Technology Vision 2024

Human by design

How AI unleashes the next level of human potential

Executive summary

accenture

Foreword

Human by design

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Welcome to our Technology Vision for 2024. This year's Vision is grounded in two realities. First, technology is driving a wave of reinvention that is impacting every part of every business. Second, this emerging technology is becoming more "human" in its nature, creating unprecedented capabilities that in essence give people superpowers. Collectively these two realities stand to reshape the way we work and live.

Consider the possibilities. Where once we adapted to technology – such as changing our habits for a new app or computer interface – technology is beginning to adapt to us. Gen AI applications create realistic scripts and images as if created by people. New spatial computing mediums have begun to close the physical-digital divide to enable simultaneous activities in multiple spaces. Body-sensing technology like brain-computer interfaces and ambient computing are beginning to read and understand us like never before.

This year's Technology Vision comes at a time of expansive innovation in technology that is creating massive opportunities for leaders – from new ways to drive productivity to entirely new ways of doing business and tackling grand challenges. We identify actions to take today and also chart the steps to a future where technology transitions from a passive proxy to an active collaborator that engages with us through more natural interaction.

This move to more human-like technology raises questions about the impact on people. In this year's Vision, we explore this issue from all dimensions, centering on the importance of shaping technology that is human by design. Technology amplifies human creativity and productivity so we can create a positive impact for the most important part of any enterprise. People.

Step boldly into this future with us, and together we can shape our use of technology. We believe it's **Human by design.**

Julie Sweet
Chair and CEO

Paul Daugherty
Chief Technology and Innovation Officer

Human by design

How AI unleashes the next level of human potential

The relationship between humans and technology is at an inflection point.

Have you ever seen dystopian pictures of humans in 1,000 years? Hunched backs, sallow skin, big and sensitive eyes – the hallmarks of people who spend too much time indoors, detached from the physical world. These images reflect how the artists see our relationship with technology today. They're visceral and striking, and based on true fears. People worry about screentime and the cognitive impact of technology, and increasingly we hear concerns about technology controlling our lives or about losing control of technology – despite using it more than ever.

But the future doesn't need to be what these artists imagine. Not if we recast the relationship between people and technology and design technology to amplify, rather than change, the things that make us human.

It's time to make technology human by design.

Hasn't technology always been human?

This is a moment for reinvention. In the coming years, businesses will have an increasingly powerful array of technologies at their disposal that will open new pathways to unleash greater human potential, productivity, and creativity. Autonomous agents that can act on our behalf; intelligent interfaces that transform the way we interact with information and software; spatial technologies that blend the digital world into our physical one, or instantly transport us from our desk to a factory to a mountain top; and even technologies like brain-computer interfaces that once sounded like science fiction are starting to find relevant, approachable, enterprise use cases. Early adopters and leading businesses have kick-started a race toward a new era of value and capability. And their strategies are underpinned by one common thread – the technology is becoming more human.

It sounds counterintuitive. After all, hasn't technology always been human? Humans invent technology, we build it, we scale it. We use it to overcome limitations and do more. In fact, creating tools that extend our physical and cognitive abilities is so unique to humanity that some argue it defines us as a species.[1]

Yet, by nature, the tools we build are often distinctly unhuman. They don't look or act "human," which has always been the point of creating them. As humans we had aspirations, but limitations: we wanted to plant a field, but couldn't till the ground; we wanted to reach the stars, but we were earthbound; we wanted to solve problems, but couldn't always crunch the numbers. Tools filled the gaps by doing and being what we couldn't, and in the process radically transformed our lives. Automobiles expanded our freedom of mobility. Cranes let us build skyscrapers and bridges. Machines helped us create, distribute, and listen to music.

95% of executives agree that making technology more human will massively expand the opportunities of every industry.

Technology's unhuman nature can also be its drawback, though. Extended use of hand tools can lead to arthritis. Years of looking at screens can accelerate vision problems. We have amazing navigational tools, but they still distract us from driving. The discordance can even go beyond our physical bodies and permeate the environments we live in: homes or offices are often designed to get the best bandwidth, combustion engines may be a need for some but generate pollution for others. Granted, there have been efforts to create tools that are more ergonomic or easier to use. But even so, time and again we see and make decisions about our lives based on what is best for a *machine* rather than optimizing human potential. This is why artists imagining the future of human evolution envision a world where we are at conflict with the technology we use. Technology amplifies our abilities and lets us do more, but its unnaturalness is just as likely to leave its mark.

Now, for the first time in history we see strong evidence that we are reversing course – not by moving away from technology, but rather by embracing a generation of technology that is more human. Technology that is more intuitive, both in design and its very nature, demonstrates more human-like intelligence, and is easy to integrate across every aspect of our lives.

Our world is becoming a fusion of atoms and bits, and if we want to help people better live in it, we need to design technology in ways that amplify these human-like traits. It's not an entirely new trend: the invention of the graphical user interface (GUI) created images that were friendly and more intuitive than lines of code; the smartphone miniaturized compute to reflect the mobility intrinsic to humans' lives; one of AI's most impactful uses was translating across languages. But now this slow trickle is about to become a torrential river of deliberate design.

Consider the impact generative AI and transformer models are having on the world around us. What began as chatbots like ChatGPT and Bard has become a driving force in making technology more intuitive, intelligent, and accessible to all. One example is Adobe Photoshop's Generative Fill and Generative Expand features, powered by Adobe Firefly.[2] These innovations let anyone add, expand, or remove content from images non-destructively, using simple text prompts. Users can now experiment with their ideas, ideate around different concepts, and produce dozens of variations faster than ever before. Where AI once focused on automation and routine tasks, it's now shifting to augmentation, changing how people approach work, and is rapidly democratizing the technologies and specialized knowledge work that were once reserved for the highly trained or deep-pocketed.

For more on the evolution of AI, see A new era of generative AI for everyone from Accenture Research.

And generative AI has the potential to impact much more than just the task at hand. It's also starting to profoundly reshape organizations and markets. Google Cloud, for instance, recently announced a generative AI search tool meant to help doctors and nurses rapidly find patient information that may be stored across multiple systems and in different formats – a major challenge that has plagued healthcare systems for years.[3] FrameDiff, a generative AI computational tool created by MIT CSAIL researchers, is crafting synthetic protein structures that go beyond what exists in nature to open new possibilities in drug development.[4] And for software companies, tools like GitHub's Copilot (a generative AI assistant that helps write code) are demonstrating potential to make software engineers more satisfied with their jobs.[5] In fact, in many cases generative AI tools are so intuitive to use and employees are adopting them so rapidly, they are permeating workplaces from the bottom up – faster than organizations can create formal programs.

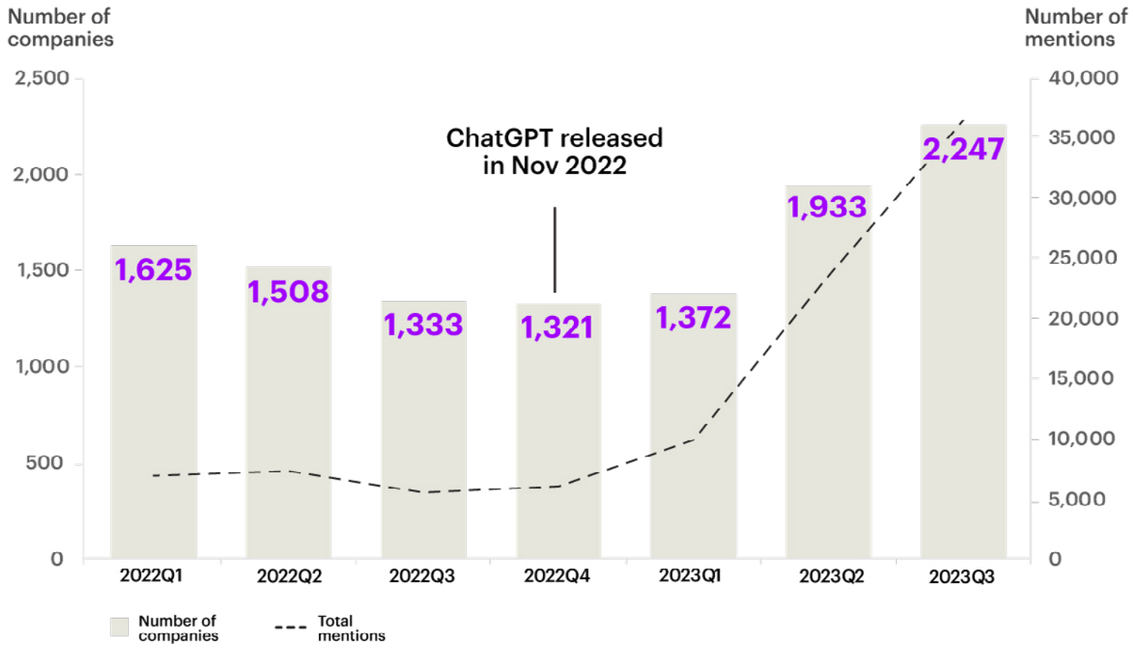
Generative AI has the potential to impact much more than just the task at hand.

To learn more about how our interaction experience is changing, go to Accenture Life Trends 2024.

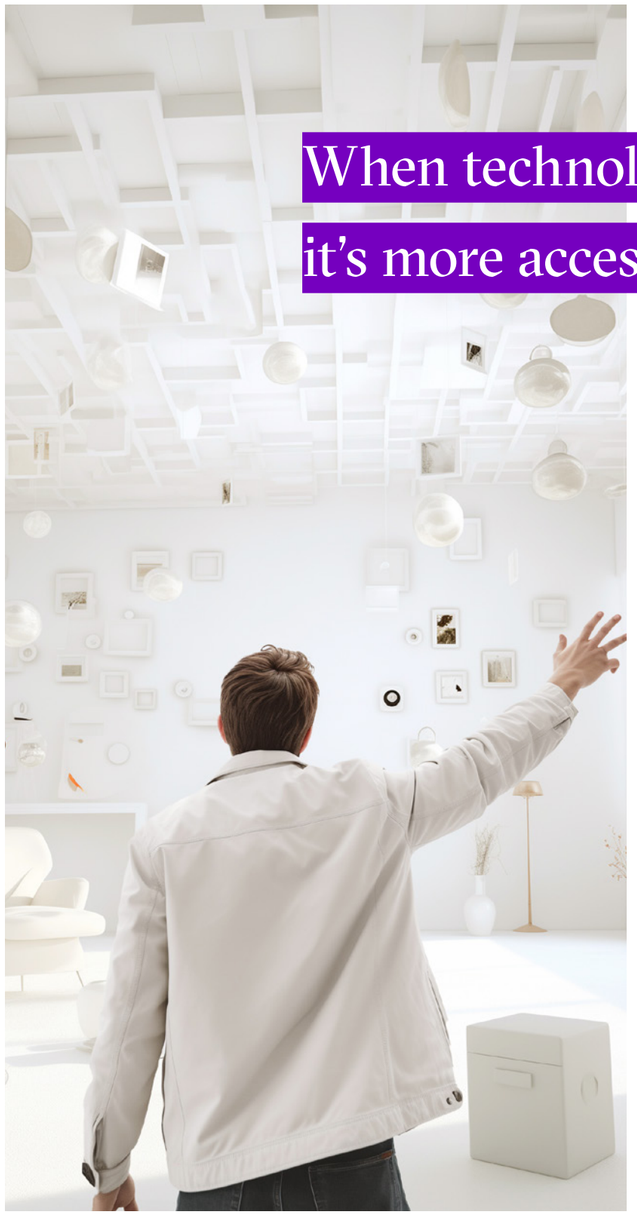
Can AI have your attention?

The number of mentions of AI in earnings call transcripts has increased by **6x** since the release of ChatGPT in November 2022.

Number of companies mentioning AI, along with total number of mentions in earnings call transcripts, 2022Q1 – 2023Q3



Source: Accenture Research NLP analysis on earnings call transcripts (S&P Global Transcripts) across 10,452 companies and over 70K transcripts; Jan 2022 – Sep 2023



When technology is more human, it's more accessible.

Of course, the advent of more human technology is happening across many more dimensions than AI alone. And in the process, it's starting to solve many of the pain points that exist between us and technology, paving the way for greater human potential.

To solve challenges innate to digital work, like video fatigue, Microsoft made major updates to Microsoft Mesh, their platform for creating immersive spaces that blend digital and physical.[6] The company is trying to use immersion to solve pain points today, as well as drive new collaborative ways of working. Recognizing the importance social media plays in many people's lives, but also the friction it can create, social media newcomers Discord and Mastodon built social networks not driven by a centralized recommendation algorithm, but one more reflective of the types of communities and relationships we build in our personal lives. And Boston Dynamics has long been at the forefront of making robotics more human, promising a smoother integration between robotics and the world around us. For instance, their bipedal robot Atlas has been trained on diverse tasks, allowing it to mimic human movement and physical intuition.[7] What's more is these robots no longer just mirror humans physically, but socially too. Humans will usually interact with robots through complex lines of code and puzzling machine logic, leaving an impasse between people who don't speak that language and the robots next to them. However, researchers found a way to put ChatGPT onboard a Boston Dynamics robot, allowing people to use natural language to command the robot or ask it about its previous tasks and receive a clear response in plain English.[8]

This is why it's so important for businesses to build and use technology that's human by design. When technology is more human it's more accessible and makes people more productive and connected. And how often do we want to do *more*? Manufacture more custom products. Expand to more markets. Work with more partners.

We are about to see a massive expansion of every industry. Think of it like this: in the 1700s, the industrial revolution made creating physical things easier, and in turn refaced the way our world works and how we live in it. Now, as technology becomes more human, it becomes easier to work with – and will spark an infusion of technology through every dimension of the business. We are already seeing its impact on our ability to create. Recent innovations have led to an explosion of digital art, music, and product designs. And technology that is human by design is also introducing brand-new possibilities – digital helpers like AI agents, or digital spaces where we can build and create even in ways that break the laws of physics. By building fundamentally intuitive bridges between people and the most advanced technologies of our age, productivity and value creation are poised to grow exponentially across every industry. It's an entire universe of new ideas and new actions for businesses and consumers alike.

Technology that is human by design will also reach new people and knowledge that has never been digitized before. While this will create more of what we have, it will also enable the creation of things and ideas to which enterprises have never had access. Think of all the people historically alienated by technology who will be able to contribute to the digital revolution. As technology becomes more intuitive, we can tap into these people as new customers and new employees. In doing so, their wealth of knowledge will become enterprise-actionable for the first time. And when every person can be part of the digital transformation, on-going efforts to modernize things like data, products, workforce, and more will only accelerate. Companies leading the shift to more human technologies will be injected with innovation opportunities as they both buoy and are buoyed by a flood of new people with the tools to affect change in the digital world.

Yet, the world we will shape from this expansion of economic growth and empowerment of entire populations is still undecided – and enterprises have a responsibility to shape it into a world we want to live in. Leaders will be faced with familiar questions: Which products and services are ripe for scaling? What new data is at your disposal? What transformative actions can you take? But they will also be at the center of answering questions they may have never expected: What kind of oversight does AI need? Who will be included in the digital transformation? What responsibilities do we have to the people in our ecosystem?

Human by design is not just a description of features, it's a mandate for what comes next. As enterprises look to reinvent their digital core, human technology will become central to the success of their efforts. Every business is beginning to see the potential emerging technologies have to reinvent the pillars of their digital efforts. Digital experiences, data and analytics, products, all stand to change as technologies like generative AI, spatial computing, and others mature and scale.

In this moment of reinvention, enterprises have the chance to build a strategy that maximizes human potential, and erases the friction between people and technology. The future will be powered by artificial intelligence but must be designed for human intelligence. And as a new generation of technology gives enterprises the power to do more, every choice they make matters that much more too. The world is watching. Will you be a role model or a cautionary tale?

Make it human: The 2024 trends

Think about the things that make us human: the way we think, act, feel, and understand one another. Now technology is starting to reflect that range of human experience. It's a transformation that will reset our relationship with technology and completely change how we use it and what we do with it.

Last year, the Technology Vision explored how the convergence of atoms and bits is building the foundations of our new reality. We described a world where the dissolving barrier between our digital and physical realities was opening up brand new innovations in nearly all dimensions of technology, from artificial intelligence, to identity and science tech – and importantly how each of these pieces would become a critical part of the enterprise core moving forward.

In this year's Technology Vision we investigate where the impact of that foundation matters most: people.

The advent of more human technology is both a highly concentrated example and the direct result of the broader trend towards a world where atoms meet bits. The four trends this year outline to enterprise leaders the key dimensions where technology is becoming human by design, and how organizations will need to prepare.

First: I think, therefore I am. The way we collect, store, and access information has always been a deeply rooted part of the human experience.

In **A match made in AI** we explore how technology is starting to imitate how we process information. These are not just superficial changes to the way we interact with technology, but rooted in memory structures designed and organized in a similar fashion to people's brains. The earliest changes are starting in search and will come to disrupt the way we approach knowledge and knowledge management.

Autonomy and the ability to act is even more innate to the human experience – before people could write or build, we were hunting and gathering, making decisions, and engaging the world around us. Now, in **Meet my agent** we are tracking the evolution from AI that can perform singular tasks to AI agents that, with appropriate oversight, can work with one another and act as proxies for people and enterprises alike. Today we might think of it as automated assistants for individual interactions, but tomorrow the agent ecosystem has the potential to underpin the entire business-to-business landscape.

In **The space we need**, we're watching the emergence of a new spatial computing medium, and the applications taking advantage of its capabilities to pierce the physical-digital divide. The metaverse struggled under the weight of ever-expanding definitions and expectations, but the value in the technology behind it has never been in doubt. In the end we are physical beings, and the digital world has always been a strange environment. Now spatial computing is letting the digital world reflect what it means to be human and in a physical space.

And lastly, it's always been a challenge to understand people. While technology can track and observe what people do, it often lacks the specificity of what was intended. **Our bodies electronic** looks at an emerging suite of technology that is starting to sidestep the unnatural technology interactions of the past to read and understand people more closely than has ever been possible.

To think, act, feel, and understand – these are human qualities. But by surrounding ourselves with tools that mirror us, we make it easier to connect to the world on a deeper level, and we empower people to take a larger role in shaping it. Individuals, companies, and governments – all empowered to do more.

More human technology means more ethical questions, and many of these questions require answers before we can proceed.

Positive engineering: Our technology crossroads

Human by design technologies can deliver profound benefits to people and enterprises alike, but the path forward isn't so simple. The world is arriving at what might be technology's biggest inflection point in history, and enterprises – and the decisions their leaders make – are at the heart of shaping how we move forward.

As we experience more growth and innovation, it won't all be for the better. There will be more (and new) opportunities for fraud, misinformation, and breaches of security. If we engineer tools with human capabilities but without human intelligence – or even human conscience – we can create in a way that deteriorates both the bottom line and the greater good.

More human technology means more ethical questions, and many of these questions require answers before we can proceed. We made agents that could talk and act indistinguishably from humans, expanding human capabilities in impressive ways. But as quickly as ChatGPT was released, we also started seeing fear-laden headlines. Will machines devolve human creativity? Will they take our jobs? Will they try to destroy us? This isn't merely luddite speculation, many leading AI researchers have (controversially) raised concerns and halted research over the potential dangers of AI.[9,10] When the metaverse was introduced, it challenged us to question the impact it would have on people. Would the allure of the metaverse cause us to cocoon in our homes, potentially impacting our mental health?[11] Now brain scanning can be used to decode what people are thinking.[12] Will that potential be used for or against us?

None of these questions have a clear resolution, but enterprises *will* be on the front lines of answering them. While some may seem implausible, borderline unfathomable, they are quietly creeping out of science fiction books and into boardroom conversations. In the era of human tech, every product and every service that enterprises bring to market holds the potential to transform lives, empower communities, and ignite change – for better or for worse. And, invariably, enterprises will face the delicate balancing act of needing to act fast versus needing to act carefully, as well as the expectation that competitors or other countries may not share the same concerns or impose the same guardrails.

93% of executives agree that with rapid technological advancements, it is more important than ever for organizations to innovate with purpose.

The choices enterprise leaders make, the values they uphold, and the priorities they set will reverberate far beyond profit margins and shareholder returns – which makes it more important than ever that enterprises innovate with purpose. As we strive to make technology human by design, we need to think of security as an enabler – an essential way to build trust between people and technology – rather than as a limitation or requirement. And we need to build technology without overshadowing or upending what it means to be human. It's a concept we call "positive engineering." Over the last few years, ethical questions have entered the technology domain from a number of different directions. Inclusivity, accessibility, sustainability, job security, protection of creative intellectual property, and so much more. Each of them roots back to one single question: how do we balance what we can achieve with technology with what we want as people?

As some humans enter the digital world for the first time, and others dive deeper and deeper in, companies must prioritize their well-being, privacy, and security. Companies that strive for technological inclusivity will bridge both societal gaps and the voids that exist between the organization, its employees, and its customers. As technologies become more human and expand opportunities for enterprise growth, they must also create new paths for humans to thrive.

This is a transformative moment for technology and people alike, and the world is ready for you to help shape it.

Human by design

How AI unleashes the next level of human potential

A match made in AI

Reshaping our relationship with knowledge

People are asking generative AI chatbots for information – transforming the business of search today, and the futures of software and data-driven enterprises tomorrow.

Meet my agent

Ecosystems for AI

AI is taking action, and soon whole ecosystems of AI agents could command major aspects of business. Appropriate human guidance and oversight is critical.

The space we need

Creating value in new realities

The spatial computing technology landscape is rapidly growing, but to successfully capitalize on this new medium, enterprises will need to find its killer apps.

Our bodies electronic

A new human interface

A suite of technologies – from eye-tracking to machine learning to BCI – are starting to understand people more deeply, and in more human-centric ways.

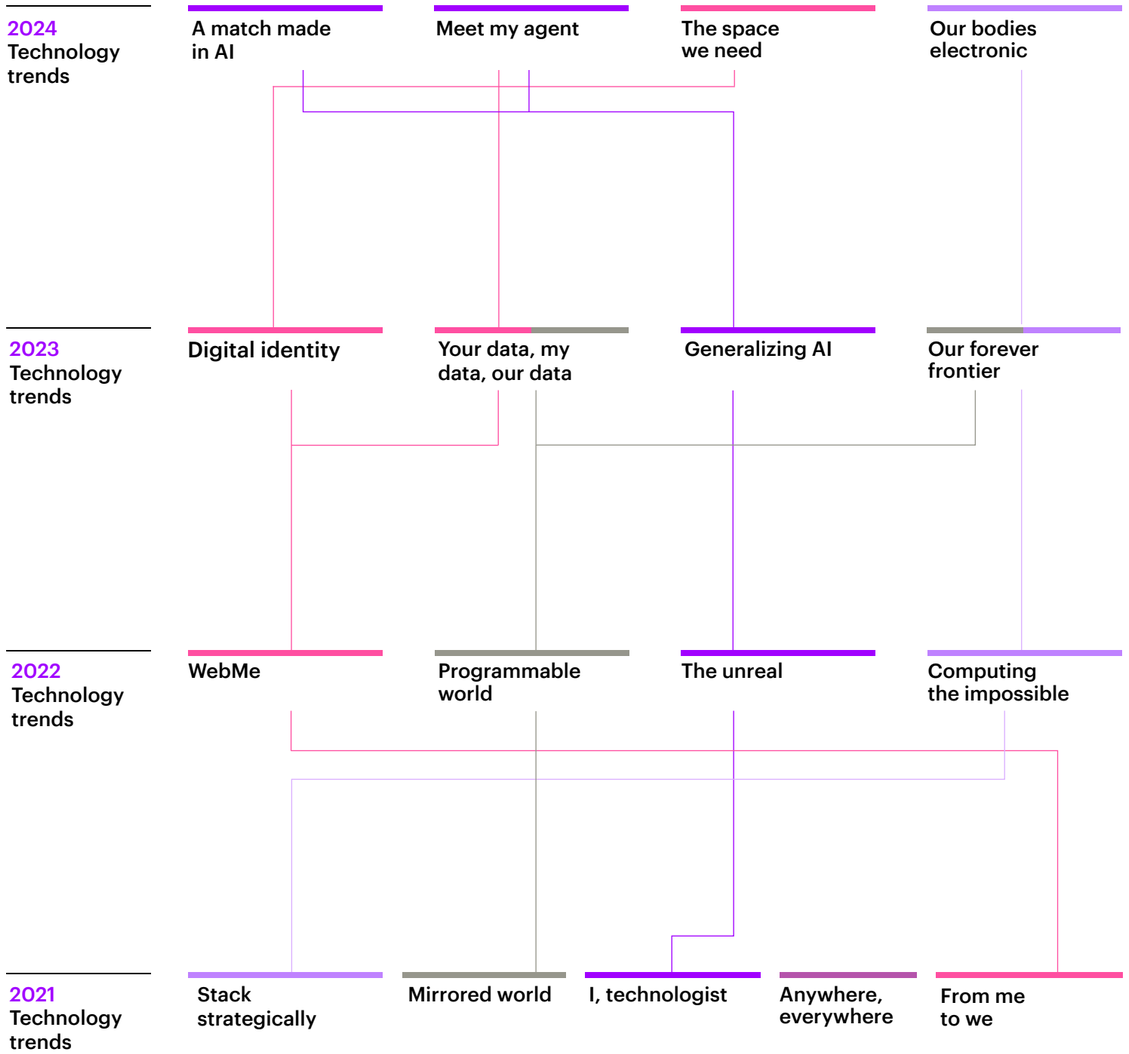
Epilogue

The ongoing story:
Trend evolution

The Technology Vision trends represent some of the most impactful, exciting advancements in technology innovation. However, these are just a few of the trends making up a much broader technology revolution that is touching every dimension of businesses.

Two years ago we asked businesses to "Meet us in the Metaverse," and last year we demonstrated how our digital and physical lives are converging with "When Atoms Meet Bits" – messages that are still as topical and impactful as ever. While some trends may garner more excitement or progress more than others year over year (just look at the breakneck pace of AI innovation), innovation is still happening across all these areas – and it remains critical for enterprises to consider the entire scope of change taking place when planning their long-term strategy.

New this year we present the ongoing story: major themes that have been raised in the Technology Vision and are underpinning enterprise strategy, the market, and the future of technology.



Science Tech

The convergence of science and technology continues to influence innovation at large. Technologies such as AI are accelerating scientific advancements, which are proliferating into industry faster than ever. New domains like energy, materials, space, and biology will increasingly take a primary role in the innovation strategy of the world's most disruptive companies. This feedback loop between science and technology is expanding the horizon of what we can compute, creating tools that will allow us to solve bigger problems, and fundamentally transforming industries and marketplaces.

Sustainability

From regulatory requirements to customer pressure to the desire to be more efficient, sustainability remains top of mind among executives across industries. And technology innovation continues to play a vital part in creating truly circular economies. Emerging technologies at enterprises can build cleaner energy systems, which can offset or diminish negative environmental impacts. While the short-term costs of sustainability efforts may concern some executives, enterprises must not lose sight of the long-term gains – and how leveraging technologies can help.

Digital Ownership

The emergence of digital ownership driven by technologies like blockchain and digital ledgers continues to completely upend long held conventions around data, identity, customer relationships, and online ecosystems. Distributed computing lets us create unique identities for an array of people and things, allowing for once-impossible ownership across digital domains. But ownership itself is not the point – it is what this can support. Digital ownership can excitingly spur new forms of customer engagement, of raising capital, and of interoperability between digital environments.

The Unreal

While generative AI has seized the attention of boardrooms around the world, conversations on deepfakes, doctored images, and falsified videos have inevitably followed. Enterprises are in the middle of debates over what is real, what is not, and whether people really care. The "unreal", however, can be incredibly advantageous to enterprises under the right circumstances. Synthetic data can help us identify and prepare for edge events. Talking to a "fake" sales assistant could be a better, more judgement-free customer interaction. Yet to navigate these possibilities, enterprises will still need to monitor their "unreal" solutions' impact on people, all while bolstering security and risk practices.

Authors

Paul Daugherty
Chief Technology and Innovation Officer
LinkedIn

Adam Burden
Global Innovation Lead
LinkedIn

Michael Biltz
Managing Director – Accenture Technology Vision
LinkedIn

Technology Vision 2024 Editorial & Research Team

Ari Bernstein
Julian Dreiman
Maria Fabbroni
Naomi Nishihara
Krista Schnell
David Strachan-Olson

Accenture Research

Prashant P. Shukla, PhD
Renee Byrnes
Gerry Farkova
Donovan Griggs
Abira Sathiyanathan
Vincenzo Palermo
Tal Roded
Mariusz Bidelski
Lohith Kumar
Krish Jhaveri
Shruti Shalini
Raghav Narsalay
Sandra Najem
Anna Marszalik
Linda Ringnalda
Carrie Kleiner

About the Technology Vision

For more than 20 years, Accenture has developed the Technology Vision report as a systematic review across the enterprise landscape to identify emerging technology trends that will have the greatest impact on companies, government agencies, and other organizations in the coming years. This year the trends look five to ten years into the future, while remaining relevant across industries and actionable for businesses today.

Accenture Labs and Accenture Research collaborate on the annual research process, which this year included:

Input from the Technology Vision External Advisory Board, a group of more than two dozen experienced individuals from the public and private sectors, academia, venture capital, and entrepreneurial companies. In addition, the Technology Vision team conducts interviews with technology luminaries and industry experts, as well as many Accenture business leaders from across the organization.

Primary research, including a global survey of 20,027 consumers to capture insights into their use of, familiarity with, and perceptions about technology in their daily lives. In addition, Accenture conducted a survey of 3,450 C-level executives across 21 industries to understand their perspectives and organizational priorities regarding emerging technologies. The surveys were fielded from October to November 2023 across 20 countries.

Research and data science to analyze technology developments and advancements; and generative AI-led interviews of 50 developers, industrial workers, and advanced users of spatial computing.

As a shortlist of themes emerges from the research process, the Technology Vision team works to validate and refine the set of trends. The themes are weighed for their relevance to real-world business challenges. The Technology Vision team seeks ideas that transcend the well-known drivers of technological change, concentrating instead on the themes that will soon start to appear on the C-level agendas of most enterprises.

Survey demographics

Countries	Consumer Survey (N=20,027)	Business Survey (N=3,450)
Australia	5%	4%
Brazil	5%	3%
Canada	5%	4%
China	5%	8%
France	5%	4%
Germany	5%	4%
India	5%	5%
Ireland	5%	3%
Italy	5%	3%
Japan	5%	4%
Netherlands	5%	3%
Saudi Arabia	5%	2%
Singapore	5%	3%
South Africa	5%	3%
Spain	5%	3%
Sweden	5%	3%
Switzerland	5%	3%
United Arab Emirates	5%	1%
United Kingdom	5%	4%
United States	5%	32%

Business Survey Industries	
Aerospace & Defense	3%
Airline, Travel & Transport	5%
Automotive	5%
Banking	7%
Biopharmaceuticals	3%
Capital Markets	3%
Chemicals	4%
Communications, Media & Entertainment	8%
Consumer Goods	5%
Energy	5%
Health	6%
High Technology	4%
Industrial Goods & Equipment	8%
Insurance	8%
MedTech	3%
Natural Resources	4%
Private Equity	1%
Public Service	3%
Retail	5%
Software & Platforms	5%
Utilities	5%

Business Survey Roles	
Chief Analytics Officer	2%
Chief Customer Officer	2%
Chief Data Officer	2%
Chief Executive Officer	32%
Chief Experience Officer	2%
Chief Financial Officer	11%
Chief HR Officer	9%
Chief Information Officer	5%
Chief Innovation Officer	5%
Chief Marketing Officer	6%
Chief Operating Officer	4%
Chief Production Officer	2%
Chief Sales Officer	1%
Chief Strategy Officer	8%
Chief Supply Chain & Operations Officer	3%
Chief Technology Officer	7%
R&D Lead	1%

Business Survey Revenues (USD)	
$50 billion or more	1%
$30 to $49.9 billion	1%
$10 to $29.9 billion	23%
$5 to $9.9 billion	31%
$1 to $4.9 billion	43%
$500 to $999 million	1%

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Executive summary

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About Accenture

Accenture is a leading global professional services company that helps the world's leading businesses, governments and other organizations build their digital core, optimize their operations, accelerate revenue growth and enhance citizen services—creating tangible value at speed and scale. We are a talent- and innovation-led company with approximately 743,000 people serving clients in more than 120 countries. Technology is at the core of change today, and we are one of the world's leaders in helping drive that change, with strong ecosystem relationships. We combine our strength in technology and leadership in cloud, data and AI with unmatched industry experience, functional expertise and global delivery capability. We are uniquely able to deliver tangible outcomes because of our broad range of services, solutions and assets across Strategy & Consulting, Technology, Operations, Industry X and Song. These capabilities, together with our culture of shared success and commitment to creating 360° value, enable us to help our clients reinvent and build trusted, lasting relationships. We measure our success by the 360° value we create for our clients, each other, our shareholders, partners and communities. Visit us at www.accenture.com.

About Accenture Labs

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