

#TechVision

Technology Vision 2022

Meet Me in the Metaverse

The continuum of technology and experience, reshaping business

Utilities Executive Summary



On an ordinary day in 2030, a power line worker is repairing a damaged line in California.

He and his co-worker talk as they direct a drone to inspect the section of power line he has been working on. Suddenly, his artificial intelligence (AI) assistant appears as a hologram on the site, waving him over to confirm the work summary of the day and to remind him that it's time to meet with the work scheduler for his next assignments.

He walks over to his truck, puts on his virtual reality (VR) headset, and finds himself in the lobby of the utility's maintenance work scheduling department. His AI assistant reappears to direct

him towards the virtual conference room where his meeting will be held. When he enters the room, it transforms to look like a recently built substation, using a real-time feed from an onsite drone. As-built drawings from the utility's geographic information system (GIS) are laid over the live footage, and the powerline worker and his team begin to assess the work. On approval by the manager, he sends his assistant to submit a workorder in the enterprise asset management system. Then he pops off his headset and heads back to the current worksite.

Welcome to the “**Metaverse Continuum**” a spectrum of digitally enhanced worlds, realities and business models poised to revolutionize utility operations and customer experience in the next decade. This continuum is bringing the next major wave of digital change to utilities, and leaders need to start making big leaps forward in how they think about their business – today. Soon, utilities will be at the intersection of many new worlds, from building new physical and virtual realities to providing customers with energy services in environments created by others.

Where people will actively live in and jump between these worlds on a daily basis. Our powerline worker starts his day repairing a damaged line on a digitally and robotically enhanced site, and ends it in an office in the metaverse – a virtual environment created by the utility’s maintenance team, which lets him travel between geographies in seconds to perform asset inspections.

As this future starts to emerge, utilities’ physical world is coming alive environment by environment, each with its own capabilities and rules. Today, we already have small-scale intelligent physical worlds like smart turbines, smart grids, and smart buildings. Tomorrow, these will grow into entirely integrated smart energy systems, where massive digital twins mirror physical reality.

This continuum is bringing the next major wave of digital change to utilities, and leaders need to start making big leaps forward in how they think about their business – today

And the digital world is expanding too. Soon, new consumer spaces in the metaverse will enable utilities to engage with customers in more meaningful ways, helping them navigate a far more complex energy system. Utility operations

will also shift to the metaverse, where internal virtual environments will enable employees to work from anywhere and collaborate in exciting new ways. With opportunity proliferating across all these new worlds, utilities will need a strategy for operating across the full spectrum if they’re to best serve customers and partners alike.

This way of life seems futuristic for now. But it’s already on its way.

Detecting signals of profound change, the Accenture Technology Vision found it appropriate to set its sights further forward than ever before. The building blocks of the Metaverse Continuum are taking shape today, but will coalesce over the next decade to create an entirely new landscape for the energy system. The 2020s will see ambitious utilities design and build new physical and digital realities. These new worlds will be co-populated by people and AI, where new business models will be made possible by significant advances in computing.





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Why Metaverse Continuum?

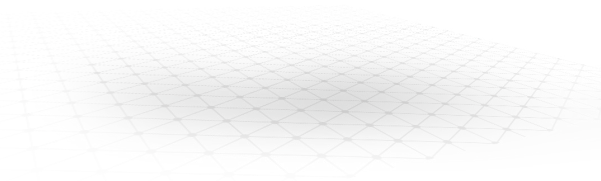
You've probably heard the word "metaverse" many times over the past year, evoking a science fiction future of a persistent and shared virtual reality space. Although the metaverse is still in its early stages, the utility industry – undergoing significant disruption in the energy transition – will increasingly rely on the metaverse to engage with customers and improve business operations.

Just as the internet evolved beyond simple websites to underpin the majority of today's businesses, it would be wrong to think the experience of the metaverse will be constrained to digital space. That is why we've introduced the "Metaverse Continuum." Accenture looks at the metaverse as a continuum that's evolving and expanding in multiple dimensions. It:

- Comprises multiple technologies encompassing extended reality, blockchain, artificial intelligence, digital twins, smart objects – including cars and factories – and edge computing.
- Encompasses the "virt-real" – the range of experiences, from purely virtual to a blend of virtual and physical.
- Describes the spectrum of emerging consumer experiences and the business applications and models across the enterprise that will be reimagined and transformed.

98%

of utilities executives believe continuous advances in technology are becoming more reliable than economic, political, or social trends in informing their organization's long-term strategy.



Take energy retail, for example. In just five years, significant change will occur behind the meter. The current transactional relationship between a utility and its residential customers will transform into a partnership with much greater interaction. New ecosystems and technologies will develop

to help consumers better manage their power consumption. Importantly, all these new business models will rely on data. This data will transform the way utilities engage with their customers, shifting from volume-based commodity sales to service-based offerings that help reduce energy consumption.

But energy efficiency is just the tip of the iceberg. Utilities will use predictive analytics to identify if a customer's solar photovoltaic (PV), storage or household appliances are faulty. They will provide maintenance services and offer replacements when assets reach the end of their lives. Working alongside aggregation partners, they will help householders optimize their investments in different assets, charging electric vehicles (EVs) or in-home batteries when prices are low, and selling power back to the grid when prices are high. Most importantly, this is all automated. Consumers aren't drowned in the complexity of day-ahead markets; they are just provided with the cheapest and greenest power available.

As developments like these challenge our basic assumptions about technology and business, we are entering a new landscape where there are not yet rules or expectations – creating a rich opportunity to build and shape the worlds of tomorrow.

Consider this: utilities that deploy human-like AI aren't just reaping the benefits of automation, they are pioneering new forms of collaboration between customers, the utility workforce, and machines. Grid-edge capabilities are transforming what people expect from their utilities. Utilities selling new services in a metaverse environment will create fundamentally different business models,

piloting new modes of commerce and creating best practices for the future of the internet.

All the companies building – and building in – these new worlds are bringing ideas and precedents to them, shaping how people will soon live, where utilities will find new opportunities, and what it will mean to be a responsible energy service provider in these environments.

For now, it may seem that the future we're rocketing toward holds more questions than answers. How will utilities conduct business? What services will they offer in these new worlds? How will consumers buy them? How

will human interaction unfold in the metaverse, and how will that reshape what we look for outside of it? What does the world of work look like when utilities become more distributed or autonomous? How do we manage a supply chain that cuts through different physical worlds where some cities are smart and some are not?

In many ways, the new worlds utilities will build have no history or legacy – no right way to do anything. This means immense opportunity. But it also means that utilities pushing these boundaries will be operating far ahead of policy and regulation. It will be completely new territory for many. They will find themselves on the front lines of establishing trust and safety and defining

the human experience in these new places. Trust will be paramount to adoption of the new experiences that leaders are beginning to build.

Your future is starting today, are you ready for it?

**Is remote work here to stay?
Does all utility infrastructure really
need to be smart? Do I need to
care about the metaverse?**



The answer to these questions and others is a resounding “yes.”

Just like in the early years of the web, the energy transition forces utilities into a future utterly different from the one they were designed for. Over the next decade we will witness a complete transformation of every environment in the utility value chain.

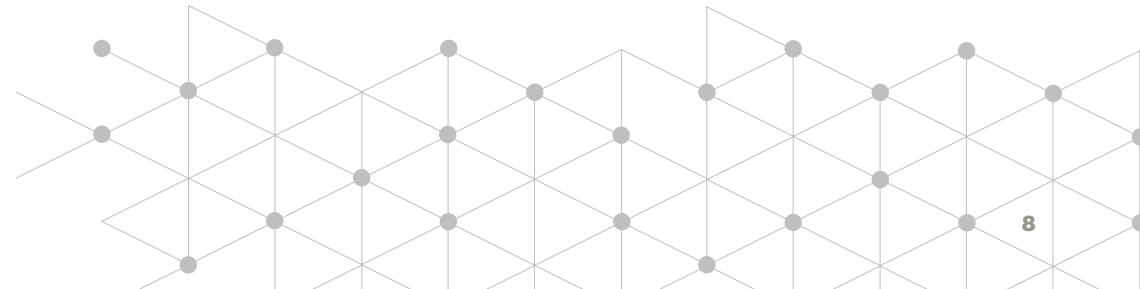
How employees and customers experience the digital world; the technology that manages and automates physical infrastructure; how human-like, collaborative, and productive our interactions with machines can be; and even the very outer limit of computers’ capabilities – these are all being upended.

This doesn’t mean your current business is going away – just as an online web presence didn’t remove the need for physical locations. But to be successful in the energy transition, utilities must create new revenue streams, rethink how they augment their operations, and contend with a host of new and disruptive competitors.

The good news? There’s still time to get ahead – but companies must make decisive technology investments. At a minimum, they must build on a digital foundation, pick partners to build a digital twin, go beyond data and analytics to use AI in more visible and collaborative ways. The stronger the digital foundation, the greater a utility’s ability to participate in (or build) new environments and worlds.

94%

of utilities executives agree that leading organizations will push the boundaries of the virtual world to make it more real, increasing the need for persistence and seamless navigation between the digital and physical worlds.



WebMe

Putting the Me in Metaverse

WebMe explores how the internet is being reimagined and how utilities must explore new modes of digital experience. The past two years spurred enterprises to explore new modes of digital experience, and pushed people to live virtually to an extent they never expected. Now the metaverse is emerging as a natural evolution that reconciles how the internet is designed today with what we will demand from it going forward. The metaverse presents the utility industry with an opportunity to transform customer and community engagement. It creates an immersive approach that enhances the nuances of a transformed utility-customer relationship. It will be used to educate and engage customers on energy efficient technologies, local energy markets, EV route planning and charging, and much more. And it will be used to train a new generation of utility employee, drawn into an industry leading the charge to a more sustainable world.

We're only at the start of the metaverse continuum. But it's vital that every utility executive understands where they can be in a decade's time.

Big Takeaways

- The metaverse is not an abstract idea. We're already doing things in the metaverse – we're just not calling it that as yet. It's an evolution of the combination of humans and machines, from today's use of digital twins and conversational AI, to completely new business models based on Web3.
- The competitive battleground of the future will be fought over who simplifies the complexity that millions of prosumers will face. It will require a more personalized approach to the residential customer experience. The metaverse can help personalize this relationship.
- The metaverse continuum perfectly describes the increasing convergence of fieldworkers and machines over the next decade. Over this period, as technologies mature, utilities will incrementally improve approaches to fieldworker training, safety, and asset planning.





Programmable World

Our Planet, Personalized

The value of new virtual worlds would be capped were it not for parallel changes that anchor them in the physical one. The Programmable World projects how the convergence of new technologies like software-defined everything, IoT, digital twins and analytics is changing the way utilities manage the physical world. These technologies are being threaded through utilities' physical environments in increasingly sophisticated ways, and are paving the way for utilities to reshape how they interact with the physical world. As technology becomes part of the fabric of our environment, distribution networks will change dramatically. Intelligence will be embedded throughout, from generation, across transmission and distribution, at the meter, and deep into customer buildings. We'll soon be able to unlock an unprecedented level of control, automation and personalization.

Big Takeaways

- Customer interaction changes completely, as utilities move from volume-based supply models to energy services. Utilities will support customer participation in local energy markets through highly personalized services.
- The profusion of new network data sources combined with high performance computing enables utilities to create a no-failure world. Self-healing grid technologies dramatically improve reliability.
- This new way of working requires a completely different skill set: data-focused business models demand a data-focused culture. The challenge for utilities is to build the skills required to support this new world.

The Unreal

Making Synthetic, Authentic

We're exploring the emergence of The Unreal—a trend where our environments are increasingly filled with machines that are passably human. “Unreal” qualities are becoming intrinsic to the AI, and even the data, that utilities are integrating into mission-critical functions. But bad actors are using it, too—from deepfakes to bots and more – igniting what may turn into the biggest hurdle for utilities looking to grow their use of AI. As custodians of critical national infrastructure, utilities must adopt a more holistic and integrated approach to security. Because, like it or not, they will be thrust to the forefront of a world questioning what's real and what isn't, and even whether the line between those two really matters.

Big Takeaways

- Protecting grid infrastructure will become more complex in the future. Billions more sensors greatly increases the potential risk of cyberattack and, because network utilities' reach will extend behind the meter, the risks also extend into customers' premises.
- Utilities will have a responsibility to protect customers who may not be prepared for the new energy system. Uncertainty, mistrust, and a lack of knowledge of the new market are weaknesses that could be exploited by scammers.
- Security becomes a proactive business process and timing is everything. So when should utilities embed security into their DNA? The sooner the better, the sooner the simpler, the sooner the cheaper.





Computing the Impossible

New Machines, New Possibilities

We are on the precipice of resetting the boundaries of traditional utilities as we begin Computing the Impossible. The outer limit of what is computationally possible is being disrupted as a new class of machines emerges. Quantum, biologically-inspired, and high-performance computers are each allowing utilities to tackle the grand challenges that once defined and shaped the very core of the industry. As problems previously considered impossible become solvable, utility leaders will be pushed to reimagine some of the most basic assumptions about the industry.

This new technology becomes vital in markets where most customers are close to self-sufficient, and grid operations focus less on managing consumption, and more on managing inertia. Grid operators will use market signals to optimize ammonia and hydrogen production, or decide when to dispatch power from grid-scale storage, or when EV owners should charge their cars. They will manage more than we can currently foresee.

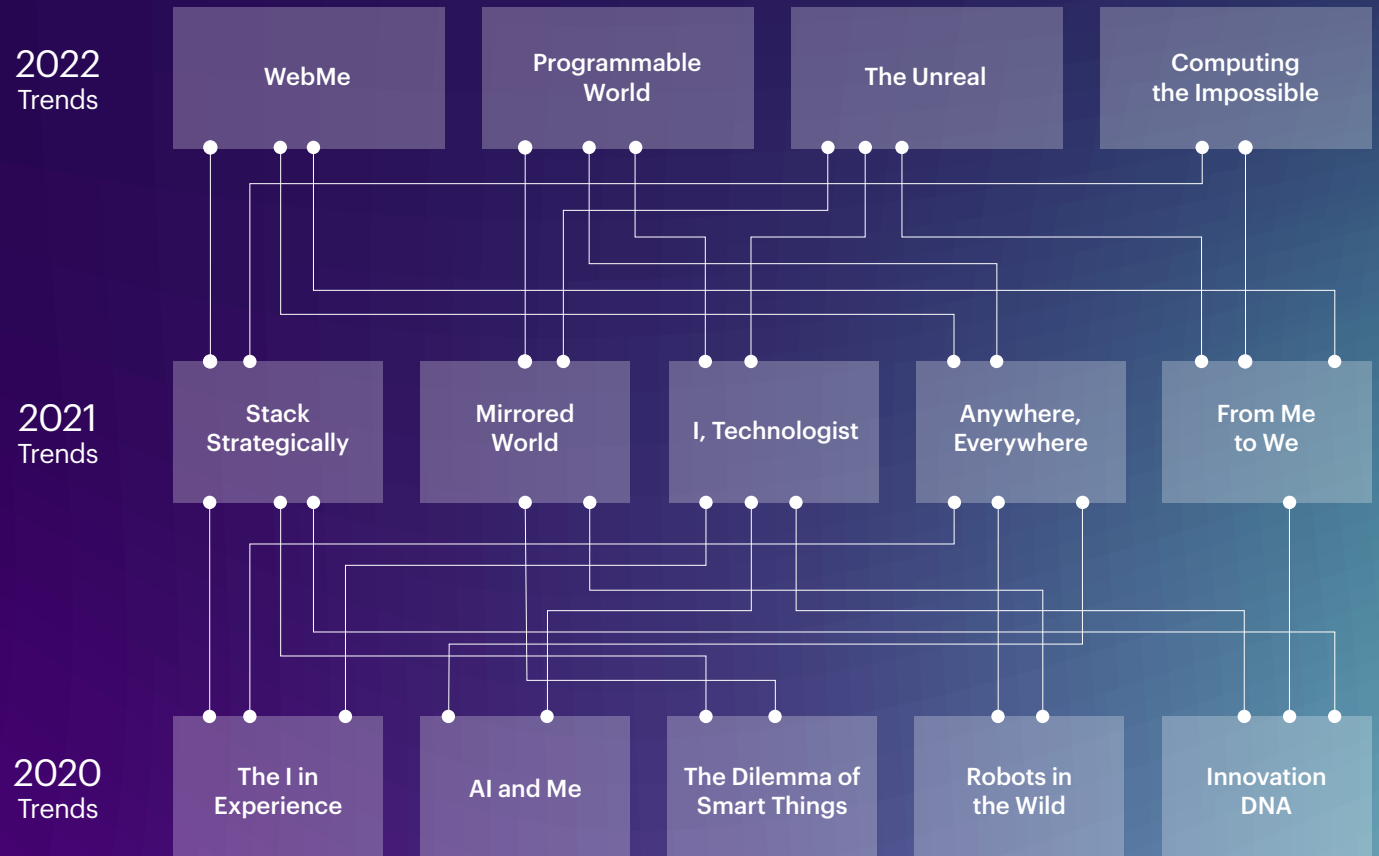
Big Takeaways

- A combination of sensor data and digital twins with high-performance, neuromorphic and quantum computing will enable processes that were previously thought impossible.
- AI-based control loops will automate network operations by processing in milliseconds the data from billions of sensors across networks and on customer premises
- The biggest barrier to grid automation will be the willingness to take humans out of the day-to-day decision-making process. However, this presents a leapfrog moment to those wanting to become tomorrow's market leaders.

Completing the Picture

Accenture's Technology Vision report comprises a three-year set of technology trends, currently including trends from 2020 and 2021.

It's important to recognize that each year's trends are part of a bigger picture. Tracking how they evolve over time offers a glimpse into how they may continue to grow in the future.



2021 trends

Stack Strategically

Architecting a Better Future

A new era of industry competition is dawning – one where companies compete on their architecture.

Mirrored World

The Power of Massive, Intelligent, Digital Twins

Growing investments in data, AI, and digital twin technologies are giving rise to a new generation of business and intelligence: the mirrored world.

I, Technologist

The Democratization of Technology

Natural language processing, low-code platforms, robotic process automation, and more are democratizing technology, putting powerful capabilities into the hands of people all across the business.

Anywhere, Everywhere

Bring Your Own Environment

It's time for enterprises to transform remote work from an accommodation, to an advantage.

From Me to We

A Multiparty System's Path Through Chaos

The global disruption of COVID-19 ignited a scramble for enterprises to reimagine their partnerships – and multiparty systems gained newfound attention.

2020 trends

The I in Experience

Helping people choose their own adventure

Redesign digital experiences with new models that amplify personal agency. Turn passive audiences into active participants by transforming one-way experiences into true collaborations.

AI and Me

Reimagine the business through human and AI collaboration

Take a new approach that uses artificial intelligence to bring out the full power of people. Move beyond deploying AI for automation alone and push into the new frontier of co-creation between people and machines.

The Dilemma of Smart Things

Overcome the “beta burden”

Address the new reality of product ownership in the era of “forever beta.” Transform pain points into an opportunity to create an unprecedented level of business-customer partnership.

Robots in the Wild

Growing the enterprise’s reach - and responsibility

Build new models of interaction and impact as robotics move beyond the walls of the enterprise. Companies in every industry will unlock new opportunities by introducing robots to the next frontier: the open world.

Innovation DNA

Create an engine for continuous innovation

Tap into the unprecedented scale of disruptive technology available today. Build the capabilities and ecosystem partnerships necessary to assemble the organization’s unique innovation DNA.

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 further out into the future than ever before, while remaining relevant across industries and actionable for businesses today.

Accenture Labs and Accenture Research collaborate on the annual research process, which includes:

- 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.
- A global consumer survey to capture insights into the use of, interactions with, and beliefs about technology in people's everyday lives. In addition, Accenture conducts a global survey of C-level executives and directors to understand their perspectives and use of emerging technologies across their organizations.
- Experiential research and data science to analyze technology developments and advancements.

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

Business and Consumer Surveys

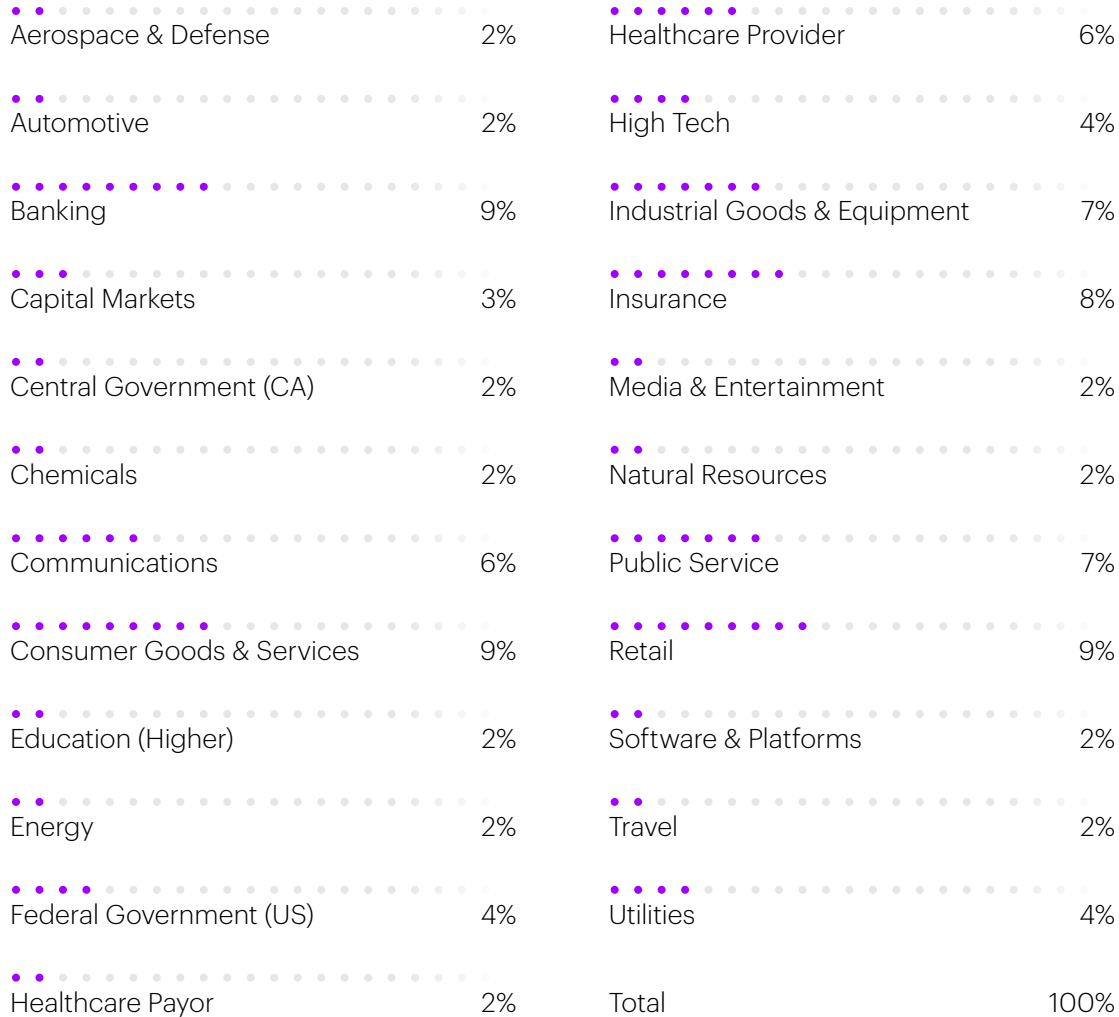
Accenture Research conducted a global survey of 24,000 consumers to capture insights into their use of, interactions with, and beliefs about technology in their everyday lives. In addition, Accenture conducted a survey of 4,650 C-level executives and directors across 23 industries to understand their perspectives and use of emerging technologies across their organizations. The surveys were fielded from December 2021 through January 2022 across 35 countries.

35 COUNTRIES

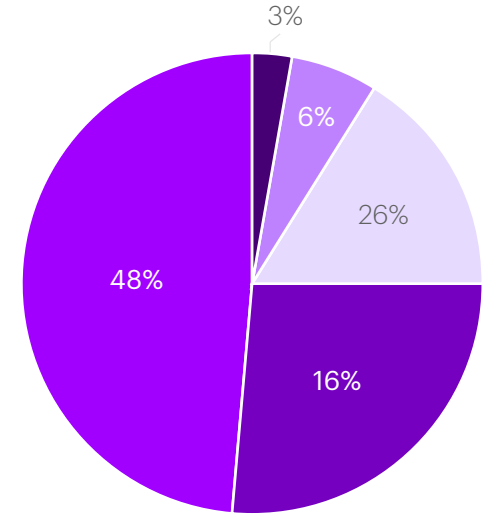
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|-------------|--------------|-----------------|-------------------------|
| 1 Argentina | 10 Denmark | 19 Malaysia | 28 South Africa |
| 2 Australia | 11 Finland | 20 Mexico | 29 Spain |
| 3 Austria | 12 France | 21 Netherlands | 30 Sweden |
| 4 Belgium | 13 Germany | 22 Norway | 31 Switzerland |
| 5 Brazil | 14 India | 23 Poland | 32 Thailand |
| 6 Canada | 15 Indonesia | 24 Portugal | 33 United Arab Emirates |
| 7 Chile | 16 Ireland | 25 Russia | 34 United Kingdom |
| 8 China | 17 Italy | 26 Saudi Arabia | 35 United States |
| 9 Colombia | 18 Japan | 27 Singapore | |



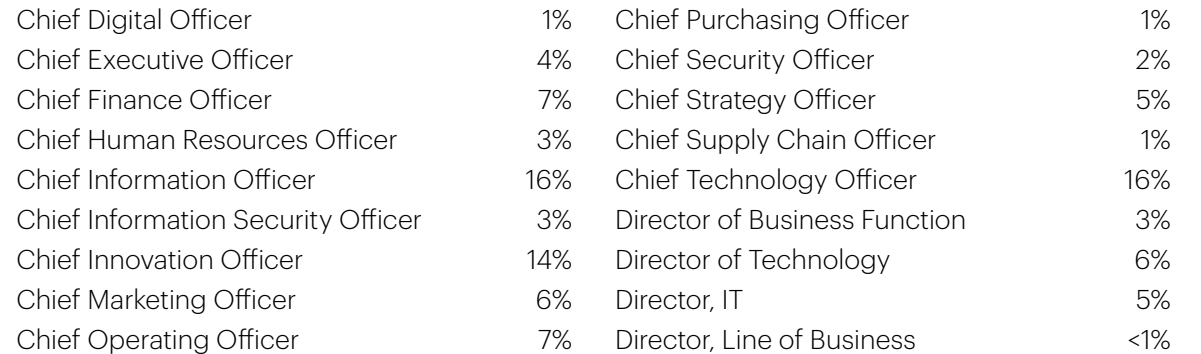
INDUSTRIES



REVENUES (USD)



ROLES



About Accenture

Accenture is a global professional services company with leading capabilities in digital, cloud and security. Combining unmatched experience and specialized skills across more than 40 industries, we offer Strategy and Consulting, Technology and Operations services and Accenture Song—all powered by the world’s largest network of Advanced Technology and Intelligent Operations centers. Our 710,000 people deliver on the promise of technology and human ingenuity every day, serving clients in more than 120 countries. We embrace the power of change to create value and shared success for our clients, people, shareholders, partners and communities. Visit us at www.accenture.com.

About Accenture Labs

Accenture Labs incubates and prototypes new concepts through applied R&D projects that are expected to have a significant impact on business and society. Our dedicated team of technologists and researchers work with leaders across the company and external partners to imagine and invent the future. Accenture Labs is located in seven key research hubs around the world: San Francisco, CA; Washington, D.C.; Dublin, Ireland; Sophia Antipolis, France; Herzliya, Israel; Bangalore, India; Shenzhen, China and Nano Labs across the globe. The Labs collaborates extensively with Accenture’s network of nearly 400 innovation centers, studios and centers of excellence to deliver cutting edge research, insights and solutions to clients where they operate and live. For more information, please visit www.accenture.com/labs.

About Accenture Research

Accenture Research shapes trends and creates data-driven insights about the most pressing issues global organizations face. Combining the power of innovative research techniques with a deep understanding of our clients’ industries, our team of 300 researchers and analysts spans 20 countries and publishes hundreds of reports, articles and points of view every year. Our thought provoking research – supported by proprietary data and partnerships with leading organizations, such as MIT and Harvard – guides our innovations and allows us to transform theories and fresh ideas into real-world solutions for our clients. Visit us at www.accenture.com/research.

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