through targeted workforce programs that develop local expertise in AI, data governance, and secure infrastructure management to create meaningful employment opportunities while reducing foreign dependencies.

Create independent monitoring agencies measuring the strategic impacts of sovereignty on fragmentation, equity, sustainability, and human rights. Publish annual assessments that hold all stakeholders accountable with prescriptive course corrections measured against fragmentation and inequality outcome indicators.

● Current trend

3.3

The Emergence of Competing Technology Blocs

Evolution of DET 2025 trend: Advancing Industrial Policies for the Digital Economy

What does the trend encompass?

As countries strengthen their digital economies through industrial policies, a broader global pattern is emerging: groups of countries and corporations are increasingly aligning around technology standards, frameworks, and regulations. Interoperability is increasing within these emerging blocs, but often reducing between them. Driven by the need for more resilient supply chains, secure digital infrastructure, and access to increasingly complex and capital-intensive technologies, the shift from national efforts toward more regional and multi-country collaboration is influencing semiconductor production, cloud and data ecosystems, AI governance approaches, and digital trade frameworks. These dynamics are reshaping the global digital economy into a set of interconnected but increasingly differentiated technology spheres.

Why is it important?

The emerging blocs create new pathways for shared standards, pooled investment, and more resilient supply chains. However, they make it harder for firms — especially in emerging economies — to operate seamlessly across markets with increasingly different compliance rules, technical standards, and regulatory expectations. How countries navigate these ecosystems will determine whether they gain access to broader innovation networks or face higher costs and barriers to entry.

Economic outlook

This trend shows moderate potential for value creation over the next 18 months, with 3.3% average growth in gross-value-added driven by the manufacturing, transport, storage, and communication sectors. Growth potential is highest in Latin America, at 4.5%. Achieving this economic value in full will require stakeholders to put into action the recommendations outlined at the end of this trend profile.

Technology blocs definition

Technology blocs are collaborative ecosystems spanning multiple countries. They emerge as shared standards, regulations, and technical compatibility enable more integrated supply chains and joint investment across the digital economy within each bloc.²⁷³

Total potential economic value creation:

US\$2.92 trillion

Growth rate:

3.3%

Notable developments

Overview of past and likely future developments highlighting the formation of competing technology blocs:

2023

G20 Leaders endorsed the G20 Framework for Systems of Digital Public Infrastructure under India's presidency, including the creation of a Global Digital Public Infrastructure Repository. This initiative reflects growing alignment on interoperability standards — an important counterbalance to divergent regional technology ecosystems.^{274,275}

2024

Under the framework of the European Chips Act, European manufacturers formed the European Semiconductor Manufacturing Company to build a semiconductor lab in Germany; marking a major step toward deeper cross-country coordination in Europe's semiconductor ecosystem.^{276,277}

2025

The United States, South Korea, and Japan signed Technology Prosperity Deals to deepen collaboration across strategic technologies such as AI, quantum computing, fusion energy, and 6G and to strengthen the resilience of critical supply chains.²⁷⁸

2025

Saudi Arabia's HUMAIN, AWS, NVIDIA, AMD, and Cisco announce a partnership on cloud infrastructure, compute capacity, and advanced networking to support AI at scale, strengthening cross-country technological collaboration and expanding access to frontier AI capabilities.^{279,280,281}

2027

UN member states implement the Global Digital Compact, using its shared principles for connectivity, inclusivity, and the governance of AI and other emerging technologies as a common baseline that regional technology blocs must consider when designing their digital ecosystems.^{282,283}

2030

The BRICS Centre for Industrial Competences enhances the capabilities of micro, small, and medium-sized enterprises in the digital economy, with the 2025-2030 Action Plan for SMEs providing training policies for companies to harness AI for digital transformation.

2030

The average market share of the top three producers of critical minerals — copper, lithium, nickel, cobalt, graphite, and rare earth elements — falls back to 82%, the same level as in 2020.²⁸⁴

What's
next? →

Enabling conditions and countries' readiness

Key drivers

DET Survey respondents believe these three drivers were the most relevant for the emergence of competing technology blocs:



Industry Digital Transformation

Countries with digitally mature industries — using aligned standards, interoperable systems, and integrated supply-chain technologies — are better positioned to participate in cross-country manufacturing, cloud, and AI ecosystems. Higher industrial interoperability lowers coordination costs and accelerates the formation of technology blocs.



Digital Capabilities

Strong domestic talent pipelines in areas such as AI engineering, semiconductor fabrication, cybersecurity, and cloud operations increase a country's ability to integrate with regional technology ecosystems. When countries' skill bases are sufficiently advanced and compatible, cross-country collaboration, knowledge transfer, and ecosystem-building become more feasible.



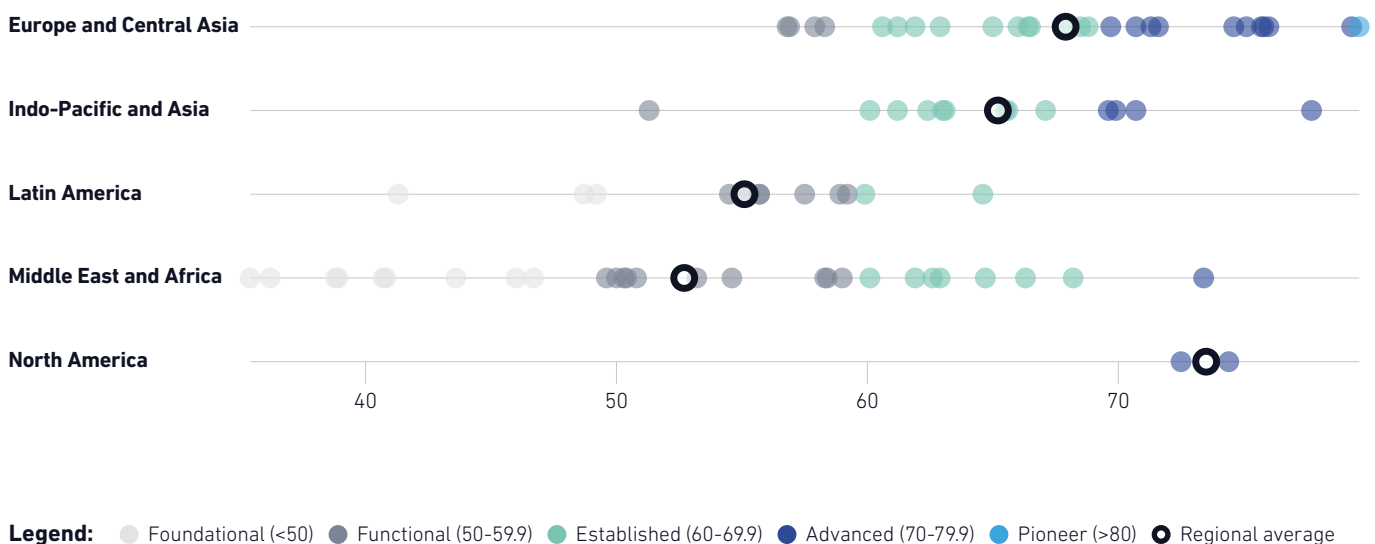
Digital Innovation

A strong innovation ecosystem attracts cross-country investment and enables joint projects because shared research capacity, complementary expertise, and aligned technological standards reduce collaboration costs and create incentives for firms and governments to co-invest in new technologies.

Countries' readiness for trend adoption

Across the digital economy trends identified in this report, this trend shows one of the lowest spreads, with countries displaying broadly similar levels of readiness. However, only one country is categorized as a *pioneer*. As shown in Figure III.14, North America (73.5) leads in readiness thanks to policies such as the CHIPS act, followed by Europe and Central Asia (67.9). In Indo-Pacific and Asia (65.2), large players aim for scale through domestic substitution. All DEN 2025 countries would benefit from strengthening their readiness to capture the opportunities arising from this trend.

Figure III.14: The Emergence of Competing Technology Blocs: trend readiness by region



Source: Results from the DCO's 2025 Digital Economy Trends Survey combined with data from the DCO's Digital Economy Navigator 2025.

Q: At a global level, select the three key enabling factors countries need in order to benefit from the opportunities provided by the following digital economy trends?

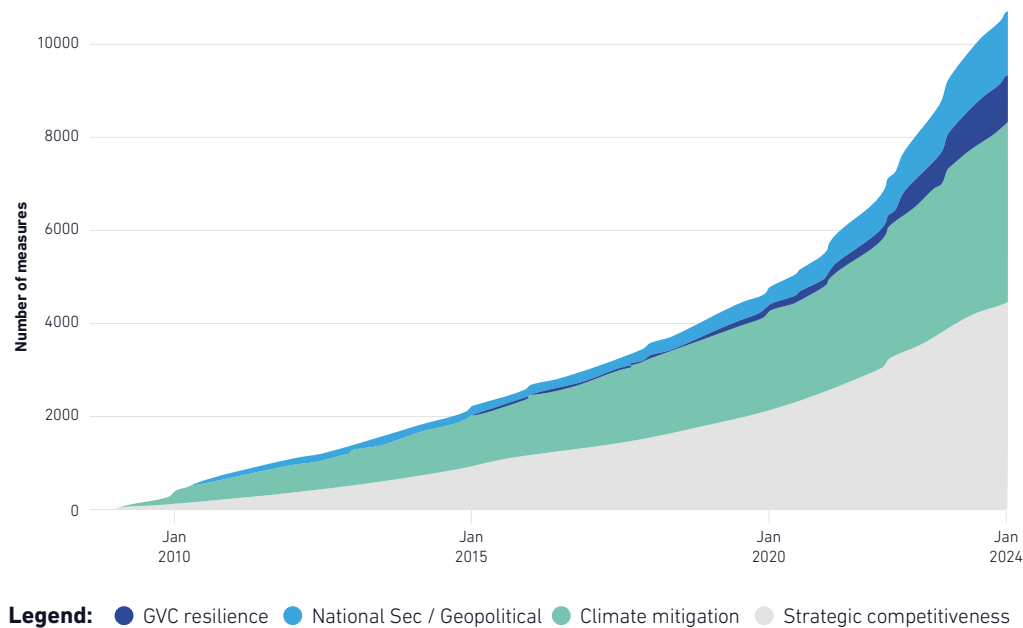
Respondents: 272 CTOs and senior technologists working in large companies (+250 employees), 60 policymakers, and 74 digital economy experts.

How is the trend materializing

Industrial policies motives

A recent working paper from the International Monetary Fund using LLM techniques to identify the policy motivations behind industrial policies finds not only an increase in such policies, but also a shift in their underlying motives, as shown in Figure III.15. Strategic competitiveness and climate goals were dominant in the aftermath of 2008-09 global financial crisis. Since the Covid-19 pandemic, national security, geopolitical concerns, and supply-chain resilience have become central drivers, with measures now targeting dual-use technologies, advanced manufacturing inputs, and critical minerals. This concentration of policy attention on strategically important sectors has reinforced the formation of aligned technology blocs.²⁸⁵

Figure III.15: New industrial policies with LLM-assigned motive²⁸⁶



Source: IMF's report on industrial policy since the great financial crisis (2025)

Automotive sector

Amid evolving regulatory, security, and market considerations, China has introduced domestic technology standards — such as the 2024 UBIOS firmware²⁸⁷ — to reduce reliance on existing global systems. The emergence of differing technology approaches across major economies is contributing to fragmentation in the automotive technology landscape, with manufacturers adopting distinct AI architectures, operating systems, and data standards for in-car AI, connected-vehicle platforms, and autonomous-driving technologies.²⁸⁸

Semiconductors

Shifts in global semiconductor manufacturing capacity highlight the emergence of distinct technology blocs. Recent analyses indicate significant planned capacity additions across Asia, Europe, and North America through the mid-2020s. Measures such as Japan's support for leading-edge fabrication plants, Europe's incentives under the EU Chips Act, and the United States' CHIPS and Science Act reflect how semiconductor manufacturing capacity is being geographically diversified by emerging regional technology blocs.^{289,290}

Industry spotlight

Airtel's Nxtra is building a 44-MW data center in Tatu City, a special economic zone (SEZ) in Kenya that pairs pro-investment rules with supporting infrastructure. It has attracted over 100 manufacturing, logistics, and tech firms with on-site customs clearance, tax and duty relief, reliable utilities, and dedicated corridors for data infrastructure.^{291,292} As blocs strengthen their own technology stacks, investments in such SEZs illustrate how companies are anchoring key digital infrastructure within supportive regional hubs rather than relying on globally dispersed facilities.

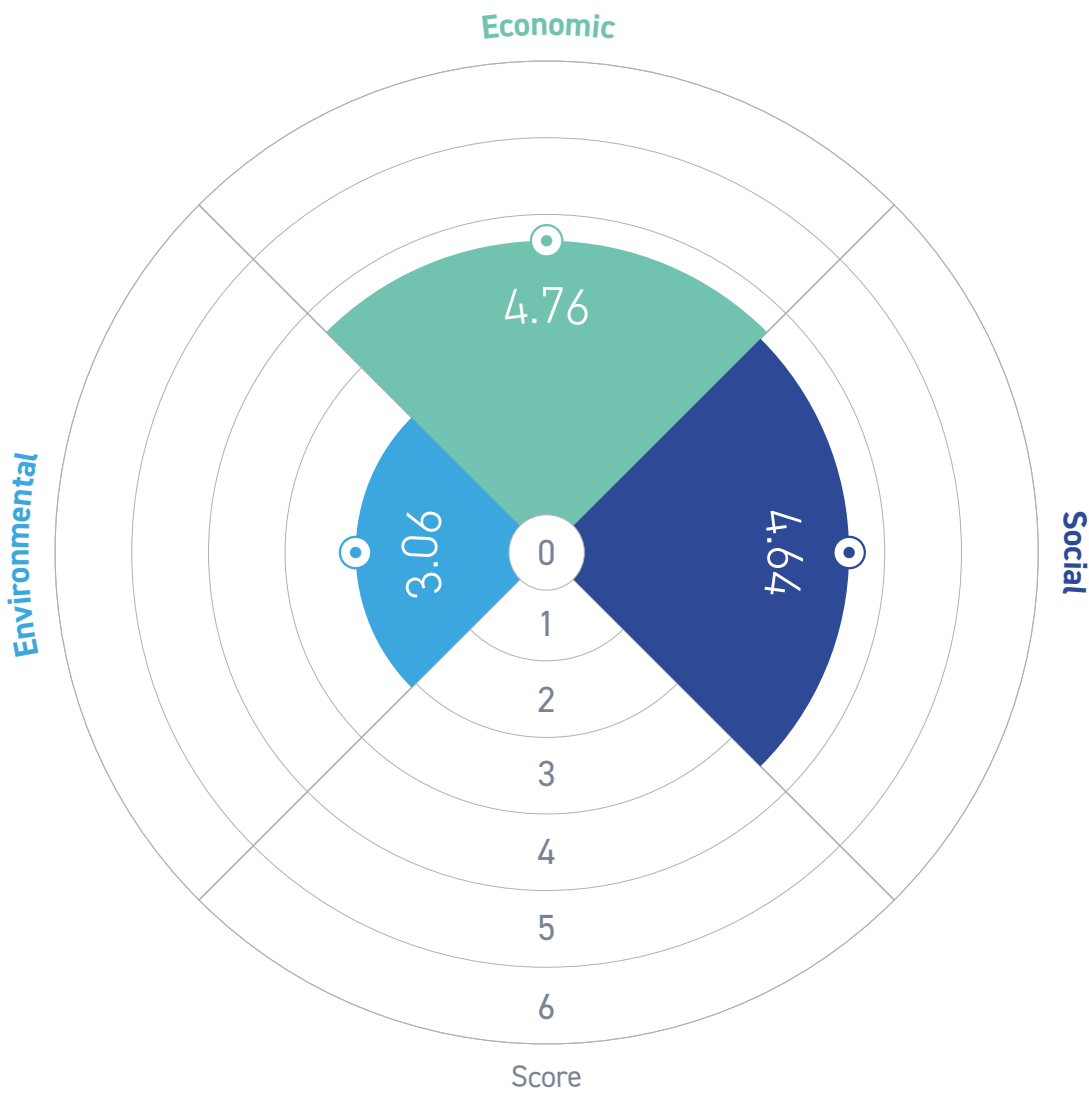
Country spotlight

In September 2025, **Brazil** launched the REDATA program, offering tax exemptions to attract global data-center investments — which are expected to reach US\$377 billion over the next decade. As regions work to build their own integrated technology ecosystems, REDATA aligns data center expansion strategies with cross-border standards and supply-chain partnerships, positioning Brazil as a key node within a more coordinated Latin American technology bloc.²⁹³

Economic, social, and environmental impact

The positive economic (4.76), social (4.64), and environmental (3.06) impacts of this trend are all relatively modest, as shown in Figure III.16, suggesting that while respondents see some economic and social benefits from regions strengthening their own technology ecosystems and supply-chain positions, they do not expect these shifts to yield broad gains. The environmental impact score is even lower, reflecting how activities driving technology blocs — such as semiconductor fabrication, data center expansion, and advanced manufacturing — tend to be energy-intensive and emission-heavy. Private sector respondents are more optimistic about economic impacts, reflecting expectations that regionalized technology investments may create new commercial opportunities.

Figure III.16: The Emergence of Competing Technology Blocs: expected positive impact



Legend: ● Average score per impact area

Source: DCO 2025 Digital Economy Trends Survey.

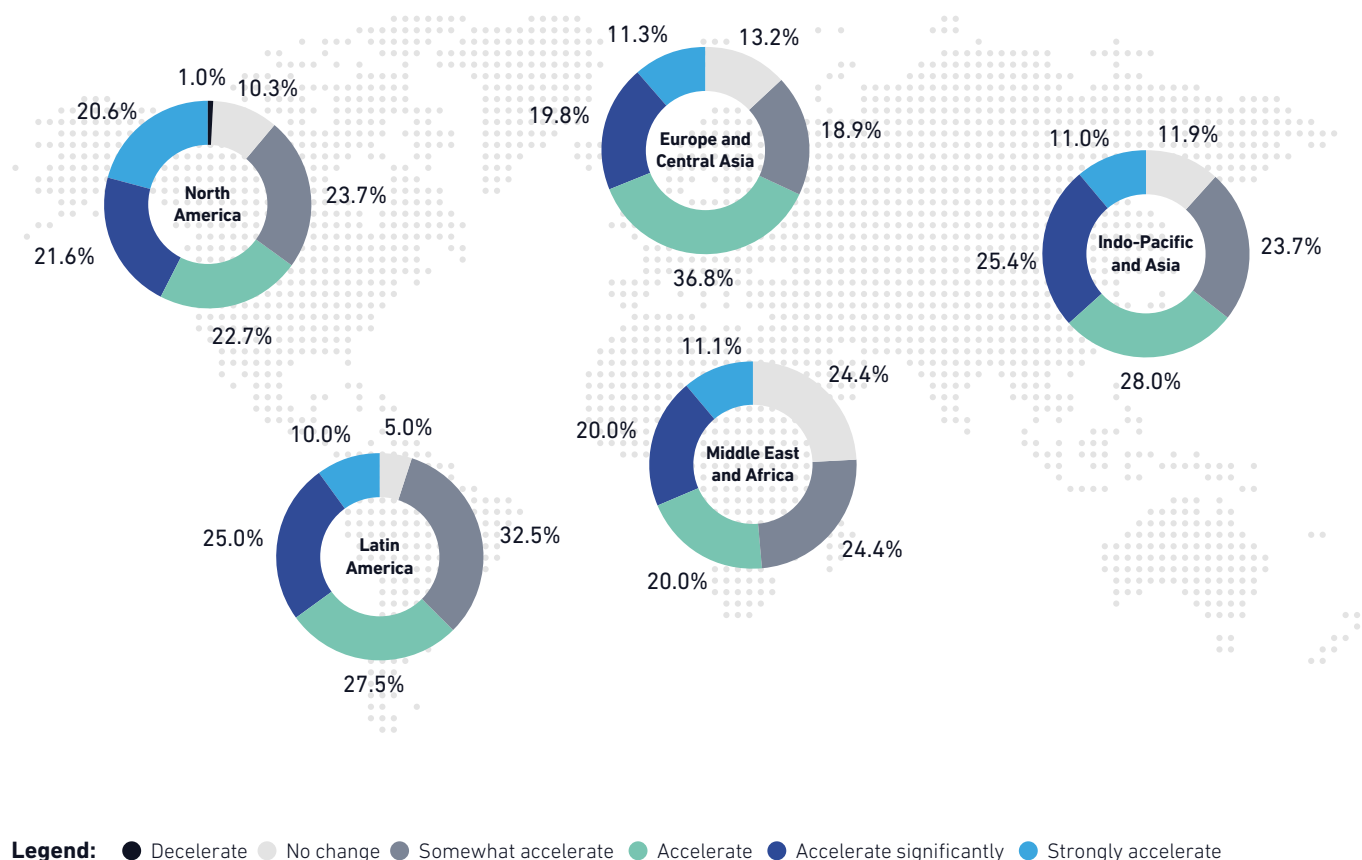
Q: In your country, how would you assess the economic/social/environmental impact of these current digital trends in the next 12-18 months?

Respondents: 272 CTOs and senior technologists working in large companies (+250 employees), 60 policymakers, and 74 digital economy and financial experts.

Pace of change

Around 36% of respondents expect the trend to accelerate significantly or strongly. The figure is lowest in the Middle East and Africa (24.4%), as shown in Figure III.17, perhaps signaling its independence from the emerging technology blocs. More government respondents (43.4%) than those from the private sector (34.4%) expect acceleration, indicating the importance of government-led policies.

Figure III.17: The Emergence of Competing Technology Blocs: anticipated speed of change by region



Source: DCO 2025 Digital Economy Trends Survey.

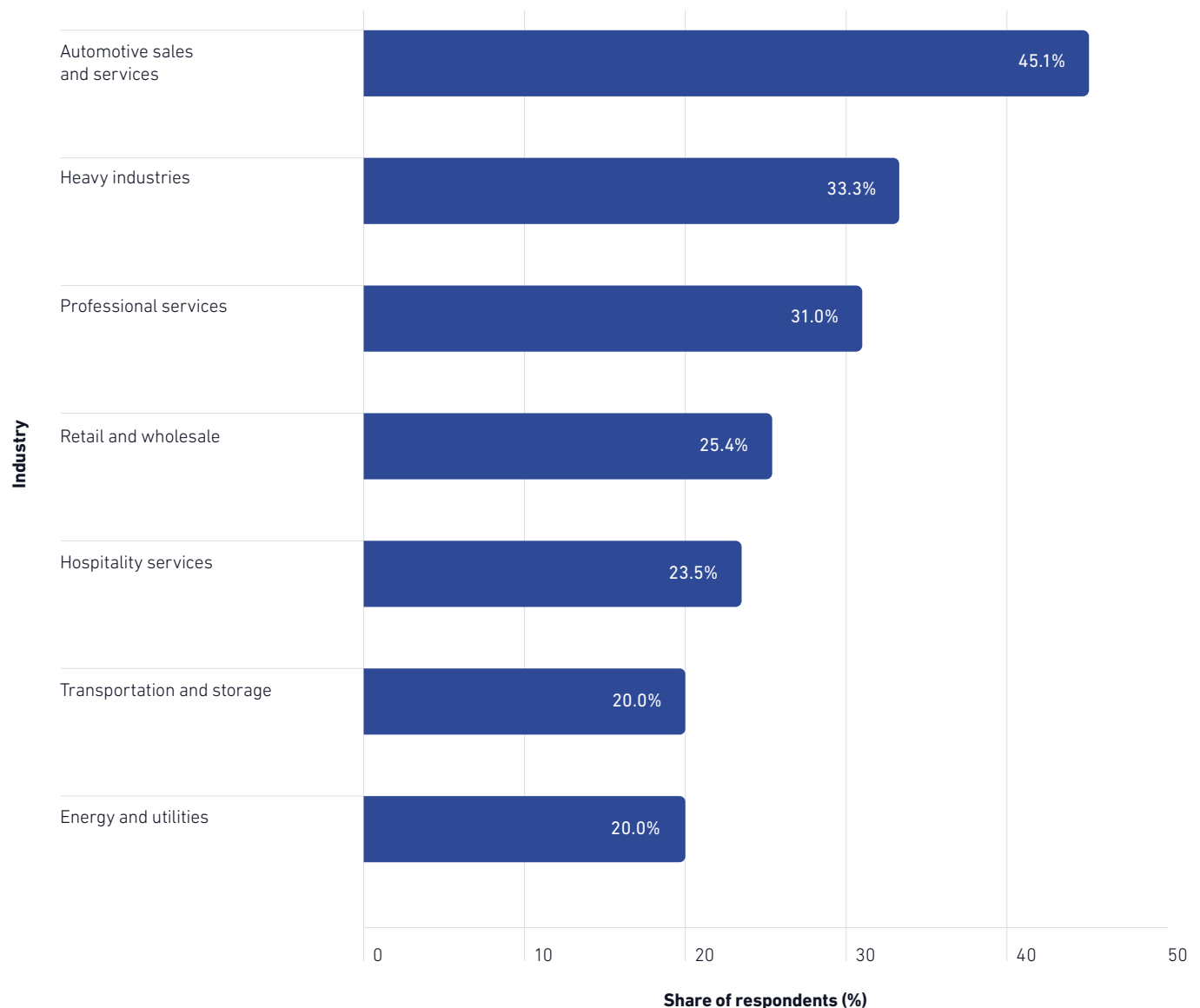
Q: In your country, how do you anticipate the speed at which the following digital economy trends will evolve in the next 12-18 months?

Respondents: 272 CTOs and senior technologists working in large companies (+250 employees), 60 policymakers, and 74 digital economy and financial experts.

Industry outlook

Automotive sales and services (45.1%) ranks as the most positively impacted sector (Figure III.18), as differing regional rules for vehicle software, connectivity, and charging standards lead to greater localization of services. This, in turn, can generate higher margins. Heavy industries (33.3%) follows, as industrial policy and supply-chain resilience measures encourage localized sourcing and investment in bloc-aligned production of materials such as steel, chemicals, and other core inputs. This indicates that industries already structured around bloc-oriented supply chains are well positioned to benefit.

Figure III.18: The Emergence of Competing Technology Blocs: top industries for expected growth



Source: DCO 2025 Digital Economy Trends Survey.

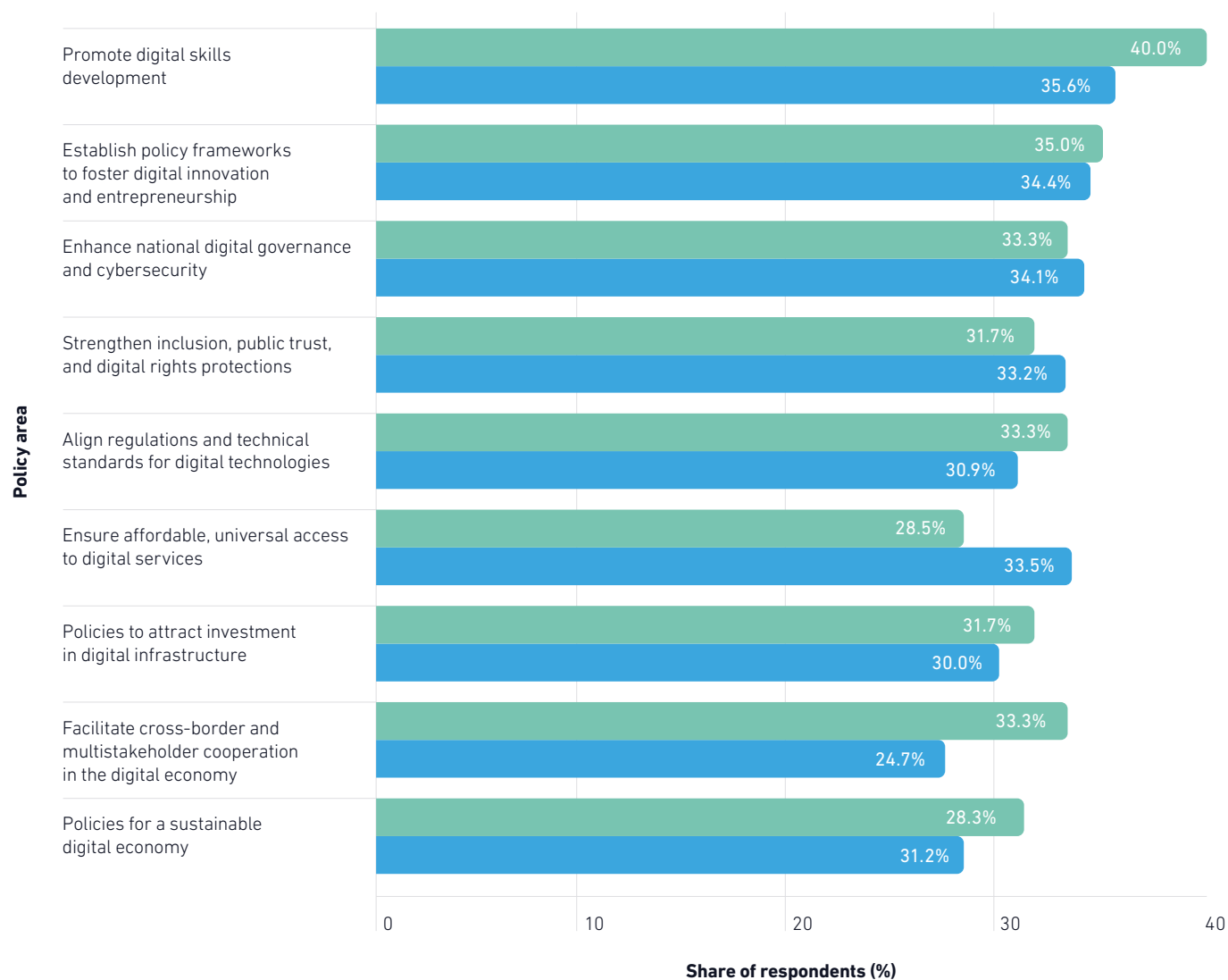
Q: In your industry, select the three digital economy trends, in order of importance, that you expect to create the most growth opportunities (e.g., new markets and customers or reducing operational costs) in the next 12-18 months.

Respondents: 272 CTOs and senior technologists working in large companies (+250 employees) and 74 digital economy and financial experts.

Policy actions

As shown in Figure III.19, both government (40.0%) and private sector (35.6%) respondents identify digital skills development as the top priority for managing the risk of blocs fragmenting the digital economy. Digital skills enable firms to adopt interoperable technologies, comply with global standards and enhance production and service capabilities across value chains. To this end, public-private collaboration should begin by identifying local digital skills gaps and their key determinants (both enablers and barriers) and then developing a comprehensive yet practical workforce development program to address these critical skills shortages across sectors and organizations. Codifying pro-innovation frameworks (35.0%, government) and entrepreneurship support (34.4%, private sector) are the next priorities.

Figure III.19: The Emergence of Competing Technology Blocs: priority policy actions



Legend: ● Public sector ● Private sector

Source: DCO 2025 Digital Economy Trends Survey.

Q: In your country, select the three most critical national policy actions needed for people, businesses, and states to benefit from each of the following current digital economy trends.

Respondents: 272 CTOs and senior technologists working in large companies (+250 employees), 60 policymakers, and 74 digital economy and financial experts.

Asking AI

We asked three leading LLMs (ChatGPT-5, Gemini 2.5 Flash, and DeepSeek-V3.2) to predict the likely impacts of this trend over the next 12-18 months.

Please refer to the methodology annex to see the exact prompts used.

Prompt >_



Economic impact

ChatGPT:

"Governments will intensify industrial policies to secure leadership in digital technologies like AI, semiconductors, and cloud infrastructure. While this will spur local innovation and investment, it will also create market distortions and deepen competition among major economies, fragmenting global digital value chains."



Social impact

Gemini:

"Targeted digital industrial policies could expand job opportunities in tech sectors and stimulate new education and training programs. Yet unequal policy capacity across countries risks widening social and regional divides, as some populations benefit from digital growth while others remain excluded."

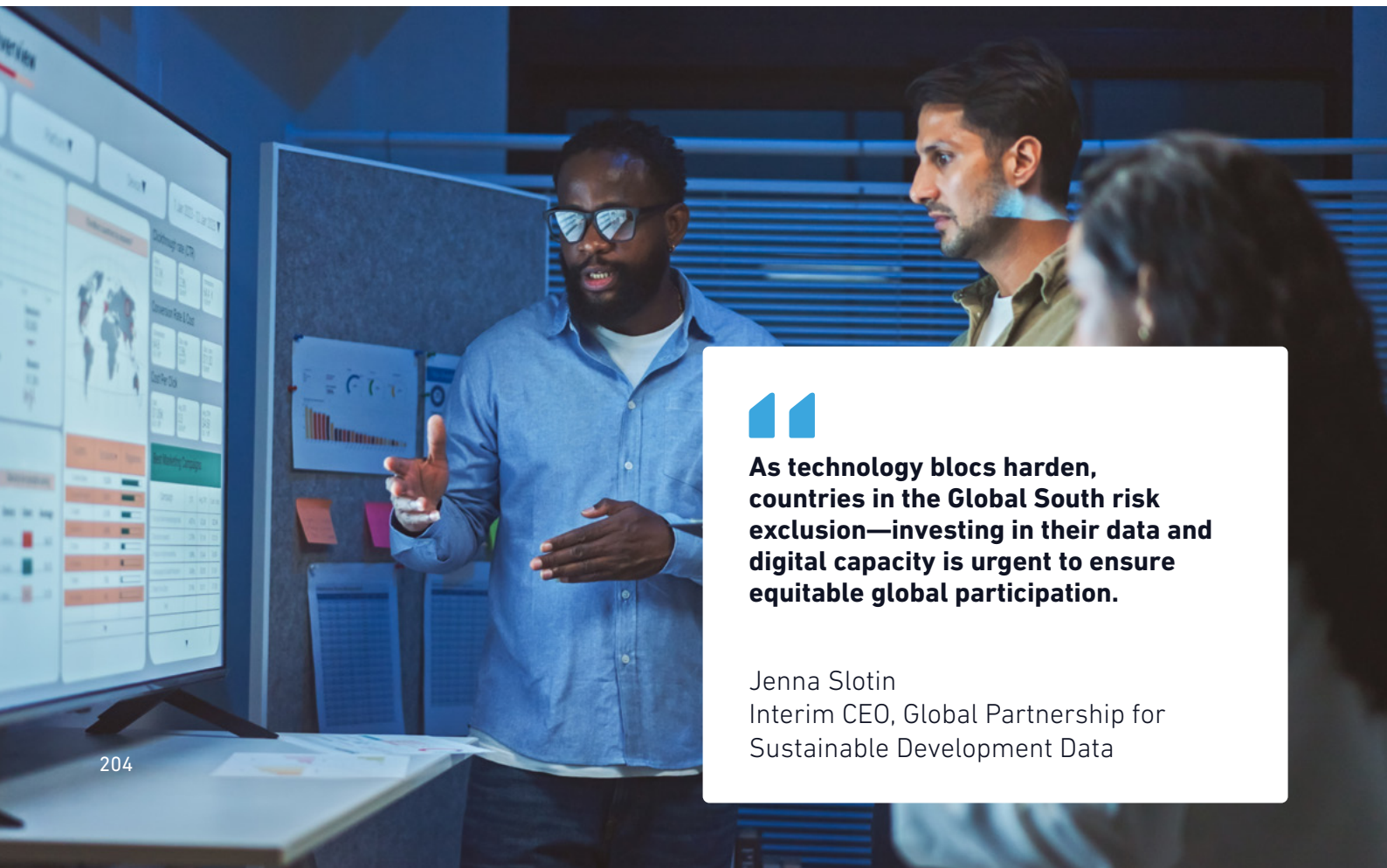


Environmental impact

DeepSeek:

"The environmental consequence is starkly negative. The duplication of semiconductor fabrication plant data infrastructure and supply chains in multiple regions to achieve strategic autonomy leads to a tremendous waste of resources and a surge in carbon emissions, directly countering global sustainability goals by prioritizing national security over ecological efficiency."

Note: these insights from LLMs are not data driven. They are provided as directional and sentimental and the LLMs have not had access to the survey data.



As technology blocs harden, countries in the Global South risk exclusion—investing in their data and digital capacity is urgent to ensure equitable global participation.

Jenna Slotin
Interim CEO, Global Partnership for
Sustainable Development Data

Stakeholder recommendations

Private sector

To maintain competitiveness while navigating an increasingly fragmented digital economy, business leaders need to:

Advance the adoption of flexible and modular technology architectures that allow products and services to adapt to different regional standards in areas such as semiconductors, cloud infrastructure, and AI systems, reducing redesign costs while meeting bloc-specific compliance requirements.

Invest in regional talent ecosystems by co-funding programs with governments and educational institutions to build specialized skills in AI, semiconductor design, cloud operations, and cybersecurity to strengthen competitiveness across blocs.

Engage with industry consortia and technical bodies to shape interoperable standards in areas such as data exchange, AI governance, identity management, and cloud services to minimize compliance fragmentation and enable firms to scale across blocs.

Diversify supply chains across regions in areas such as semiconductors, cloud, and hardware to reduce exposure to bloc-specific disruptions or export controls.

Public sector

To strengthen domestic capabilities without isolating the economy from global markets, policymakers and regulators need to:

Co-invest with neighboring countries and industry partners to build shared semiconductor capacity, data center hubs, and regional AI infrastructure, supporting strategic autonomy across aligned markets while reducing cost duplication.

Establish mutual recognition frameworks across regulatory systems that enable technology transfers, talent mobility, and interoperability for specific sectors, allowing firms to operate across blocs without excessive compliance hurdles.

Invest in digital skills development through STEM education, technical vocational training, and continuous reskilling programs that build national talent pipelines for AI, cybersecurity, semiconductors, and cloud engineering.

Support SMEs through simplified compliance pathways and shared digital services so they are not disproportionately disadvantaged by fragmented standards across blocs.

IGOs, IOs, and others

To balance national sovereignty with the need for global digital integration, international government organizations, international organizations, civil society, and academia need to:

Facilitate inter-bloc dialogue to establish minimum interoperability standards in semiconductors, cloud infrastructure, and AI systems to enable essential cross-bloc collaboration while respecting different regulatory environments.

Build capacity in emerging economies through technology transfer, open-source platforms, shared toolkits, and regional training programs that help prevent widening divides.

Develop global frameworks for monitoring the economic, social, and environmental implications of fragmented technology systems to help countries make informed decisions.

Promote sustainable models for regional cooperation that reduce redundant infrastructure investments and improve transparency and accountability when implementing digital strategies.

● Current trend

3.4

The Holistic Digital Trade Revolution

New trend in DET 2026

What does the trend encompass?

Digital services are reshaping international trade, shifting value creation from physical goods to cross-border digital solutions. Technology advances are expanding the range of tasks that can be digitalized and traded, from financial services and education to creative industries and AI-powered solutions. This expansion depends on digital trade policy frameworks that enable data mobility, interoperable digital-payment systems, trusted digital identity, and secure cloud infrastructure. New international trade agreements will be essential to enable fair market access and responsible technology transfer amid the rise of digital sovereignty approaches. Clear, harmonized standards for cross-border data interoperability, security, data governance, and intellectual property (IP) will be crucial to build trust, security, and global economic integration.

Digital trade definition

Digital trade encompasses the exchange of goods and services that are digitally ordered (for example, online purchases of software, services, or goods) or digitally delivered (for example, streaming media, cloud services, or remote data processing).^{294,295}

Why is it important?

Digital trade is becoming a core driver of growth and participation in the global economy. Yet the necessary rules, infrastructure, and trust frameworks are evolving unevenly. If standards for data, security, and IP remain fragmented, restrictions and compliance costs will limit market access, particularly for emerging economies and smaller firms. Advancing interoperable, secure, and transparent digital trade systems is essential for expanding economic opportunity, enabling fair participation in global markets, and preventing widening divides in the digital economy.

Economic outlook

This trend ranks fifth among the 12 current digital economy trends for potential value creation over the next 18 months, at 4.1% average growth in gross-value-added. It records the strongest gains in service-oriented sectors, such as community, maintenance, and personal support services, and, regionally, is concentrated in the Middle East and Africa (4.6%). Unlocking this value will rest on the extent to which stakeholders apply the measures identified in the stakeholder recommendations section below.

Total potential economic value creation:

US\$3.63 trillion

Growth rate:

4.1%

Notable developments

Overview of past and likely future developments showcasing The Holistic Digital Trade Revolution:



Enabling conditions and countries' readiness

Key drivers

The following three drivers were seen by DET respondents as the most important for encouraging holistic digital trade:



Digital Infrastructure

Interoperable data and payments rails, cross-border digital identity systems, and secure cloud environments support trusted data mobility and help services move reliably across jurisdictions.



Industry Digital Transformation

Business systems (e-invoicing, digital payments, and contracts) that align to common compliance standards and are auditable by design will reduce friction and increase execution speeds of cross-border digital services.



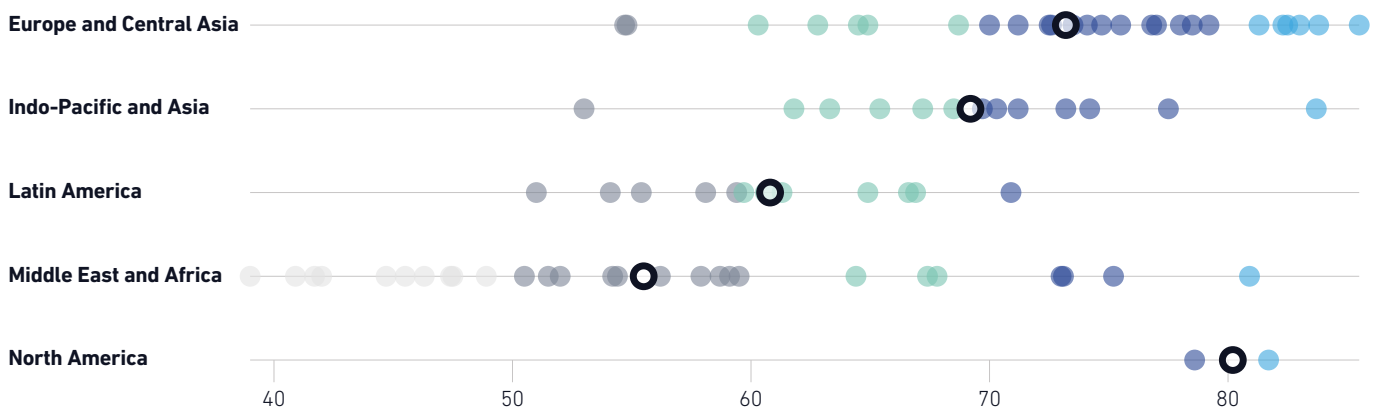
Digital Capabilities

Workforce skills that support AI-enabled compliance, digital rights management, and secure data handling reduce trade errors and disputes while enabling digital services to be scaled into new markets.

Countries' readiness for trend adoption

North America (80.2) leads in readiness for this trend, powered by its mature cross-border digital services. As shown in Figure III.20, Europe and Central Asia (73.2) follows, grounded in its digital single market and EU data governance framework. Although readiness levels vary across regions, the country with the lowest readiness score remains ahead of the lowest performers across other trends. This suggests that all countries benefit from a comparatively strong baseline to benefit from the opportunities presented by the adoption of this trend.

Figure III.20: The Holistic Digital Trade Revolution: trend readiness by region



Legend: ● Foundational (<50) ● Functional (50-59.9) ● Established (60-69.9) ● Advanced (70-79.9) ● Pioneer (>80) ● Regional average

Source: Results from the DCO's 2025 Digital Economy Trends Survey combined with data from the DCO's Digital Economy Navigator 2025.

Q: At a global level, select the three key enabling factors countries need in order to benefit from the opportunities provided by the following digital economy trends?

Respondents: 272 CTOs and senior technologists working in large companies (+250 employees), 60 policymakers, and 74 digital economy experts.

How is the trend materializing

Technology, media, and communications

Non-tariff measures are increasingly shaping how digital services operate across borders, influencing firms' structures around data flows, pricing, and compliance in different markets. For example, the EU fined Apple and Meta €700 million for altering payment options and ad consent, demonstrating how platform conduct has become a condition of digital market access. In the United States, recent export-control measures on frontier AI models and the restructuring of TikTok's operations — under a framework ensuring majority American ownership — show how national security and data-governance concerns have come together to affect cross-border digital services trade. Other jurisdictions have introduced digital-services taxes on revenues from online ads, marketplaces, and user-data use, adding further variation to the regulatory environment for international digital trade.^{309,310,311}

Cross-border trade in Africa

The Common Market for Eastern and Southern Africa (COMESA) is trialing a Digital Retail Payments Platform in Malawi and Zambia to settle cross-border trade in local currencies. It targets <3% fees, removing costly US dollar conversions with support from regional financiers. In parallel, MTN MoMo is expanding Uganda-Tanzania cross-border transfers and a Dubai Duty Free remittance corridor, providing evidence of public-private momentum for SME digital trade.^{312,313}

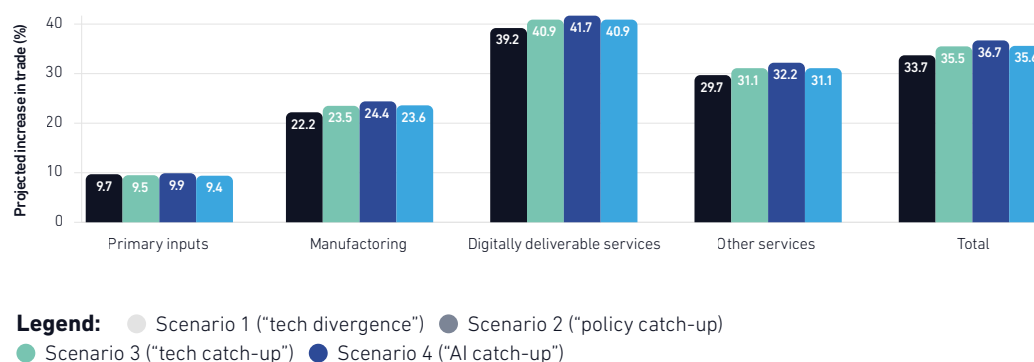
In the retail sector

In the retail sector, digital-trade platforms are enabling sellers to participate in cross-border e-commerce by improving security, reliability, and compliant data handling across transactions, logistics, and data-exchange services. One such platform, FlyLink, integrates payment and distribution services over 200 countries with support for 70 currencies, enabling business users to expand direct-to-consumer e-commerce models into new countries more efficiently. FlyLink users reportedly average a 29% reduction in operating costs.^{314,315}

Digitalizing trade documentation

Digital trade depends on the digitalization of the documents and logistics processes that accompany cross-border transactions. When major ports — such as the Port of Rotterdam — adopt standards like the Digital Container Shipping Association's Track & Trace protocol, shipping data become more verifiable, machine-readable, and exchangeable across carriers, customs systems, and trade platforms.³¹⁶ Around 11% of bills of lading, a crucial document for enabling shipping by verifying ownership, were electronic in 2025, reducing the delays and coordination frictions that affect cross-border transactions.³¹⁷ Lowering operational trade costs is a key driver of the WTO's projection of reaching 39–42% growth in digitally deliverable service by 2040 (Figure III.21).^{318,319}

Figure III.21: WTO simulations of AI's impact on global trade, 2025–40³²⁰



Source: Simulations using the WTO Global Trade Model.

AI is driving a new wave of global trade with the potential to reduce costs, boost productivity, and raise real incomes.

Country spotlight

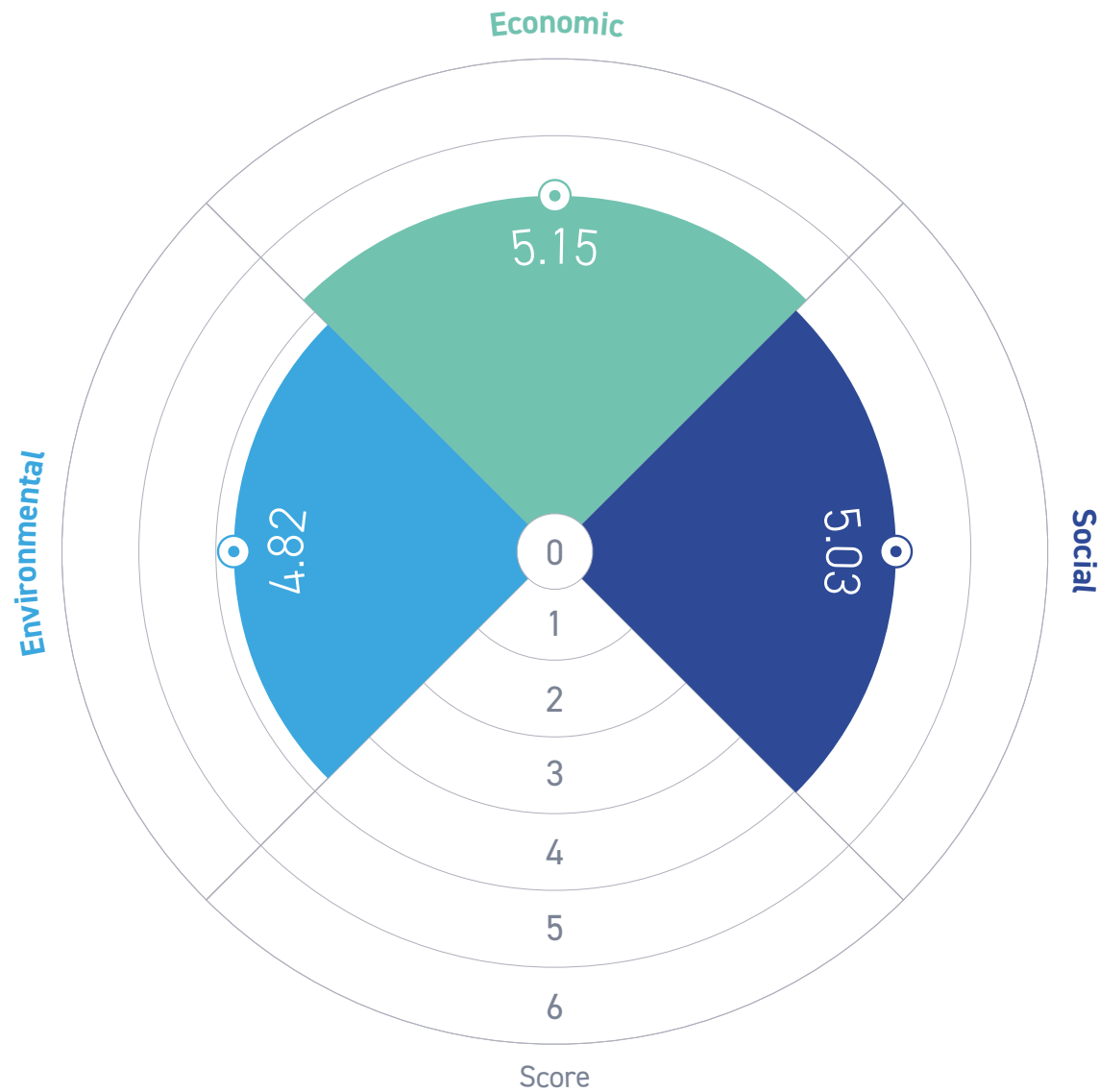
In 2025, Ghana advanced its holistic digital trade agenda by launching a National E-Commerce Strategy, in collaboration with UNCTAD. The strategy covers improving digital payment systems and enhancing logistics and cross-border trade, with support for smaller enterprises. Implementation is overseen by a steering committee composed of government, private sector, academic, and civil-society representatives.³²¹

In 2025, **Singapore** and **Australia** are set to launch the Green and Digital Shipping Corridor, enabling real-time, paperless trade documentation and carbon-tracking systems across maritime routes. This initiative is innovative because it fuses cross-border digital trade facilitation with green-transition goals, marking a new model for sustainable, tech-driven commerce.^{322,323}

Economic, social, and environmental impact

This trend ranks third-highest for its positive environmental impact (4.82), highlighting efficiency gains from paperless trade and reduced physical logistics, and in the upper-middle tier for economic (5.15) and social (5.03) impacts, as shown in Figure III.22. North America ranks highest for environmental impact, while private sector respondents (5.24) foresee higher economic benefits than those from government (4.98). Overall, the outlook for the next 12-18 months is positive, with trend adoption expected to generate meaningful benefits across regions and impact areas.

Figure III.22: The Holistic Digital Trade Revolution: expected positive impact



Legend: ● Average score per impact area

Source: DCO 2025 Digital Economy Trends Survey.

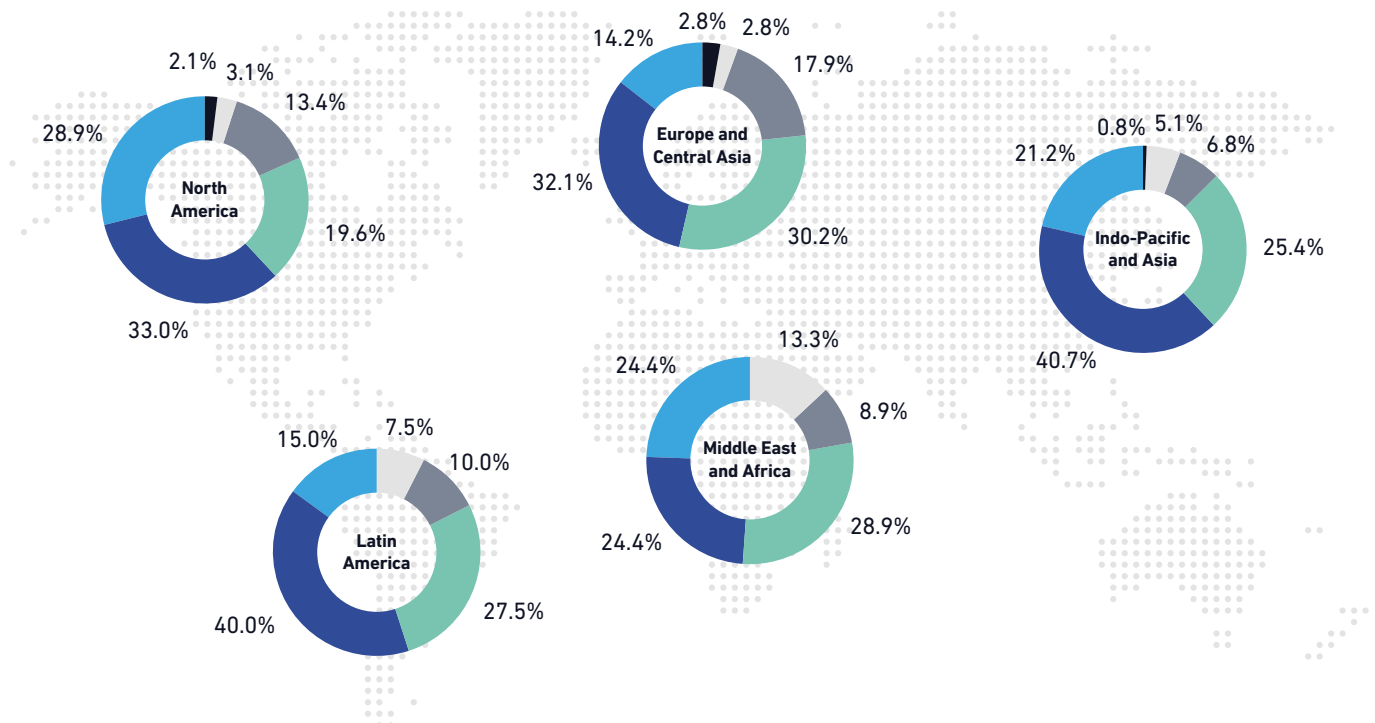
Q: In your country, how would you assess the economic/social/environmental impact of these current digital trends in the next 12-18 months?

Respondents: 272 CTOs and senior technologists working in large companies (+250 employees), 60 policymakers, and 74 digital economy and financial experts.

Pace of change

Nearly 56% of respondents expect strong or significant acceleration, with those in Indo-Pacific and Asia and North America (61.9% each) the most enthusiastic, as shown in Figure III.23. Respondents from the private sector are much more likely to foresee strong acceleration (23.5%) than those in government (8.3%).

Figure III.23: The Holistic Digital Trade Revolution: anticipated speed of change by region



Legend: ● Decelerate ● No change ● Somewhat accelerate ● Accelerate ● Accelerate significantly ● Strongly accelerate

Source: DCO 2025 Digital Economy Trends Survey.

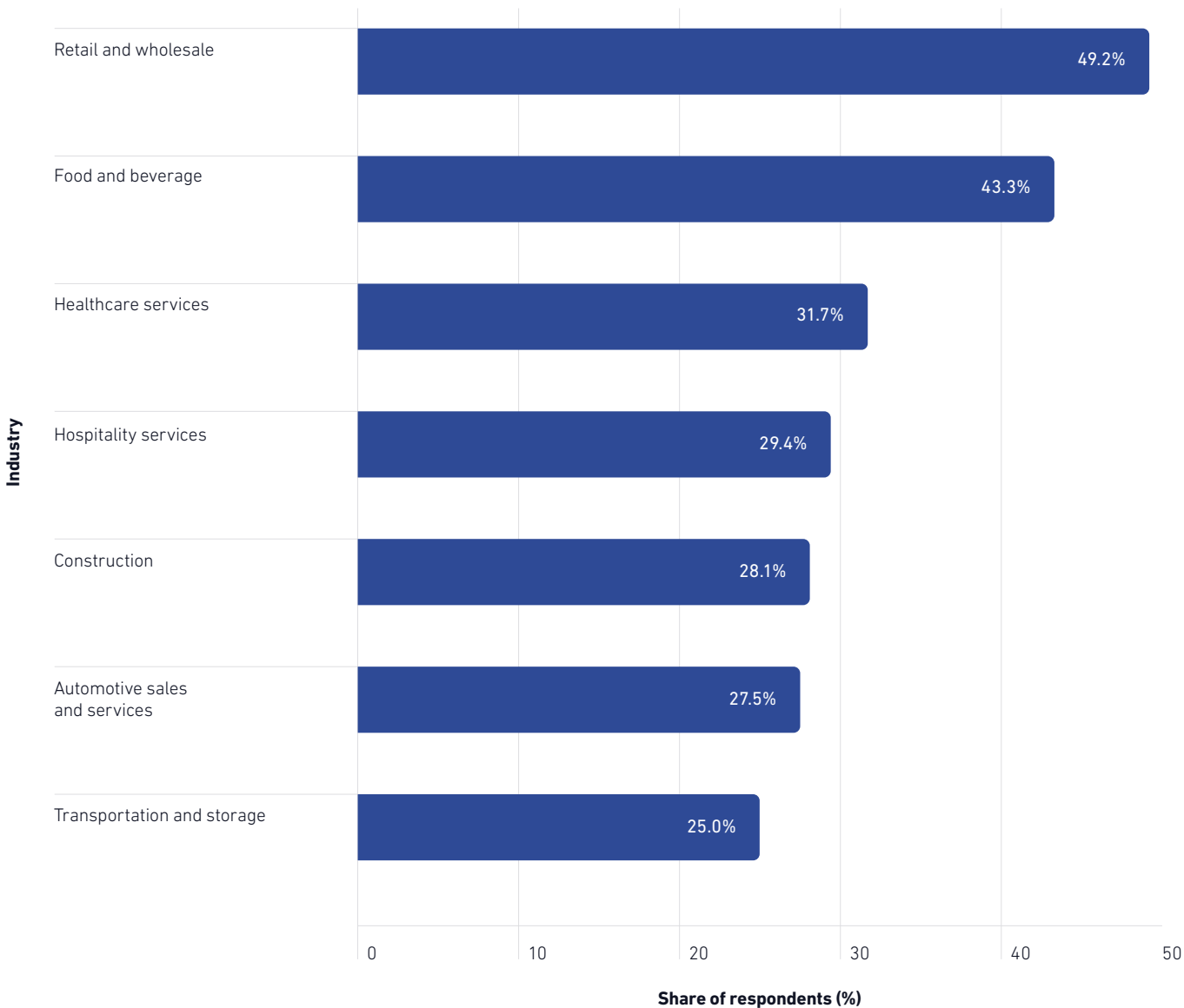
Q: In your country, how do you anticipate the speed at which the following digital economy trends will evolve in the next 12-18 months?

Respondents: 272 CTOs and senior technologists working in large companies (+250 employees), 60 policymakers, and 74 digital economy and financial experts.

Industry outlook

As shown in Figure III.24, retail and wholesale (49.2%) is the industry respondents see as most impacted by holistic digital trade, from marketplace onboarding to payments, tax, and cross-border transactions. Food and beverage (43.3%) follows, as digital trade supports cross-border product flows through digital certifications, simplified export documentation, and verifiable provenance, improving both supplier integration and product traceability. Together, the findings suggest that industries with frequent cross-border transactions and complex compliance requirements are likely to experience the strongest effects.

Figure III.24: The Holistic Digital Trade Revolution: top industries for expected growth



Source: DCO 2025 Digital Economy Trends Survey.

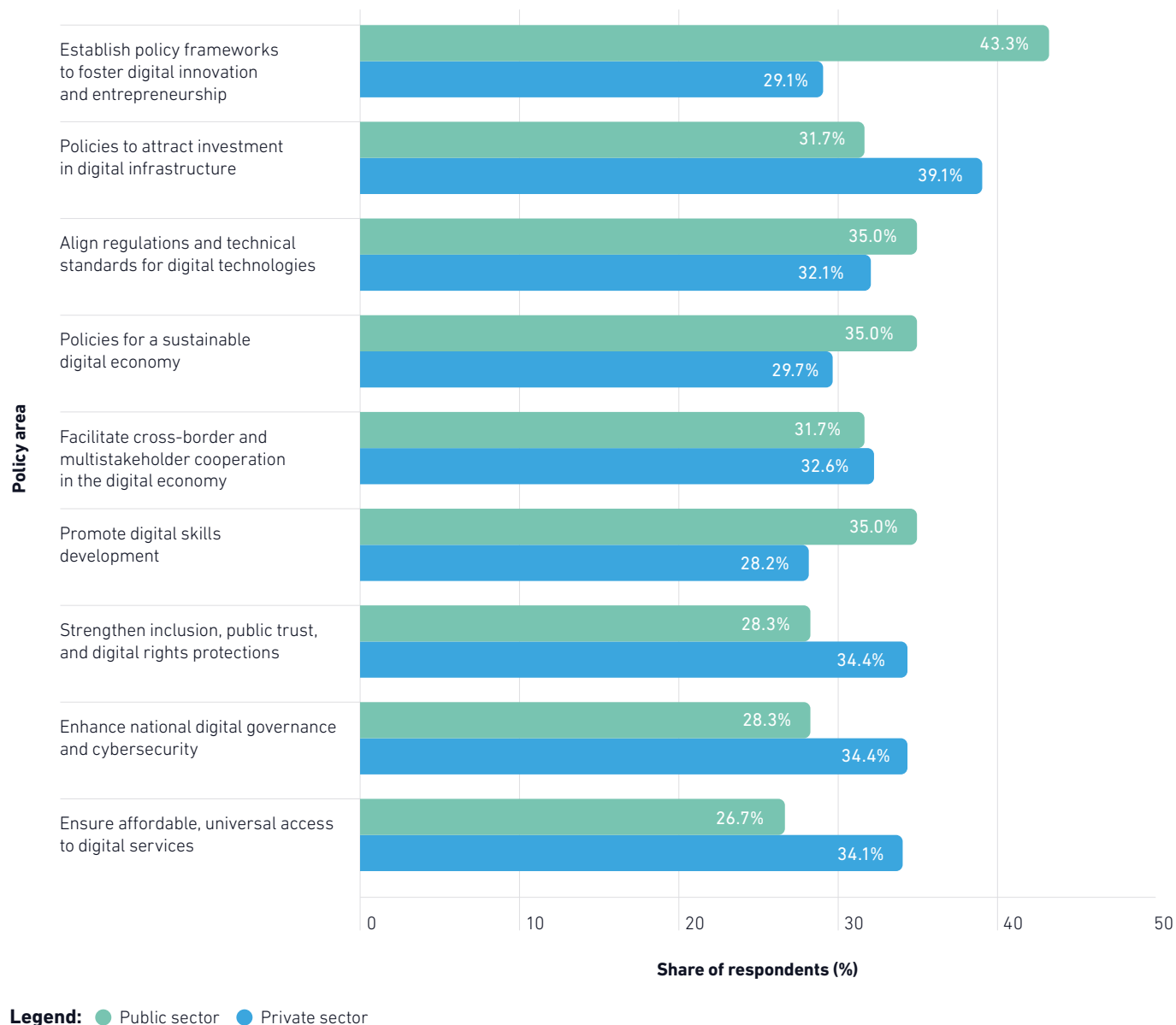
Q: In your industry, select the three digital economy trends, in order of importance, that you expect to create the most growth opportunities (e.g., new markets and customers or reducing operational costs) in the next 12-18 months.

Respondents: 272 CTOs and senior technologists working in large companies (+250 employees) and 74 digital economy and financial experts.

Policy actions

Government respondents prioritize pro-innovation policy frameworks (43.3%) to clarify rules for data, payments, and cross-border services, as shown in Figure III.25, reflecting the growing need for regulatory certainty to foster holistic digital trade and investment. On the private side, priorities include channeling investment into digital infrastructure (39.1%) to modernize supply chains, and strengthening inclusion, trust, and rights protection (34%), signaling a broader transition toward a digital trade model built on trust, inclusion, and shared standards across borders. Overall, the survey responses indicate that enabling cross-border digital trade will depend on a coordinated mix of clear regulatory frameworks, sustained infrastructure investment, and inclusive digital market policies.

Figure III.25: The Holistic Digital Trade Revolution: priority policy actions



Source: DCO 2025 Digital Economy Trends Survey.

Q: In your country, select the three most critical national policy actions needed for people, businesses, and states to benefit from each of the following current digital economy trends.


Respondents: 272 CTOs and senior technologists working in large companies (+250 employees), 60 policymakers, and 74 digital economy and financial experts.

Asking AI

We asked three leading LLMs (ChatGPT-5, Gemini 2.5 Flash, and DeepSeek-V3.2) to predict the likely impacts of this trend over the next 12-18 months.


Please refer to the methodology annex to see the exact prompts used.

Prompt >_




Economic impact

ChatGPT:
“Digital trade will expand rapidly as countries modernize e-commerce frameworks and digital payment systems. SMEs will gain new export opportunities through online marketplaces and cross-border data flows. However, uneven digital infrastructure and fragmented regulations may slow full integration, creating a dual-speed global trade landscape.”



Social impact

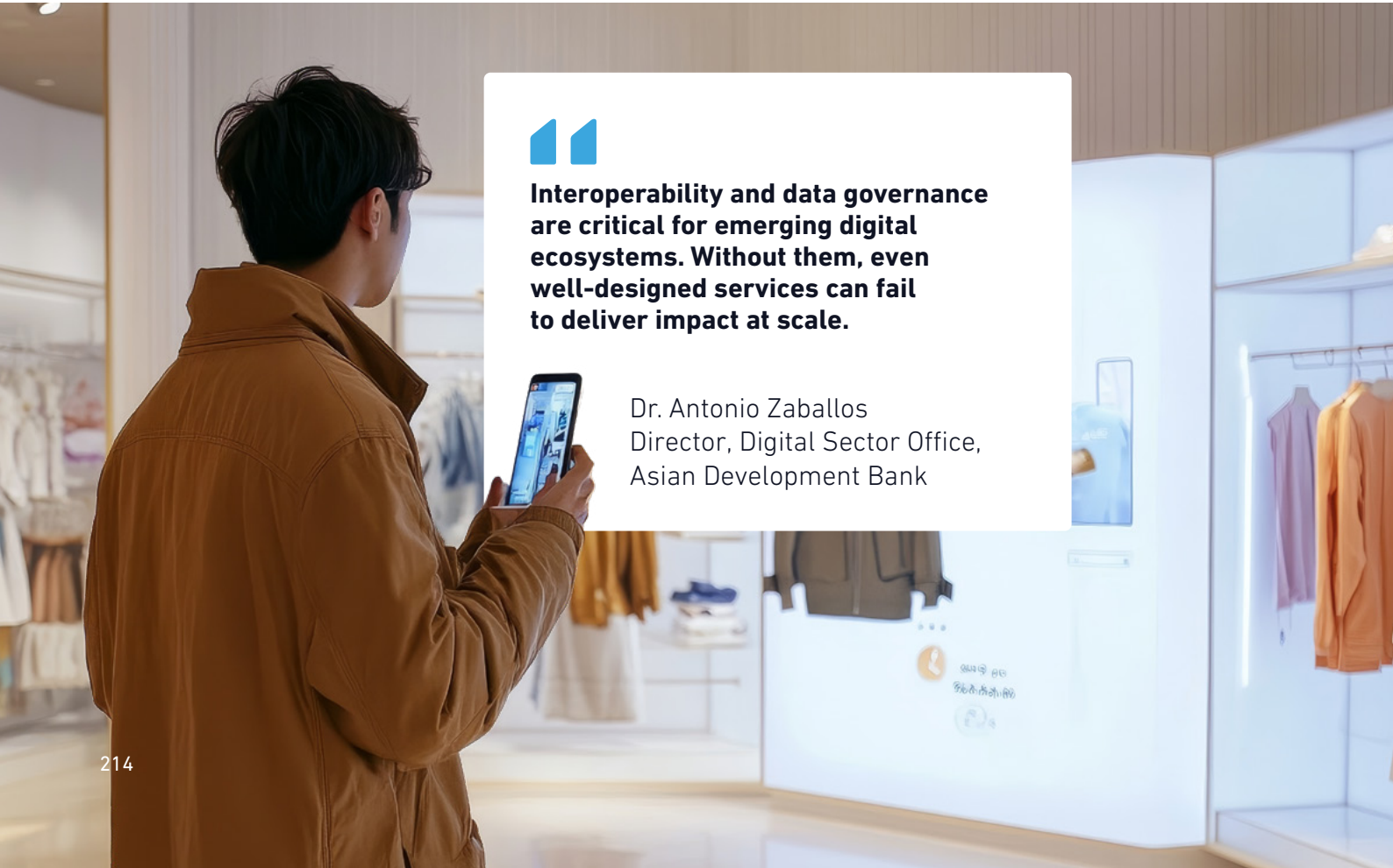
Gemini:
“Digital trade will empower entrepreneurs, freelancers, and small creators by connecting them directly to global consumers. This increased inclusion will reshape livelihoods — especially in emerging markets. Yet without strong data protections and fair digital labor standards, the benefits could remain concentrated among well-connected groups.”



Environmental impact

DeepSeek:
“The impact is dual-sided. Optimized digital logistics can reduce empty shipping and fuel waste, but the explosion in micro-shipments and consumer demand for faster delivery increases packaging waste and last-mile emissions. The net effect depends on whether efficiency gains outpace rising consumption.”

Note: these insights from LLMs are not data driven. They are provided as directional and sentimental and the LLMs have not had access to the survey data.



Interoperability and data governance are critical for emerging digital ecosystems. Without them, even well-designed services can fail to deliver impact at scale.

Dr. Antonio Zaballos
Director, Digital Sector Office,
Asian Development Bank

Stakeholder recommendations

Private sector

To ensure sustainable digital trade while maintaining interoperability and trust in an increasingly fragmented digital economy, business leaders need to:

Advance the adoption of interoperable digital trade infrastructure by implementing cross-border payment rails, standardized e-invoicing systems, and verified digital identity frameworks that enable seamless transactions across multiple jurisdictions.

Invest in digital trade capabilities by training teams to manage cross-border data flows, IP licensing, digital contracts, and multi-jurisdiction compliance using AI-powered tools that reduce errors and accelerate dispute resolution.

Accelerate the industry-wide adoption of transparent trust metrics by publishing auditable certifications on payment reliability, data protection standards, and transaction integrity that demonstrate proven performance in secure cross-border digital commerce.

Public sector

To ensure inclusive digital transformation that strengthens domestic capabilities without isolating the economy from global integration or deepening the global AI divide, policymakers and regulators need to:

Establish pro-innovation frameworks with security standards by co-creating interoperable rules for cross-border data flows, digital identity verification, and payment systems that provide regulatory certainty while ensuring strong authentication and fraud prevention.

Modernize trade infrastructure by digitalizing customs, simplifying tax compliance for digital services, and streamlining consumer protections to make cross-border digital commerce accessible for local entrepreneurs and SMEs.

Develop digital trade capabilities through targeted programs that empower entrepreneurs, SMEs, and workers with skills in cross-border compliance, digital contracts, IP management, and payment systems.

IGOs, IOs, and others

To ensure equitable access, trusted systems, and sustainable outcomes as digital trade accelerates globally, intergovernmental organizations, international organizations, civil society, and academia need to:

Harmonize digital trade infrastructure by convening global coalitions to develop reference architectures for cross-border payment systems, digital identity frameworks, and data exchange protocols that balance interoperability with sovereignty concerns.

Deploy practical capacity-building programs including open-source toolkits for digital identity integration, payment system compliance, e-invoicing implementation, and cross-border data governance that lower barriers for emerging economies to participate in digital trade.

Align trade policy with digital advances by strengthening multilateral dialogues that establish shared standards for data interoperability, IP protection, and transaction security while preventing regulatory fragmentation that creates compliance barriers.

◆ Emerging trend

3.5

Preparing for the Quantum Era

Continuation of DET 2025 trend: Preparing for the Quantum Era

What does the trend encompass?

Accelerating progress in quantum computing is driving financial institutions, healthcare systems, and critical infrastructure providers to move from the assessment of PQC to active implementation. Quantum key distribution and random-number generators are emerging in limited commercial deployments, indicating early steps toward a new era of cybersecurity in which more quantum-resilient architectures will be deployed commercially. The combination of stable qubits, scalable architectures, and cloud-accessible quantum services means industries from medicine and materials science to finance and climate change modeling are preparing to tap the extraordinary potential of quantum machines and networks.³²⁴

Why is it important?

By enabling quantum-secure communication protocols, accelerating ML through quantum kernel methods, and solving previously intractable combinatorial problems, quantum technologies are set to redefine digital infrastructure, creating new value chains and computational economies beyond the reach of classical systems.³²⁵

Impacts on the horizon

Organizations are redesigning security architectures to anticipate emerging quantum decryption risks. Migration strategies integrate algorithm testing, encryption audits, and hardware-agnostic key systems. The finance and health sectors are among the early adopters, implementing compliance frameworks, insurance clauses, and workforce training. However, the absence of global standardization is delaying coordinated deployment.^{326,327}

Quantum computing definition

Quantum computing applies concepts of quantum physics — including superposition, entanglement, and quantum interference — to computing technology. Quantum computing applications allow certain optimization, simulation, and cryptographic tasks to be explored more efficiently than on classical computing systems.^{328,329}

Potential developments

Prospective turning points that could catalyze the trend into rapid, widespread materialization:

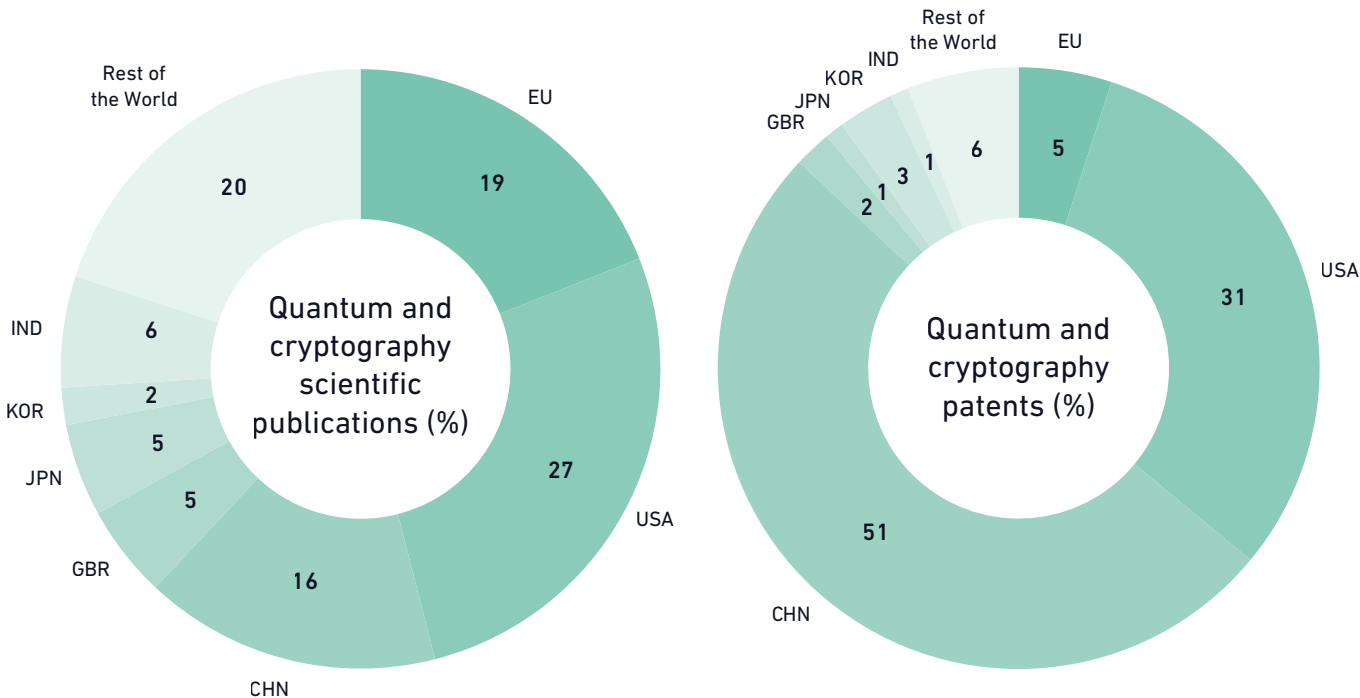
- 2026**
Major content delivery networks and browsers upgrade to pair current safety algorithms with post-quantum safety, while the European Commission's roadmap requires all member states to begin post-quantum cryptography transitions by the end of 2026.^{330,331}
- 2027**
The United States' National Security Agency's operating systems are expected to fully integrate quantum safety measures.³³²
- 2029**
Reliable and fault-tolerant quantum computers are expected to become available, marking an inflection point for the commercialization of quantum in fields such as semiconductor manufacturing.³³³

Frontier use case

A pilot by HSBC and IBM found that hybrid quantum-classical computations improved predictions by 34% in real bond-trading data, improving decision-making speed and risk management. JPMorgan, Goldman Sachs, and BNP Paribas are among others testing quantum applications in domains such as high-frequency trading, portfolio optimization, forecasting, and compliance.^{336,337} These developments illustrate how preparing for the quantum era is strengthening trust, security, and resilience in financial systems.

While progress is being made in quantum cryptography, it is uneven, as shown by Figure III.26: the United States leads in research on quantum cryptography (making up 27% of scientific publications) while China is commercializing solutions faster (with 51% of patents). This highlights the need for coordinated PQC migration and interoperable research and commercialization standards.³³⁴

Figure III.26: Share of quantum and cryptography scientific publications and patents by country³³⁵

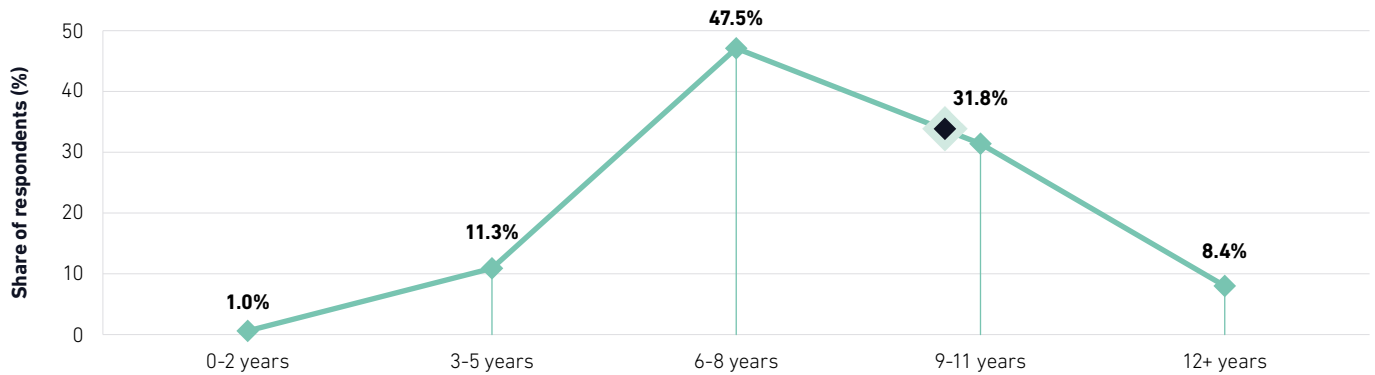


Source: The European Commission's report titled 'Weak signals in Science and Technologies' (2024)

When will this trend materialize?

Survey respondents expect this trend to take about 8 years to materialize, on average, as shown in Figure III.27. Those in North America anticipate materialization earlier (in around 6.7 years) than those in Latin America (10.2 years). Private sector and government respondents anticipate broadly similar timelines.

Figure III.27: Preparing for the Quantum Era: likely materialization timeline



Legend: ◆ Expected number of years until materialization (average)

Source: DCO 2025 Digital Economy Trends Survey.

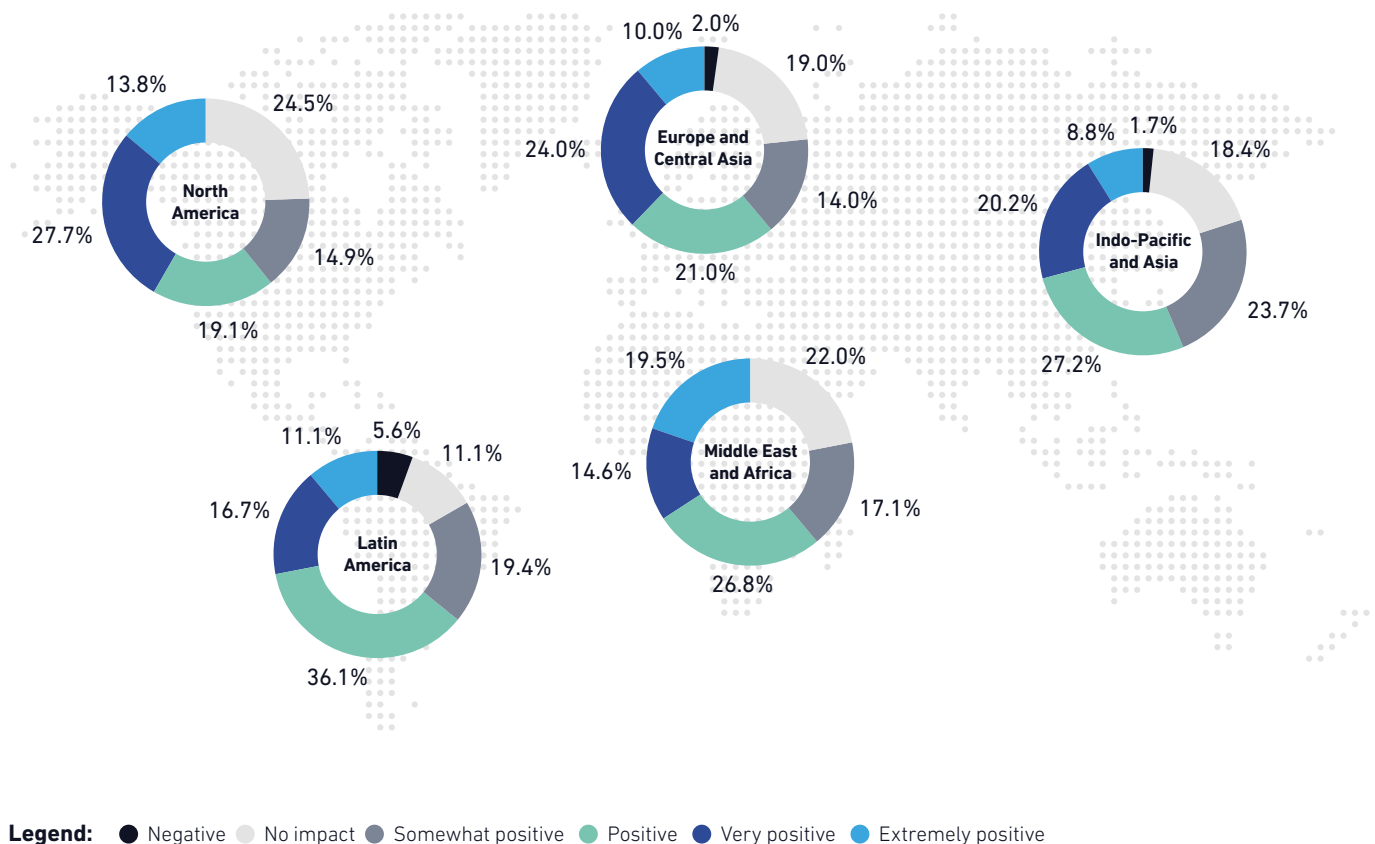
Q: In your country, when do you expect the following emerging digital economy trends to affect businesses and societies?

Respondents: 272 CTOs and senior technologists working in large companies (+250 employees), 60 policymakers, and 74 digital economy and financial experts.

Expected socio-economic impact in 3-5 years

Respondents view quantum computing preparations as having a moderately positive socio-economic impact, with expectations highest in the Middle East and Africa (3.91) and lowest in Indo-Pacific and Asia (3.30), as shown in Figure III.28. Private sector respondents (3.77) show more enthusiasm than those in government (3.12). Compared with last year, DET experts appear less optimistic about the socio-economic outlook of this trend, with more than double the share of respondents expecting no impact (20% versus 6% in 2025). This shift may reflect the limited progress achieved over the past year.

Figure III.28: Preparing for the Quantum Era: expected socio-economic impact by region



Source: DCO 2025 Digital Economy Trends Survey.

Q: In your country, to what extent do you believe the following emerging trends will have a net positive or negative socio-economic impact in the next 3-5 years?

Respondents: 272 CTOs and senior technologists working in large companies (+250 employees), 60 policymakers, and 74 digital economy and financial experts.

How can stakeholders prepare?

DET Survey respondents consider the following drivers as most important for stakeholders to be able to effectively prepare for the quantum era:



Digital Innovation

Collaboration between regulators and the private sector on open-source tools to scan for outdated encryption, and small-scale pilots to test PQC approaches, can support wider migration.



Digital Infrastructure

The transition to post-quantum protection will require a modernized cryptographic stack implemented by operators, cloud providers, and hardware manufacturers that provides crypto-agile key management, hardware with PQC support, and edge-based device firmware updatability.



Digital Capabilities

Highly skilled engineers (to build algorithms), system architects (to design crypto-agile systems), and auditors (to validate implementations) will reduce migration errors and compliance failures during transitions.



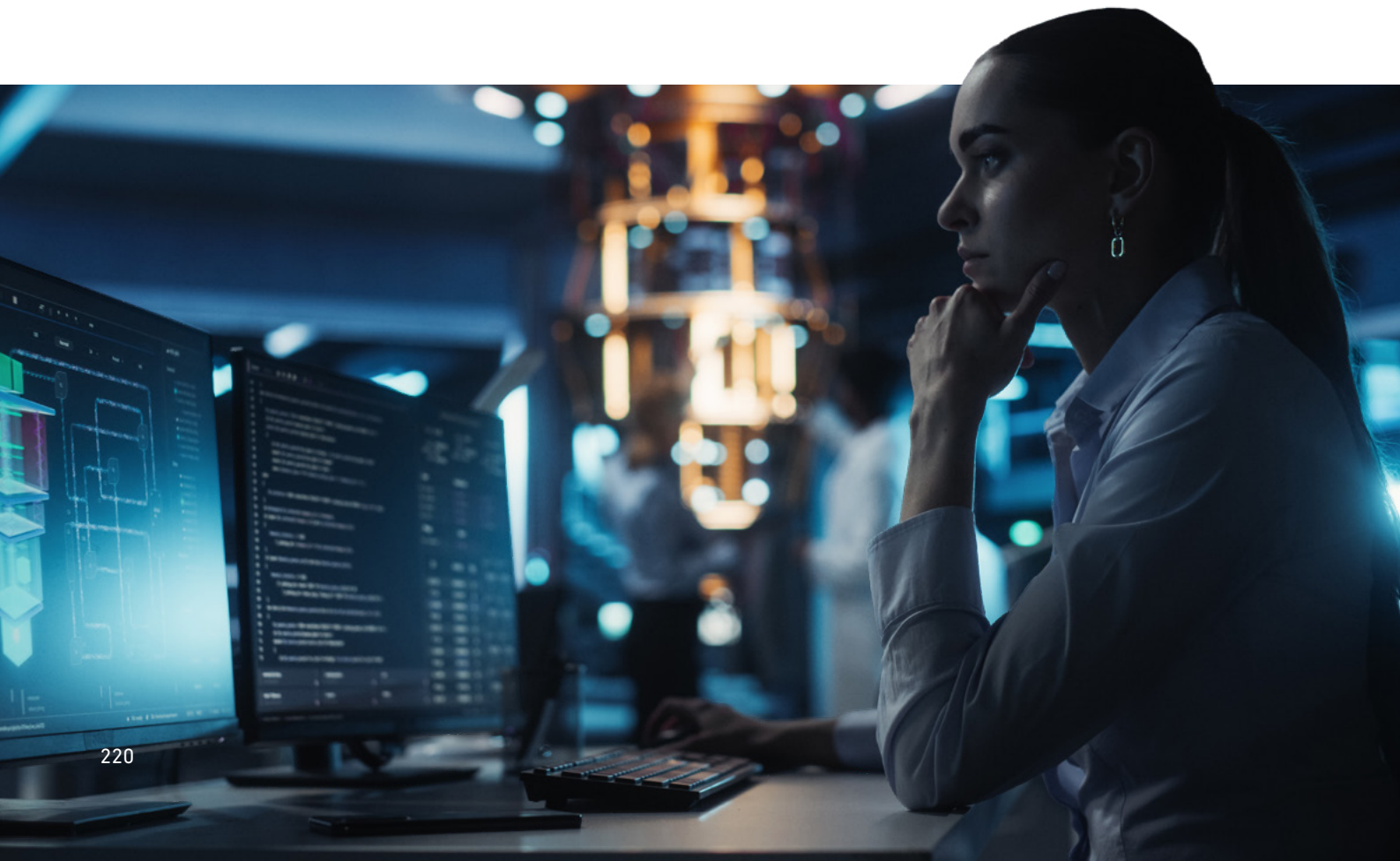
Industry Digital Transformation

Embedding PQC requirements in industry is facilitating the emergence of trusted, quantum-ready ecosystems. These agreements replace fragmented security practices with a unified architecture, ensuring that digital ecosystems advance collectively toward quantum readiness.



Digital for Sustainability

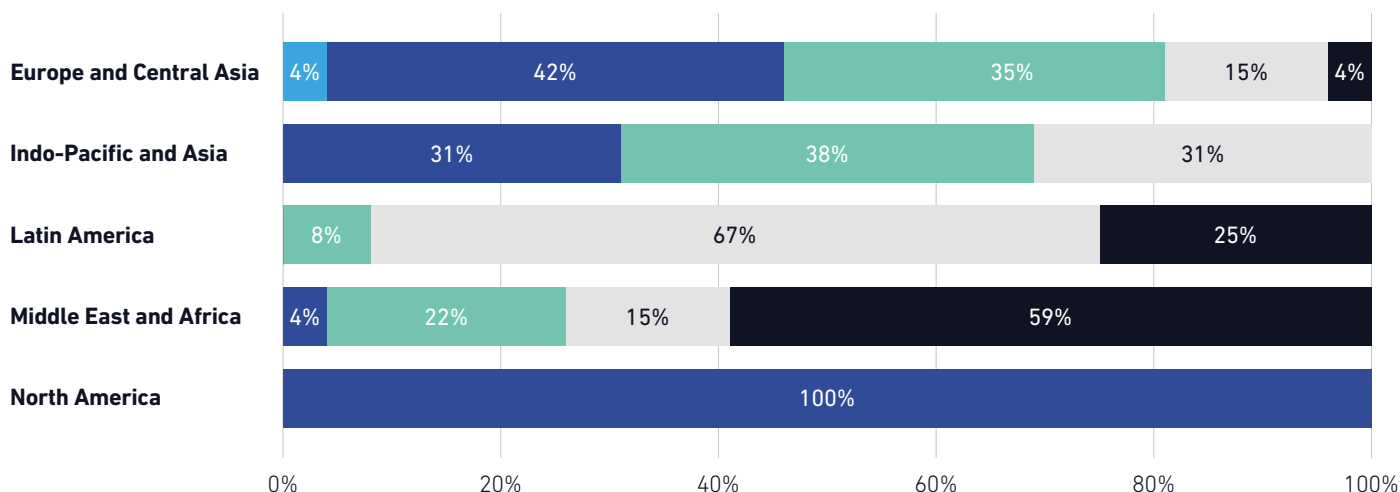
Preparing for the quantum era requires modern, energy-efficient, and resilient digital infrastructure. Early investment in such infrastructure creates the necessary capacity to integrate quantum-ready technologies without exceeding energy or environmental limits.



Countries' preparedness for trend materialization

As shown by Figure III.29, Europe and Central Asia has the only economies at *frontier* readiness (4%), supported by the EU's Quantum Flagship program, but preparedness is uneven, with the same proportion remaining *experimenting*. North American economies are *evolving* thanks to their concentration of quantum research hubs, while the picture is mixed in other regions. Some countries have started investing in encryption programs, but large-scale regional quantum readiness efforts are lacking.

Figure III.29: Preparing for the Quantum Era: trend readiness by region



Legend: ● Experimenting (<50) ● Developing (50–59.9) ● Positioning (60–69.9) ● Evolving (70–79.9) ● Leading (>80)

Source: DCO 2025 Digital Economy Trends Survey.

Q: At a global level, select the three key enabling factors countries need in order to benefit from the opportunities provided by the following digital economy trends.

Respondents: 272 CTOs and senior technologists working in large companies (+250 employees), 60 policymakers, and 74 digital economy and financial experts.

Open questions

How can international standard-setting bodies, private vendors, and national security agencies work together to balance open innovation with national interests as PQC standards evolve?

How can we ensure that post-quantum security upgrades are not limited to well-resourced countries and enterprises, preventing a new form of global divide in digital security?

How can governments and industries build workforce and research capacity to accelerate quantum readiness while maintaining trust and security in existing digital infrastructure?

What governance frameworks are needed to ensure ethical use, data integrity, and accountability, safeguarding trust and security as quantum computing intersects with AI, encryption, and critical public systems?

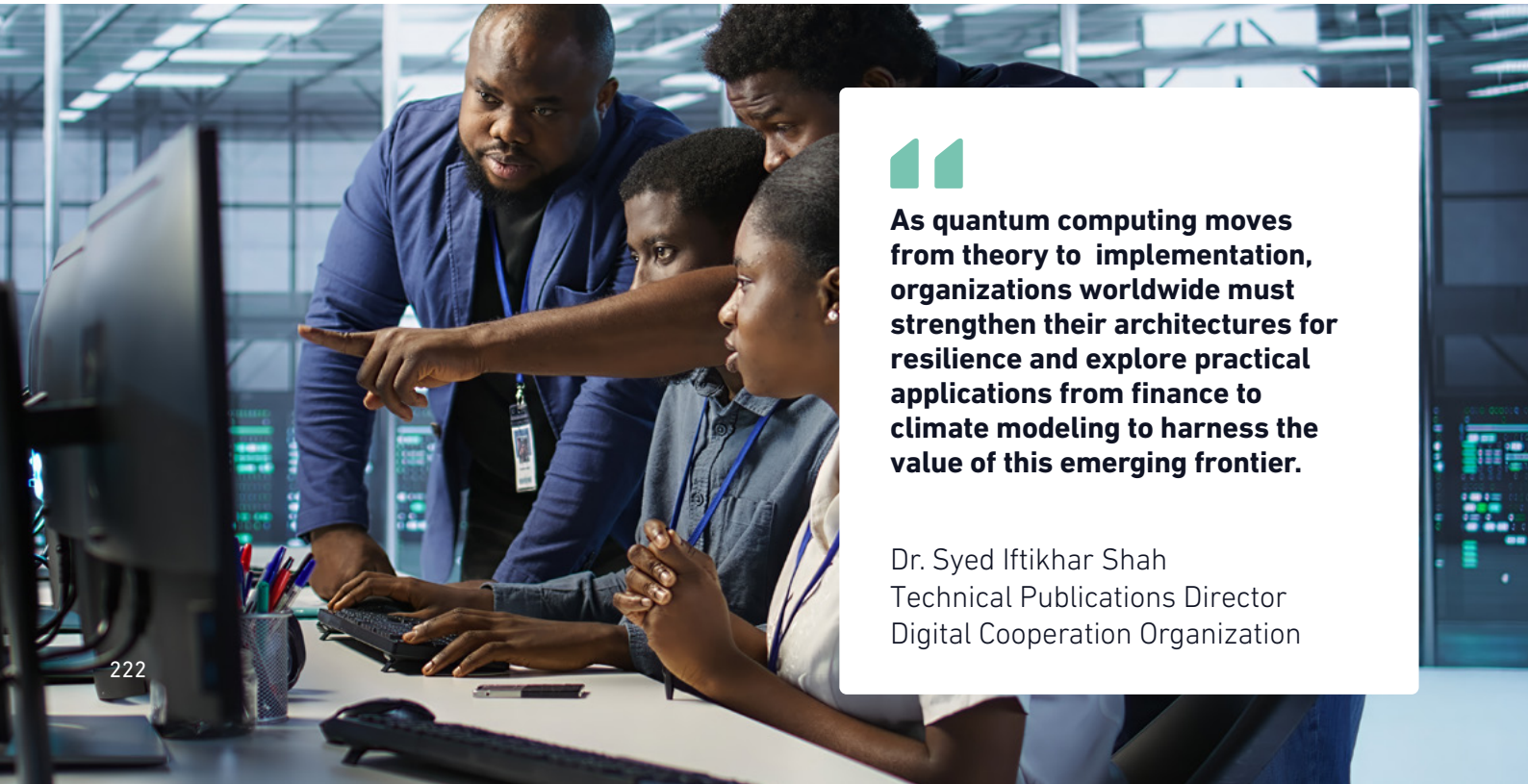
Asking AI

We asked a leading LLM: what are the potential benefits, challenges, and considerations for this trend over the next 3-5 years?

Please refer to the methodology annex to see the exact prompts used.

Prompt >_

| ChatGPT response | | |
|--|--|--|
| <p>Potential benefits</p> <p>Quantum technologies could revolutionize computing by solving problems beyond today's capabilities — like advanced drug discovery, faster financial modeling, and smarter logistics. Quantum communication will also strengthen cybersecurity by making data nearly impossible to hack, while new industries and research hubs will emerge, boosting innovation and high-skilled employment.</p> | <p>Key challenges</p> <p>However, it threatens current encryption systems, risking major data breaches if security isn't upgraded in time. The high costs and technical barriers mean only a few countries and firms can lead, deepening global inequality. A shortage of skilled experts further limits how fast most economies can adapt.</p> | <p>Strategic considerations</p> <p>Governments and businesses must act now to become quantum-ready. This means investing in post-quantum security, research partnerships, and education programs. Global cooperation will be vital to share knowledge, set common standards, and ensure that all economies benefit from the quantum revolution.</p> |
| <p>Note: these insights from LLMs are not data driven. They are provided as directional and sentimental and the LLMs have not had access to the survey data.</p> | | |





As quantum computing moves from theory to implementation, organizations worldwide must strengthen their architectures for resilience and explore practical applications from finance to climate modeling to harness the value of this emerging frontier.

Dr. Syed Iftikhar Shah
Technical Publications Director
Digital Cooperation Organization

Stakeholder recommendations

Private sector

To safeguard critical assets from future quantum decryption threats and maintain customer trust in the quantum era, business leaders need to:

Modernize and map the cryptographic stack across all systems, first piloting PQC algorithms in non-critical systems while building crypto-agile key management and hardware with PQC support that enables seamless algorithm upgrades.

Embed quantum-resistant security as a core component of business contracts rather than an afterthought, ensuring new products have default support for modern encryption with easy upgrade pathways as standards evolve.

Collaborate with peers to co-develop open-source tools that scan for outdated encryption and recommend replacements, while utilizing shared testing environments and cloud labs that reduce energy consumption and hardware waste during the transition.

Build high-skill capabilities in cryptographic engineering, system architecture, and security auditing to **ensure internal expertise for designing crypto-agile systems and validating implementations**.

Public sector

To protect national security systems, prevent a foreseeable security crisis, and ensure equitable quantum readiness, policymakers and regulators need to:

Mandate clear timelines for PQC transitions — starting with national security systems and critical infrastructure, establishing compliance frameworks that require modernized cryptographic stacks including crypto-agile key management and edge-based device firmware updatability.

Co-develop harmonized standards with international partners to prevent regulatory and technical fragmentation while launching regulatory sandboxes for finance, healthcare, and infrastructure sectors to validate algorithms and hardware with PQC support.

Fund national workforce development programs building high-skill talent pipelines in cryptographic engineering (for building algorithms), system architecture (for designing crypto-agile systems), and security auditing (for validating implementations).

Launch public-private partnerships for shared quantum testing environments and cloud labs that provide open tools to scan, prioritize, and guide cryptographic upgrades while cutting collective energy use and hardware waste.

IGOs, IOs, and others

To prevent a new digital security divide and ensure the quantum transition strengthens global stability, international governmental organizations, international organizations, civil society, and academia need to:

Convene global coalitions to publish interoperable PQC standards, open reference implementations, and practical guidance for modernizing cryptographic stacks including crypto-agile key management and edge-based firmware updatability.

Establish regional quantum security hubs providing shared cloud labs, testbeds, and training programs to help emerging economies build quantum readiness while ensuring the trusted and secure adoption of next generation technologies.

Coordinate capacity-building initiatives ensuring post-quantum security upgrades extend beyond well-resourced nations through knowledge transfer, technical assistance focused on high-skill capabilities, and access to shared testing infrastructure.

Coordinate multi-stakeholder scenario planning and simulations to anticipate quantum-enabled threats and strengthen global digital security resilience.

◆ Emerging trend

3.6

Converging Frontier Technologies

New trend in DET 2026

What does the trend encompass?

Digital and physical technologies are beginning to converge, especially where AI acts as an integrating layer across manufacturing, robotics, biotechnology, and materials science. Examples include AI-accelerated drug discovery and embedded medical devices; blockchain-secured quantum communication; AI-driven materials informatics; digital twin simulations; and robotic lab modules. While maturing at different speeds, these intersections of technologies all depend on trusted and secure digital infrastructure, from cloud platforms to automation systems and advanced compute for simulation dynamics. By allowing data, models, and physical processes to operate in coordinated loops, convergence is enabling more autonomous workflows and increasing the share of economic activity executed through software, models, and automated decision systems. It is deepening the digital economy's reliance on integrated data flows, secure infrastructure, and reliable governance frameworks.

Why is it important?

Convergence matters because it reshapes how value is created, reconfigures production systems, creates new interdependencies among value chains, and alters competitiveness. Firms and countries that integrate these combinations gain structural advantages in capability, cost, and efficiency. Convergence also challenges governance, as decisions in one domain (e.g., AI data regulations) start to influence outcomes in others (e.g., biotech research or materials design). This necessitates integrated regulatory approaches and coordinated safety frameworks.

Impacts on the horizon

Over the next decade, convergence is expected to reshape production and research by linking AI, robotics, materials science, and biotechnology into shared workflows, speeding up iteration cycles and reducing reliance on physical trial-and-error. In manufacturing, AI-guided robots, materials informatics, and digital twins shorten factory changeovers from days to hours by co-simulating robot paths, novel materials, and vision systems before deployment. In healthcare, AI-biotechnology interfaces support the identification of myriad proteins and enzymes, with image-based diagnostics reducing the volume of physical experiments needed before devices reach clinical testing stages.³³⁸

These shifts are already visible in patenting and regulatory data: Figure III.30 shows the growing convergence of AI with collaborative robotics, with patents led by major AI chip manufacturers. Similarly, Figure III.31 shows the rising number of FDA approvals for AI-embedded medical devices, showing how regulators are responding to convergence between AI and biotechnologies.

Converging frontier technologies definition

The convergence of frontier technologies refers to the growing integration and mutual reinforcement of digital technologies including AI and advanced analytics, robotics and autonomous systems, immersive technologies, blockchain and decentralized technologies, quantum computing, material science, and biotechnology.

Potential developments

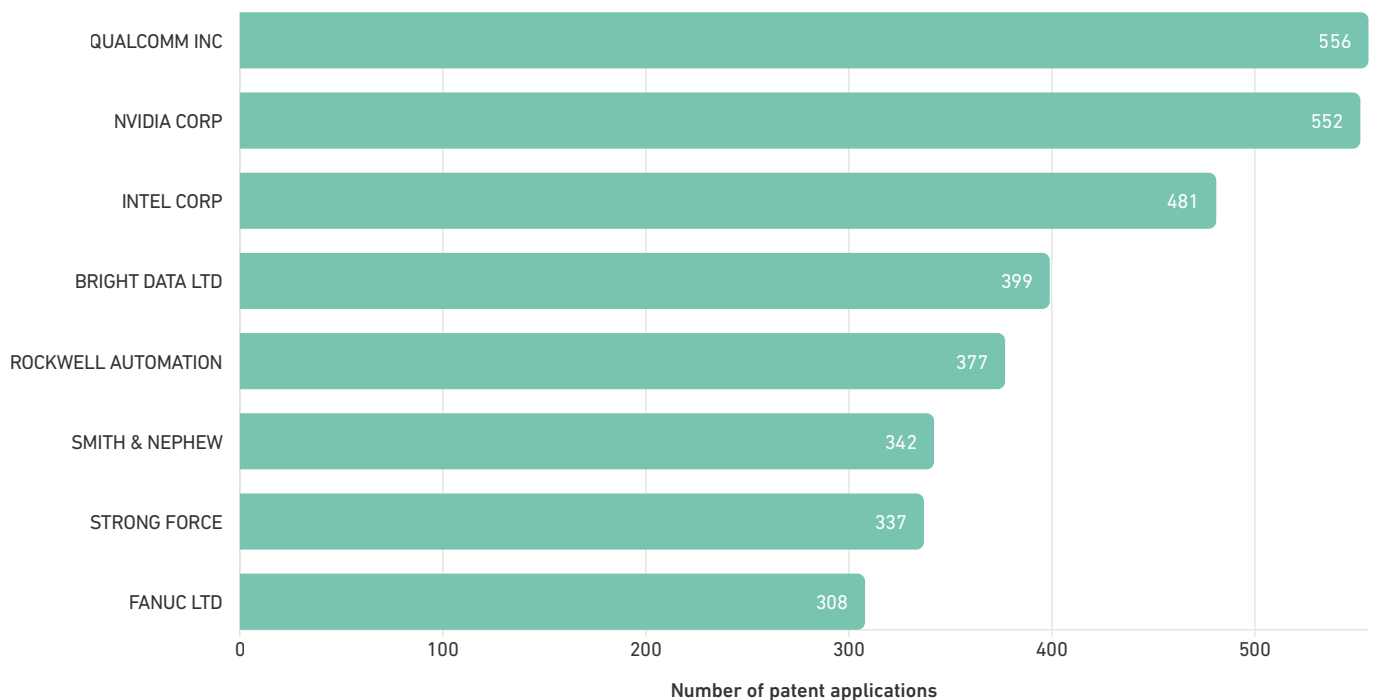
Prospective turning points that could catalyze the trend into rapid, widespread materialization:

- 2026**
Factory lines integrate AI vision models for defect detection, digital twins for production planning, and collaborative robots for plan executions. Vendors ship standardized packages combining these technologies for industry-specific use-cases.³³⁹
- 2028**
Decentralized physical infrastructure networks are projected to grow into to a US\$3.5 trillion market. They provide more resilient, efficient, and democratic digital systems using a combination of decentralized AI models and blockchain technology to coordinate activities and resources (compute, storage, bandwidth, and sensor data) for wireless networks, energy systems, and transportation platforms.^{340,341}
- 2030**
Materials informatics develops a closed R&D loop: AI models propose candidates and predict properties; digital twin simulations screen them for viability; robotic lab modules synthesize and test them; and the results flow back to train the AI models, improving advanced material discovery.^{342,343,344}

Frontier use case

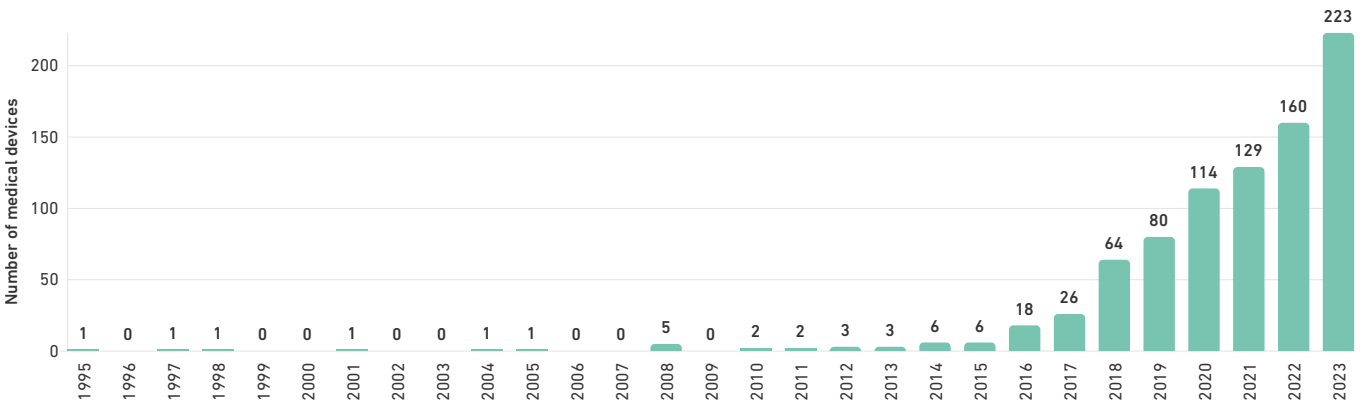
North Carolina State University's Rainbow Lab fuses AI planning, robotic synthesis, in-line sensing, and automated analysis to discover quantum-dot materials. The system designs, executes, and learns from 1,000 experiments per day without human intervention, shrinking discovery timelines and making translating research findings into large-scale manufacturing faster.^{345,346}

Figure III.30: Ranking of the top ten patent applicants in collaborative robotics, 2006-25³⁴⁷



Source: Zhang, D., & Liu, L's article titled 'Analysis of collaborative robot technology patent map and research on development trends' (2025)

Figure III.31: Number of medical devices approved by the FDA, 1995-2023³⁴⁸

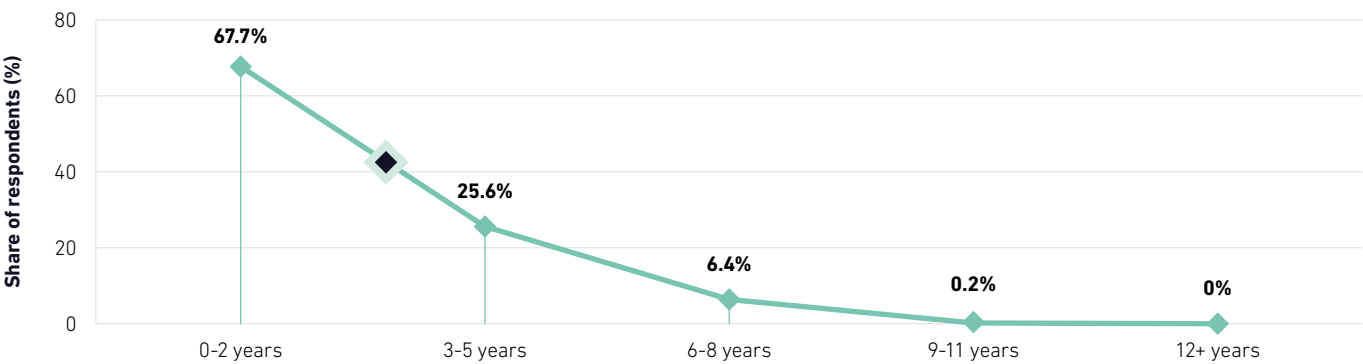


Source: FDA, 2024. Chart: 2025 AI Index report

When will this trend materialize?

Respondents expect this trend to materialize very quickly — in just over 2 years, on average, as shown in Figure III.32. Regional expectations are broadly consistent, as are those of respondents in government (1.8 years) and the private sector (2.2 years), which reflects a shared sense of urgency and recognition of the trends' significance for policy, industry, and innovation planning.

Figure III.32: Converging Frontier Technologies: likely materialization timeline



Legend: ◆ Expected number of years until materialization (average)

Source: DCO 2025 Digital Economy Trends Survey.

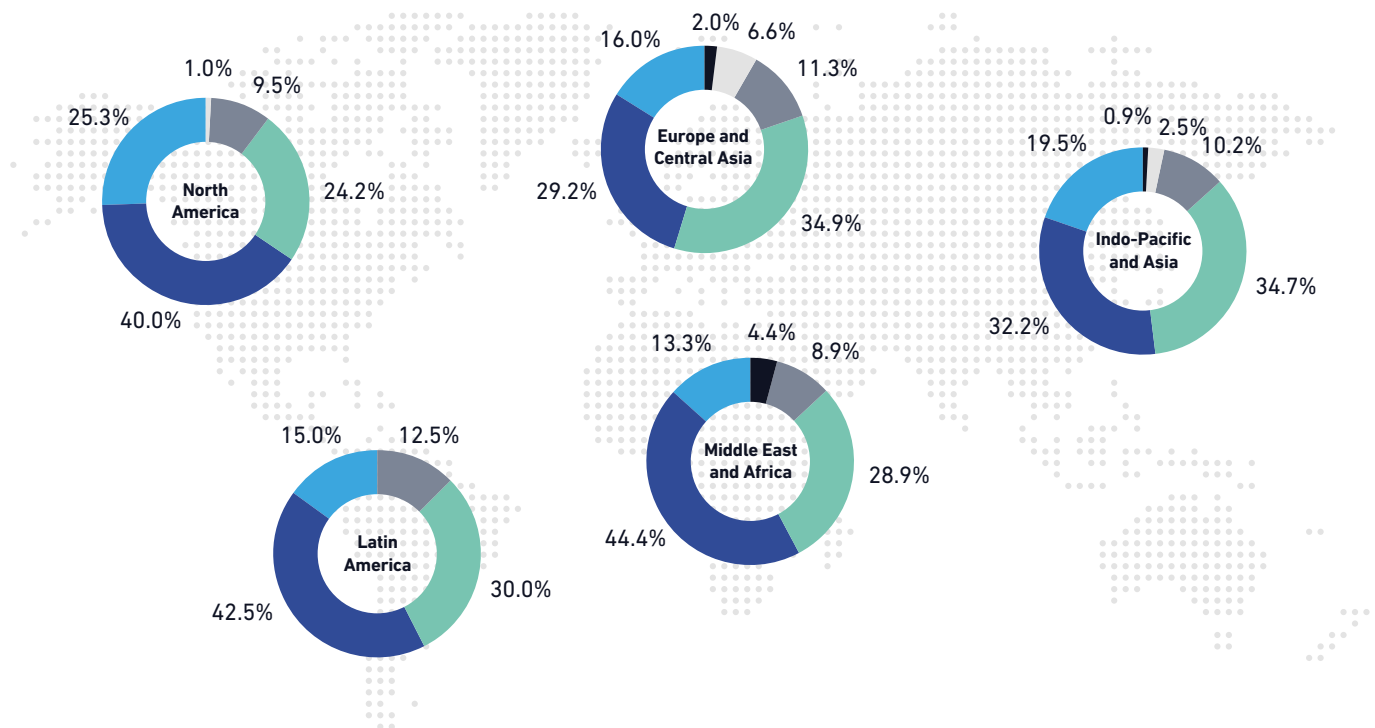
Q: In your country, when do you expect the following emerging digital economy trends to affect businesses and societies?

Respondents: 272 CTOs and senior technologists working in large companies (+250 employees), 60 policymakers, and 74 digital economy and financial experts.

Expected socio-economic impact in 3-5 years

Technological convergence is among the most positively anticipated trends, averaging a socio-economic impact score of 5.28. As Figure III.33 shows, North America leads (5.84) with respondents in Europe and Central Asia showing the most tempered expectations (4.71). Government and private sector respondents are closely aligned.

Figure III.33: Converging Frontier Technologies: expected socio-economic impact by region



Legend: ● Negative ● No impact ● Somewhat positive ● Positive ● Very positive ● Extremely positive

Source: DCO 2025 Digital Economy Trends Survey.

Q: In your country, to what extent do you believe the following emerging trends will have a net positive or negative socio-economic impact in the next 3-5 years?

Respondents: 272 CTOs and senior technologists working in large companies (+250 employees), 60 policymakers, and 74 digital economy and financial experts.

How can stakeholders prepare?

These five drivers were chosen by DET Survey respondents as the most important for this trend:



Digital Innovation

Cross-disciplinary R&D that links AI models, domain-specific datasets, digital twin simulation tools, and automated experimentation environments enable frontier technologies to be developed as integrated workflows rather than in isolation.



Digital Infrastructure

Convergence depends on digital infrastructure that allows different technologies to operate in connected workflows rather than as standalone systems. This entails interoperable data and connectivity standards, synchronized sensing networks, and secure edge-to-cloud computing architecture so technologies can exchange data, coordinate tasks, and run jointly.



Digital Capabilities

Promoting literacy in systems engineering, data integration, simulation workflows, and cross-domain problem solving will enable diverse teams of scientists, engineers, policymakers, and business leaders to work cross-functionally and design, test, and operate combined frontier technologies with minimal integration failures.



Industry Digital Transformation

Shared design frameworks, common data models, and coordinated testing cycles create a unified foundation for development. This will enable AI models, automation systems, digital twins, and emerging materials or biotech processes to operate against consistent production requirements.



Digital Policy and Governance

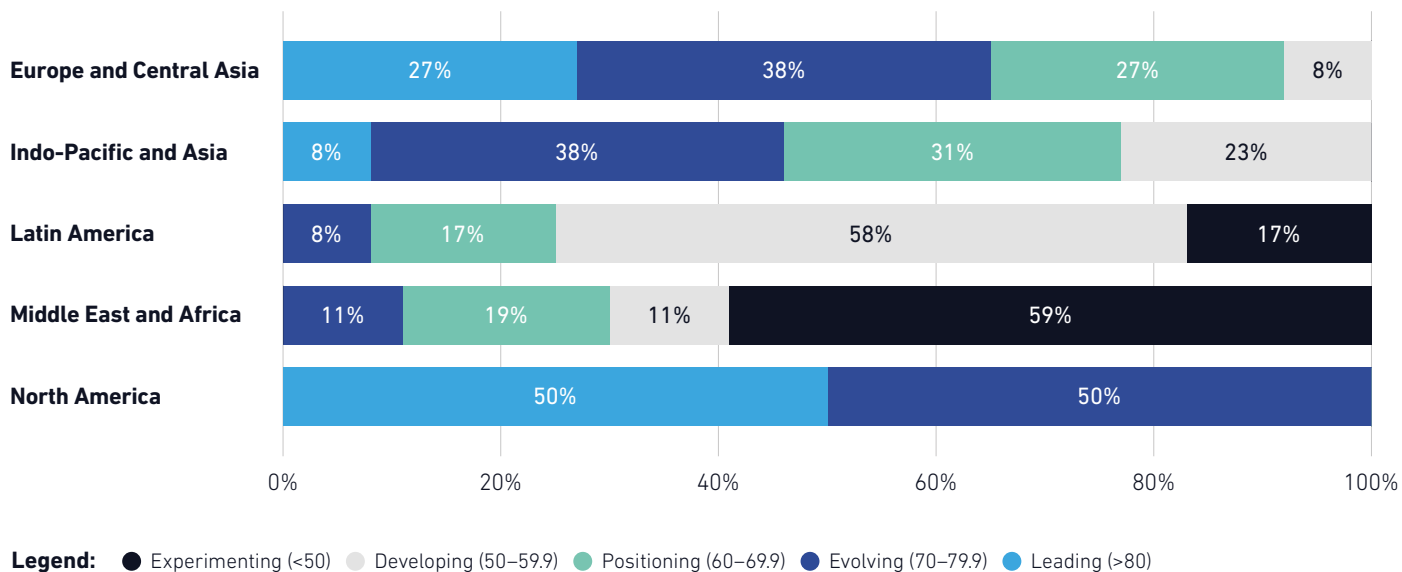
Harmonized standards, incident reporting, cross-sectoral sandboxes, clear regulations, and governance frameworks that focus on measurable results all support the safe, privacy-preserving, and accountable development of converging technologies.



Countries' preparedness for trend materialization

In terms of readiness for this trend across regions, Europe and Central Asia is practically evenly divided among *leading* (27%), *evolving* (38%), and *positioning* (27%) economies as shown in Figure III.34. One North American economy is *leading* and the other is *evolving*. Both regions combine strong cross-disciplinary R&D with compute access. Indo-Pacific and Asia also has some *leading* economies (6%) in East Asian hubs. The Middle East and Africa is mostly *experimenting* (59%), while countries such as Saudi Arabia and the United Arab Emirates are *evolving* thanks to sizeable investments in R&D, interoperability, and co-design systems.

Figure III.34: Converging Frontier Technologies: trend readiness by region



Source: DCO 2025 Digital Economy Trends Survey.

Q: At a global level, select the three key enabling factors countries need in order to benefit from the opportunities provided by the following digital economy trends.

Respondents: 272 CTOs and senior technologists working in large companies (+250 employees), 60 policymakers, and 74 digital economy and financial experts.

Open questions

How can governments and companies collaborate to ensure interoperability and openness across converging technologies, while still allowing fast innovation and avoiding dependence on a few dominant players?

How can education and training systems keep up with convergence so that people have the skills to work across digital, physical, and biological technologies?

As these technologies come together in sensitive areas like healthcare, defense, or energy, what checks and safeguards are needed to make sure deployment remains safe and trusted?

How can shared digital infrastructure and interoperable data ecosystems support the safe and equitable scaling of converging frontier technologies across regions?

Asking AI

We asked a leading LLM: what are the potential benefits, challenges, and considerations for this trend over the next 3-5 years?

Please refer to the methodology annex to see the exact prompts used.

Prompt >_

| ChatGPT response | | |
|---|---|---|
| Potential benefits Technological convergence can drive cross-sector innovation, enhance efficiency, and create new business models. It enables breakthroughs in healthcare, energy, AI, and IoT, fostering economic growth and societal advancement globally. | Key challenges Integration complexity, cybersecurity risks, and regulatory misalignment pose significant hurdles. Legacy systems, high investment costs, and potential job displacement require careful management to ensure equitable and safe adoption. | Strategic considerations Policymakers and businesses must prioritize interoperability, standards, and ethical frameworks. Continuous workforce reskilling, data governance, and inclusive innovation strategies are essential to maximize benefits and minimize systemic risks. |
| Note: these insights from LLMs are not data driven. They are provided as directional and sentimental and the LLMs have not had access to the survey data. | | |



The convergence of AI with robotics, biotechnology, and quantum computing demands global standards and coordinated international actions to safeguard security, ensure interoperability, and build trust.

Dr. Syed Iftikhar Shah
Technical Publications Director, Digital Cooperation Organization

Stakeholder recommendations

Private sector

To accelerate the deployment of converged frontier technologies while securing competitive advantage and ensuring safe, interoperable operations, business leaders need to:

Establish cross-industry convergence labs that co-develop integrated technology stacks combining AI, robotics, spatial computing, biology, and advanced materials that accelerate time-to-market while reducing fragmentation.

Build collaborative ecosystems rather than isolated prototypes to unlock scalable solutions that reshape value chains, compress innovation cycles, and create new competitive advantages.

Invest in workforce integration and literacy programs that foster systems thinking and equip professionals to confidently design, test, and operate complex, converged systems comprised of hardware, software, connectivity, and biological components.

Partner with public sector entities to pilot converged technologies in regulated industries, co-creating harmonized standards and incident-reporting mechanisms that meet safety, privacy, and accountability expectations.

Public sector

To accelerate the trusted adoption of converged frontier technologies while strengthening economic competitiveness and ensuring equitable access, policymakers and regulators need to:

Champion the development of agile, human-centered governance frameworks by establishing cross-sectoral task forces dedicated to the ethical deployment of converged frontier technologies.

Pool public-private funding for shared compute, reference datasets, and digital twin infrastructure accessible to SMEs.

Co-create regulatory pathways that span digital, physical, and biological domains to ensure equitable access and public trust.

IGOs, IOs, and others

To ensure global scalability of converged frontier technologies while bridging readiness gaps and delivering broadly shared benefits, international government organizations, international organizations, civil society, and academia need to:

Convene multi-stakeholder coalitions to publish open reference architectures, cross-domain ontologies, and assurance frameworks **that ensure compatibility across borders**.

Establish shared principles for responsible deployment in sensitive domains like healthcare, materials discovery, and critical infrastructure.

Coordinate capacity-building initiatives that prioritize emerging markets' access to compute, datasets, test-bed environments, and cross-disciplinary research funding.

Establish cross-sectoral task forces to guide the ethical deployment and adaptive governance of converging technologies that balance innovation velocity with accountability.

CONCLUSION

The DCO DET 2026 builds on the foundation of previous editions to provide a comprehensive analysis of the key trends shaping the digital economy and their implications for stakeholders. The deepening integration of digital technologies across societies and economies heightens the need to ensure no one is left behind.

The report highlights the sustained potential of the digital economy to drive innovation and growth, with a projected growth rate threefold that of the global economy in 2026. Reflecting the rapid pace of change, most of the trends the report identifies are evolutions rather than direct continuations of trends from last year's report.

The major difference since last year is a shift from expanding access to the digital economy toward building the capacity to actively participate. This reflects the growing importance of individual and national agency and resilience, as technology matters more to national competitiveness and societal wellbeing. This shift is reflected in each theme:

- › *Sustainable Intelligent Ecosystems*: AI has become mainstream, but the infrastructure it needs — especially energy and computing power — remains unequally distributed. The trends in this theme address renewable energy, specialized intelligence, trusted data frameworks, and the novel opportunities being opened by autonomous systems in cognitive and physical autonomy.
- › *Empowered Communities*: the focus is on strengthening people's ability to adapt, create value, and stay safe and resilient in a digital environment that is evolving rapidly: AI is reshaping work, goods and services are becoming more personalized and user experiences more hybrid, concerns are rising about digital wellbeing, and trends such as human-machine interfaces are redefining what meaningful empowerment will require in future. Individuals need the digital skills, confidence, and ability to make informed choices and shape the technologies in their lives.
- › *Trust and Security*: the focus has moved from the security of individual technologies to the strategic resilience of entire digital ecosystems. As countries pursue digital sovereignty and technological spheres become fragmented, the challenge is now systemic: safeguarding interconnected infrastructures, updating governance and trade frameworks, and preparing for the disruptions posed by the emergence of quantum computing and the convergence of frontier technologies.

Several open questions remain, notably the future balance between centralized and localized AI models; the long-term influence of hyperscalers; and the speed and extent of automation and its implications for human labor. The answers will depend on how effectively stakeholders leverage the 18 trends outlined in this report and on the collective choices made to shape an inclusive, secure, and sustainable digital future.

The report provides insights into how digital-economy trends may shape economic, social, and environmental outcomes, and offers an assessment of countries' readiness to adopt current trends and strengthen preparedness for emerging ones. It also delivers targeted recommendations for the private sector, public sector, and IGOs, IOs, and others.

As decision-makers across stakeholder groups work to leverage digital-economy trends, four cross-country and multistakeholder priorities merit particular attention:

- › **Strengthening governance and trust in the digital economy.** Governments and international organizations must strengthen governance systems and regulatory alignment by reducing legal and policy fragmentation, enhancing cross-border interoperability, and ensuring coherent approaches to digital technologies such as AI, cloud services, cybersecurity, and quantum computing. Joint governance mechanisms, interoperable standards, and cross-border cooperation will be critical as geopolitical dynamics and technology become increasingly intertwined.
- › **Expanding the benefits of the digital economy to all.** Ensuring that all countries can participate fully in emerging digital value chains requires enabling the seamless flow of digital goods, services, data, and talent. This is essential for narrowing divides in AI, skills, and infrastructure. Priority areas include cooperation on digital-trade frameworks, interoperable and secure data-exchange systems, and mutual recognition of skills alongside targeted visa pathways for digital professionals.
- › **Building innovation ecosystems.** Countries need to strengthen their innovation ecosystems by expanding access to cross-border capital, supporting regional accelerator programs, and promoting research and development through centers of excellence and shared ethical standards. Translating innovation into broad-based gains requires empowering SMEs and strategic sectors, especially in unserved communities, to adopt digital tools and productivity-enhancing technologies.
- › **Promoting a sustainable digital economy.** A sustainable and resilient digital economy requires responsible infrastructure and robust protection against systemic risks. This includes adopting sustainable design principles, improving energy efficiency, and strengthening cyber-resilience. These efforts will help mitigate exposure to disruptions arising from operational dependencies, infrastructure weaknesses, and increasing cyber threats.

Through coordinated national and multilateral action, leaders can help shape a digital economy that is resilient, secure, people-centered, and grounded in equitable access and shared prosperity.

APPENDIX

Methodology

The research behind the DCO DET 2026 report followed a rigorous methodology to identify and assess the impact of trends. The following sections explain each aspect of the methodological approach in detail.

Definitions

- › **Digital economy:** the economic activity that relies on, is significantly enhanced, or is enabled by digital technologies and their applications. This includes activities that improve human wellbeing or lead to social or environmental benefits.
- › **Trend:** in the context of this report, a digital economy trend results from the emergence or implementation of a digital technology or platform that enables or accelerates innovation, provides access to information and services, or connects individuals, communities, and markets. A digital economy trend has a discernible direction, and offers measurable, positive financial, social, and/or environmental benefits.

Trends are differentiated into:

- › **Current trends:** have already demonstrated impacts that are expected to continue in the next 12-18 months.
- › **Emerging trends:** may not yet have had a significant impact but could disrupt the global economy in the next 3-5 years.
- › **Driver:** a driver is a physical, human, financial, policy, or regulatory factor necessary to enable and/or accelerate the evolution and impact of a trend, for example, physical communication networks, data storage, or data regulations. Generally, drivers fall under the powers of the state or public private agreements. The drivers are consistent with the relevant pillars of the DCO DEN 2025.

Trend identification process

While the underlying methodology remains consistent with the one used in the DET 2025, the inputs for each edition ensure that the final trend list each year evolves to reflect the evolving and often rapid transformations across the digital economy.

The DET 2026 report features 12 current and six emerging trends, which were identified through a three-step process:

- › The process begins with an extensive review of existing literature, including peer-reviewed reports on the digital economy by international organizations, think tanks, consulting firms, and scientific research articles.
- › Following the literature review, an initial long list of trends is selected based on the DET trend criteria (see next page). This long list is then streamlined through additional research and rigorous filtering using the established criteria, followed by in-depth analysis of the shortlisted trends to validate their relevance and impact. Finally, the list was validated during an expert workshop that incorporated feedback from digital economy specialists, policymakers, and industry leaders (see the Acknowledgements section of this report for the full list of experts).

DET trend criteria

The following criteria were applied to the trends:

- › **Expected impact:** the digital trend is anticipated to make an impact on at least one of four key impact areas:
 - › Access to information, insights, and knowledge
 - › Access to markets and geographics
 - › Improved operational efficiencies
 - › Strengthening relationships with customers, communities, and citizens.
- › **Time horizon:**
 - › **Current:** the trend's impact is already measurable and/or anticipated to grow in the near-term (12-18 months).
 - › **Emerging:** the trends are starting to materialize but it is difficult to identify how and when they will impact the digital economy.
- › **Scope:** the trend forms part of the digital economy and affects business, the environment, and society in emerging and advanced economies, across multiple regions and more than three industries.
- › **Relevance:** the trend is or will be relevant to governments, international organizations, business, technology innovators, and society at large.
- › **Assessment:** to assess the impact of the trends, each trend was assessed based on the DET 2026 Survey and secondary data from recent, credible, and reputable sources to complement the survey findings.

Exclusion criteria: trends are excluded if they constitute intentionally disruptive attacks or acts of war, as these fall outside the scope of economic development and innovation.

Similarly, trends that might advantage individual countries at the expense of global welfare were excluded, as the DET 2026 report takes a collaborative rather than zero-sum perspective on digital economy growth.

Survey methodology

The DET 2026 Survey comprised two respondent profiles — industry technologists and global experts — captured through a single online survey conducted from September to October 2025. The survey instrument consisted of 24 questions in total.

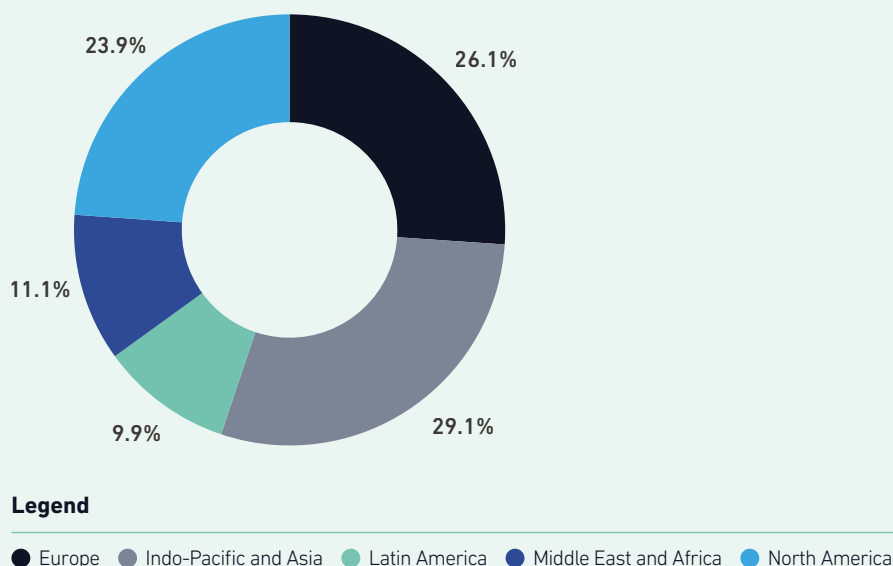
It included 406 respondents in total, including 272 chief technology officers and senior technologists in large companies, 60 policymakers, and 74 digital economy experts from 26 countries covering 80% of global GDP.

Coverage spanned all major regions (see Figure A1), grouped as follows:

- › Latin America: Argentina, Brazil and Mexico.
- › Indo-Asia and Pacific: Australia, China, India, Indonesia, Japan, Republic of Korea, Singapore and Viet Nam.
- › North America: Canada and United States.
- › Europe and Central Asia: France, Germany, Italy, Netherlands, Poland, Türkiye and United Kingdom.
- › Middle East and Africa: Kenya, Nigeria, Rwanda, Saudi Arabia and South Africa.

Following survey data collection, the data underwent a cleaning process to detect unusual patterns in individual responses. Responses not meeting the quality criteria (response time, pattern, etc.) were discarded.

Figure A1: Survey respondents by region



Economic outlook estimate

The estimate of each trend's potential economic value creation combines industry-level economic data with country-level macroeconomic growth indicators. It is important to note that these estimates serve only as indicative proxies for economic value creation, intended to provide a high-level sense of the relative magnitude of each trend at the regional level rather than detailed, for example, industry-specific valuations.

- › The DET 2026 Survey respondents indicate the net impact of each trend on their company's revenues based on the following question: "In your industry, select the THREE digital economy trends, in order of importance, that you expect to create the most growth opportunities (e.g., new markets and customers or reducing operational costs) in the next 12-18 months." This is aggregated to the ILO ISIC Rev.3³⁴⁹ sectors to provide a growth projection for each country-sector. As survey respondents differ in geography and industry representation, these results reflect perceived impacts rather than specific measured outcomes.
- › These responses are then aggregated within each DET 2026 region, producing trend-specific percentage impact rates at the region-sector level. Aggregating to the regional level also manages individual-firm biases and reduces sensitivity to outliers.
- › Sector-level gross-value-added (GVA) estimates³⁵⁰ for 2023 serve as the baseline for producing comparable values for 2025. Each country's sector-level GVA is scaled forward using the most recent IMF World Economic Outlook (IMF-WEO) GDP³⁵¹ growth rates for 2023-25. This results in a consistent set of country-sector GVA estimates for 2025.
- › The scaled country-sector GVA values are then aggregated into the DET 2026 regional groupings, producing region-sector GVA totals for 2025.
- › Each region-sector's 2025 GVA value is multiplied by the corresponding survey-derived percentage impact (calculated in step 2) for that trend. This yields a numerical estimate of the GVA associated with that trend in that region-sector.
- › Finally, the region-sector GVA estimates are aggregated to produce global totals.

Readiness scores

The DET 2026 report builds on the DEN 2025 by extending its measurement framework toward future-oriented insights and strategic next steps. The DEN primarily assesses the current state of digital development across key components and pillars capturing where the country stands today.

The DET 2026 report uses these 11 DEN pillars (referred to as drivers in the DET 2026 report) as a baseline for evaluating how ready each country is to respond to and benefit from the adoption of digital economy trends.

The country-level readiness scores for each digital economy trend were derived by combining data from the DET 2026 survey with aggregated pillar-level results of the DEN 2025. This calculation followed a structured methodology outlined as follows:

- Respondents to the DET 2026 survey selected the three most important drivers for each current trend from a predefined list based on the DEN 2025 pillars. The survey question was phrased as: “At a global level, select the three key enabling factors countries need in order to benefit from the opportunities provided by the following digital economy trends.”
- All survey responses were averaged to identify the top three DEN pillars for each current trend.
- Each selected driver was then assigned a weight according to its position in the ranking, as follows:
 - First: 50%
 - Second: 30%
 - Third: 20%
- The readiness score for each country and trend is obtained by applying the driver weights from Step 3 to that country’s DEN 2025 scores on the top three pillars identified in Step 2, and then taking the weighted average of those three pillar scores. Regional readiness scores were then calculated as the simple average of country-level scores within each region.
- Readiness categories were classified using the following thresholds:
 - *Foundational*: <50
 - *Functional*: 50–59.9
 - *Established*: 60–69.9
 - *Advanced*: 70–79.9
 - *Pioneer*: >= 80.

Preparedness scores

Similarly to readiness scores, the DET 2026 calculates preparedness scores for emerging digital economy trends. These reflect countries’ preparedness for the materialization of digital economy trends.

Preparedness scores for emerging digital economy trends were calculated using the same structure as the readiness scores, with adjustments made to the number and weighting of the drivers.

- Using the same DET Survey question as preparedness, the survey responses were averaged and ranked to obtain the five most important drivers for each emerging trend.
- Each selected driver was then assigned a weight, as follows:
 - First: 33.33%
 - Second to Fifth: 16.66% each.

The top driver identified by respondents was given a higher weight.

- › Based on the DEN 2025 country-pillar score, the preparedness score is computed as the weighted average of that country's scores on the five selected pillars for that trend.
- › Regional preparedness scores are computed as simple averages of country scores within each region.
- › Preparedness categories were classified using the following thresholds:
 - › *Experimenting*: < 50
 - › *Developing*: 50–59.9
 - › *Positioning*: 60–69.9
 - › *Evolving*: 70–79.9
 - › *Leading*: ≥ 80.0

Digital economy impact on employment

The estimated high-level impact of digital economy trends on employment over the next 12–18 months is calculated in three steps, combining ILO modelled estimates with DET 2026 survey-based sectoral expectations. It is important to note that these are high-level indicative estimates of the net impact of digital technologies based on the survey responses.

- › Baseline sectoral employment for 2025 is calculated using the 2024 ILO-modelled estimates, which incorporate the most recent employment figures available up to 2023,³⁵² disaggregated by ISIC Rev. 4 sectors (e.g., manufacturing and utilities). For each sector, a linear time trend is fitted to the 2023 estimate and extrapolated to 2025, to generate a sectoral employment estimate while assuming that recent structural patterns remain consistent.
- › Total employment for 2025 is calculated by summing the sectoral employment estimates derived in Step 1.
- › Respondents for the DET 2026 Survey identified the *net impact of digital technologies* on their organization's headcount, with values ranging from significant decrease (–9% or more) to significant increases (+9% or more). The survey question was phrased as: "In your view, what net impact do you expect the implementation of digital technologies to have on your company's headcount over the next 12–18 months?"
- › For each ISIC Rev. 4 sector, an average expected percentage change in company headcount due to digital technologies is calculated as the weighted average of these values, using the number of responses in each category as weights. The average expected percentage change is then converted to a growth factor.
- › This growth factor is then applied to the 2025 baseline sectoral employment estimates (as calculated in step 1), yielding a total employment estimate for 2026 based on the survey responses.
- › To calculate the final estimate on change in employment due to digital technologies, the total employment for 2025 (calculated in step 2) is subtracted from the total employment estimate for 2026 (calculated in step 5).

The following calculations provide a step-by-step walkthrough for how the estimate was calculated for the change in employment due to digital technologies.

1. Baseline sectoral employment in 2025

| Sector | 2025 Employment (thousands) |
|--|-----------------------------|
| Agriculture, forestry, and fishing | 961,629.04 |
| Mining and quarrying | 23,583.73 |
| Utilities | 35,905.90 |
| Manufacturing | 519,607.98 |
| Construction | 294,184.80 |
| Wholesale and retail trade | 508,118.93 |
| Accommodation and food service activities | 157,586.97 |
| Transport, storage, and communication | 256,531.24 |
| Real estate, business, and administrative activities | 183,386.35 |
| Financial and insurance activities | 59,083.94 |
| Public administration and defence | 142,536.15 |
| Education | 190,641.08 |
| Human health and social work activities | 145,570.00 |
| Other services | 210,389.85 |

2. Total employment for 2025: 3,688,756,000

3. The calculation in the following table indicates Sector and Percentage in employment due to the digital technologies.

| Sector | Percentage change in employment due to digital technologies (based on DET 2026 survey responses) |
|--|--|
| Agriculture, forestry, and fishing | 4.00% |
| Mining and quarrying | 5.20% |
| Utilities | 6.20% |
| Manufacturing | 2.27% |
| Construction | 2.32% |
| Wholesale and retail trade | 1.37% |
| Accommodation and food service activities | 3.76% |
| Transport, storage, and communication | 1.22% |
| Real estate, business, and administrative activities | 2.86% |
| Financial and insurance activities | 2.86% |
| Public administration and defence | 0.00% |
| Education | 0.00% |
| Human health and social work activities | 2.00% |
| Other services | 0.00% |

4. The calculation in the following table indicates Sector, 2025 employment, growth factor, and 2026 employment figures.

| Sector | 2025 (thousands) | Growth factor (from step 3 above) | 2026 Employment (thousands) |
|--------------------------------|---------------------|--------------------------------------|--------------------------------|
| Agriculture | 961,629.04 | 1.04 | 1,000,094.20 |
| Mining | 23,583.73 | 1.05 | 24,808.67 |
| Utilities | 35,905.90 | 1.06 | 38,141.64 |
| Manufacturing | 519,607.98 | 1.02 | 531,431.65 |
| Construction | 294,184.80 | 1.02 | 300,000.07 |
| Wholesale and retail | 508,118.93 | 1.01 | 515,067.56 |
| Accommodation and food | 157,586.97 | 1.03 | 163,515.34 |
| Transport and communication | 256,531.24 | 1.01 | 259,662.72 |
| Real estate and business admin | 183,386.35 | 1.02 | 188,635.47 |
| Finance | 59,083.94 | 1.02 | 60,775.35 |
| Public administration | 142,536.15 | 1.00 | 142,536.15 |
| Education | 190,641.08 | 1.00 | 190,641.09 |
| Health and social work | 145,570.00 | 1.02 | 148,481.40 |
| Other services | 210,389.85 | 1.00 | 210,389.85 |

5. Total employment for 2026 (accounting for impact of digital technologies): 3,775,169,630

6. Change in employment due to digital technologies:
 $3,775,169,630$ (step 5) – $3,688,756,000$ (step 2) = $86,413,630$

Industry mapping

| Survey industry | Reporting industry | ISIC Rev3 | ISIC Rev4 |
|---|---------------------------------------|--|--|
| Clinical research (incl. R&D) and biotechnology | Healthcare and life science | Other activities | Real estate; business and administrative activities |
| Electric, gas, water, and waste Utilities | Energy and utilities | Mining, utilities | Utilities |
| Engineering, procurement, and construction | Construction and real estate | Construction | Construction |
| Farming, forestry, and fishing | Agriculture | Agriculture, hunting, forestry, and fishing | Agriculture; forestry and fishing |
| Food and beverage | Hospitality, food, and beverage | Manufacturing | Manufacturing |
| Hospitals, clinics, and care facilities | Healthcare and life science | Other activities | Human health and social work activities |
| Manufacturing | Manufacturing | Manufacturing | Manufacturing |
| Oil, coal, and gas extraction | Energy and utilities | Mining, utilities | Mining and quarrying |
| Pharmaceutical and medical device manufacturing | Healthcare and life science | Manufacturing | Manufacturing |
| Professional, scientific, and technical activities | Professional services | Other activities | Real estate; business and administrative activities |
| Property development, real estate management, and brokerage | Construction and real estate | Other activities | Real estate; business and administrative activities |
| Refining and petrochemicals | Heavy industries | Manufacturing | Manufacturing |
| Restaurants and catering | Hospitality, food, and beverage | Wholesale, retail trade, restaurants, and hotels | Accommodation and food service activities |
| Retail and wholesale | Retail and wholesale | Wholesale, retail trade, restaurants, and hotels | Wholesale and retail trade; repair of motor vehicles and motorcycles |
| Shipping, trucking, rail, and warehousing | Automotive and transportation | Transport, storage, and communication | Transport; storage and communication |
| Steel, cement, and chemicals | Heavy industries | Manufacturing | Manufacturing |
| Technology, media, and communications | Technology, media, and communications | Transport, storage, and communication | Transport; storage and communication |
| Vehicle and vehicle parts manufacturing | Automotive and transportation | Manufacturing | Manufacturing |
| Vehicle dealerships and repair | Retail and wholesale | Wholesale, retail trade, restaurants, and hotels | Wholesale and retail trade; repair of motor vehicles and motorcycles |

For the digital economy impact calculations, the industries reported in the DET Survey were mapped to the ISIC classification. Both ISIC Rev.3 and Rev.4 appear in the data: Rev.3 reflects older statistics, while Rev.4 is the updated version with more detailed sector definitions.

Prompts used for 'Asking AI' boxes

The following prompts were used for the Asking AI boxes throughout the text.

For all trends the LLMs were given the following definitions:

- › **Digital economy definition:** the economic activity reliant on, significantly enhanced, or enabled by digital technologies and their applications. This includes activities that increase human wellbeing or lead to social or environmental benefits.
- › **Trend definition:** in the context of this report, a digital economy trend results from the emergence and/or deployment of a digital technology or platform that supports or accelerates innovation, access to information and services, and connects individuals, communities, and markets.
- › They were also provided the trend analysis from the DET report for each of the trends, provided on a trend-by-trend basis in a new chat window, and told that a digital economy trend offers measurable, positive financial, social, and/or environmental benefits.

The LLMs were then provided the following prompts:

- › **Current trends:** at a global level, what do you expect the economic/social/environmental impact of the following digital trend to be over the next 12-18 months?
- › **Emerging trends:** act as a global expert on the digital economy. Over the next 3-5 years what are the potential benefits, challenges, and considerations for this trend?

For current trends, the report features one response from each LLM (ChatGPT-5, DeepSeek-V3.2, and Gemini 2.5 Flash) per impact area per trend. For emerging trends it features a response from one LLM per trend.

Glossary

A/B testing: a method of comparing two versions of a product, webpage, or service to determine which performs better based on user responses or data-driven metrics.

Access management: the processes and technologies used to define, enforce, and monitor who can access which systems, data, or applications in an organization, typically through authentication and authorization.

Agentic AI: AI systems designed to act autonomously, make decisions, and carry out tasks on behalf of users with minimal human intervention.

AI-as-a-Service (AlaaS): cloud-based delivery of AI capabilities — such as model training, inference, and analytics — through subscription or pay-as-you-go models, removing the need for organizations to build their own AI infrastructure.

AI ecosystems: interconnected networks of AI models, data sources, infrastructure, tools, and organizations that collectively develop, deploy, and govern AI solutions within and across sectors.

Application programming interface (API): a set of protocols, tools, and definitions that allow different software applications to communicate with each other, enabling the integration of functionalities and data across systems.

Algorithm: a set of programmed instructions used to process data, automate tasks, optimize processes, and drive decision-making in applications such as AI, data analysis, and digital services.

Artificial intelligence (AI): the simulation on machines of human intelligence processes such as learning (acquiring information and rules for using it), reasoning (using rules to reach approximate or definite conclusions), and self-correction.

Augmented reality (AR): a technology that overlays digital content, such as images, sounds, or information, onto the physical world in real-time through devices like smartphones, tablets, or AR glasses.

Big data: large, complex datasets that are too vast or fast-moving for traditional data processing tools to handle, often analyzed to uncover patterns, trends, and insights for decision-making in various industries.

Blockchain: a decentralized, distributed ledger technology that securely records transactions across multiple computers, ensuring transparency, immutability, and trust without the need for a central authority.

Brain-machine Interface: technology that enables direct communication between the brain and external devices, allowing the control of machines or computers via neural signals.

Cellular Internet-of-Things (IoT): use of mobile (cellular) networks to connect IoT devices such as sensors, meters, and machines so they can send and receive data over wide geographic areas with high quality of service.

Closed-loop utilities: systems that automatically monitor, adjust, and optimize processes or outputs in real time, based on feedback from the environment or user inputs.

Cloud computing: the delivery of computing services, including storage, processing, and software, over the internet, allowing users to access and manage data and applications remotely without the need for on-site infrastructure.

Compute capacity: the amount of processing power available in a system, network, or device to perform computations, run applications, or analyze data efficiently.

Cross-border data flows: the transfer of digital information across national boundaries, often subject to regulations governing privacy, security, and data sovereignty.

Cross-border open architecture marketplace: a digital marketplace that allows financial or digital services from multiple countries and providers to interoperate via open, standardized interfaces (such as APIs), enabling competition and cross-border service provision.

Cross-border trusted data ecosystem: a framework that enables organizations in different countries to share and use data securely and lawfully, with agreed rules on privacy, security, interoperability, and governance.

Cryptography: the practice of securing communication and data through techniques such as encryption and decryption, ensuring privacy, integrity, and authentication in digital transactions and information exchanges.

Data ecosystem: a network of organizations, systems, and governance rules that enables the structured collection, sharing, processing, and reuse of data across multiple actors for defined economic or policy purposes.

Digital public infrastructure (DPI): DPI encompasses foundational digital systems that enable societal participation by providing secure platforms for digital identity verification, payments, and data sharing. These systems are designed to be inclusive, interoperable, and publicly accountable.

Digital twin: a virtual replica of a physical object, system, or process that simulates its real-world counterpart in real-time, enabling monitoring, analysis, and optimization through data-driven insights.

Distributed ledger-based technologies: digital systems that record transactions across multiple locations or participants, providing decentralized, secure, and tamper-resistant record-keeping.

Edge AI: the deployment of AI algorithms and data processing on local devices near the source of data generation (the 'edge' of the network). This approach reduces latency and enhances privacy by processing data locally rather than in centralized cloud systems.

Edge computing: a decentralized computing model that processes data closer to its source, such as on devices or local servers, to reduce latency, enhance speed, and improve efficiency in real-time applications.

Energy-smart architectures: system and infrastructure designs that reduce overall energy use by optimizing how computing, storage, networking, and cooling are deployed, often using techniques such as workload shifting, efficient hardware, and dynamic power management.

Entanglement: a quantum physics phenomenon where particles become interconnected such that the state of one instantaneously affects the state of another, even over distance.

Event driven architecture: a software design approach where systems respond to events or changes in state in real time, triggering workflows or processes dynamically.

Extended reality (XR): an umbrella term that encompasses immersive technologies such as virtual reality, AR, and mixed reality blending physical and digital environments for exploring simulated worlds and interactive experiences.

Federated learning: a machine learning approach that trains models across multiple decentralized devices or servers while keeping the data localized. This ensures privacy and reduces reliance on centralized data storage.

Generative AI: AI systems capable of creating new content such as text, images, audio, or code by learning patterns from existing data and generating outputs that mimic human creativity.

Genomics: the study of genomes, including the sequencing, analysis, and interpretation of DNA, enabling insights into genetics, health, and biological processes.

Graphics processing unit (GPU): a specialized processor designed to accelerate complex computations, especially for graphics rendering, AI, and parallel data processing.

Hyperscaler: large-scale cloud service providers offering massive compute, storage, and network infrastructure that can scale resources dynamically for global clients.

Internet of Things (IoT): a network of interconnected devices embedded with sensors and software that communicate and exchange data over the internet, enabling automation, monitoring, and enhanced decision-making in various industrial contexts.

Interoperability: the ability of systems, applications, and devices to exchange and use information seamlessly across different platforms or technologies.

ISO 20022: an international standard for electronic data interchange between financial institutions, defining common message formats and data structures for payments, securities, and other financial transactions.

JSON Schema: a structured definition (or “contract”) that describes the format, required fields, and validation rules for JSON data, helping ensure that systems exchange data consistently and correctly.

Latency: the time delay between a user’s action or data request and the system’s response, often measured in milliseconds, which is crucial in evaluating the performance of networks, applications, and devices.

Large language model (LLM): a type of deep-learning AI model trained on extensive datasets to generate coherent, human-like outputs based on input prompts.

Low-code/no-code: software development environments that enable individuals with minimal coding knowledge to create applications, for example by providing a graphical user interface with drag-and-drop components.

Machine learning: a subset of AI that enables systems to learn and improve from data without explicit programming, by identifying patterns and making predictions or decisions.

Multi-sector interoperability: the ability of digital systems, standards, and data models from different sectors (such as finance, health, and transport) to work together, allowing services and data to be combined across domains.

Multimodal data: data that come in multiple formats or types, such as text, images, audio, and video, often analyzed together to generate richer insights.

Open-source: software or tools whose source code is freely available for use, modification, and distribution, promoting collaboration and transparency.

Payment Services Directive (PSD2): an EU directive that regulates payment services and providers, opening up access to bank account data via secure APIs and enabling new payment services while strengthening consumer protection and security.

Payment Services Directive (PSD3): the forthcoming update to EU payment regulation that aims to further strengthen payment security, harmonize rules for banks and non-banks, and refine open banking and digital payment frameworks across the EU.

Peer exchanges: mechanisms or platforms where organizations or individuals share information, knowledge, or resources directly with one another.

Quantum computing: a revolutionary computing technology that leverages the principles of quantum mechanics to process information in ways that traditional computers cannot, enabling faster and more efficient solutions for complex problems like cryptography, optimization, and simulations.

Radio frequency identification (RFID): a technology that uses small tags and radio signals to identify and track objects (such as goods, assets, or IDs) without direct line-of-sight scanning.

Sandboxes: controlled, isolated environments used for testing and experimenting with new software, technologies, regulatory requirements, or applications without affecting existing systems or data integrity.

Semiconductors: materials or components that conduct electricity under certain conditions, forming the foundation of modern electronic devices and digital technologies.

Software-as-a-Service: cloud-based software delivery model where applications are hosted remotely and accessed via the internet, often on a subscription basis.

Spatial computing: the integration of physical and digital worlds through technologies like AR, virtual reality, and spatial sensors, allowing for the interaction, visualization, and manipulation of data in three-dimensional space.

Superposition: a principle in quantum computing where particles can exist in multiple states simultaneously, enabling powerful parallel computations.

Tensor processing unit (TPU): a specialized AI accelerator designed to efficiently perform machine learning computations, especially for neural networks.

Vertical AI: vertical AI refers to AI systems that are specifically designed and optimized to be applied within particular industries or supply chains. This contrasts with horizontal AI, which is designed for a broad range of uses across many industries.

Vision-language-action models: AI models that integrate visual inputs, language understanding, and decision-making capabilities to perform tasks or interact intelligently with environments.

Virtual reality (VR): a technology that creates a fully immersive digital environment, often experienced through a headset, allowing users to interact with and explore simulated worlds in a way that feels real.

Zero-trust models: security frameworks that require continuous verification of users, devices, and systems, assuming no implicit trust even within internal networks.



Endnotes

- 1 Digital Economy Trends Survey 2025
- 2 DCO. (2025). *Digital Economy Navigator 2025*. <https://den.dco.org/report>
- 3 Please refer to the Key findings section of this report
- 4 The first fully open AI language model was launched earlier this year: <https://www.swiss-ai.org/apertus>
- 5 Furman, J. (2025). Tweet: <https://x.com/jasonfurman/status/1971995367202775284>
- 6 IMF. (2025). *World Economic Outlook: October 2025*. <https://www.imf.org/en/Publications/WE0/Issues/2025/10/14/world-economic-outlook-october-2025>
- 7 Projection based on DCO DET Survey 2025, and IMF projection of global GDP in 2026 (available at: <https://www.imf.org/en/publications/weo/issues/2025/10/14/world-economic-outlook-october-2025>)
- 8 OECD. (2024). *Artificial intelligence and wage inequality*. https://www.oecd.org/content/dam/oecd/en/publications/reports/2024/04/artificial-intelligence-and-wage-inequality_563908cc/bf98a45c-en.pdf
- 9 Bloomberg. (2025). *OpenAI's Nvidia, AMD deals boost \$1 trillion AI boom with circular agreements*. <https://www.bloomberg.com/news/features/2025-10-07/openai-s-nvidia-amd-deals-boost-1-trillion-ai-boom-with-circular-deals>
- 10 Wall Street Journal. (2025). *Wall Street's AI spending boom shows signs of overheating*. <https://www.wsj.com/finance/investing/wall-street-ai-spending-bubble-810d270e>
- 11 Stanford HAI. (2025). *2025 AI Index Report*. <https://hai.stanford.edu/ai-index/2025-ai-index-report>
- 12 Digital Cooperation Organization. (2025). *Digital Trade Acceleration Initiative*. <https://dco.org/initiatives/digital-trade-acceleration-initiative-2/>
- 13 CERN Quantum. (2025). *Our collaborations*. <https://quantum.cern/our-collaborations>
- 14 United Nations News. (2025). *Sixty-five nations sign first UN treaty to fight cybercrime, in milestone for digital cooperation*. <https://news.un.org/en/story/2025/10/1166182>
- 15 UNDP. (n.d.). *The next great divergence*. <https://www.undp.org/asia-pacific/next-great-divergence>
- 16 International Energy Agency. (2024). *Energy and AI: Energy demand from AI*. IEA. <https://www.iea.org/reports/energy-and-ai/energy-demand-from-ai>
- 17 Additional information on how the projected economic value creation is estimated is provided in the Methodology annex.
- 18 Diagnostic and Interventional Cardiology. (2017). *Arterys Cardio DL cloud MRI analytics software receives FDA clearance*. <https://www.dicardiology.com/product/arterys-cardio-dl-cloud-mri-analytics-software-receives-fda-clearance>
- 19 European Bioinformatics Institute. (2022). *AlphaFold reaches 200 million protein predictions*. EMBL–EBI. <https://www.ebi.ac.uk/about/news/technology-and-innovation/alphafold-200-million/>
- 20 Nobel Prize Organization. (2024). *The Nobel Prize in Chemistry 2024: Popular information*. <https://www.nobelprize.org/prizes/chemistry/2024/popular-information/>
- 21 Bloomberg. (2025). *Bloomberg Terminal: Collaboration tools*. <https://www.bloomberg.com/professional/products/bloomberg-terminal/collaboration-tools/>
- 22 Bloomberg. (2025). *BloombergGPT: 50-billion-parameter LLM tuned for finance*. <https://www.bloomberg.com/company/press/bloomberggpt-50-billion-parameter-llm-tuned-finance/>
- 23 OpenAI. (2025). *OpenAI × Klarna partnership announcement*. <https://openai.com/index/klarna/>
- 24 Office of the Principal Scientific Adviser to the Government of India. (2025). *National AI Mission*. <https://www.psa.gov.in/ai-mission>
- 25 Itemize. (2025). *Vertical AI solutions*. <https://www.itemize.com/vertical-ai/>
- 26 AI Time Journal. (2025). *Vertical AI meets SaaS: The rise of industry-specific AI-as-a-Service (AlaaS)*. <https://www.aitimejournal.com/vertical-ai-meets-saas-the-rise-of-industry-specific-ai-as-a-service-aias/51660/?p=51660>
- 27 Additional information on how the readiness scores are calculated is provided in the Methodology annex.
- 28 International Energy Agency. (2024). *AI for energy optimisation and innovation*. IEA. <https://www.iea.org/>

[reports/energy-and-ai/ai-for-energy-optimisation-and-innovation](#)

- 29 Adobe. (2025). *Adobe Firefly*. <https://www.adobe.com/uk/products/firefly/landpa.html?msockid=287f581caac661762bc24db9abbc602e>
- 30 Blackmagic Design. (2025). *DaVinci Resolve: What's new*. <https://www.blackmagicdesign.com/products/davinciresolve/whatsnew>
- 31 TrendForce. (2025). *AI server market forecast 2025*. <https://www.trendforce.com/presscenter/news/20250106-12433.html>
- 32 Financial Times. (2025). *AI reshapes the global technology landscape*. <https://www.ft.com/content/6cda7685-40f7-493a-9d24-8355083c8ecd>
- 33 National University of Sciences and Technology. (2025). *How AI-powered smart traps are transforming pest control in agricultural farms*. <https://researchblog.nust.edu.pk/how-ai-powered-smarttraps-are-transforming-pest-control-in-agricultural-farms/>
- 34 Monetary Authority of Singapore. (2018). *World's first cross-border open architecture platform to improve financial inclusion*. <https://www.mas.gov.sg/news/media-releases/2018/worlds-first-cross-border-open-architecture-platform-to-improve-financial-inclusion>
- 35 International Organization for Standardization. (2018). *ISO 20022 standard (ISO 74353)*. <https://www.iso.org/standard/74353.html>
- 36 Payment Services Directive 3. (2025). *About the PSD3 directive*. <https://www.payment-services-directive-3.com/>
- 37 Association of Southeast Asian Nations. (2025). *Public summary of implementation roadmap to establish regionally comparable and recognised UBIN in ASEAN*. <https://asean.org/wp-content/uploads/2025/04/Public-Summary-of-Implementation-Roadmap-to-Establish-Regionally-Comparable-and-Recognised-UBIN-in-ASEAN-1.pdf>
- 38 Nordic APIs. (2025). *Are AI agents the new APIs?* <https://nordicapis.com/are-ai-agents-the-new-apis/>
- 39 ArXiv. (2025). *Paper 2502.17443: Advances in AI agent architectures*. <https://arxiv.org/pdf/2502.17443>
- 40 Catena-X. (2025). *Catena-X, CAAM and VDA launch first China pilot with 50 companies advancing global data collaboration*. <https://catena-x.net/news/catena-x-caam-and-vda-launch-first-china-pilot-with-50-companies-advancing-global-data-collaboration/>
- 41 Catena-X. (2025). *Standardization in the Catena-X Association*. <https://catena-x.net/association/standardization/>
- 42 GSMA. (2025). *GSMA Open Gateway*. <https://www.gsma.com/solutions-and-impact/gsma-open-gateway/>
- 43 GSMA Intelligence. (2025). *AI and telecom innovation report*. <https://www.gsmainelligence.com/research/research-file-download?reportId=65231&assetId=65298>
- 44 European Union. (2023). *Regulation (EU) 2023/2854*. EUR-Lex. <https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1762177594076&uri=CELEX%3A32023R2854>
- 45 Organisation for Economic Co-operation and Development. (2025). *Competition in the provision of cloud computing services*. OECD. <https://www.oecd.org/content/dam/oecd/en/publications/reports/2025/05/competition-in-the-provision-of-cloud-computing-services-f42582ad/595859c5-en.pdf>
- 46 The Economic Times Retail. (2025). *ONDC crosses 20.4 crore transactions in March 2025*. <https://retail.economictimes.indiatimes.com/news/e-commerce/e-tailing/ondc-crosses-20-4-cr-transactions-in-march-2025/120308007>
- 47 Open Banking Nigeria. (2025). *Open banking in Nigeria*. <https://openbanking.ng/open-banking-in-nigeria/>
- 48 ISO 20022. (2025). *APIs and ISO 20022*. <https://www.iso20022.org/about-iso-20022/apis-and-iso-20022>
- 49 ScienceDirect. (2025). *LOBEMS: IoT for building and energy management systems*. <https://scispace.com/pdf/lobems-iot-for-building-and-energy-management-systems-yay8o8y7rl.pdf>
- 50 Amazon Web Services. (2025). *Announcing AWS IoT Greengrass 2.0 with open-source edge runtime and new developer capabilities*. <https://aws.amazon.com/blogs/aws/announcing-aws-iot-greengrass-2-0-with-an-open-source-edge-runtime-and-new-developer-capabilities/>
- 51 Forbes. (2022). *Walmart to use RFID to improve store-level inventory accuracy in home goods and consumer electronics*. <https://www.forbes.com/sites/marshallkay/2022/02/09/walmart-to-use-rfid-to-improve-store-level-inventory-accuracy-in-home-goods-consumer-electronics/>
- 52 OPC Foundation. (2025). *The OPC Foundation releases the OPC UA Field Exchange (UAFX) specifications*. <https://opcfoundation.org/news/press-releases/the-opc-foundation-releases-the-opc-ua-field-exchange-uafx-specifications/>

- 53 NVIDIA. (2025). *New NVIDIA Metropolis microservices fast-track cloud-native vision AI development*. <https://developer.nvidia.com/blog/new-nvidia-metropolis-microservices-fast-tracks-cloud-native-vision-ai-development/>
- 54 Peterson Health Technology Institute. (2025). *Adoption of AI in healthcare delivery systems: Early applications and impacts*. <https://phti.org/wp-content/uploads/sites/3/2025/03/PHTI-Adoption-of-AI-in-Healthcare-Delivery-Systems-Early-Applications-Impacts.pdf>
- 55 Circularise. (2025). *EU battery passport regulation requirements*. <https://www.circularise.com/blogs/eu-battery-passport-regulation-requirements>
- 56 Based on DEN 2025 scores and including 80 countries covered by the DEN.
- 57 Amplyfi. (2025). *AI-optimised smart grids: How EU and US utilities are transforming energy management*. <https://amplyfi.com/blog/ai-optimised-smart-grids-how-eu-and-us-utilities-are-transforming-energy-management/>
- 58 ScienceDirect. (2025). *Artificial intelligence for sustainable materials discovery*. <https://www.sciencedirect.com/science/article/pii/S2590174525004611#ab005>
- 59 ScienceDirect. (2024). *AI applications in climate risk management*. <https://www.sciencedirect.com/science/article/pii/S2666519024000293>
- 60 Yum! Brands. (2025). *Yum! Brands to accelerate AI innovation in an industry-first collaboration with NVIDIA*. <https://www.yum.com/wps/portal/yumbrands/Yumbrands/news/press-releases/yum+brands+to+accelerate+ai+innovation+in+an+industry-first+collaboration+with+nvidia>
- 61 GSA. (2025). *5G Standalone: August 2025 update*. <https://gsacom.com/paper/5g-standalone-august-2025/>
- 62 Ericsson. (2025). *IoT connections outlook*. <https://www.ericsson.com/en/reports-and-papers/mobility-report/dataforecasts/iot-connections-outlook>
- 63 IoT Analytics. (2025). *Cellular IoT module shipments grew 23 percent in Q1 2025*. <https://iot-analytics.com/wp-content/uploads/2025/07/INSIGHTS-RELEASE-Cellular-IoT-Module-Shipments-Grew-23-percent-in-Q1-2025.pdf>
- 64 World Meteorological Organization. (2025). *Number of wildfires forecast to rise 50 percent by 2100*. <https://wmo.int/media/news/number-of-wildfires-forecast-rise-50-2100>
- 65 Google Research. (2025). *FireSat: AI satellite wildfire detection project*. <https://sites.research.google/gr/wildfires/firesat/>
- 66 Kuwait Times. (2025). *New mobile speed cameras launched as traffic offences fall*. <https://kuwaittimes.com/article/26356/kuwait/other-news/new-mobile-speed-cameras-launched-traffic-offenses-fall/>
- 67 Times of India. (2025). *Kuwait cuts traffic violations by 95 percent using smart cameras and mobile radars*. <https://timesofindia.indiatimes.com/world/middle-east/kuwait-cuts-traffic-violations-by-95-using-smart-cameras-and-mobile-radars-heres-how/articleshow/123010489.cms>
- 68 Global E-Waste Statistics Partnership. (2024). *The global e-waste monitor 2024*. https://ewastemonitor.info/wp-content/uploads/2024/03/GEM_2024_18-03_web_page_per_page_web.pdf
- 69 Climate Neutral Data Centre Pact. (2024). *Working groups*. <https://www.climateneutraldatacentre.net/working-groups/>
- 70 European Parliament. (2021). *Climate Neutral Data Centre Pact – Data centre sustainability*. <https://www.europarl.europa.eu/cmsdata/235215/20210531-CND-CP-Data%20Centre.pdf>
- 71 COP28 UAE. (2024). *Global renewables and energy efficiency pledge*. <https://www.cop28.com/en/global-renewables-and-energy-efficiency-pledge>
- 72 European Commission. (2024). *Commission adopts EU-wide scheme rating sustainability of data centres*. https://energy.ec.europa.eu/news/commission-adopts-eu-wide-scheme-rating-sustainability-data-centres-2024-03-15_en
- 73 International Energy Agency. (2024). *AI is set to drive surging electricity demand from data centres while offering the potential to transform how the energy sector works*. <https://www.iea.org/news/ai-is-set-to-drive-surging-electricity-demand-from-data-centres-while-offering-the-potential-to-transform-how-the-energy-sector-works>
- 74 BBC News. (2024). *AI's growing energy appetite sparks concern over data-centre power use*. <https://www.bbc.com/news/articles/cjewvpkw7weo>
- 75 Helion Energy. (2023). *Announcing Helion fusion PPA with Microsoft and Constellation*. <https://www.helionenergy.com/articles/announcing-helion-fusion-ppa-with-microsoft-constellation/>
- 76 Taiwan Semiconductor Manufacturing Co. (TSMC). (2024). *A practitioner of green power*. <https://investor.tsmc.com/sites/ir/annual-report/2024/2024%20Annual%20Report%20E.pdf>
- 77 International Energy Agency. (2024). *Data-centre electricity consumption by region, base case 2020–2030*. <https://www.iea.org/data-and-statistics/charts/data-centre-electricity-consumption-by-region-base-case-2020-2030>

-
- 78 ScienceDirect. (2024). *The environmental footprint of hyperscale data centres*. <https://www.sciencedirect.com/science/article/pii/S2352484724000386>
-
- 79 Future Technology Systems Group (FTSG). (2025). *FTSG 2025 Technology Report* (pp. 379–380). https://ftsg.com/wp-content/uploads/2025/03/FTSG_2025_TR_FINAL_LINKED.pdf
-
- 80 Data Center Dynamics. (2025). *Morocco plans to build 500 MW renewable-energy data centre*. <https://www.datacenterdynamics.com/en/news/morocco-plans-to-build-500mw-renewable-energy-data-center/>
-
- 81 Kearney. (2025). *The age of the agents: How agentic AI offers unprecedented opportunities to reimagine business processes*. <https://www.kearney.com/service/digital-analytics/article/the-age-of-the-agents-how-agentic-ai-offers-unprecedented-opportunities-to-reimagine-business-processes>
-
- 82 Microsoft WorkLab. (2025). *2025: The year the frontier firm is born*. <https://www.microsoft.com/en-us/worklab/work-trend-index/2025-the-year-the-frontier-firm-is-born?msockid=287f581caac661762bc24db9abbc602e>
-
- 83 IoT Analytics. (2025). *What CEOs talked about Q1 2025: Tariffs, uncertainty, and agentic AI*. <https://iot-analytics.com/what-ceos-talked-about-q1-2025-tariffs-uncertainty-agentic-ai/>
-
- 84 Kearney. (2025). *The age of the agents: How agentic AI offers unprecedented opportunities to reimagine business processes*. <https://www.kearney.com/service/digital-analytics/article/the-age-of-the-agents-how-agentic-ai-offers-unprecedented-opportunities-to-reimagine-business-processes>
-
- 85 arXiv. (2025). *The AI Agent Code of Conduct: Automated guardrail policy-as-prompt synthesis*. <https://arxiv.org/abs/2509.23994v1>
-
- 86 IBM Institute for Business Value. (2025). *Agentic AI operating model*. <https://www.ibm.com/thought-leadership/institute-business-value/en-us/report/agentic-ai-operating-model>
-
- 87 Amazon Web Services Insights. (2025). *The rise of autonomous agents: What enterprise leaders need to know about the next wave of AI*. <https://aws.amazon.com/blogs/aws-insights/the-rise-of-autonomous-agents-what-enterprise-leaders-need-to-know-about-the-next-wave-of-ai/>
-
- 88 Accenture Banking Blog. (2025). *Agentic payments and commerce*. <https://bankingblog.accenture.com/agentic-payments-commerce>
-
- 89 Toyota Motor Corporation. (2025). *AI-powered robot by Boston Dynamics and Toyota Research Institute takes a key step toward general-purpose humanoids*. <https://pressroom.toyota.com/ai-powered-robot-by-boston-dynamics-and-toyota-research-institute-takes-a-key-step-towards-general-purpose-humanoids/>
-
- 90 International Federation of Robotics. (2025). *Record of 4 million robots working in factories worldwide*. <https://ifr.org/ifr-press-releases/news/record-of-4-million-robots-working-in-factories-worldwide>
-
- 91 PitchBook Data. (2025). *Vertical snapshot: Robotics preview 2025*. <https://pitchbook.com/news/reports/2025-vertical-snapshot-robotics>
-
- 92 NVIDIA Corporation. (2025). *NVIDIA accelerates robotics research and development with new open models and simulation libraries*. <https://nvidianews.nvidia.com/news/nvidia-accelerates-robotics-research-and-development-with-new-open-models-and-simulation-libraries>
-
- 93 Engineering.com. (2025). *Robot safety standard gets fresh update*. <https://www.engineering.com/robot-safety-standard-gets-fresh-update/>
-
- 94 NVIDIA Blogs. (2025). *Introducing Jetson Thor: The platform for physical AI at the edge*. <https://blogs.nvidia.com/blog/jetson-thor-physical-ai-edge/>
-
- 95 NVIDIA. (2025). *Jetson Thor embedded systems for autonomous machines*. <https://www.nvidia.com/en-us/autonomous-machines/embedded-systems/jetson-thor/>
-
- 96 Time. (2015). *Discover Weekly: How Spotify's algorithm picks your playlist*. <https://time.com/4131520/spotify-discover-weekly-playlists/>
-
- 97 McGinnis, M. (2020). *How do Netflix's algorithms work? Machine learning helps to predict what viewers will like*. Wired. <https://www.wired.com/story/how-do-netflixs-algorithms-work-machine-learning-helps-to-predict-what-viewers-will-like/>
-
- 98 Morozov, E. (2017). *Artwork personalization*. Netflix Tech Blog. <https://netflixtechblog.com/artwork-personalization-c589f074ad76>
-
- 99 Biddle, G. (2020). *A brief history of Netflix personalization*. Medium. <https://gibsonbiddle.medium.com/a-brief-history-of-netflix-personalization-1f2deb010a1>
-
- 100 Amazon Web Services (2019). *Amazon Personalize is now generally available*. <https://aws.amazon.com/blogs/aws/amazon-personalize-is-now-generally-available/>
-
- 101 Google Cloud. (2023). *Online shopping gets personal with recommendations AI*. Google Cloud Blog. <https://cloud.google.com/blog/products/ai-machine-learning/online-shopping-gets-personal-with-recommendations-ai>

google.com/blog/products/ai-machine-learning/online-shopping-gets-personal-with-recommendations-ai

- 102 EMBO. (2023). *AI model forecasts disease risk decades in advance*. EMBL News. <https://www.embl.org/news/science-technology/ai-model-forecasts-disease-risk-decades-in-advance/>
- 103 Nature. (2025). *Artificial intelligence for healthcare: Forecasting disease risk*. Nature, 595(7893). <https://www.nature.com/articles/s41586-025-09529-3#Sec1>
- 104 McDonnell, R. (2025). *NHS to launch world's biggest trial of AI breast cancer diagnosis*. The Guardian. <https://www.theguardian.com/society/2025/feb/04/nhs-to-launch-worlds-biggest-trial-of-ai-breast-cancer-diagnosis>
- 105 eMarketer. (2025). *Retail media forecast report update*. eMarketer. <https://www.emarketer.com/content/retail-media-forecast-report-update>
- 106 Business Insider. (2025). *How retail media networks convert consumers into customers*. Business Insider. <https://www.businessinsider.com/sc/how-retail-media-networks-convert-consumers-into-customers>
- 107 OpenReview. (2025). *Paper Title: The future of AI in consumer behavior*. OpenReview. <https://openreview.net/forum?id=bluMStaUC>
- 108 Meta. (2025). *Improving your recommendations with apps AI*. Facebook News. <https://about.fb.com/news/2025/10/improving-your-recommendations-apps-ai-meta/>
- 109 TikTok. (2025). *TikTok Travel Ads: Optimizing your campaigns*. TikTok Business. <https://ads.tiktok.com/business/en/blog/tiktok-travel-ads>
- 110 Reddit. (2025). *Conversation Ads: Engage your audience*. Reddit Business. <https://www.business.reddit.com/advertise/ad-types/conversation-ads>
- 111 Counterpoint Research. (2025). *Global GenAI smartphone cumulative shipments surpass 500 million*. Counterpoint Research. <https://counterpointresearch.com/en/insights/global-genai-smartphone-cumulative-shipments-surpass-500-million>
- 112 TechRadar. (2025). *Don't want an AI PC? Tough. They're coming to take over, new figures claim*. TechRadar. <https://www.techradar.com/pro/dont-want-an-ai-pc-tough-theyre-coming-to-take-overs-new-figures-claim>
- 113 Counterpoint Research. (2025). *Global GenAI smartphone cumulative shipments surpass 500 million*. Counterpoint Research. <https://counterpointresearch.com/en/insights/global-genai-smartphone-cumulative-shipments-surpass-500-million>
- 114 Khan Academy. (2025). *Need to know: BTS 2025*. Khan Academy Blog. <https://blog.khanacademy.org/need-to-know-bts-2025/>
- 115 Telecom Review Americas. (2025). *Makasib: Transforming loyalty into everyday impact in Oman*. Telecom Review. <https://www.telecomreviewamericas.com/articles/reports-and-coverage/makasib-transforming-loyalty-into-everyday-impact-in-oman/>
- 116 Omantel. (2025). *Makasib: Your loyalty program made simple*. Omantel. <https://www.omantel.om/Personal/makasib>
- 117 OECD. (2019). *OECD Employment Outlook 2019: The future of work*. OECD Publishing. https://www.oecd.org/content/dam/oecd/en/publications/reports/2019/04/oecd-employment-outlook-2019_0d35ae00/9ee00155-en.pdf
- 118 World Economic Forum. (2020). *The reskilling revolution: Better skills, better jobs, better education for a billion people by 2030*. World Economic Forum. <https://www.weforum.org/press/2020/01/the-reskilling-revolution-better-skills-better-jobs-better-education-for-a-billion-people-by-2030/>
- 119 UNESCO. (2023). *Artificial intelligence competency framework for teachers*. UNESCO. <https://unesdoc.unesco.org/ark:/48223/pf0000376709>
- 120 European Commission. (2023). *Europe's fit for the digital age: European Year of Skills 2023*. European Commission. https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/europe-fit-digital-age/european-year-skills-2023_en
- 121 Digital SME Alliance. (2023). *The European Year of Skills: Boosting competitiveness, participation, and talent of digital SMEs*. Digital SME. <https://www.digitalsme.eu/the-european-year-of-skills-boosting-competitiveness-participation-and-talent-of-digital-smes/>
- 122 UNESCO. (2023). *AI Competency Framework for Teachers*. UNESCO. <https://unesdoc.unesco.org/ark:/48223/pf0000391104>
- 123 Cedefop. (2025). *AI competency framework for teachers*. Cedefop. https://www.cedefop.europa.eu/files/unesco_ai_competency_framework_for_teachers.pdf
- 124 UNESCO. (2025). *Artificial Intelligence: Framework for Teachers*. UNESCO. <https://www.unesco.org/en/articles/ai-competency-framework-teachers>
- 125 WTI. (2025). *The year the frontier broke through: Trends in technology*. WTI Reports. https://assets-c4akfrf5b4d3f4b7.z01.azurefd.net/assets/2025/04/WTI-2025-04-The-Year-the-Frontier-v13_68535917c7c2a.pdf

- 126 Brynjolfsson, E., Chandar, P., & Chen, Y. (2025). *The canaries in the coal mine: AI and the changing workforce*. Stanford Digital Economy. <https://digitaleconomy.stanford.edu/wp-content/uploads/2025/08/Canaries-BrynjolfssonChandarChen.pdf>
- 127 OpenAI. (2025). *ChatGPT usage and adoption patterns at work*. OpenAI. <https://cdn.openai.com/pdf/3c7f7e1b-36c4-446b-916c-11183e4266b7/chatgpt-usage-and-adoption-patterns-at-work.pdf>
- 128 LinkedIn Economic Graph. (2025). *Skills-based hiring: A transformative approach*. LinkedIn. <https://economicgraph.linkedin.com/content/dam/me/economicgraph/en-us/PDF/skills-based-hiring-march-2025.pdf>
- 129 Coursera. (2025). *Micro-credentials report 2025: The rise of digital credentials*. Coursera. <https://www.coursera.org/enterprise/resources/ebooks/micro-credentials-report-2025>
- 130 World Economic Forum. (2025). *The future of jobs report 2025*. https://reports.weforum.org/docs/WEF_Future_of_Jobs_Report_2025.pdf
- 131 Chen, J., & Zhang, Q. (2025). *DeepSeek reshaping healthcare in China's tertiary hospitals* (arXiv:2502.16732). arXiv. <https://arxiv.org/abs/2502.16732>
- 132 Lv, J., Xu, Y., Jiang, M., Lv, Y., Sun, J., Lu, J., Wang, L., & Wang, H. (2025). *A DeepSeek-powered locally deployed closed-loop system for enhancing quality control in electronic nursing documentation: Development and clinical validation*. *Journal of the American Medical Informatics Association*, 32(10), 1526-1532. <https://doi.org/10.1093/jamia/ocaf109> (Ovid)
- 133 Fastweb + Vodafone. (2025). *Fastweb Digital Academy alongside Public Administration Department for the dissemination of digital skills in public employment* [Press release]. <https://www.fastwebvodafone.it/area-media/comunicati-stampa/fastweb-digital-academy-al-fianco-di-funzione-pubblica-per-la-diffusione-delle-competenze-digitali-nel-pubblico-impiego/?lng=EN> (fastwebvodafone.it)
- 134 TOI World Desk. (2025). *UAE teams up with Oxford, MIT, and top universities to train government leaders in AI and economic strategy*. *The Times of India*. <https://timesofindia.indiatimes.com/world/middle-east/uae-teams-up-with-oxford-mit-and-top-universities-to-train-government-leaders-in-ai-and-economic-strategy/articleshow/124252176.cms> (The Times of India)
- 135 LinkedIn Economic Graph. (2025). *The work-change report*. <https://economicgraph.linkedin.com/content/dam/me/economicgraph/en-us/PDF/Work-Change-Report.pdf>
- 136 Digital Cooperation Organization. (2025). *AI Real Toolkit: AI readiness to empowerment, adoption, and leadership toolkit guide*. <https://dco.org/ai-real-toolkit-ai-readiness-to-empowerment-adoption-and-leadership-toolkit-guide/>
- 137 The World Bank. *P170669 – Digital jobs project* <https://documents1.worldbank.org/curated/en/099082825081518892/pdf/P170669-9bcef011-a146-4596-8352-4ae5f6b3b9c8.pdf>
- 138 The World Bank. (2020). *Jordan: US\$200 million to improve digital services and access to jobs for youth and underserved communities* [Press release]. <https://www.worldbank.org/en/news/press-release/2020/03/20/jordan-us200-million-to-improve-digital-services-and-access-to-jobs-for-youth-and-underserved-communities> (EPALE – European Commission)
- 139 UNESCO. (2025). *UNESCO and partners convene national dialogue on Pakistan's media and information literacy strategy*. <https://www.unesco.org/en/articles/unesco-and-partners-convene-national-dialogue-pakistans-media-and-information-literacy-strategy>
- 140 Apple. (2018). *iOS 12 introduces new features to reduce interruptions and manage screen time*. <https://www.apple.com/newsroom/2018/06/ios-12-introduces-new-features-to-reduce-interruptions-and-manage-screen-time/>
- 141 Google. (2018). *Technology in today's world: Helping you reclaim a sense of balance*. <https://blog.google/products/android/technology-todays-world-helping-you-reclaim-sense-balance/>
- 142 Orrick. (2021). *The UK's Age-Appropriate Design Code comes into force in September 2021*. <https://www.orricks.com/en/Insights/2021/07/The-UKs-Age-Appropriate-Design-Code-Comes-into-Force-in-September-2021>
- 143 TikTok. (2024). *Partnering with our industry to advance AI transparency and literacy*. <https://newsroom.tiktok.com/partnering-with-our-industry-to-advance-ai-transparency-and-literacy?lang=en>
- 144 Digital Cooperation Organization. *Combating online misinformation: A comprehensive framework for strengthening national agendas*. <https://dco.org/combating-online-misinformation-a-comprehensive-framework-for-strengthening-national-agendas/>
- 145 Digital Cooperation Organization. (2025). *Fourth General Assembly declaration*. https://dco.org/wp-content/uploads/2025/02/4th-GA-Declaration_Final.pdf
- 146 Jones, C. (2025). *Spain to impose massive fines for not labelling AI-generated content*. Reuters. <https://www.reuters.com/technology/artificial-intelligence/spain-impose-massive-fines-not-labelling-ai-generated-content-2025-03-11/> and Government of Spain – La Moncloa. (2025). *Referencia del Consejo de Ministros*

- [Press release]. <https://www.lamoncloa.gob.es/consejodeministros/referencias/Paginas/2025/20250311-referencia-rueda-de-prensa-ministros.aspx#artificial>
-
- 147 Ritzau. (2025). *Danmark går forrest: Politisk aftale sætter en ny standard for digital beskyttelse af børn og unge* [Press release]. <https://via.ritzau.dk/pressemeddelelse/14664986/danmark-gar-forrest-politisk-aftale-saetter-en-ny-standard-for-digital-beskyttelse-af-born-og-unge?publisherId=13560322>
-
- 148 eSafety Commissioner. *Social media age restrictions*. <https://www.esafety.gov.au/about-us/industry-regulation/social-media-age-restrictions>
-
- 149 European Commission. (2024). *Artificial Intelligence Act: Article 50*. <https://artificialintelligenceact.eu/article/50/>
-
- 150 World Health Organization. (2025). *World Health Assembly endorses extension of the global digital health strategy to 2027*. <https://www.who.int/news/item/23-05-2025-world-health-assembly-endorses-extension-of-the-global-digital-health-strategy-to-2027>
-
- 151 NutraIngredients. (2025). *AI personalized nutrition app improves gut health*. <https://www.nutraingredients.com/Article/2025/04/07/ai-personalized-nutrition-app-improves-gut-health/>
-
- 152 Sony Europe. (2025). *Sony launches Camera Verify feature for its Camera Authenticity solution for news organisations* <https://www.sony.eu/presscentre/sony-launches-camera-verify-feature-for-its-camera-authenticity-solution-for-news-organisations>
-
- 153 Adobe. (2025). *Adobe Content Authenticity beta overview*. <https://helpx.adobe.com/creative-cloud/apps/adobe-content-authenticity/beta-overview.html>
-
- 154 Cloudflare. (2025). *Cloudflare launches one-click content credentials to track image authenticity and preserve creator attribution*. <https://www.cloudflare.com/press/press-releases/2025/cloudflare-launches-one-click-content-credentials-to-track-image-authenticity/>
-
- 155 World Economic Forum. (2025). *Rethinking media literacy 2025*. https://reports.weforum.org/docs/WEF_Rethinking_Media_Literacy_2025.pdf
-
- 156 European Commission. (2025). *Digital Services Act: Keeping us safe online*. https://commission.europa.eu/news-and-media/news/digital-services-act-keeping-us-safe-online-2025-09-22_en
-
- 157 United Nations. (2025). *Information integrity issue brief*. <https://www.un.org/sites/un2.un.org/files/un-information-integrity-issue-brief-01.pdf>
-
- 158 Google. *Government removal requests transparency report*. https://transparencyreport.google.com/government-removals/government-requests?hl=en&lu=country_item_amount&country_request_amount=group_by:reasons&country_item_amount=group_by:reasons
-
- 159 Opal. (2025) *Introducing Opal for Kids*. <https://www.opal.so/blog/introducing-opal-for-kids>
-
- 160 Journal of Medical Internet Research Pediatrics. (2024). *[Article on pediatric digital health]*. <https://pediatrics.jmir.org/2024/1/e57041?utm>
-
- 161 Zhang, Y., & Li, H. (2024). *Advances in AI-driven digital systems* (arXiv:2409.10064v1). arXiv. <https://arxiv.org/html/2409.10064v1>
-
- 162 Microsoft Azure. (2018). *Announcing the public preview of Azure Digital Twins*. <https://azure.microsoft.com/en-us/blog/announcing-the-public-preview-of-azure-digital-twin/?msocid=287f581caac661762bc24db9abbc602e>
-
- 163 Digital Twin Consortium. (n.d.). *About us*. <https://www.digitaltwinconsortium.org/about-us/>
-
- 164 IKEA. (2024). *IKEA launches new AI-powered digital experience empowering customers to create lifelike room designs*. <https://www.ikea.com/us/en/newsroom/corporate-news/ikea-launches-new-ai-powered-digital-experience-empowering-customers-to-create-lifelike-room-designs-pub58c94890/>
-
- 165 NVIDIA. (2023). *Omniverse open beta available*. <https://blogs.nvidia.com/blog/omniverse-open-beta-available/>
-
- 166 NVIDIA News. (2025). *NVIDIA brings millions more into the metaverse with expanded Omniverse platform*. <https://nvidianews.nvidia.com/news/nvidia-brings-millions-more-into-the-metaverse-with-expanded-omniverse-platform>
-
- 167 Apple. (2023). *Introducing Apple Vision Pro*. <https://www.apple.com/newsroom/2023/06/introducing-apple-vision-pro/>
-
- 168 Siemens. (2025). *Siemens unveils breakthrough innovations in industrial AI and digital twin technology at CES*. <https://press.siemens.com/global/en/pressrelease/siemens-unveils-breakthrough-innovations-industrial-ai-and-digital-twin-technology-ces>
-
- 169 BMW Group. (2025). *BMW Group scales virtual factory*. <https://www.press.bmwgroup.com/global/article/detail/T0450699EN/bmw-group-scales-virtual-factory>
-
- 170 Bloomberg. (2025). *Apple shelves Vision headset revamp to prioritize Meta-like AI smart glasses*. <https://www.bloomberg.com/news/articles/2025-10-01/apple-shelves->

[vision-headset-revamp-to-prioritize-meta-like-ai-smart-glasses](#)

- 171 Bank of America Institute. (2025). *Smart glasses report* <https://institute.bankofamerica.com/content/dam/transformation/smart-glasses.pdf>
- 172 Medivis. (2025). *Medivis receives FDA 510(k) clearance for spine navigation and announces commercial launch in the United States* <https://www.medivis.com/press-release/medivis-receives-fda-510-k-clearance-for-spine-navigation-and-announces-commercial-launch-in-the-united-states>
- 173 GE Healthcare. (2025). *Children's Mercy Kansas City increases access to care after launching Command Center*. <https://www.gehealthcare.com/en-ph/insights/article/childrens-mercy-kansas-city-increases-access-to-care-after-launching-command-center?srsId=AfmBOogNEwjj53XJ3ZdwR85JQc4x3eQqcQcRvVy25KxDGlrPRWjts&>
- 174 Amazon. (2025). *Smart glasses for Amazon delivery drivers*. <https://www.aboutamazon.com/news/transportation/smart-glasses-amazon-delivery-drivers>
- 175 Ericsson. (n.d.). *Mobile subscriptions outlook*. <https://www.ericsson.com/en/reports-and-papers/mobility-report/dataforecasts/mobile-subscriptions-outlook>
- 176 Treeview Studio. (2025). *AR, VR, MR, XR, metaverse, and spatial computing industry stats*. <https://treeview.studio/blog/ar-vr-mr-xr-metaverse-spatial-computing-industry-stats>
- 177 European Union. (2023). *Shaping Europe's digital future: Publication*. <https://op.europa.eu/en/publication-detail/-/publication/4cff5301-ece2-11ef-b5e9-01aa75ed71a1/language-en>
- 178 Kingdom of Bahrain. (2025). *Digital twinning in Bahrain*. <https://www.bahrain.bh/wps/portal/en/BNP/BahrainAtAGlance/DigitalTwinning>
- 179 Perey, C. (2024). *Interoperability is a fundamental requirement for the open metaverse*. Metaverse Standards Forum. <https://metaverse-standards.org/wp-content/uploads/Interoperability-is-a-Fundamental-Requirement-for-the-Open-Metaverse-PEREY-Christine.pdf>
- 180 Khronos Group. (2023). *Khronos releases OpenXR 1.1 to further streamline cross-platform XR development*. <https://www.khronos.org/news/press/khronos-releases-openxr-1.1-to-further-streamline-cross-platform-xr-development>
- 181 Android Central. (2025). *Honor Magic V5 brings real-time AI translation straight to your pocket*. <https://www.androidcentral.com/phones/honor-phones/honor-magic-v5-brings-real-time-ai-translation-straight-to-your-pocket>
- 182 TOP500. *TOP500 List – November 2025*. <https://top500.org/lists/top500/list/2025/11/>
- 183 Stanford University. (2025). *AI index report 2025: Economy*. <https://hai.stanford.edu/ai-index/2025-ai-index-report/economy>
- 184 Economic Times. (2023). *Govt gets bids offering 18,000 GPUs in round 2 of IndiaAI Mission tender*. <https://economictimes.indiatimes.com/tech/technology/govt-gets-bids-offering-18000-gpus-in-round-2-of-indiaai-mission-tender/articleshow/121118580.cms>
- 185 National Science Foundation. (2025). *Operating National Artificial Intelligence Research Resource (NAIRR-OC) foundations*. <https://www.nsf.gov/funding/opportunities/nairr-oc-foundations-operating-national-artificial-intelligence>
- 186 European Commission. (2025). *AI factories*. <https://digital-strategy.ec.europa.eu/en/policies/ai-factories>
- 187 Government of Chile. (2023). *It's a reality: Government signs agreement with Google to install first fiber optic cable between South America and Oceania*. <https://www.gob.cl/en/news/its-a-reality-government-signs-agreement-with-google-to-install-first-fiber-optic-cable-between-south-america-and-oceania/>
- 188 Microsoft. (2023). *Microsoft announces R\$14.7 billion investment over three years in cloud and AI infrastructure and provides AI training at scale to upskill 5 million people in Brazil*. <https://news.microsoft.com/pt-br/microsoft-announces-14-7-billion-reais-investment-over-three-years-in-cloud-and-ai-infrastructure-and-provide-ai-training-at-scale-to-upskill-5-million-people-in-brazil>
- 189 African Union. (2024). *Continental AI strategy* (July 2024). https://au.int/sites/default/files/documents/44004-doc-EN-Continental_AI_Strategy_July_2024.pdf
- 190 National Institutes of Health. (2025). *Brain-computer interface helps paralyzed man speak*. <https://www.nih.gov/news-events/nih-research-matters/brain-computer-interface-helps-paralyzed-man-speak>
- 191 Nature. (2023). *Walking naturally after spinal cord injury using a brain-spine interface*. <https://www.nature.com/articles/s41586-023-06094-5>
- 192 ScienceDirect. (2025). *Fatigue monitoring using wearables and AI: Trends, challenges, and future opportunities*. <https://www.sciencedirect.com/science/article/pii/S0010482525008121>
- 193 Organisation for Economic Co-operation and Development. (2025). *Neurotechnology toolkit*. <https://www.oecd.org/content/dam/oecd/en/topics/policy-sub-issues/emerging-technologies/neurotech-toolkit.pdf>

-
- 194 Frontiers in Human Dynamics. (2024). Article: Human dynamics research. <https://www.frontiersin.org/journals/human-dynamics/articles>
-
- 195 MobiHealthNews. Synchron will enable thought-control of Apple devices via brain implant. <https://www.mobihealthnews.com/news/synchron-will-enable-thought-control-apple-devices-brain-implant>
-
- 196 Wired. (2025). Synchron's brain-computer interface now has Nvidia's AI. <https://www.wired.com/story/synchrons-brain-computer-interface-now-has-nvidias-ai/>
-
- 197 Precedence Research. (2025). Brain-computer interface market. <https://www.precedenceresearch.com/brain-computer-interface-market>
-
- 198 Crunchbase News. (2025). Braintech funding, semiconductors, Neuralink. <https://news.crunchbase.com/health-wellness-biotech/braintech-funding-semiconductors-neuralink/>
-
- 199 UNESCO. (2025). Global standards for neurotechnology. <https://unesdoc.unesco.org/ark:/48223/pf0000394866/PDF/394866eng.pdf.multi>
-
- 200 U.S. Food & Drug Administration. (2025). FDA issues comprehensive draft guidance for developers of artificial intelligence-enabled medical devices. <https://www.fda.gov/news-events/press-announcements/fda-issues-comprehensive-draft-guidance-developers-artificial-intelligence-enabled-medical-devices>
-
- 201 Emergo by UL. (2025). Shift in compliance landscape: EU GPAI code of practice. <https://www.emergobyul.com/news/shift-compliance-landscape-eu-gpai-code-practice-here>
-
- 202 Wired. (2025). China is getting serious about brain-computer interfaces. <https://www.wired.com/story/china-is-getting-serious-about-brain-computer-interfaces/>
-
- 203 National Institute of Standards and Technology. (2025). End-to-end security. Computer Security Resource Center. <https://csrc.nist.gov/glossary/term/end-to-end-security>
-
- 204 National Institute of Standards and Technology. (2025). Access control. Computer Security Resource Center. <https://csrc.nist.gov/glossary/term/access-control>
-
- 205 IBM. (2025). What is end-to-end encryption? IBM THINK. <https://www.ibm.com/think/topics/end-to-end-encryption>
-
- 206 Crosignani, M., Macchiavelli, M., & Silva, A. F. *Pirates without Borders: The Propagation of Cyberattacks through Firms' Supply Chains* (Staff Report No. 937, revised 2021). Federal Reserve Bank of New York. https://www.newyorkfed.org/medialibrary/media/research/staff_reports/sr937.pdf
-
- 207 Steinberg, S., Stepan, A., & Neary, K. (2021). NotPetya: A Columbia University Case Study (SIPA-21-022.1). Columbia University School of International and Public Affairs. <https://www.sipa.columbia.edu/sites/default/files/2022-11/NotPetya%20Final.pdf>
-
- 208 Fortinet. (n.d.). SolarWinds cyber attack. Fortinet Cyber Glossary. <https://www.fortinet.com/resources/cyberglossary/solarwinds-cyber-attack>
-
- 209 Ramakrishna, S. (2021). An investigative update of the cyberattack. SolarWinds Blog. <https://www.solarwinds.com/blog/an-investigative-update-of-the-cyberattack>
-
- 210 Henderson, K. (2025). What the 2024 CrowdStrike glitch can teach us about cyber risk. Harvard Business Review. <https://hbr.org/2025/01/what-the-2024-crowdstrike-glitch-can-teach-us-about-cyber-risk>
-
- 211 IBM. (n.d.). Recent CrowdStrike outage: What you should know. IBM THINK News. <https://www.ibm.com/think/news/recent-crowdstrike-outage-what-you-should-know>
-
- 212 World Economic Forum & Accenture. (2025). Global Cybersecurity Outlook 2025. https://reports.weforum.org/docs/WEF_Global_Cybersecurity_Outlook_2025.pdf
-
- 213 United Nations Office on Drugs and Crime. (n.d.). Convention on Cybercrime <https://www.unodc.org/unodc/en/cybercrime/convention/convention-against-cybercrime-chapters.html>
-
- 214 United Nations. (2025). UN News: Highly significant cyber incidents rise. <https://news.un.org/en/story/2025/10/1166182>
-
- 215 Google Threat Intelligence / Google Cloud. (2025). Cybersecurity Forecast 2026. <https://services.google.com/fh/files/misc/cybersecurity-forecast-2026-en.pdf>
-
- 216 Aztech IT Solutions. (2025). Cyber Security 2025 Predictions: Trends and Challenges to Watch. [https://www.aztechit.co.uk/blog/cyber-security-predictions#:~:text=The%20cyber%20security%20landscape%20in,and%20virtual%20CISOs%20\(vCISOs\).](https://www.aztechit.co.uk/blog/cyber-security-predictions#:~:text=The%20cyber%20security%20landscape%20in,and%20virtual%20CISOs%20(vCISOs).)
-
- 217 National Cyber Security Centre (UK). (2025) *Impact of AI on the cyber threat from now to 2027*. <https://www.ncsc.gov.uk/report/impact-ai-cyber-threat-now-2027>
-
- 218 Miller & Chevalier. (2025). *Data Privacy and Cybersecurity in 2025: PCI DSS 4.0*. <https://www.mwe.com/insights/data-privacy-and-cybersecurity-in-2025-pci-dss-4-0/>
-
- 219 Financial Times. (2025). UK retailers face 10% rises in premiums after cyber attacks. <https://www.ft.com/content/190803d9-e646-4a58-8cd2-9a627cf40bb1>

- 220 UK Government. (2025) *Summary of the Cyber Security and Resilience Bill*. GOV.UK. <https://www.gov.uk/government/publications/deleted-cyber-security-and-resilience-network-and-information-systems-bill-factsheets/summary-of-the-bill>
- 221 Reuters. (2025). *UK warns business leaders as 'highly significant' cyber incidents rise 50%*. <https://www.reuters.com/world/uk/uk-warns-business-leaders-highly-significant-cyber-incidents-rise-50-2025-10-13/>
- 222 Allianz Commercial. (2025) *Cyber risk trends 2025: Cyber security resilience report*. <https://commercial.allianz.com/news-and-insights/reports/cyber-risk-trends.html>
- 223 World Economic Forum & Accenture. (2025). *Global Cybersecurity Outlook 2025*. https://reports.weforum.org/docs/WEF_Global_Cybersecurity_Outlook_2025.pdf
- 224 Check Point Software Technologies. (2025). *Langham Hospitality Group case study*. <https://www.checkpoint.com/downloads/customer-stories/langham-hospitality-group-case-study.pdf>
- 225 Health Management. (2025). *AI's role in strengthening healthcare cybersecurity in 2025*. <https://healthmanagement.org/c/artificial-intelligence/News/ais-role-in-strengthening-healthcare-cybersecurity-in-2025>
- 226 Cloudflare. *Adoption & usage worldwide*. (2025). Cloudflare Radar. <https://radar.cloudflare.com/adoption-and-usage>
- 227 European Commission. (2025) *Cyber Resilience Act*. Shaping Europe's digital future. <https://digital-strategy.ec.europa.eu/en/policies/cyber-resilience-act>
- 228 National Institute of Standards and Technology. (2025). *Post-Quantum Cryptography Standardization project*. NIST Cybersecurity Resource Center. <https://csrc.nist.gov/projects/post-quantum-cryptography/post-quantum-cryptography-standardization>
- 229 European Commission. (2025) *Cyber Resilience Act*. Shaping Europe's digital future. <https://digital-strategy.ec.europa.eu/en/policies/cyber-resilience-act>
- 230 IndustrialCyber. (2024) *Qatar's National Cyber Security Agency joins ISA's ISASecure certification program to advance industrial cyber resilience*. <https://industrialcyber.co/control-device-security/qatars-national-cyber-security-agency-joins-isas-isasecure-certification-program-to-advance-industrial-cyber-resilience/>
- 231 Emirates News Agency. (2025). *NCSA inaugurates 4th Cyber Governance and Assurance Conference* (2025). QNA. <https://qna.org.qa/en/news/news-details?id=nlsa-inaugurates-4th-cyber-governance-and-assurance-conference&date=29/09/2025>
- 232 Qatar News Agency. (2025). *Kuwait oil sector's impenetrable cybersecurity system keeps perils at bay*. WAM / Emirates News Agency <https://www.wam.ae/en/article/bk8zh51-kuwait-oil-sectors-impenetrable-cybersecurity>
- 233 ItPro. (2025). *'We are helping organizations strengthen their overall security postures': Fortinet hits major milestone as partner program surpasses 400 partners*. <https://www.itpro.com/business/business-strategy/we-are-helping-organizations-strengthen-their-overall-security-postures-fortinet-hits-major-milestone-as-partner-program-surpasses-400-partners>
- 234 United Nations. (2024). *United Nations Convention against Cybercrime; Strengthening international cooperation for combating certain crimes committed by means of information and communications technology systems and for the sharing of evidence in electronic form of serious crimes*. United Nations Treaty Collection. https://treaties.un.org/pages/ViewDetails.aspx?src=TREATY&mtdsq_no=XVIII-16&chapter=18&clang=en
- 235 European Commission. (2025). *NIS2 Directive: securing network and information systems*. Shaping Europe's digital future. <https://digital-strategy.ec.europa.eu/en/policies/nis2-directive>
- 236 GDPR.eu. (n.d.) *What is GDPR?* <https://gdpr.eu/what-is-gdpr/>
- 237 PwC Switzerland. (2025). *Data protection global footprint*. <https://www.pwc.ch/en/insights/fs/data-protection-global-footprint.html>
- 238 European Commission. (2025). *A European strategy for data*. Shaping Europe's Digital Future. <https://digital-strategy.ec.europa.eu/en/policies/strategy-data>
- 239 Saudi Press Agency (SPA). (2024). *SDAIA's ALLaM Recognized as Top Arabic Language Model* <https://www.spa.gov.sa/en/N2169386>
- 240 IBM Middle East & Africa. (2024). *IBM watsonx.ai and ALLaM available to Saudi government entities with DEEM Cloud*. <https://mea.newsroom.ibm.com/watsonx-and-ALLaM-on-DEEM-cloud>
- 241 Microsoft Tech Community. (2024). *Introducing SDAIA and their latest Arabic LLM on Azure AI Model Catalog*. <https://techcommunity.microsoft.com/blog/azure-ai-foundry-blog/introducing-sdaia-and-their-latest-arabic-llm-on-azure-ai-model-catalog/4240241>
- 242 Gobierno de Chile. (2025) *LATAM GPT: learn about the Latin American AI model developed in Chile* <https://www.gob.cl/en/news/latam-gpt-learn-about-the-latin-american-ai-model-developed-in-chile/>

- 243 DeepSeek, Inc. (2025). *DeepSeek-R1 release*. DeepSeek API Docs. <https://api-docs.deepseek.com/news/news250120>
- 244 Liu, A., Feng, B., Wang, B., et al. (2024). *DeepSeek-V2: A strong, economical, and efficient mixture-of-experts language model*. <https://arxiv.org/abs/2405.04434>
- 245 Guo, D., Yang, D., Zhang, H., Song, J., Zhang, R., Xu, R., Zhu, Q., Ma, S., Wang, P., et al Liu, A. (2025). *DeepSeek-R1: Incentivizing reasoning capability in LLMs via reinforcement learning*. <https://arxiv.org/html/2501.12948v1>
- 246 Xu, Z., Liu, S., Huang, W., Shi, J., Xu, F., Tang, X., & Lu, H. (2025). *DeepSeek: Implications for data science and management in the AI era*. *Data Science and Management*. <https://www.sciencedirect.com/science/article/pii/S2666764925000451>
- 247 Microsoft. (2025). *Microsoft completes landmark EU Data Boundary, offering enhanced data residency and transparency*. Microsoft On the Issues. <https://blogs.microsoft.com/on-the-issues/2025/02/26/microsoft-completes-landmark-eu-data-boundary-offering-enhanced-data-residency-and-transparency/>
- 248 Amazon Web Services (AWS). (2025). *Built, operated, controlled and secured in Europe: AWS unveils new sovereign controls and governance structure for the AWS European sovereign cloud*. <https://www.aboutamazon.eu/news/aws/built-operated-controlled-and-secured-in-europe-aws-unveils-new-sovereign-controls-and-governance-structure-for-the-aws-european-sovereign-cloud>
- 249 Associated Press. (2025). *Amazon's AWS Europe cloud expands EU privacy and data protections*. AP News <https://apnews.com/article/amazon-cloud-aws-europe-eu-privacy-data-751b8530e4ebbfac2e0f857675180370>
- 250 Press Information Bureau (PIB), (2025). *Government of India*. <https://www.pib.gov.in/PressReleasePage.aspx?PRID=2178092>
- 251 National e-Governance Division (NEGd), Government of India. (2025). *AI for All: India's blueprint for a smarter future*. <https://negd.gov.in/blog/ai-for-all-indias-blueprint-for-a-smarter-future/>
- 252 Ministry of Science, Technology and Innovations (MCTI), Brazil. (2025). *Evolution of the Brazilian Artificial Intelligence Plan in the Federal Senate*. <https://www.gov.br/mcti/pt-br/acompanhe-o-mcti/cct/documentacao/noticias/2025/cct-apresenta-evolucao-do-plano-brasileiro-de-inteligencia-artificial-no-senado-federal>
- 253 Ministry of Science, Technology and Innovation (MCTI). (2025). *Final version of the Brazilian Artificial Intelligence Plan published under MCTI coordination*. <https://www.gov.br/mcti/pt-br/acompanhe-o-mcti/noticias/2025/06/publicada-versao-final-do-plano-brasileiro-de-inteligencia-artificial-sob-coordenacao-do-mcti>
- 254 Tata Consultancy Services. (2025). *TCS, Sybyl, and iXAfrica partner to accelerate sovereign cloud adoption in East Africa*. <https://www.tcs.com/who-we-are/newsroom/press-release/tcs-sybyl-ixafrica-partner-accelerate-sovereign-cloud-adoption-east-africa>
- 255 Microsoft. (2025). *Microsoft announces in-country data processing for Microsoft 365 Copilot in the UAE to accelerate AI adoption*. <https://news.microsoft.com/source/emea/2025/10/microsoft-announces-in-country-data-processing-for-microsoft-365-copilot-in-the-uae-to-accelerate-ai-adoption/>
- 256 Turkcell. (2025). *Turkcell announces strategic partnership with Google Cloud, with plans to establish a Google Cloud region in Türkiye*. Business Wire <https://www.businesswire.com/news/home/20251111239976/en/Turkcell-Announces-Strategic-Partnership-with-Google-Cloud-with-Plans-to-Establish-a-Google-Cloud-Region-in-Trkiye>
- 257 Google Cloud. (2025). *Merhaba Türkiye! We are thrilled to announce LinkedIn*. https://www.linkedin.com/posts/google-cloud_merhaba-t%C3%BCrkiye-we-are-thrilled-to-announce-activity-7394376745052839936-zPeD/
- 258 Bahrain News Agency. (2025). *Beyon Solutions, iGA sign agreement to launch Bahrain's first Sovereign HyperCloud*. <https://www.bna.bh/en/news?cms=q8FmFJgiscL2fwlz-ON1%2BDvuLJsK8DZQsQ0oJDOMPfUw%3D>
- 259 Beyon Solutions. (2025). *Beyon Solutions and the Information & eGovernment Authority sign agreement to launch Kingdom of Bahrain's first Sovereign HyperCloud*. Beyon <https://beyon.com/2025/11/02/beyon-solutions-and-the-information-egovernment-authority-sign-agreement-to-launch-kingdom-of-bahrains-first-sovereign-hypercloud/>
- 260 OECD. (n.d.). *Cross-border data flows*. <https://www.oecd.org/en/topics/cross-border-data-flows.html>
- 261 European Commission. (2025). *The Commission moves forward on cloud sovereignty with a EUR 180 million tender*. https://commission.europa.eu/news-and-media/news/commission-moves-forward-cloud-sovereignty-eur-180-million-tender-2025-10-10_en
- 262 SAP. (2025). *Saudi Arabia becomes first in the world to host SAP Business Network for public sector with full data sovereignty compliance*. SAP MENA Press Room. <https://news.sap.com/mena/2025/10/saudi-first-in-world-to-host-sap-business-network-for-public-sector-with-full-data-sovereignty-compliance/>

- 263 JEPA. (2025). *From fields to skies: How drones are transforming agriculture in East Africa*. <https://www.jepafrica.com/insights/ehh1f40t70rareoedsv7rjhv7l5exf>
- 264 Pan-African Parliament. (2025). *Pan-African Parliament champions Africa's quest for data sovereignty and ethical AI*. <https://pap.au.int/en/news/press-releases/2025-07-25/pan-african-parliament-champions-africas-quest-data-sovereignty-and>
- 265 National Institute of Standards and Technology. (2024). *Post-quantum cryptography FIPS approved*. CSRC. <https://csrc.nist.gov/news/2024/postquantum-cryptography-fips-approved>
- 266 Microsoft. (2025). *Announcing comprehensive sovereign solutions empowering European organizations*. <https://blogs.microsoft.com/blog/2025/06/16/announcing-comprehensive-sovereign-solutions-empowering-european-organizations/>
- 267 National Information Technology Development Agency. (2025). *Nigeria advances citizen-led digital governance with Online Harm Protection Bill*. <https://nitda.gov.ng/nigeria-advances-citizen-led-digital-governance-with-online-harm-protection-bill/9037/>
- 268 National Information Technology Development Agency. (2024). *White paper on the framework for an Online Harms Protection Bill in Nigeria*. https://nitda.gov.ng/wp-content/uploads/2020/11/NCCPolicy_New1.pdf
- 269 Government of Luxembourg. (2024). *Strategy ADS2030*. <https://gouvernement.lu/en/dossiers/gouv2024-smc+en+dossiers+strategy-ads2030+strategy-ads2030.html>
- 270 Kadium Publishing. (2025). *Data Centres Africa (Q32025)*. <https://datacentresafrica.com/Media/Default/archive/DCA25Q3.pdf>
- 271 Techloy. (2025) *Why Visa plans to open its first African data centre*. <https://www.techloy.com/what-visa-building-its-first-data-centre-in-south-africa-means-for-africa/>
- 272 Kianpour, M., Earls Davis, P. A., & Windekilde, I. M. (2025). *Digital sovereignty in practice: Analyzing the EU's NIS2 Directive*. *International Journal of Information Security*, 24, Article 167 Center for Strategic and International Studies. *The world in blocs*. <https://link.springer.com/article/10.1007/s10207-025-01090-4>
- 273 Center for Strategic and International Studies.(2023). *A world of blocs*. <https://www.csis.org/analysis/world-blocs>
- 274 G20. (2023). *G20 New Delhi Leaders' Declaration*. Ministry of External Affairs, Government of India. <https://www.mea.gov.in/Images/CPV/G20-New-Delhi-Leaders-Declaration.pdf>
- 275 South Centre. (2025). *Taking forward digital public infrastructure for the Global South* (Policy Brief No. 146). https://www.southcentre.int/wp-content/uploads/2025/09/PB146_Taking-Forward-Digital-Public-Infrastructure-for-the-Global-South_EN.pdf
- 276 European Commission. (2024). *Press corner – EU Commission announces new data strategy for the European data space*. https://ec.europa.eu/commission/presscorner/detail/en/ip_24_4287
- 277 Infineon Technologies. (2023). *Infineon press release – Infineon expands capacity for power semiconductors*. <https://www.infineon.com/press-release/2023/infxxx202308-144>
- 278 The White House. (2025). *U.S.-Japan Technology & Prosperity Deal*. <https://www.whitehouse.gov/articles/2025/10/the-united-states-signs-technology-prosperity-deals-with-japan-and-korea/>
- 279 Humain. *Humain and AMD and Cisco*. (2025). <https://www.humain.com/en/news/humain-and-amd-and-cisco>
- 280 Humain. (2025). *Humain and AWS*. <https://www.humain.com/en/news/humain-and-aws>
- 281 Humain. (2025). *Humain and NVIDIA strategic partnership*. <https://www.humain.com/en/news/humain-and-nvidia-strategic-partnership>
- 282 International Telecommunication Union. (2024). *Information session on GDC*. https://www.itu.int/en/council/cwgwsis/Documents/2024/InfoSession%20on%20GDC_20Oct2024V2.pdf
- 283 United Nations. (2024). *Pact for the Future*. https://www.un.org/sites/un2.un.org/files/sotf-pact_for_the_future_adopted.pdf
- 284 International Energy Agency. (n.d.). *Critical minerals*. IEA. <https://www.iea.org/topics/critical-minerals>
- 285 Evenett, S., Jakubik, A., Kim, J., Martín, F., Pienknagura, S., Ruta, M., Baquie, S., Huang, Y., & Machado Parente, R. (2025). *Industrial policy since the Great Financial Crisis* (IMF Working Paper No. WP/25/222). International Monetary Fund. <https://www.imf.org/en/-/media/files/publications/wp/2025/english/wpiea2025222-source-pdf.pdf>
- 286 Evenett, S., Jakubik, A., Kim, J., Martín, F., Pienknagura, S., Ruta, M., Baquie, S., Huang, Y., & Machado Parente, R. (2025). *Industrial policy since the Great Financial Crisis* (IMF Working Paper No. WP/25/222). International Monetary Fund. <https://www.imf.org/en/-/media/files/publications/wp/2025/english/wpiea2025222-source-pdf.pdf>

- 287 Gulf Organization for Industrial Consulting. (2025). *GCC-3007-2025 Unified Basic Input/Output System (UBIOS) Infrastructure Specification*. GOIC. <https://www.gccorg.com/article/69/426.html>
- 288 Tom's Hardware. (2025). *China releases "UBIOS" standard to replace UEFI – Huawei-backed BIOS firmware replacement charges China's domestic computing goals*. Tom's Hardware <https://www.tomshardware.com/software/china-releases-ubios-standard-to-replace-uefi-huawei-backed-bios-firmware-replacement-charges-chinas-domestic-computing-goals>
- 289 U.S. International Trade Commission / ITIF. (2025). *Section 232 semiconductor report*. <https://www2.itif.org/2025-semiconductors-section-232.pdf>
- 290 Boston Consulting Group. (2024). *Emerging resilience in the semiconductor supply chain* <https://www.bcg.com/publications/2024/emerging-resilience-in-semiconductor-supply-chain>
- 291 Abojani. (2025). *The Tatu City experience: Special economic zone (SEZ)*. <https://www.abojani.com/the-tatu-city-experience-special-economic-zone-sez/>
- 292 Abojani. (2025). *How Tatu City SEZ unlocks global market access*. <https://www.abojani.com/how-tatu-city-sez-unlocks-global-market-access/>
- 293 Reuters. (2025). *Brazil launches proposals to attract data centers, regulate digital competition*. <http://reuters.com/world/americas/brazil-launches-proposals-attract-data-centers-regulate-digital-competition-2025-09-18/>
- 294 Organisation for Economic Co-operation and Development. (n.d.). *Digital trade*. <https://www.oecd.org/en/topics/policy-issues/digital-trade.html>
- 295 European Commission. (n.d.). *Digital trade: Help exporters and importers access markets*. https://policy.trade.ec.europa.eu/help-exporters-and-importers/accessing-markets/goods-and-services/digital-trade_en?u
- 296 Ministry of Foreign Affairs and Trade (New Zealand). *Digital Economy Partnership Agreement (DEPA) overview*. <https://www.mfat.govt.nz/en/trade/free-trade-agreements/free-trade-agreements-in-force/digital-economy-partnership-agreement-depa/overview>
- 297 United Nations Economic and Social Commission for Asia and the Pacific. (n.d.). *CPTA project*. <https://www.unescap.org/projects/cpta>
- 298 United Nations Economic and Social Commission for Asia and the Pacific. (2020). *FAQ on the Framework Agreement*. <https://www.unescap.org/sites/default/d8files/knowledge-products/FAQ%20on%20the%20Framework%20Agreement%20Dec%202020.pdf>
- 299 World Trade Organization. (2024). *MC13 news release*. https://www.wto.org/english/news_e/news24_e/mc13_01mar24_e.htm
- 300 Ministry of Foreign Affairs of Japan. (2024). *WT/MIN(24)/38 – Work Programme on Electronic Commerce (PDF)*. <https://www.mofa.go.jp/mofaj/files/100630865.pdf>
- 301 Ministry of Foreign Affairs (Japan). (n.d.). *Work Programme on Electronic Ministerial Decision* https://unstats.un.org/unsd/business-stat/UNCEBTS/Documents/Seventh-Meeting_2024/Ecom_WTO_Gallo.pdf
- 302 World Trade Organization.(2024). *INF/ECOM/87 document. Joint Statement Initiative on Electronic Commerce*. <https://docs.wto.org/dol2fe/Pages/SS/directdoc.aspx?filename=q:/INF/ECOM/87.pdf&Open=True>
- 303 WTO Plurilateral Initiatives. (n.d.). *E-commerce*. https://wtoplurilaterals.info/plural_initiative/e-commerce/
- 304 European Commission. (2025). *Press release: Digital services policy*. https://ec.europa.eu/commission/presscorner/detail/en/ip_25_1085
- 305 ASEAN. (2023). *ASEAN launches world's first regionwide digital economy framework agreement*. <https://asean.org/asean-launches-worlds-first-regionwide-digital-economy-framework-agreement/>
- 306 ASEAN. (October 2025). *Adopted AECC statement on substantial conclusion of DEFA negotiations*. [ADOPTED-AECC-Statement-on-Substantial-Conclusion-of-DEFA-Negotiations-24Oct2025.docx.pdf](https://www.asean.org/adopted-aecc-statement-on-substantial-conclusion-of-defa-negotiations-24Oct2025.docx.pdf)
- 307 World Economic Forum. (2025). *ASEAN DEFA digital economy pact negotiations*. <https://www.weforum.org/stories/2025/10/asean-defa-digital-economy-pact-negotiations/>
- 308 Financial Stability Board. (n.d.) *G20 targets for enhancing cross-border payments*. <https://www.fsb.org/work-of-the-fsb/financial-innovation-and-structural-change/cross-border-payments/g20-targets-for-enhancing-cross-border-payments-2/>
- 309 Boston Consulting Group. (2025). *Services are the new fault lines in global trade*. <https://www.bcg.com/publications/2025/services-are-the-new-fault-lines-in-global-trade>
- 310 The White House. (2025). *Saving TikTok while protecting national security* <https://www.whitehouse.gov/presidential-actions/2025/09/saving-tiktok-while-protecting-national-security/>

- 311 CNBC. (2025). *Trump says TikTok China-related concerns*. <https://www.cnbc.com/2025/09/15/trump-tiktok-china.html>
- 312 Yahoo Finance. (n.d.). *African trade bloc COMESA launches cross-border payments* <https://finance.yahoo.com/news/african-trade-bloc-comesa-launches-125409687.html>
- 313 Nile Post. (2025). *MTN MoMo unveils cross-border payments and rewards campaign*. <https://nilepost.co.ug/news/290059/mtn-momo-unveils-cross-border-payments-and-rewards-campaign?>
- 314 Flylinking. (2025). *Embrace cross-border shopping with Flylink*. <https://www.flylinking.com/2025/04/28/embrace-cross-border-shopping-with-flylink/>
- 315 World Internet Conference. (2025). *Collection of cross-border e-commerce practice cases*. <https://www.wicinternet.org/pdf/2025WorldInternetConferenceCollectionofCross-BorderE-commercePracticeCases.pdf>
- 316 Digital Container Shipping Association. (2025). *Track & trace ready for use in Port of Rotterdam*. <https://dcsa.org/newsroom/track-trace-ready-for-use-in-port-of-rotterdam>
- 317 Digital Container Shipping Association. (n.d.). *Understanding soft barriers to digital adoption*. <https://dcsa.org/newsroom/understanding-soft-barriers-to-digital-adoption>
- 318 World Trade Organization. (2025). *World Trade Report 2025*. https://www.wto.org/english/res_e/booksp_e/wtr25_e.pdf
- 319 World Trade Organization. (2023). *Improvements in digital connectivity and trade regulation*. https://www.wto.org/english/res_e/reser_e/ersd202307_e.htm#:~:text=Improvements%20in%20digital%20connectivity%20can,than%20at%20the%20median%20regulation.
- 320 World Trade Organization. (2025). *World Trade Report 2025* https://www.wto.org/english/res_e/booksp_e/wtr25_e.pdf
- 321 United Nations Ghana. (2025). *Ghana validates first national e-commerce strategy*. <https://ghana.un.org/en/296318-ghana-validates-first-national-e-commerce-strategy>
- 322 Department of Foreign Affairs and Trade (Australia). (2025). *Singapore and Australia green and digital shipping corridor factsheet*. <https://www.dfat.gov.au/trade-and-investment/singapore-and-australia-green-and-digital-shipping-corridor-factsheet-2025>
- 323 Department of Foreign Affairs and Trade (Australia). (2025). *Singapore-Australia green economy agreement: Progress and implementation*. <https://www.dfat.gov.au/geo/singapore/singapore-australia-green-economy-agreement/singapore-australia-green-economy-agreement-progress-implementation>
- 324 National Institute of Standards and Technology. (2025). *Quantum breakthroughs: NIST SQMS lead the way*. <https://www.nist.gov/news-events/news/2025/04/quantum-breakthroughs-nist-sqms-lead-way>
- 325 Quantum Technology Flagship. (2025). *Artificial intelligence and quantum computing: White paper*. https://qt.eu/media/pdf/Artificial_Intelligence_and_Quantum_Computing_white_paper.pdf
- 326 FS-ISAC. (2024). *Building cryptographic agility in the financial sector*. <https://www.fsisac.com/hubfs/Knowledge/PQC/BuildingCryptographicAgilityInTheFinancialSector.pdf>
- 327 IT Pro. (2025). *Nearly half of enterprises aren't prepared for quantum cybersecurity threats*. <https://www.itpro.com/security/nearly-half-of-enterprises-arent-prepared-for-quantum-cybersecurity-threats>
- 328 Microsoft Azure. (n.d.). *What is quantum computing?* <https://azure.microsoft.com/en-us/resources/cloud-computing-dictionary/what-is-quantum-computing>
- 329 European Parliament. (2021). *List of background documents on quantum computing*. https://www.europarl.europa.eu/meetdocs/2014_2019/plmrep/COMMITTEES/AIDA/DV/2021/04-23/ListBackgroundDocumentsQuantumComputing_EN.pdf
- 330 Cloudflare Blog. (2024). *Automatically secure*. <https://blog.cloudflare.com/automatically-secure/>
- 331 European Commission. (2025). *EU reinforces its cybersecurity post-quantum cryptography*. <https://digital-strategy.ec.europa.eu/en/news/eu-reinforces-its-cybersecurity-post-quantum-cryptography>
- 332 U.S. Department of Defense. (2025). *Announcing the Commercial National Security Algorithm Suite 2.0*. https://media.defense.gov/2025/May/30/2003728741/-1/-1/0/CSA_CNSA_2.0_ALGORITHMS.PDF
- 333 IBM Newsroom. (2025). *IBM delivers new quantum processors, software, and algorithm breakthroughs on path to advantage and fault tolerance* <https://newsroom.ibm.com/2025-11-12-ibm-delivers-new-quantum-processors-software-and-algorithm-breakthroughs-on-path-to-advantage-and-fault-tolerance>
- 334 COIT. (2024). *Weak signals in science and technologies*. https://www.coit.es/sites/default/files/jrc_weak_signals_in_science_and_technologies_2024.pdf

- 335 COIT. (2024). *Weak signals in science and technologies*. https://www.coit.es/sites/default/files/jrc_weak_signals_in_science_and_technologies_2024.pdf
- 336 HSBC. (2025). *HSBC demonstrates world's first known quantum-enabled algorithmic trading with IBM*. <https://www.hsbc.com/news-and-views/news/media-releases/2025/hsbc-demonstrates-worlds-first-known-quantum-enabled-algorithmic-trading-with-ibm>
- 337 Quantinuum. (2025). *HSBC and Quantinuum explore real-world use cases of quantum computing in financial services*. <https://www.quantinuum.com/press-releases/hsbc-and-quantinuum-explore-real-world-use-cases-of-quantum-computing-in-financial-services#>
- 338 World Economic Forum. (2025). *Technology convergence report 2025*. https://reports.weforum.org/docs/WEF_Technology_Convergence_Report_2025.pdf
- 339 World Economic Forum. (2025). *Frontier technologies in industrial operations 2025*. https://reports.weforum.org/docs/WEF_Frontier_Technologies_in_Industrial_Operations_2025.pdf
- 340 Zhibin Lin, Taotao Wang, Long Shi, Shengli Zhang and Bin Cao. (2024). *Decentralized Physical Infrastructure Network (DePIN): Challenges and Opportunities*. <https://arxiv.org/html/2406.02239v1>
- 341 World Economic Forum. (2025). *Technology convergence report 2025*. https://reports.weforum.org/docs/WEF_Technology_Convergence_Report_2025.pdf
- 342 Cheng, M., Fu, C-L., Okabe, R., Chotrattanapituk, A., Boonkird, A., Hung, N. T., Li, M., et al. (2025). *AI-driven materials design: A mini-review*. arXiv. <https://arxiv.org/html/2502.02905v1>
- 343 National Renewable Energy Laboratory. (2025). *Autonomous experimentation in materials science*. <https://www.nrel.gov/materials-science/autonomous-experimentation>
- 344 Fushimi, K., Nakai, Y., Nishi, A., Suzuki, R., Ikegami, M., Nimura, R., ... Hasunuma, T. (2025). *Development of the autonomous lab system to support biotechnology research*. *Scientific Reports*, 15, Article 6648. <https://www.nature.com/articles/s41598-025-89069-y>
- 345 North Carolina State University. (2025). *Rainbow multi-robot lab*. Stanford Human-Centered AI. (2025). *AI Index Report 2025*. <https://news.ncsu.edu/2025/08/rainbow-multi-robot-lab/>
- 346 Xu, J., Moran, C. H. J., Ghorai, A., Bateni, F., Bennett, J. A., Mukhin, N., Latif, K., Cahn, A., Jha, P., Licon, F. D., Sadeghi, S., Politi, L., ... Abolhasani, M. (2025). *Autonomous multi-robot synthesis and optimization of metal halide perovskite nanocrystals*. *Nature Communications*, 16, Article 7841. <https://www.nature.com/articles/s41467-025-63209-4>
- 347 Zhang, D., & Liu, L. (2025). *Analysis of collaborative robot technology patent map and research on development trends*. *Scientific Reports*, 15, Article 30083. <https://www.nature.com/articles/s41598-025-14074-0>
- 348 Stanford HAI. (2025). *HAI AI Index Report 2025*. https://hai.stanford.edu/assets/files/hai_ai_index_report_2025.pdf
- 349 United Nations Statistics Division. (n.d.). *Economic statistics classifications structure*. <https://unstats.un.org/unsd/classifications/Econ/Structure>
- 350 UN Data. (n.d.). *Gross Value Added by Economic Activity*. <https://data.un.org/Data.aspx?d=S-NAAMA&f=grID%3A201%3BcurrID%3ANCU%3Bpc-Flag%3A0>
- 351 International Monetary Fund. (n.d.). *World Economic Outlook data mapper: Real GDP growth*. https://www.imf.org/external/datamapper/NGDP_RPCH@WEO/OEMDC/ADVEC/WEOWORLD/MEQ
- 352 International Labour Organization. (n.d.). *Employment by sex and economic activity*. https://rshiny.ilo.org/dataexplorer31/?lang=en&segment=indicator&id=EMP_2EMP_SEX_ECO_NB_A



Follow Us on



@dcorg



www.dco.org

© 2025-2026, The Digital Cooperation Organization, all rights reserved.