Cognizanť

The Future of Information Services & Technology

The future of information services & technology offers a world of opportunities, but the transformation will require substantial steps and boldness. The industry needs to be open to new insights instead of being mentally closed by existing ones.

Each industry has its owns challenges, and digital disruption is everywhere. Organizations must be agile and build new momentum that respects the new reality of their industry. As organizations continuously try to remain relevant, this requires adaptation to changes not only today, but also tomorrow. Change is the only constant. Constant change requires scenario-based thinking, exploring several paths and crafting a digital strategy based on preparing for the future. For businesses to stay relevant, they need to explore the future and look at next generations.

No one can predict the future; organizations must actively explore various possible futures to anticipate what disruptions are coming. We believe that future winners in the digital economy will be those that can deliver on one key insight: put technology in the background and focus on people first. Putting customers first does not diminish technology's importance; rather, a deep customer understanding should help guide the choice of which technologies to incorporate in your business.

Cognizant can bring together digital strategy, deep industry knowledge, human sciences, experience design and technology expertise to help companies design, build and scale digital business solutions. Cognizant has both the expertise and experience with digital transformation. Together with clients we can explore tomorrow's opportunities.





The rise of connectivity between humans and things

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An external perspective by futurist and trendwatcher Tony Bosma

The future is

already here





Euan Davis leads Cognizant's Center for the Future of Work in EMEA. A respected speaker and thinker, Euan has guided many Fortune 500 companies into the future of work with his thought provoking research and advisory skills.

Within Cognizant's Center for the Future of Work, he helps ensure that the unit's original research and analysis jibes with emerging business-technology trends and dynamics in Europe, and collaborates with a wide range of leading thinkers to understand how the future of work will look. Previously, Euan held senior analyst, advisory and leadership positions at Forrester Research, IDC and CEB. Euan can be reached at: Euan.Davis@cognizant.com รือม Center for The Future of Work

A view by Cognizant's Center for the Future of Work

Meet the customer **of the future**

Mike and Vicky awaken at different times. Their devices continuously monitor their sleep data and wake them up at the optimal time in their circadian sleep cycle. The smart closet suggests an outfit for each of them, based on the weather and their agendas. Vicky loves the new dress that her favorite shop sent over yesterday.

The couple's breakfast smoothies – perfectly balanced for their individual nutritional needs – await them in the smart refrigerator, which has already re-ordered ingredients that are running low. They both swallow their personalized medicine tablets, which are adjusted based on data collected by their smart toilet. Mike uses a retinal scanner to unlock his self-driving car. Vicky's device suggests that public transport is the fastest way to her meeting, so she jumps in the tram and scans her smartwatch to pay the fare. Both of them read their curated news feeds – a balance of perspectives in which they strongly believe, and factual, informative articles about the opposing viewpoints.

Quick take Post COVID-19 impact

The tech giants are stepping up to the plate and assisting governments with tracking the spread of the COVID-19 virus. This includes tracking and reporting the whereabouts of individuals. At any other time, this would be seen as a gross intrusion into personal privacy, but extraordinary times call for extraordinary measures.

However, post-COVID, the need to assure consumers that their privacy is secure will be paramount.



After work, the couple will head to a new restaurant that their devices suggested based on their social media posts and previous restaurant reviews. At home, their appliances are automatically washing their clothes and dishes at optimal, off-peak times.

In the digital future, who will be the masters of the game? The manufacturers that build smart devices? The programmers who design the apps? Not quite. In 2025 and beyond, the companies that control our data will rule. But with great power comes great responsibility.

Tomorrow begins today

With each passing day, technological advances become more and more a part of our lives. Our devices learn more about us every day, and offer opportunities to make our lives easier in ways as simple as turning on the lights, to as complex as our long-term mental and physical health.

At the center of all these advancements is data. The more our technology "learns" about us, the more support it can offer. But the line between convenience and intrusion is razor-thin. Consumers are more than willing to share their data when it provides a benefit. But they are quick to turn their backs on any company that betrays their trust. From the Cambridge Analytica/ Facebook scandal to Quest Diagnostics exposing 11.9 million people's financial data – damage from a single data breach can be devastating, both for the company and its customers.

The future of technology is human

Today, the masters of data include Facebook, Amazon, Google and Alibaba. But new players still have an opportunity to join this exclusive club. This won't happen by creating the shiniest new gadget or the user-friendliest interface, but by making an effort to do real good, both for people and the planet.

Many experts agree that the future of technology doesn't lie in what is technologically possible, but what is ethically and morally responsible. The antiquated idea that robots will take over the roles of humans is being replaced by the idea that technology will make humans better, more productive, healthier, stronger and happier. Consumers will provide the data; they only need the right company to unlock its potential. That's why Nestor is already offering Al-driven courses that use face recognition to make sure students are paying attention. And 7Cups is providing free, device-based emotional support to address the worldwide mental health problem. Using therapeutic protocols and a network of 340,000 trained volunteers, emotional and mental support is now accessible to those who need it most, anywhere in the world. The masters of data will be responsible for the direction our technology takes, and the speed of its advancement. From AR consults with doctors to biometric scanning that controls our transportation and shopping, there is literally no industry that can't use technology to help advance the health, well being and productivity of the human race. But irresponsible data usage can fill the digital landscape with landmines. Which is why data management starts with security, but also includes ethics, standards and even morality.

No one can say for certain what the future will look like, but it will definitely be digital.

The business case for ethical technology

In the United States, a shared cooperative has developed the Ethical OS Toolkit: an ethics checklist that helps start-ups and developers identify risk areas and potential social harm. And Hu-Manity is working on ways to create intentionally consensual relationships between consumers and companies to redefine privacy and enhance data agency, data ethics and data reciprocity. But why should the masters of data care about ethics? Isn't this simply a "survival of the fittest, bigger is better" competition to collect data at all costs? Probably not. As it turns out, focusing on the ethical, responsible use of data may open the door to future business opportunities.

Think here, of a new pricing model in which consumers can decide how much data they share, with whom, and why. Want to fully protect your privacy and share as little data as possible? Then you pay a premium price for your protected devices. OK with sharing a great deal of data through your new devices? You'll enjoy a 50% discount. All trends point to the idea of consumers having complete control of their own data. So the smartest masters of data today will learn how to use it to their advantage. By driving down the total cost of ownership on the devices consumers want, companies mine the ever-more-valuable data they need to truly impact their bottom lines – not to mention the lives of consumers. This is just one of the many opportunities that future masters of data shouldn't ignore.

Regulating the Wild West

No one can say for certain what the future will look like. But it will definitely be digital. The World Economic Forum estimates that 70% of new economic value will come from digitally enabled platforms and more than 60% of global GDP will be digitized by 2022. But who will protect the valuable data that will make the future world go around? Chances are, security will be a two-way street: governments will play a role, but the role of the data masters can't be underestimated.

The days of technological Wild West are most likely coming to an end. Beyond the legislative restrictions on platforms and content that are almost certain to develop, tech companies will likely also need to do quite a bit of self-regulation. After all, consumers are becoming more and more vocal, and taking more and more action, to ensure that their precious data is used responsibly. And one thing that won't change in the digital future: the customer will still be king.

Taking a stand

Rather than throwing up their hands and claiming they have no responsibility, tech giants may even be able to help address some of the more negative aspects of the digital revolution. Today, internet trolling, fake news and extremism are happening – and spreading – on an epic scale. Current algorithms recognize consumers' online behavior and simply feed them more of what they already like. It's a self-propagating system that can swallow consumers in a spiral of negativity or misinformation. One might therefore conclude that the masters of data have a role to play in changing the tide.

Current platforms claim to take a politically and morally neutral position: allowing content – whatever the political slant – to proliferate. But imagine a situation in which social media could take a more altruistic approach? If a consumer spends too much time on radical sites, his/her platforms could begin to influence the news and information he/she receives, gently trying to reverse the effects with clear, factual counter-arguments. And that nasty troll who takes such pleasure in attacking others behind the guise of anonymity? What if multiple offenses resulted in their true identity, picture and information being publicized? These are just two of the many ways that masters of data might have an impact on the world in which we live.

the future of technology is human

Instead of avoiding a political affiliation or moral standpoint, data masters might even become the force behind local and global politics, using that valuable data to shape our future more directly. This may be sheer speculation at this point, but it's speculation supported by current trends and the latest thinking about the role of data in our lives, and it's certainly food for thought for all the masters of data who aim to stay in the game. A day like Mike and Vicky's seems just around the corner. The only question that remains is which masters of data will help shape that reality, ethically and responsibly.





Tony Bosma (1973) is a futurist and trendwatcher. He is the founder of futuring and consultancy organization Extend Limits (www.extendlimits.nl). Extend Limits does not predict the future but helps organizations anticipate it. Do not ask yourself why things are happening. Ask yourself why hasn't it happened yet? This is the mindset companies need to adopt in this era of change.

Tony Bosma is an authority in future thinking and trendwatching and was nominated in The Netherlands several times for trendwatcher of the year. He is an internationally renowned keynote speaker. He is known for his confronting, inspiring, visually attractive and surprising sessions about a wide variety of topics. He also works for a variety of companies and governments, helping them anticipate the future and, more important, challenge and question today's world and mindset.

In collaboration with Cognizant, Tony Bosma did extensive research into near future trends across industries. Together with Cognizant, he made abstracts of the most dominant developments – not far fetched futuristic worldviews – but realistic developments which are seen right now. These are not only plausible future developments but also the challenges of technological developments.

An external perspective by futurist & trendwatcher Tony Bosma

Information Services & Technology **reinvented**

Technology today is like a 21st century demigod to which we turn to solve our human problems and existential risks. While technology has historically been a key driver of human progress, today it has a particularly fundamental impact on every aspect of business, society and even our personal lives.

People are both curious and concerned about the current speed of technological developments and their impact. But that mix of worry and optimism isn't new. Since the invention of the printing press, there have always been people who panic about technology innovations and their possible implications. After all, as Batya Friedman, human-computer and interaction professor at the University of Washington, has said, "At stake is nothing less than what sort of society we want to live in and how we experience our humanity."



At the same time, technological transformations demand people and organizations to be open to new insights instead of being mentally closed by existing ones. The stickiness of our current worldview is one of the biggest barriers to encouraging widely disseminated progress with technology. This is because real progress lies not in making the past world more efficient but in reinventing today's world. It lies in creating a world where technology assists people and not the other way around – an inclusive and sustainable world enabled by technology and driven by humans.

For companies, it all comes down to anticipating the right technological developments instead of mindlessly adopting the speed of change.

The full implications of fast-moving technology developments are unknown. These include the social, political and economic shifts driven by technology, the new business models and organizational structures, as well as our changing consumption patterns and human relationships. Even our human bodies and nature are being adjusted by technology. Ultimately, technology will affect what it actually means to be human, a sentence many experts say in today's world. Technology has become so interconnected with society that the questions and challenges it raises grow with every passing second. Technology raises new questions but has also become an essential part of the solution to every challenge the world faces today and in the future.

We've all heard the predictions of futurists, from flying cars, genetic modification, underwater cities, space elevators, printing food, defining death, human-like robots and a completely virtual world where our artificial selves live. While many of these predictions are still not widely available, they're also not science fiction anymore. The hardest part is predicting the timing of when a new technological innovation will be applied in the real world. Remember Q System One, introduced in the beginning of 2019 and seen as the first commercially available quantum machine in the world? Although this is considered a big breakthrough in the world of computing, the real practical quantum computer is still far away. Looking to the upcoming decades, then, what will be the most impactful technological trends? We've looked at the future landscape and selected a few.

Now comes the second machine age. Computers and other digital advances are doing for mental power – the ability to use our brains to understand and shape our environments – what the steam engine and its descendants did for muscle power.

The rise of connectivity between humans and things

Smart interconnected world

One of the most prevalent trends is the rise of connectivity between humans and things, along with intelligence and data to make our environments smart and able to anticipate our needs. From cities, to offices, to homes, the magic word for future connectivity is "smart".

Huge amounts of data flow from our interconnected worlds. Our bodies, digital representations, devices, organizations, environments, governments – all generate data. This unprecedented data flow can be analyzed non-stop and used to fully adapt to our human needs and wants. This will be the new definition of smart: a world adaptable to and self-organizing around an individual human need.

Interconnected sensors will help businesses transform from making products for target groups to creating and anticipating customers' needs and desires. They'll shift from a reactive world to a predictive and even prescriptive one. Technology will know things before we do and anticipate them.

This interconnected world will transform the relationship between citizens and governments, as well. Public services will become hyper-personalized and even citizen-centric, and governments will use real-time data to enhance their services.

When data becomes the new oil and even becomes more important than money, the question is what does it mean for leading technology companies? Are people living in smart cities citizens or consumers? How does the smart city see us in the future? A world driven by data will ultimately be led by the companies which collect, analyze and use our data. To be successful, technology companies need to connect with society. Technology companies need to become less tech driven and more human focused. Great things come from technology when technology becomes the new connecting force between everything we do, want, need and share in our lives. Will technology companies become our doctors, taxi drivers, teachers, shop assistants and even politicians? More than ever, technology companies will transform to be the most dominant force in everyone's individual life. The question is whether people need and want this.

Rise of 'humanware'

Some futurists say it's becoming increasingly difficult to tell where the human body ends and the computer begins. While the most important platform for technology in the 20th century was the physical computer, for the 21st century, it will be the human body. An article in the *Frontiers of Neuroscience* even predicts that human-brain connectivity with cloud computing could be a reality within the coming decades.

Elon Musk's Neuralink, for example, wants to connect our brains with the internet. Other innovations that could help merge technology with the human body are nanotechnology, robotics, smart sensors and artificial intelligence. While the idea of merging technology with our body may seem undesirable, many people already rely on technology augmentations, such as implants or other medical devices. Future disabled persons are those who have no technological augmentations in their body.

It may be daunting to consider the symbiosis of our human body and technology – or "human-ware" – but it's only by thinking about these extreme examples of technological progress that the future of technology can come into view. What will it mean if we could connect our brains and body to the virtual world?



What would it mean to be human in such a world, and what will it mean for business? The questions may seem frightening, but these trends are evolving right now. We're extending our human biological limitations with technologies like phones (augmented memory), computers (augmented calculating power) or exoskeletons (augmented muscle). As many business and technology leaders say, the next step in artificial intelligence is not replacing humans but augmenting them.

The big tech companies are becoming the new gods. Science and technology is the new hope and belief. They will save us from disaster and help humankind move forward. But besides the enormous possibilities of data, hyper-personalization, smart surroundings and autonomous worlds, there is also a human side of life technology cannot threaten. The big technology companies need more than ever to focus on the human side of progress and technology. Technology companies need to help transform economic models and societies and focus on more equally distributed wealth and access of information and data. Big Tech needs to innovate more from a basis of societal need than technological possibility. Big Tech will become the new leaders in every sector as technology becomes the new driving force. But to realize this utopian future for the technology industry, the players need to take a step aside and become less dominant. The future of the big technology companies is about collaboration, not domination.

By 2023, nearly every enterprise will act like a digital native.

International Data Corporation

In the future, it is likely that the smartphone will not be separated from you at all. It may be embedded in your body or brain, constantly scanning your biometric data and your emotions.

Yuval Noah Harari

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Imagine, one day...

By letting go of our mental barriers, we can freely think about a possible future of technology. By 2050, for example, imagine a world in which technology is ubiquitous. The use of the word technology is obsolete because everything is technology. We live in a fully predictable world. Our health and lifestyles are being monitored continuously, and virtual doctors help us retain peak health. Getting ill is a thing of the past, and we have defeated death as a result of illness. While physical death is a choice, everyone will live on virtually. Love has become highly efficient, and we can decide to design our babies. Food is fully personalized and based on what we like most. Making your own dinner is history or is seen as entertainment.

Everything we see and do is hyper-personal. Physical travel has become an unnecessary luxury because virtual experiences are better, faster and more efficient than their physical counterparts. Money no longer exists, nor does work. Products are designed and developed by robots via creative algorithms. Consumption is circular, and waste doesn't exist. Safety is ensured by algorithms and robotics. In our ability to control climate and weather, we've become like gods. Still, there is still a need for real human emotions, including negative feelings. This can all be experienced by choice and delivered when and where we want. The unlimited virtual world makes our physical borders obsolete. We have found new planets to live on, which give us extra resources and space.

Our lives are fully connected. Via data, medicines are created that are fully autonomous and personalized. The technology companies know everything about our lives and can proactively respond to it. Technology has also become the linchpin between once totally separated industries. Food industries are, for example, connected with healthcare providers. Based on our patterns in life, technology decides what we eat and when we sleep. Technology prevents us from getting ill and even makes our relationships extremely effective. Technology gives us the right amount and personalized forms of entertainment and connects us with people who add value to our lives. Technology has become the necessary artificial oxygen of human life. It entertains us, keeps us healthy, educates us and provides the work we want and need.

What does this future mean for being a human? What will the consequences be for privacy and human values? Can technology create real progress by fundamentally changing what it is to be human?

Information Services & Technology reinvented **New challenges** and questions

Technology companies promise a utopian future, but reality suggests another side too. We see scandals surrounding the biggest tech companies and social media threatening democracy. Technology-driven healthcare innovations are not only fighting diseases but also putting a strain on ethics. Surveillance states, advanced weaponry, biased algorithms, pet cloning, neurohacking and cyborgs are just a few dystopian challenges that loom.

In a world of advanced technological innovation, digital ethics are increasingly essential. If the technology sector doesn't embrace ethics at its core, it will become a sector distrusted by society. But trust will drive the success of every technological breakthrough in the future, superseding even ease of use in importance.

With every technological innovation, we need to balance out what we can do with technology with what we want from technology. Can we leave the ethics questions to the developers of technology? The success of future implementation and adoption of technology lies in digital ethics.

I'm concerned about the reduction of human autonomy as our systems aided by technology - become more complex and tightly coupled.

Jonathan Zittrain, professor, Harvard Law School

Future technologies may make our lives easier, but it's also important to ask questions about their impact on free will, privacy, ethics and human morale. Are new technologies increasing the imbalance between the new powerful who have access to data and technology and those who don't? Misinformation, filter bubbles and privacy conflicts have become the new normal in our digitally driven society.

Of course, new technological solutions for these challenges can be anticipated, but technology will continue to evolve. Within a decade we'll need to ask ethical questions like who is responsible for the content made by smart machines? Can our future role models and influencers be artificial? Will we be able to distinguish the difference between artificial and human? Technology should not dominate our lives and society. It has to serve us. But like author Douglas Rushkoff has said, it's as if humans are the problem and technology the solution.

Of course, with every trend comes a countertrend. In our technology-centered digital world, the demand for non-personalized experiences, "offline astonishment" and physical rather than digital experiences will grow. In an ever digital and artificial world, human contact will be the new luxury good and even a status symbol.

Although everyone understands the importance of ethics as competitive advantage within the field of technology, many organizations lack the confidence that their organizations are ready to act on it. Technology companies may claim they put ethics at the center of their developments, but we need to continuously question whether these companies are able to make decisions about the ethics and morality of their technologically driven advancements.

Our biggest failure is to fear technology, letting all the possible dystopian tech futures paralyze our way forward. That will lead to an unprecedented amount of unused and potentially valuable technological innovation. Our second biggest failure is to blindly follow technological opportunity. We humans have the ability to envision the future and to act accordingly. Let us be aware of the potential risks and opportunities and steer them toward the world we want to live in, with everyone included. That's a shared human challenge.





¹¹ Unless we address these fundamental issues of inclusion and trust, we risk technology becoming a force for greater division and discord rather than a boon.





The future is already here

Technology will transform every aspect of our lives. Rather than the physical computer acting as the main platform for data, that role will shift toward the human body and mind. Humans will become the data platforms of the future. Communication will no longer be channeled but frictionless, and everything will be centered around an individual, enabling technology-driven, hyper-personal, prescriptive products and services. In addition to augmenting and enhancing "things," technology will also augment and enhance human emotions. Physical and dumb interfaces will be replaced by auditive and biological interfaces like speech, mimicking the human body. Our primary contact with technology will be through interactions with smart algorithms. Although data will be collected continuously, the individual will be in control of what is shared and analyzed, and when. Our privacy will be controlled by even smarter software working for us.

From:	То:
Consumer	Prosumer
Individual	Hyper-personal
Computer as the platform	Humans as the platform
Robots	Cobots
Augment things	Augment emotions
Predictive	Prescriptive
Digital	Phygital
Mobile first	Al first
Channeled	Frictionless
Technology-driven	Human-centered
Dumb interface	No interface
Privacy pressure	Privacy first

Real-life cases

The following cases are inspirational and show how the technology industry is changing. Startups and new innovative ideas can grow but also fail fast – that is innovation at the frontiers of an industry. (No business relationship exists between the cases below and Cognizant.)

Nestor

Nestor delivers Al-driven courses. Its system uses facial recognition to detect students' attention levels. Using that data, it can predict when students are more likely to lose focus and send preemptive alerts. It also analyzes student behavior to suggest more effective ways and times to study.

www.nestor-ai.com

7 Cups

7 Cups offers free web- and smartphone-based emotional support. The service is anonymous and is available anywhere, anytime. The organization uses therapeutic protocols, adaptive machine learning, trained volunteers and credentialed professionals to address worldwide mental health issues and deliver help via new technologies. 7 Cups already has 340,000 trained volunteers in 189 countries and 140 languages.

www.7cups.com

Drishti

Drishti helps manufacturers measure the value of people in a world of robotics and automation. The organization makes it possible to digitize human activity to show what people do. With its datasets, Drishti aims at shaping a future in which technology does not displace people; it makes them more valuable. www.drishti.com

Technology changes all the time; human nature, hardly ever

Evgeny Morozov

EthicalOS

The EthicalOS toolkit is aimed at helping startups ensure the products and services they create are used to change the world for the better. Developed in cooperation with the Institute for the Future and Omidyar Network, the framework offers an ethical checklist with eight emerging areas of risk most critical for technology to address; 14 scenarios to spark conversation about the long-term impacts of the technology under development; and seven future-proofing strategies to encourage immediate ethical action.

www.ethicalos.org

Hu-manity.co

Hu-manity.co wants to redefine the story of privacy. The organization envisions a world in which consumers and companies share intentionally consented relationships regarding data agency, data ethics and data reciprocity. Its mission is to help companies become more data-driven by redesigning and transforming the contracting relationship with consumers at a global scale. To accomplish this, the company offers a PDK toolkit for multiple industries. **www.hu-manity.co**

The future is human

Humans excel at being creative, in seeing, identifying and investing in opportunities, and solving problems. Our human experiences and emotions – anger, sadness, love – will drive the future of technology. Even as technology becomes more prevalent, it will never replace humans. The biggest challenge for the future of technology is to spur real human progress by creating an inclusive society enabled by technology and driven by humans.

Let's be curious about the future, not fearful. Let us, as a society, create and discover the future by using innovation and technology to challenge our current assumptions, institutions and models. The future is not about making the current world more efficient but about redefining it. Humans will continue to make the difference, using technology to do so.





- 1. Put customers in control of their own data, and enable them to utilize it their way.
- Technology organizations need now, more than ever, to show how they are ethically using tech and their customer's data.
- Technology companies hold an ever greater influence over society, and therefore, they need to focus on societal issues instead of just technological possibilities.
- 4. Make sure the impact of a technology on a person's life is always clear.
- 5. Use the power of new technology to totally change the world we live in. Reinvent and disrupt!
- 6. Do not overestimate the impact of technology and the power of humans.

Cognizant

ABOUT COGNIZANT

Cognizant (Nasdaq-100: CTSH) is one of the world's leading professional services companies, transforming clients' business, operating and technology models for the digital era. Our unique industry-based, consultative approach helps clients envision, build and run more innovative and efficient businesses. Headquartered in the U.S., Cognizant is ranked 193 on the Fortune 500 and is consistently listed among the most admired companies in the world.

Driven by a passion to help our clients build stronger, more agile and more innovative businesses, we enable global enterprises to address a dual mandate: to make their current operations as efficient and cost-effective as possible and to invest in innovation to unleash new potential across their organizations. What makes Cognizant unique is our ability to help clients meet both challenges. We help them enhance productivity by ensuring that vital business functions work faster, cheaper and better. And, our ability to conceptualize, architect and implement new and expanded capabilities allows clients to transform legacy models to take their business to the next level.

Learn how Cognizant helps clients lead with digital at **www.cognizant.com**

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