# TechnoVision 2020

## Change Making Simplified

**Addressing technology-business transformation in the COVID-era**

Enter

# Contents

# Special **Foreword**

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*Group Executive Board Member and Group CTO*

## "Future Thinking, Change Making"

It's a sobering thought that, only a few months ago, when we were developing this 2020 edition of TechnoVision, an era-defining global crisis was just around the corner.

At the time of writing, the fight against COVID-19 is continuing. Words cannot express the gratitude we feel for the thousands of health workers, scientists and front-line staff who continue to work for our safety.

The crisis has left people without jobs, and children without education, while organizations everywhere struggle to establish new ways of working. And yet, the world has paused to take a breath; carbon emissions have fallen; people have come together (virtually) like never before; and sentiments like "stay safe" have become truly meaningful.

One of the most interesting narratives through this upheaval has been the role played by technology. Technology has brought people together, facilitating collaboration, creativity and sharing. It has enabled businesses to operate, retailers to sell and companies to deliver. While the value of traditional 'safe' commodities has dropped exponentially, the popularity of technology and technological companies has soared beyond our wildest expectations.

One thing is for certain: the world is changing. Technology – and the technology businesses that drive it – is needed now more than ever, and this trend is set to continue.

Our Technology and Innovation agenda is driven by the principle of 'Future Thinking, Change Making'. This two-pronged approach has never been more relevant: we help our clients consider what the future holds; and then translate that into change that fuels growth and success.

To this end, we release 'TechnoVision' each year, as a point of view in two parts. For those focused on anticipating and assessing emerging technologies, we encourage you to read our 'Future Thinking' report. The 'Change Making' report you're reading now, called 'TechnoVision 2020: Simplify', is intended to guide the implementation of emerging technology trends, and is aimed primarily at CIOs and IT practitioners.

The theme of this edition is 'Simplify' because, in a world where data seems to overwhelm us all, we recognize that technology should aim to make the lives of consumers, colleagues and citizens easier. TechnoVision offers a holistic approach, helping organizations assess the potential of new trends while validating their enterprise-readiness, and suggesting ways to exploit them.

To generate the insights in this report, we leverage our expertise in Future Thinking and Change Making from across our Invent consulting colleagues and Technology Innovation Ventures network, capturing trends in our comprehensive technology database. We equip our architects and practitioners with tools to exploit technology insights in a way that matches domains to enterprise systems, supporting our clients to develop their change roadmaps.

We look forward to working with you to apply our TechnoVision 2020 insights. In the meantime, please stay safe and enjoy this 'Change Making' edition.

# Introduction

When we published the original version of this 'Technovision 2020: Simplify' report in January, we included two editorials: the first was a plea for Simplification; the second a rallying cry focusing on Being Architects of Positive Futures.

We felt Simplification captured the zeitgeist of the technology moment, in terms of how technology solutions should be considered, selected and applied – as well as the overall change-making mindset.

Being Architects of Positive Futures was a call to action for technology to be the solution in the fight against climate change and in the drive to improve digital inclusion.

Then, seemingly out of the blue, came the COVID-19 pandemic – a Black Swan event, avant la lettre. The virus confronts us with a vast human cost, together with staggering societal, political and economic implications.

Charting a way forward with technology amid these challenging times will take raw creativity, coupled with guiding design principles and continuous dialogue. These are the qualities we seek to draw out in TechnoVision.

As a framework to inspire and drive the business / technology conversation, it can be used to devise innovation strategies, digital stories, and IT architectures, and to apply the most promising technology trends.

*"With business so perfectly infused with technology, the quest for simplicity becomes paramount."*

# Introduction

When used in the context of the COVID-19 pandemic, it becomes a guide for every organization seeking a tailored roadmap out of the crisis. And even as our physical movements are restricted, TechnoVision still lends itself well to virtual, collaborative discussion and application.

At its core, 'TechnoVision 2020: Simplify' describes 37 key Technology Business trends, grouped into seven containers and set in a framework designed to inspire and encourage dialogue. It has been shaped by real stories of how businesses infuse themselves with technology for better outcomes.

In this special edition, we have added an editorial that presents a COVID-19 'response lifecycle', to model the technology impact on organizations passing through – and out of – the current crisis.

We hope it will serve as a roadmap, or at least offer a spark of inspiration, to help guide your unique Technology Business towards a stable and more resilient future.

**We wish you good luck. Stay safe and healthy!**

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# TechnoVision **and COVID-19**

# TechnoVision **and COVID-19**

**In this editorial we assess the technology trends highlighted in TechnoVision 2020 in the context of the COVID-19 pandemic. We build on a three-stage 'lifecycle', which reflects the technology journey many businesses are taking during this period, offering a roadmap to navigate the crisis.**

This model is based on our observations of real-world organizations reacting to the pandemic at the time of writing.

The cycle has started with the initial response to the first shock of the crisis, focusing on business survival and continuity. It then moves through an adjustment period to the 'new normal', which is here to stay for a considerable time to come, and which may include cost reductions and efficiencies. The third phase is about planning for renewed growth in the renaissance after the crisis, envisioning innovative business models that still seemed far-fetched and risky back in the good old days – you know, not so long ago.

Clearly, all organizations will need to establish their own priorities as they move through each stage or 'scenario', and their plans will vary widely per sector. So an organization will need to shape its own, customized roadmap that balances the corporate raison d'être with harsh practicalities.

## Technology is a driving factor

One thing is for sure: technology is the driving force behind every scenario. Where the physical world may constrain us for a considerable time in what we do where, its virtual 'digital twin' provides many alternative options – both in our personal lives and within the enterprise context.

Consequently, there are serious implications for technology in areas as basic as availability, scalability, reliability and security. Now, as ever, IT can help us achieve cost savings and efficiencies, while also being scrutinized for these itself.

## Using TechnoVision to deal with the crisis

At each stage or scenario it will take raw creativity, coupled with guiding design principles and continuous dialogue, to plot a way forward with technology. These are the qualities we seek to draw out in TechnoVision. This edition, with its focus on use-cases set within the context of the COVID-19 pandemic, is essentially a tailored technology roadmap for any organization looking to navigate the crisis.

We recommend the TechnoVision Theater as a means to brainstorm, ideate and craft 'digital stories' to address the crisis. Meanwhile, the Business Model Canvas is perfect for designing business models, both to adjust to the new normal and to envision what business could look like when the crisis is over.

Although TechnoVision is typically applied in a workshop setting, it lends itself very well to a virtual, collaborative environment. Therefore it can be applied right now, despite the current restrictions on physical contact, in a variety of ways: in a small team; by mobilizing a wider audience within the organization; in a few hours for quick brainstorming; or a one-day online workshop. Read more about the virtual options in a new, additional chapter called Applying TechnoVision.

## Three Scenarios

We recommend exploring this special edition of TechnoVision for COVID-19 through the lens of three scenarios. Each may apply at a certain moment in time to any organization, possibly in parallel:

- **Response –** Dealing with the initial impact of the crisis by ensuring business continuity and mitigating direct risk; for many organizations now a done deal, although much of it may continue to apply for a long time
- **Adjustment –** Tuning the Technology Business to the 'new normal', which may involve cost-cutting and efficiencies, and shifting to new (virtual) channels and ways of collaborating
- **Renaissance –** Preparing for the bounce-back, which will come sooner or later, including opportunities to scale up activities again and launch new, next generation products, services and even entirely reimagined business models

# TechnoVision **and COVID-19**

We have not included the fight against COVID-19 itself in our analysis. This is currently the focus of intense research and development within the life science sector, government bodies, universities and technology providers. However, the importance of technology in this endeavor is undeniable, through open data, AI algorithms, adaptive supply chains, 5G, diagnosing apps and real-time location tracking and notifications. Although companies like Capgemini are actively involved in trying to help as much as possible, in this edition of TechnoVision we are limiting our focus to the business impact of the crisis.

## Response

If nothing else, almost every business will see its existing IT infrastructure and applications landscape pushed to the very limit – unless it was already 100% online and working virtually. Moreover, employees across the world are being forced to work and collaborate from home, often on personal devices that have not been designed for the purpose. Having access to mission-critical business applications is not a given, and the risks in areas such as data privacy and cybersecurity are almost too obvious to point out. Organizations that have not been delivering their products and services exclusively online may be forced to shift quickly to digital channels as their main – or only – route to market.

**101**

The crisis has made many organizations realize – rather abruptly – that modernizing their IT landscape is long overdue. Although it might be painful, this process of fixing the basic '101' functionality may be exactly what is required. Improvements that start at the bottom are often the most important, and we can assume Maslow's 'Hierarchy of Needs' pyramid applies for a Technology Business as much as a human being.

This part of the scenario would assess the IT infrastructure on its ability to support the new workloads and workplaces in a manageable, scalable and – above anything else – secure and compliant way. Many of the core facilities of a modern, highly automated, software-driven and fully virtualized infrastructure – as in The Soft, the Hard and the Virtual – are the benchmark here.

A special emphasis should also be placed on boosting Cybersecurity immunity, as every day in the work-from-home world is a field day for hackers. There may be an immediate need to improve remote surveillance and facilities for threat detection, combined with quickly deployable cybersecurity orchestration, automation and response. To deal with the mounting complexity in this area, and the ever-more advanced methods used by hackers, AI may need to come to the rescue – as in Ops, AI Did it Again.

Equally so, rationalizing the existing applications landscape – getting rid of expensive, redundant, and outdated applications that spark no joy, as in Kondo My Portfolio – is often overdue and, in this scenario, should come first.

Then, access to key data – particularly sensitive personal data – is restricted when working from home or other non-captive locations. This may block workers from performing their duties in critical support functions. Data masking and data virtualization may come to the immediate rescue here, as part of rebalancing the entire data landscape to reflect the new, decentralized reality of having to manage Data Apart Together.

**Cost & efficiency**

Over the course of time, technology has been used to improve cost-effectiveness (the leitmotiv of TechnoVision's 2009 edition was, for obvious reasons, exactly that). And there are many opportunities in the current digital landscape as well. Clearly, making even more, real-time data available to the organization will be key to making informed, fact-driven decisions in terms of where and how to increase effectiveness.

The more thoroughly a business can be infused with data, the more power to the people there is, and the faster an impact can be achieved. More or less intelligent process automation systems have already had their business cases proven in the past few years – and there's definitely others out there.

Of course, the IT department should also apply these technology drivers to improve its own cost-effectiveness. (After all: nothing sells better than ***drinking your own champagne***.) There is also the move to the cloud and continuous, automated infrastructure delivery that probably could be accelerated, delivering quick benefits. Again, rationalizing the existing applications landscape – getting rid of expensive, redundant and outdated applications that spark no joy, as in Kondo My Portfolio – not only provides benefits in terms of simplicity and manageability, but can also deliver impressive, short-term cost savings.

# TechnoVision **and COVID-19**

## Adjustment

Working from home, collaborating and creating online, delivering services and even products through alternative digital channels… we all knew it could be done. But it has taken the COVID-19 pandemic to unleash the full power of these remote working solutions.

**Virtual consumers**

The demand for online shopping services is booming during the pandemic, with customers focusing on essential products rather than lifestyle and leisure goods. As such, many organizations find themselves in a pressure cooker to deliver more compelling and effective digital user experiences, along with the fine-tuned supply chain needed to deliver them. They will definitely need to turn to real-time analysis of social media in order to assess the impact of the pandemic on consumer behavior and preferences, and to understand the new Signature Moments that result from it.

Recent findings from the Capgemini Research Institute confirm the COVID-19 pandemic has accelerated the significance of online channels. Consumers consider online as their primary shopping channel, and this will persist into the immediate future – if not sustain indefinitely. In that digital-first environment, operational agility, flexibility and consumer engagement assume huge significance. For consumer products and retail organizations, three key consumer trends seem to have emerged:

1. **Convenience:** the appetite for online shopping and convenience will continue to accelerate post-lockdown
2. **Health and safety:** with consumers becoming more concerned about health and wellness, they will expect safer in-store and last-mile practices in a post-pandemic scenario; No Friction experiences, which leverage technology for full context-awareness – such as the use of AI-driven image recognition to support social distancing and crowd management – will be key
3. **Focus on purpose:** organizations that embody a sense of purpose and strong sustainability credentials will see greater consumer engagement; the corporate story not only becomes a story that is shared internally, but one that takes center stage externally as well

**Supply Chain Shock**

As the COVID-19 crisis spreads its footprint globally, organizations around the world are left grappling with reduced supplies of raw materials, transportation disruptions and manpower shortages. Established players in the supply chain may suddenly fall out, while other previously unknown partners could pop up. This leads to a delicate balancing act between risk and opportunity, where nothing is predictable. It is therefore critical that organizations, while responding with agility in the short term, also prepare for and take actions that ensure further resilience in the medium and long term.

In its research note, The great supply chain shock: COVID-19 response and recovery, the Capgemini Research Institute recommends short-term actions such as building visibility into the operations and vulnerabilities of suppliers and logistics partners, and strengthening cash flow management. It also advises organizations to continue to reassess customer demand, improving forecasts and aligning operations accordingly.

Much of this will depend on the availability of quality, real-time data, most likely coming from an ever-wider range of internal and external sources. In this sense, understanding and mastering the supply chain of data becomes just as important as taming the 'other', conventional supply chain. Furthermore, catering for a 'Data Apart Together' reality, where data can be exchanged between many different stakeholders – some completely unannounced or unanticipated – will be helpful. Cloud-based data stores that are easy to set up, deploy and share may prove particularly effective.

Meanwhile, organizations that find themselves under increasing pressure to safely – and transparently – transact with others in their business ecosystem may finally find a case for applying a Blockchain platform. And then, when all that data has come together, it might fall to the next generation of (AI) algorithms to detect patterns, forecast trends and recommend actions to determine how well the supply chain shock is endured.

# TechnoVision **and COVID-19**

**Working from home**

Companies rely on the scalability and elasticity of cloud and collaboration technology to enable a fluid, remote workforce. And since many of us (thanks, Suryanshu, for an interesting blog post) rapidly turned to the likes of WebEx, Skype, Slack, Teams, Zoom, Stormz, and Klaxoon to work and collaborate (or have Friday evening drinks, for that matter), it's clear the Team has now become the Canvas.

Mixed reality technology, probably involving VR or AR, can help bridge the gap between the less accessible physical world and its 'digital twin' mirror image, for example by remotely diagnosing and troubleshooting, training, designing and selling.

Moreover, the crisis is bound to recast fundamentally the relationship between leaders and employees. In the Capgemini Research Institute's research note, Virtual organizations need real leadership: COVID-19 and the virtual operating model, questions are raised that every business leader today must ask themselves. Among them are how to lead effectively in a virtual environment, how to ensure the workforce remains motivated and engaged, and how to encourage virtual collaboration and creativity.

Indeed, working in an environment that suddenly undergoes radical change can take a toll on anyone. Organizations will need to be empathetic towards their employees, and be mindful of the emotional journey they're on at this time. Simple measures such as virtual informal gatherings, and online polls to probe the sentiments of employees, can be effective ways to show they still "Feel For You".

## Renaissance

Every crisis has an end. Although it seems a distant prospect, the pandemic will eventually subside. And so, while our current Black Swan is particularly black, this shouldn't stop us from preparing for business life once it has departed.

Some organizations may simply try to restore 'business as usual' by scaling up again, reinvigorating their value chains as soon as the opportunity arises. Others will draw inspiration from the new digital ways of working they have been forced to explore. They may envision new, resilient business models – possibly AI-first, providing low- or no-contact experiences, delivered completely hands-free. They may look to fully leverage the upcoming hyper-connectivity of 5G, the agile scalability of the Blockchain, or the next generation fluid workforce.

And indeed, some organizations are planning to industrialize the bold technology solutions they improvised in response to the crisis. For example, Alibaba, already known for its appetite for innovation, introduced a "resource leasing" model to share manpower during the crisis. The company is now setting up a digital platform to enable this at scale, while integrating the model into its ongoing operations (also leveraging data analytics to categorize employee profiles, such as years of experience, specialization and matching roles).

This Renaissance scenario presents a context in which the entire TechnoVision framework – with all its trends and design principles – can be leveraged to deliver the next generation of compelling digital stories.

## Keep sharing

With this TechnoVision special edition, we realize we are only capturing a moment in time. In the weeks and months ahead much will be learned, and many best practices revealed. As TechnoVision is a living, breathing framework, we aim to extend it with a continuous flow of new digital stories and use-cases that illustrate how technology is being used to deal with COVID-19. Stay tuned to your favorite social media platform to keep track of this activity. We're most happy to share, and invite you to share, too. After all, we're in this together.

Simplify
**Technology.**
**Business. Simplified.**

# Simplify
# Technology. Business. Simplified.

**When we started working on the new, 12th edition of TechnoVision – building on a dense network of expert colleagues, industry partners and client contacts – we were once again fascinated by the pace at which technology is evolving. The fleetingness of technology trends is such that what was a disruptive, digital driver just a few years ago, could now already be the new legacy.**

For that matter, words such as "disruptive" and "digital" just don't seem to shine the way they used to. The business and societal landscapes are so swarmed by black swans, that unpredictability and extreme volatility are a given, not something remarkable. Also, digital technology is now intimately entwined with business change, to the extent that "Digital Transformation" has become a pleonasm. As a consequence, we propose to call a business that has achieved symbiosis with technology, simply, a Technology Business.

With business so perfectly infused with technology, the quest for *simplicity* becomes paramount.

## Simplicity is needed

Simplicity is needed to handle the surge of data and events, coming from an exploding number of internal and external sources. Simplicity is needed to deal with the broadest variety of technology solutions and delivery paths we have ever seen. Simplicity is needed to deal with the eminently complex, highly interconnected and volatile business models of original economic, political and sociocultural landscapes. And above all, it is simplicity that consumers want. As they get used to tweets ruling the world, they expect simple messages, instant action, zero friction and a continuous stream of exciting and rewarding signature moments.

Any technology moves towards simplification over time, not necessarily in their inner mechanisms, but in the way they manifest themselves.

This doesn't solely apply to technology, but to products, services and even business models as well. The final state of innovation, the ultimate simplification is that technology becomes invisible. It simply disappears. In fact, this very evolution for infrastructure was predicted twelve years ago, with the creation of TechnoVision's container title, 'Invisible Infostructure'. There have also been numerous 'No' trends in many TechnoVision releases for the very same reason; No Process, No Keyboard, No Work, No App Apps...

## A 'Leitmotiv' for Technology Business

Organizations converge upon the interdependence between digital technology and business. The relationship is so deeply entwined. Businesses are fast becoming Technology Businesses; organizations that live and breathe technology, where technology is as inseparable from business life as a Dæmon is from its human self (thanks for that analogy, Mr. Pullman). But to achieve this, technology needs be accessible, easy-to-use and seamless in its engagement, whilst navigating around countless complexities.

The overarching theme – or leitmotiv – is simplification.

So, from infrastructure and containers to robots and collaborative technologies, let TechnoVision 2020 take you on a journey to simplification.

## Infrastructure, where art thou?

No other area in technology illustrates the quest for simplicity more than IT infrastructure. The retail-style catalog of available infrastructure services, made popular by Amazon Web Services, is now the benchmark for industry providers and internal IT departments alike. Serverless computing eradicates the very idea of infrastructure services, demonstrating just how imperceptible infrastructure can be.

Yet simplicity brings its own challenges. Specialized suppliers can provide an element of simplicity to an organization, but at the cost of becoming dependent upon them. Being overly dependent on specialized suppliers may be unacceptable to some organizations, but so is the cost of building one's own capabilities. Open industry standards may well be the most effective way to benefit from simplified infrastructure services. From virtual machines and cloud deployment to containers and serverless computing, a multitude of examples exist to simplify and democratize access to powerful and complex resources, without dependence.

# Simplify
# Technology. Business. Simplified.

## Unchain my app

Ahh the app. Still the primary means to deliver information or make something do something for us, but they are certainly starting to move away from center stage. Bot is the new app. Simple chat systems and voice assistants form a front- end, seamless interaction with the user, never exposing an application service, let alone a complex navigation menu. Powerful No and Low Code tools enable a Technology Business to quickly build these application services anywhere in the organization, with a bot and voice assistant cherry-on- top. No app harmed.

Needless to say, the more established applications are still out there – albeit as white elephants, eating too much and delivering little value. There is nothing like the breath of fresh air that comes from a successful application rationalization to highlight the virtues of simplification, which consolidates and de-customizes applications, decommissioning the redundant ones.

To thrive, a Technology Business can only be built on a foundation of tidy, well-organized and secure application services, offering security, privacy, responsibility and ethical balance. An equilibrium between the simple and complex, between the individual and the enterprise.

## Well, hello data

If Technology Business is the car, then data becomes the fuel (or electricity). Coming from many different sources and in various formats, data can make any business moment ignite. Activated data can create magically simple business experiences. An AI algorithm can see right through a fraudulent network of financial transactions, predict supply chain outages, or determine the credit risk of a new client in microseconds. It can know we are bored before we even know it ourselves. Data becomes understandable, prescriptive and actionable.

Unlimited access to all that oozing data goodness throughout the organization is key for any Technology Businesses. AI to the rescue! It can find the right data, integrate it fluently and keep it all aligned – even if the business isn't centralized itself. But as Aristotle once eloquently noted, "the whole is greater than the sum of its parts" and this is true if there is 'good' data to begin with. Furthermore, whilst it is perfectly feasible to have a computer that says, "no", "42" or "tomorrow", such simplicity can only be gained with trust, transparency and a demonstrable understanding of how the data has been used to come up with such a verdict. Data holds the power to ignite, use it wisely.

## Pretty fly for a process guy

Isn't it ironic? In such a short space of time, Robotic Process Automation (fondly known as RPA) has completely redefined the notion of 'automation', thus proving its own – very efficient - point. Not so long ago, automation was perceived as the use of technology to aid or replace human work. Now 'human work' is a seamless interaction of a person with a screen and multiple applications, becoming the all-new target for automation.

RPA is surely a great thing when it brings automation to mundane, repetitive and error-prone tasks – never a place for lively career ambition. But what is next for all the office workers who have been glued (voluntarily or not) to their screens for years, when they are replaced by software? Even more so when we consider the potential impact of intelligent process automation and the touchless processes that bring the same cognitive capabilities we once thought were unique only to humans – until now. For businesses that increasingly run on processes that take care of themselves, there is a clear need to develop **Emotional Intelligence: the Technology Business EQ**.

# Simplify
# Technology. Business. Simplified.

## Was that even an experience?

We need to admit it, as consumers today we have limited attention spans. We are accustomed to swift, seamless experiences wherever we go and whatever we do. The ultimate user experience is the pinnacle of technology- enabled simplicity as it wraps itself around us in a cuddly warm blanket, adapting to our expectations, needs and behaviors.

It becomes almost psychic in its ability to anticipate what we want, when we want it, whether it be news honed to our interests, or coffee delivered to us right on time.

Bots, voice assistants and software avatars – with the aid of good ol' AI – only need a breath (or a thought) to get a job done using technology. But can these 'no experiences' make life too simple? As we turn to Twitter for our main news source, or Netflix recommendations as our only TV guide, a 'default bias' is not so far away, locking us into a comfortable bubble of 'what always has been' and therefore becoming 'what will more than likely be' tomorrow. The antidote? A proper dose of serendipity to happily discover in a coincidental and unplanned manner. Have fun experiencing.

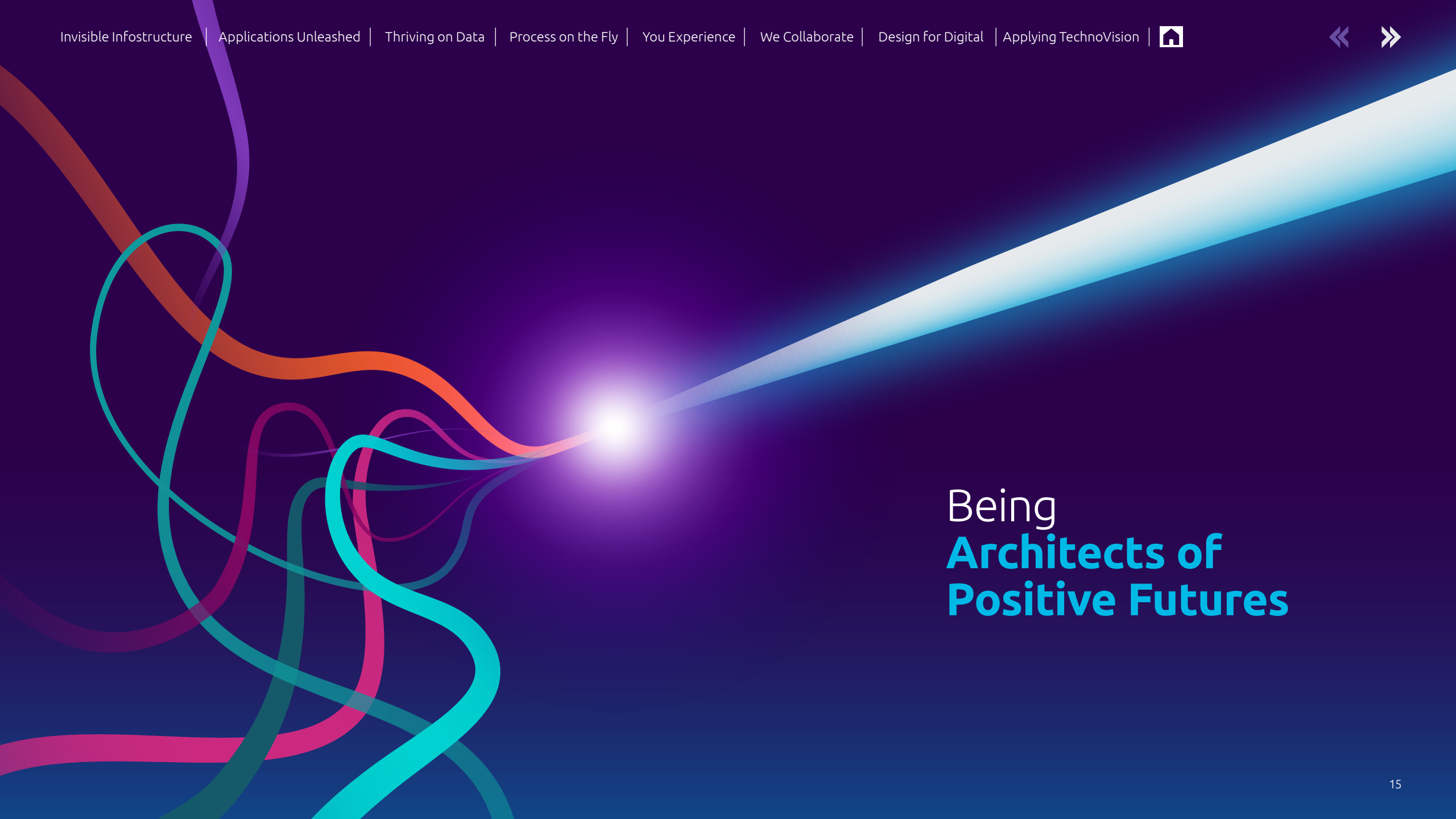
## In it together

Unique as we may be, we can only express ourselves when we connect with others. After all, a sound is not a sound unless someone is there to experience it. Technology makes it so much easier to connect, create networks, work collaboratively and co-create. As individuals, consumers and citizens, we are part of a dense social network - a worldwide pulse that resonates in real-time. Whatever the subject, we effortlessly tap into the collective knowledge and brainpower of ever-evolving communities.

For business, 'pluggable' enterprises connect in the blink of an eye, seizing opportunities and adapting to new circumstances as they arise. AI systems jump into the mix, working together with humans (or with other AI systems, or even with both) to create anything from business models and services, to new products, and even art. Connections appear and disappear quickly. Information is seemingly created out of nowhere. The challenge for organizations is to find out what is still real, what deserves trust and what partnerships still mean, from both a business and consumer standpoint. Ultimately, it is about fulfilling the corporate purpose – and we can happily conclude – there won't be a case of 'No Purpose' anytime soon.

We know technology isn't simple, but it is through its simplification when we find a true Technology Business. The heart of TechnoVision 2020. Simple.

*We know technology isn't simple, but it is through its simplification when we find a true Technology Business. The heart of TechnoVision 2020. Simple.*



# Being **Architects of Positive Futures**

# Being
# Architects of Positive Futures

Paving the way for positive futures with a responsible technology approach

## We're living and working through unprecedented times

During these unprecedented times, we acknowledge that we cannot model the future with certainty. Prepare ourselves and our organizations to stay connected and respond rapidly are critical. The pandemic has accelerated the process of digital transformation across almost all sectors. The ability to leverage digital tools and technology has become an imperative to survive the ongoing crisis. Now, more than ever, Digital inclusion and technology for good, along with shared value creation are among those factors that companies should integrate within their business model to enhance their competitiveness.

## Technology and innovation for positive futures

As is yet again evident from this TechnoVision edition, innovation and new technologies are enablers for business and drivers of a company's competitiveness. The pandemic has highlighted the tremendous potential of these technologies applied to society.

An app supporting the Public Assistance-Hospitals of Paris - France (AP-HP) by allowing remote monitoring of patients with or suspected of having Covid-19; a Cybersecurity coalition in the Netherlands - Wij Helpen Ziekenhuizen ("We Help Hospitals") to ensure the continuity of the health sector and its care provision during these challenging times; Digital platforms "The Innovator's Response" or "Keep Small Strong" in America to help small businesses; AI and face recognition technology to find missing children in India, a solution using big data and machine learning helping farmers better plan their harvesting seasons as per changing climate patterns in the Africa, are all examples of cutting-edge technologies delivering positive social impact.

Nevertheless, these powerful technological advances could have unintended consequences, accelerating risks to society, excluding a large section of the population who don't have access to digital. The COVID-19 crisis has also rightly highlighted the need of giving the most vulnerable populations access to the vital skills and equipment to reach much needed services like food supplies. We must not ignore this challenge and we all must play our part in adopting a responsible approach to ensure that technology and innovation drive sustainable and social development for all.

## For a responsible technology approach

Today, in particular for the IT industry, being a leading responsible company is more crucial than ever. We must focus on bridging the digital divide and preparing the youth of today to be ready for the jobs and opportunities of tomorrow. For example, Capgemini and WWF India created a new digital platform, One Planet Academy, to provide environment-related education, with the aim of integrating sustainability in lifestyles from an early age. Long term sustainability is all about redefining business models to ensure that technology creates value for business, people and our planet. That said, how do we embrace smart technologies and, at the same time, ensure the opportunity is not limited to only a few? To drive positive change, business leaders can pave the way for this by adopting a few key principles – more or less to be seen as a responsible annex to TechnoVision's 'Design for Digital' principles.

# Being
# Architects of Positive Futures

Paving the way for positive futures with a responsible technology approach

**Shobha Meera**
*Chief CSR officer of Capgemini Group*

## 1. Think inclusion: technology as an opportunity for all

Are your technology and innovative solutions accessible and useable by all? Do you make the most of the power and benefit offered by your solution in the long term? Does your approach maximize the positive impacts whilst mitigating unintended consequences? These are the questions we should think about when we are designing a solution to make a tangible difference.

## 2. Design responsible solutions: innovation is sustainability

Innovation and sustainability are inextricably linked; we need to determine the type of future we want to have and then create relevant technologies, which will help us achieve the same. Just as Sogeti is working to save Sweden's forests through the application of AI, we have the ability to make the most of these technologies such as data or artificial intelligence, while reinforcing digital human rights. As technology changes our society, there are new concerns that people designing, making or commissioning technology need to keep in mind - privacy, security and ethics.

## 3. Mitigate unintended consequences: create trust in a smart world

The digital revolution and automation have ripple effects, which we cannot afford to ignore. Our responsibility is to take it into consideration and to prevent any societal risks. The following three pillars have to be addressed when you create change through digital:

- **Diversity:** The lack of diversity in the workplace impacts the solutions and services we are selling. Adopting an active inclusion strategy is critical for a responsible, inclusive technology strategy and for the competitiveness of a company.
- **Digital inclusion:** The changing nature of work with the digital revolution and automation impacts existing roles and requires upskilling and reskilling of people in digital. At the same time, bridging the digital divide and supporting digitally excluded people is fundamental.

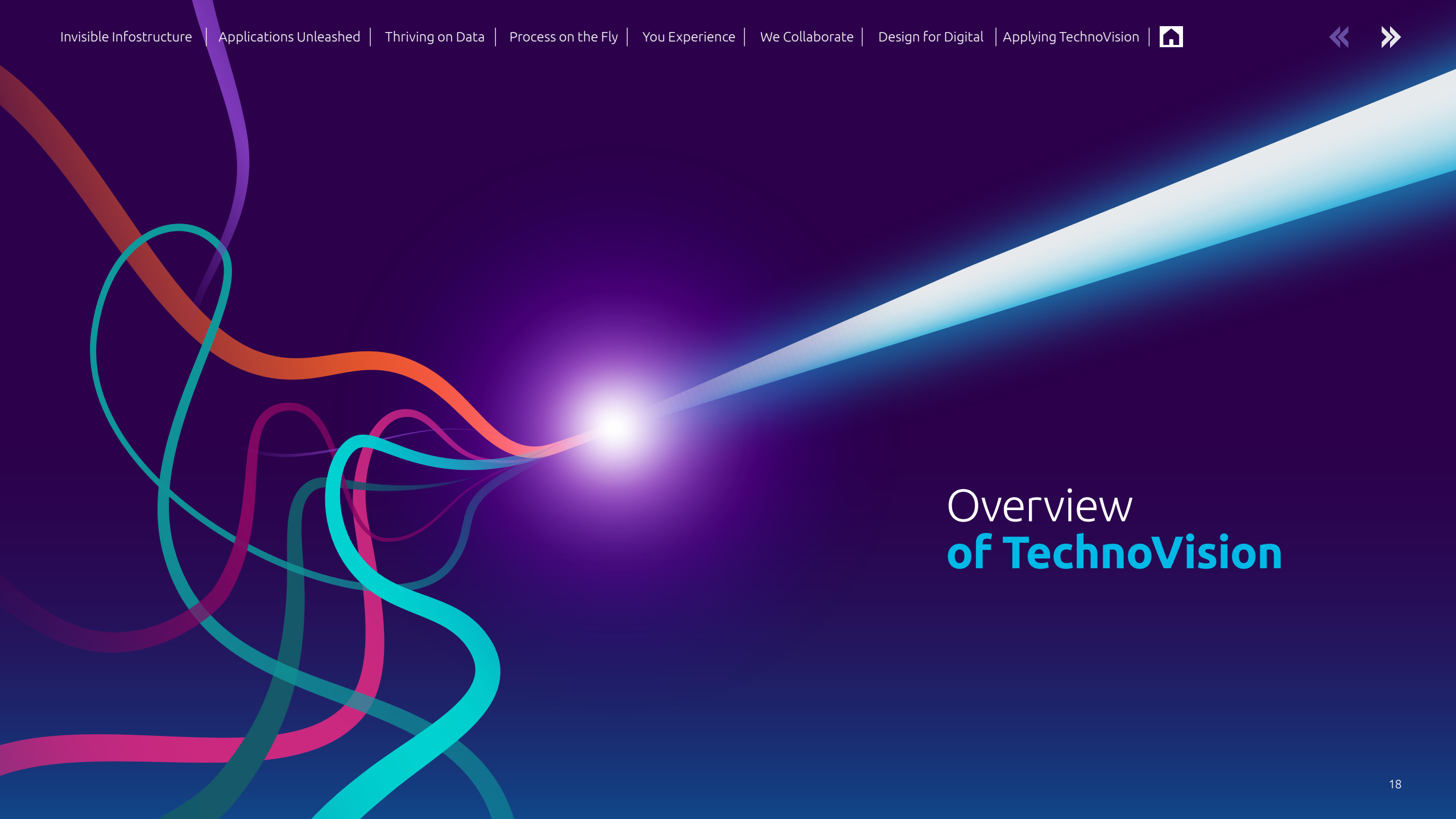
  To close the digital divide, Capgemini is implementing multiple digital literacy initiatives and expanding our Digital Academies program, a global network of learning institutions that help disadvantaged groups and those excluded from the job market to acquire digital skills.
- **Environmental sustainability:** High energy use of data centers, travel, energy, waste and water must be minimized and monitored. A proud sponsor of the World Climate Summit 2019, Capgemini has taken their stance on sustainability very seriously, launching Invent for Society; a vision for three ecosystems with the potential to contribute to sustainability, tackling global climate change into the next decade and beyond. We have an opportunity to demonstrate how technology and business can deliver a positive societal impact.

## 4. Commit to a better future: build strategic partnerships

Together, leading companies have the responsibility to bring about positive futures. Strategic partnerships with the sustainability ecosystem are a way to explore, share and highlight how technology can be a force for good. This engagement also needs to be embodied by a strong public commitment, notably by contributing to the UN's Sustainable Development Goals (SDGs).

While there is much uncertainty ahead for the world in the coming months, there are two things of which we can be sure: (a) Things will never be the same as societies and economies reshape themselves in the post-COVID world; and (b) Capgemini, powered by the passion and social conscience of our people, will accelerate the application of its technology, data and creative expertise to address some of society's biggest challenges and deliver social impact at scale.

I believe that, as a global company, we are in a position to purposefully apply our technology expertise and passion where it is most needed to truly make the world a better place.



# Overview **of TechnoVision**

# Overview of TechnoVision

## TechnoVision categorizes technology drivers into six containers that cover the "what" of Technology Business trends.

Two core containers cover trends in the foundational building areas of infrastructure, Invisible Infostructure and Applications Unleashed. Two more form the spine of any innovative IT household, Thriving on Data for leveraging data and Process on the Fly to leverage processes. The final two containers cover channels to the outside, connected world, You Experience for creating seamless, individualized user experiences, and We Collaborate to tap into the power of social connectivity.

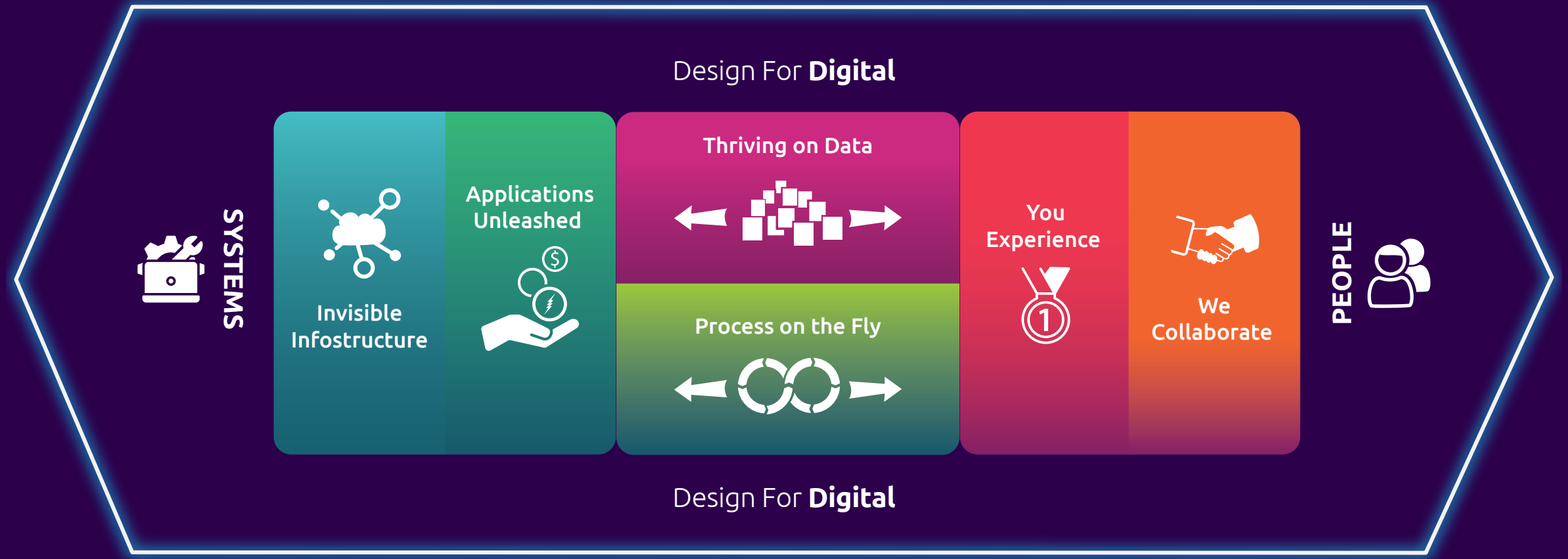
There is one final container of overarching design principles (the "how") that should be kept as part of a mindset – and a powerful checklist to apply - throughout the journey towards becoming a Technology Business: Design for Digital.

The 37 building blocks are all described through one-page summaries, designed to be crisp and to-the-point on the one hand – after all, this is the era of limited attention span – yet appetizing enough for further study through its links and case stories. As always, the authors have tried to make the building blocks more accessible, playful and memorable by the abundant use of references to rock, pop, movies and other cultural and societal phenomena. The reader is invited to try to find as many of these 'Easter eggs' as possible. It should not be ruled out however, that millennials and their 'OK, boomer' colleagues - blessed as they are with quite different frames of reference – may find completely different triggers.

Each building block contains an elevator pitch to briefly describe the trend. Then comes the "what" (a slightly more elaborate description), the "use" (actual use cases), the "impact" (potential business effect of the trend) and "tech" (links to leading technology solutions and other relevant information).

The seven Design for Digital principles are also introduced through an elevator pitch, but then shaped into something much more tangible. A 'Principle' provides a definitive action with an anticipated consequence, describing what we are striving to achieve. The 'Checklist' then follows with a series of actionable objectives before 'KPIs' (Key Principle Indicators) propose the way you track the principle in business.

If you still possess an unabated appetite for more, the TechnoVision Expert Connect community caters for a variety of detailed posts and articles that dive deeper into any of your favorite 37 building blocks. Also, if you happen to run into the colorful TechnoVision cardboard boxes, you will find a QR scan code on each block that will bring you directly to the relevant materials.


Design For **Digital**
SYSTEMS
Invisible Infostructure
Applications Unleashed
Thriving on Data
Process on the Fly
You Experience
We Collaborate
PEOPLE
Design For **Digital**

# Overview of TechnoVision

## Here are the TechnoVision 2020 Technology Business trends:

### Invisible Infostructure

Evolving the IT Infrastructure into the simple, pluggable utility it was always supposed to be.

- The Soft, the Hard and the Virtual
- Crouching Tiger, Hidden Container
- Simply the Edge
- Ops, AI did it Again
- Ceci n'est pas une Infrastructure

### Applications Unleashed

Liberating the legacy application landscape and unleashing the next generation of powerful, agile, cloud-based apps.

- Kondo My Portfolio
- Bot is the New App
- When Code Goes Low…
- API Economy
- Apps ♥ AI

### Thriving on Data

Leveraging data and algorithms as an asset to increase the "Corporate IQ".

- Crazy Data Train
- Power to the People
- Good Taimes
- Data Apart Together
- How Deep is Your Math

### Process on the Fly

Building, managing, and running processes that match the dynamics of the digital outside world.

- Processes 101
- Rock, Robot Rock
- Can't Touch This
- Pleased to Meet You, Process
- Augmented Me

### You Experience

Creating seamless user experiences for decisive, magical moments.

- Signature Moments
- Reality Bytes
- Own Private Avatar
- I Feel for You
- No Friction

### We Collaborate

Tapping into the power of the connected and collaborative "everything".

- The Team is the Canvas
- Fluid Workforce
- New Chain on the Block
- Use the 5G Force, Luke
- Creative Machine

### Design for Digital

Overarching design principles to be followed and checked throughout the journey of becoming a Technology Business.

- Simply Speed
- Open for Business
- Joined at the Hip
- Trust Thrust
- IQ Up, EQ Up
- What's our Story?
- No Hands on Deck

# Invisible Infostructure

# Invisible **Infostructure**

**Luis Delabarre**
*Expert in Residence*

**The infrastructure part of the IT landscape is a crucial foundation for any organization with business technology ambitions. Although increasingly invisible to the naked eye, it needs to provide fast, secure, agile and cost-effective access to any data or application service. It simply needs to be delivered anywhere, whether on or off premise, through the cloud or not. And it needs to tap in into a highly connected, always expanding network of people, organizations and things – clearly illustrating why "infostructure" is not a spelling mistake.**

The future of infrastructure – like so many final innovation destinies – is to become truly invisible. This means that we can consume infrastructure right from the catalog; we can use pre-defined services and workloads that support us like a truly hassle-free and Lego-style utility, satisfying current and future technology business objectives. Combine it with the incredible richness of data – increasingly through sensors, mobile devices and lots of "things" – and you start to get both the "invisible" and "infostructure" parts of the equation.

The key to an invisible infrastructure is keeping to an "as a service" principle, that covers both the more traditional, as well as cloud-native deployment scenarios. It's a matter of extending and enhancing existing infrastructure-related capabilities to define, design and build an infrastructure services catalog. This catalog should be suitable to be delivered through a genuine retail-level experience, fit to be consumed by any organizational unit.

This means that any consumer (not just a specialized infrastructure engineer) will be able to create, use, move, expand, contract and delete compute, network and storage capability.

An Invisible Infostructure platform is fully software-driven; the control of the infostructure is fully secure, automated and orchestrated by software. Any hardware configuration, storage provisioning and network configuration is managed through software. Therefore, there is no need to be exposed to complexity anymore, as abstraction and automation will allow for a simpler way of consuming infostructure capabilities, regardless of where it resides.

When you look inside your new Invisible Infostructure, you're bound to find a well-tuned world of containers, virtual machines, cybersecurity bots, storage, networks and clouds that are being orchestrated and automated along a secure and continuous pipeline of changes. It delivers the speed, availability and reliability needed by technology business in a responsible, secure and environmentally friendly way.

And as we enter the era of "serverless" solutions that do not seem to require any infrastructure at all, the "invisible" part of this cluster becomes very real.

# The Soft, the Hard and the Virtual

**Nicola Popov**
*Expert in Residence*

## Infrastructure turns virtual, software-driven and automated, delivered as easy-to-consume services

**What do you do in an intense standoff with IT infrastructure that gets more complicated and unmanageable by the day - while it's trying to steal all your money? Well, send in the cavalry. Virtualization is key to standardize, hide complexity and render deployment invisible. Software transforms hardware and everything else infrastructure-related into flexible, editable code. Automation weaves it all together, bypassing tedious, replicable and error-prone human activities, delivering infrastructure services in an instant. Together, they make the unbeatable foundation for a business that moves even faster than its shadow.**

### What

- Infrastructure is categorized as a utility-based capability, where compute, network, storage and security features are easily contracted, used, modified and deleted without manual intervention or exposure to technical details.
- Virtualizing infrastructure capabilities is a de facto approach, optimizing the use of available resources as well as the benefits from various cloud deployment options, including compute, network and storage.
- Open industry standards enable a portable, transferable definition of infrastructure services and components, not only within the industry, but also between businesses and service and platform providers.
- Declarative platforms are based on 'soft-coding' components rather than point-to-point configuration and integration of actual hardware. Combined with API, infrastructure is truly programmable.
- Orchestration and automation tools enable repetitive infrastructure component tasks to be executed time and again using managed and monitored scripts, without risk of human error.

### Use

- A leading US cruise line uses a library of declarative infrastructure modules, enabling the speedy creation of new platforms, reducing build time by up to 90% and significantly decreasing risk by limiting manual elements.
- Working with VMware to modernize its data center architecture to reduce cost and increase adaptability, SBI uses one of India's most robust private clouds supporting worldwide operations of 25-thousand branches, over 250-thousand employees and more than 50-million mobile transactions.
- Once a very traditional, complex and manual infrastructure environment; a UK-based public sector organization has moved to a fully IaaS-based one, reducing build and service times significantly.
- Replacing a legacy infrastructure that was no longer fit for purpose, the British Army partnered with VMware to deliver a software system enabling the super-speedy development and deployment of applications, coinciding with an ongoing cultural overhaul to embrace a new DevOps way of working.

### Impact

- Infrastructure complexity and costs are reduced, minimizing technology options and integration issues.
- Infrastructure aligns directly with business, working together to build an all-inclusive capability; combining compute, network, storage, and software for instant benefits.
- Diversity of technology and components enables a more elastic approach towards resiliency and scalability, whilst eliminating configuration drift and mitigating risk.

### Tech

- Industry standards:
  OpenFlow, Cisco Opflex, OpenStack, OpenShift
- Virtualization Tools:
  Hyper-V, VMWare vSphere, Red Hat Virtualization, Citrix Hypervisor, Oracle VM Server, AWS EC2, IBM PowerVM, SuSE Linux Enterprise Server
- Container Management Platforms:
  BMC BladeLogic Server and BMC Cloud Lifecycle, IBM Tivoli Provisioning, IBM Cloud Orchestrator, Microfocus Orchestration, Microfocus Server, HPE Cloud Service, VMware vRealize, vRealize Orchestrator, Puppet, Chef, Red Hat Ansible, CloudForms
- Declarative Infrastructure Tools:
  Ansible Tower, CFEngine, Otter, Puppet, Saltstack, Terraform
- CyberSecurity related:
  Akamai Kona, Arena ITI, AWS Security Hub, Azure Information Protection, Black Duck, GCP Command Center, IBM QRadar Advisor with Watson, Symantec

# Crouching **Tiger,** Hidden **Container**

**Cornelia Görs**
*Expert in Residence*

## All the complex infrastructure an application needs to run on, nothing to see but containers

**Infrastructure can be intimidating, showing its claws through different versions of operating systems, devices, connections, configurations, files, middleware and all other foundational elements needed to run an application. What worked yesterday may be extinct tomorrow, as even the tiniest change to infrastructure can bring the mightiest application down. Enter containers; they simply package an application with exactly the infrastructure and middleware components needed into a sealed-off, air-tight, standardized box. Any cloud, server or PC will then be able to run these containers, making them the silent, martial art masters of infrastructure.**

### What

- Container Management Systems can control thousands of containers simultaneously, enabling the automated operation, management and orchestration of an extensive environment from one single control point.
- Containers provide the ability to run small to very large domains entirely autonomously, encompassing not only the operating system, but also middleware and applications.
- Running on top of an operating system, such as a VM (Virtual Machine), with minimal touch points, the container has a 'self-recycling' system, easily reverting to a previous copy should the content be mistakenly changed, modified or deleted.
- Operating systems and components (such as middleware and applications) can be maintained in a holistic and automated way, by managing the version and configuration information.
- Containers are paving the way to an invisible infostructure, to be able to orchestrate and support a microservices approach.

### Use

- A large railway company is using Kubernetes to manage its entire infrastructure platform, delivering predictive and reliable services.
- International airline, Cathay Pacific, uses a Red Hat solutions and services to transform its legacy infrastructure into a modern hybrid cloud architecture, creating a more efficient, scalable platform for new services and improving the customer experience.
- CERN Manages over 300-thousand cores of OpenStack and more than 500 Kubernetes clusters using OpenStack Magnum.
- Companies like Spotify have been applying containers to deliver agile and flexible infrastructure services with greater perceived value for money.
- PayPal migrated more than 700 applications to Docker Enterprise, running over 200-thousand containers. The company also achieved a 50% productivity increase in building, testing and deploying application.
- UK Government departments are using containers to accelerate their deployment times and reduce infrastructure complexity.

### Impact

- Large and complex environments are simplified, supercharged and accelerated through the creation of modular components to the landscape.
- 'Payload' moves seamlessly from on-site to a public cloud provider – like AWS, Azure or Google – and back, without impacting end users.
- As suggested in a recent survey from The New Stack, container adoption is the most significant catalyst of orchestration adoption, paving the way to orchestration and supporting a microservices approach.

### Tech

- Industry standards:
  OpenStack, OpenShift
- Container and platform technologies:
  Docker software containers, AWS Lambda, Mesosphere DC/OS, Nginx
- Orchestration Platforms:
  BMC BladeLogic Server Automation and BMC Cloud Lifecycle Management, IBM Tivoli Provisioning Manager and IBM Cloud Orchestrator, HPE Operations Orchestration (now Microfocus), HPE Server Automation, and HPE Cloud Service Automation, VMware vRealize Automation and vRealize Orchestrator, Puppet, Chef, Red Hat Ansible and CloudForms
- Container Management Platforms:
  Kubernetes, OpenShift

# Simply **the Edge**

**Bernd Wachter**
*Expert in Residence*

## 5G and The Fog expand the edges of IT infrastructure further into the real world, making the digital twins of 'things' more realistic and smarter than ever

**5G and fog computing are pushing storage, processing and connectivity power deeper into the physical world and further away from corporate data centers. With potentially every 'thing' at the edge of infrastructure in connected real-time to the network, the vision of digital twins evolves. They become even more precise, trustworthy models of their physical equivalents. Add (artificial) intelligence, and they turn out to be much 'smarter' than their real-life twins. This brings radically different perspectives on how to orchestrate and manage so many more physical assets – and the data it generates - as part of the IT infrastructure. But once the edge is unleashed, it's better than all the rest.**

### What

- The internet of things (IoT) brings a rich infrastructure that connects physical assets to IT systems, often in real time, enabling the assets to be built in virtual models reflecting their current situation, whilst also leveraging AI to predict their future state and drive their interactions with other assets.
- Digital twins pop up in all major industries, but more notably in manufacturing, where the Industry 4.0 initiative envisions the merge of operational technology and information technology.
- Producers of physical assets look to create software and AI platforms, to model and develop using digital twins.
- 5G, fog and edge computing are pushing the speed envelope, allowing for data transaction close to where the end user sits.

### Use

- GE Aviation created a real-time dissemination and integration of digital twin configuration data in their Configure Data Exchange, enabling the exchange of essential operations, maintenance, environmental and event information.
- Auckland, New Zealand increases its 'Smart City' IQ by using sensors in streetlights to monitor traffic flow and easing congestion by analyzing data collected.
- Equinor builds digital twins for four of its oil field projects allowing for a virtual, real-time representation of the physical installations.
- To tackle the problem of lost sales due to out of stock products, US-based grocery chain, Giant Eagle deployed smart shelves in its stores to reduce stock replenishment time by two-thirds and cut the number of out of stocks on any given day by 50%.
- India's largest airline, IndiGo has deployed a Fortinet Secure software-defined wide-area network (SD-WAN) solution across its branch offices to secure its WAN edge.
- UK leading auto parts distributor, Andrew Page used telematics to reduce speeding by 97%, with a 47% reduction in crashes, and a circa 7% improvement in fuel economy and reduced maintenance costs. (Capgemini Research Institute)

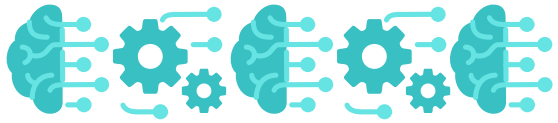
### Impact

- Optimizing the management and servicing of physical assets through predictive analytics has many advantages, for example, to improve business processes and activities that could benefit from a real-time connection to physical assets, for route optimization, or for customer experience.
- It adds value to physical products through the provision of usage analytics to customers.
- Creates new business models through the monetization of the IoT and develop a fully immersive experience through a blend of augmented and virtual reality.

### Tech

- IoT, 5G and digital twin platforms:
  GE Predix for the Industrial Internet, IBM Watson IoT, Microsoft Azure IoT Suite, C3 IoT Platform, AWS IoT Core, SAP Cloud Platform for the IoT, ThingWorx IIoT, AWS IoT Greengrass, Cisco Jasper, GE Predix, ptc ThingWorx
  Capgemini 5G Research paper, OpenFog
- Open standards:
  Open Connectivity Foundation, The Open Group IoT Work Group
- IoT marketplaces and communities:
  IoT Consortium, IoT Talent Consortium

# OPS, AI Did it Again



**Marc Bauer**
*Expert in Residence*

## AI comes to the rescue of complex IT operations, improving step-by-step efficiency and reliability while it learns, on its way to full autonomy

**So many systems, services, devices and applications swarming around in an enterprise IT operations landscape. So much data available in real-time about how they perform, succeed and fail. It's the perfect playground for AI to get a grip on the complexity, by learning from IT operations data to provide improvement. First by giving better insight into the performance of operations and by real-time detection of disturbances. Then - through predictive analytics - by anticipating these disturbances, so that timely measures can be taken. Finally - when it has found even the most complex, hidden patterns - by autonomously optimizing IT operations. Oops, is that infrastructure simply taking care of itself?**

### What

- AI for IT Operations (AIOps) – also sometimes referred to as Algorithmic IT Operations – aims to collect and analyze IT operations data, often in real-time, in order to continuously fix and improve IT operations' performance.
- Data to drive AIOps can be ingested from multiple and diverse sources including; logfiles, IT operations management platforms, problem ticket data, connected devices, 'wire' network traffic data and event monitoring / alert systems.
- In a way, AIOps may be considered as applying and extending the principles of continuous integration and delivery (CI/CD), and DevOps to the core functions of IT operations.
- AI / machine learning and (intelligent) process automation are key approaches within AIOps, to explain and understand the current situation, predict what may happen, prescribe what needs to be done to achieve performance objectives, and eventually, have IT operations run and optimize itself in (semi) autonomous ways.

### Use

- A large global car manufacturer is using an agile and AI infused DevOps capability to accelerate one of its own key IT capabilities.
- A large European-based Postal Service applied DevOps based capabilities across all its mission critical services, reducing outages by over 50% and increasing speed by twenty times.
- Brazilian telecommunications provider, Nextel provides AIOps to monitor more than 25-thousand network elements, reducing the time to respond to network incidents from 30 minutes to less than 5 minutes.
- Cisco achieved 11 million dollars in annual savings on its incident resolution activities, through applying AIOps and automation.
- Vodafone correlates data across all its infrastructure layers - from critical business and application services to underlying IT and network components - to discover the root cause of problems and their related business impact up to three times faster.
- cyBERT is an ongoing experiment to train and optimize transformer networks, to flexibly and robustly scrutinize very large cybersecurity log files. Using AI-driven natural language processing it effectively analyzes the log files, looking for anomalies, trends and other insights.

### Impact

- As discussed in the Capgemini 2018 study, 'The automation advantage', automation can deliver:
  - 76% improved company profitability
  - 87% faster product and service delivery
  - 82% improved software development
- Clearly, many of the generic advantages of automation also pertain to IT operations, when viewed as 'just another' business activity area.
- Automate and augment routine, repeatable IT operations tasks, so that staff can focus on more strategic, value-adding activities.
- Automation and AI / machine learning tools pave the way to a full self-service infrastructure and applications management landscape.
- Infrastructure and applications management trends that may result in outages are detected and mitigated before their impact is felt.
- Better delivery of SLAs and increased customer satisfaction, e.g. through faster problem resolution and fewer outages.

### Tech

- AIOps:
  BMC AIOps, Splunk IT Ops, StackState hybrid IT, CA's Broadcom AIOps, HP InfoSight Flash AIOps, ScienceLogic SL1, Moogsoft AIOps
- Application Performance Management:
  Cisco's AppDynamics, Dynatrace, New Relic systems observation, Datadog intelligent application and service monitoring
- Integrated DevOps platforms:
  IBM DevOps, Microsoft Azure DevOps, AWS DevOps

# Ceci n'est pas une **Infrastructure**

**Thomas de Vita**
*Expert in Residence*

## Continuously build and deploy the next generation of software services, without even noticing infrastructure

**Sounds like a pipedream. But the ultimately invisible 'no' infrastructure is there. Goodbye server room, hello asset-free business. Infrastructure as code, radical automation, software containers, microservices and serverless computing are all paving the way towards retail-style consumption of infrastructure, without being bothered by complexity. With software being continuously developed and deployed on an infrastructure that automatically adjusts, IT infrastructure can finally become the powerful utility it was destined to be; always available, just unperceivable. C'est tout.**

### What

- The mix of virtualization, software-defined networking and data centers, cloud, APIs, and software containers makes IT infrastructure a commodity that can be easily orchestrated and procured from a catalog of services.
- Serverless abstracts hardware from software, allowing the build and construction of server, storage and network landscapes without the need to access or manage anything.
- Serverless is driving 'intelligence' from the hardware device (like Cisco ASR or IBM DS8000 series SAN) to a pure software layer, enabling easier access to core infrastructure capabilities.
- Evolving further into 'NoOps' computing, also known as 'Functions', microservices are developed and deployed on an elastic, cloud-based infrastructure that remains fully hidden from the developers, paid per actual use. The actual infrastructure services no longer matter.

### Use

- Startups typically rely on an event-based, architectural combination of IoT, image processing, AI-driven analytics, and social media functions. The default design mix would now consist of third-party APIs and 'serverless' computing.
- Chicago-based company, Relativity developed a solution using a serverless architecture based on Microsoft Azure, saving weeks of developmental time versus traditional methods, representing a drastic improvement in its ability to solve business-critical problems and focus developer talent where it was most needed.
- British home furnishings retailer, Dunelm embraced serverless on AWS to reduce time to market and provide a platform to encourage their teams to truly innovate.
- New Zealand renewable electricity company, Mercury used AWS Lambda and AWS Step Functions to cut customer onboarding times from 20 minutes to 30 seconds, reducing their expected costs to just $20 USD per 10-thousand orders.
- UK-based government departments are using a software defined approach to infrastructure, accelerating deployment times and increasing availability.
- Open Compute is opening all their design blueprints to use and apply, saving considerable time, effort and money.

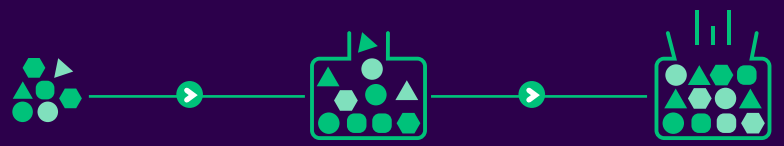
### Impact

- Serverless is reducing complexity, making it simpler to establish and construct full application environments.
- Software defined infrastructure is moving 'device logic' ever closer to the action, making it easier and faster to manage and control, paving the way to automate everything.
- Micro-segmentation is enabling a more granular security construct, increasing the security stance and enhancing Cyber Security.
- Open Compute allows re-use, saving time, energy and cost.
- Allowing for modest-to no upfront IT infrastructure investments, options are noticeably limitless.

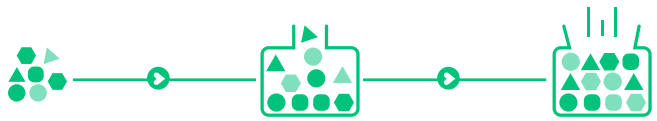
### Tech

- Open Standards:
  Open Compute Project Data Center, Open Compute Project Servers
- Software-defined infrastructure:
  VMWare's NSX (Network) and VSAN (storage), Intel's SDI
- (Hyper)Converged hardware:
  IBM, Fujitsu, Dell, Lenovo, NetApp, Cisco, Oracle, EMC
- Managed data center services:
  Mesosphere, Nutanix, Qubole
- Serverless computing:
  AWS Lambda, Google Cloud Functions, Microsoft Azure Functions, IBM Cloud Functions (based on Apache OpenWhisk)

# Applications **Unleashed**



# Applications **Unleashed**



**Gunnar Menzel**
*Expert in Residence*

**Show me your application services portfolio and I'll tell you about your company. In a world of digital realities this is truer than ever. The new reality of Technology Business demands application services to be built and delivered at high speed and in various incarnations, as close to the business as possible. And for sure, these application services no longer resemble applications as we used to know them, with even the very notion of user interfaces rapidly melting away ("Alexa, terminate my GUI" has been considered as a trend name for this edition). Although agile working through Minimum Viable Products now seems to be the established norm, the quality of applications needs to be enterprise level, as the trust balance of the organization is always at risk.**

The applications portfolio of a thriving Technology Business is much more light-weight, easy to connect to and built on the shoulders of typical cloud-native qualities. Yet, applying this new applications blueprint is far from straight forward, as existing core systems – coming from a different decade or even decades – are a reality to all but the youngest startups. To unleash the Technology Business applications blueprint, various steps should be considered:

- Existing applications need to be simplified, rationalized, consolidated and decommissioned. What may have once been differentiating solutions for organizational growth, are now all too often petrified, budget-devouring nuisances. Standard, industry best practice solutions from the cloud are a quick – though possibly disruptive – way to break the inertia. Loosely coupled layers on top of silo applications are another – through bots, APIs, Robotic Process Automation. In all cases, it needs the dedicated mind of a tidying-up guru to actually get things done.
- Existing or newly developed applications can be augmented by adding a touch of "smart" to them. AI services in areas such as vision, speech, language, knowledge, and predictive analytics are routinely available as microservices, so no need for application developers to dive into the possibly alien worlds of deep learning, neural networks, reinforcement learning and computer linguistics. Again, by adding easy-to-use, conversational interfaces – such as voice assistants and bots – on top of applications services, it makes solutions much more accessible and acceptable to users.
- New applications are rapidly built and released DevOps-style - in quick iterations by joint business and IT teams, leveraging microservices, APIs, software containers, serverless computing and radically automated, high-productivity tools. Built-in analytics, cognitive AI capabilities and smart contracts further add to both the corporate IQ and the trust balance of the enterprise.
- The unleashed application works in the most fluent, seamless way – seemingly anticipating the intentions of its users almost before they are expressed. It's not a beast to be tamed, it's the silent, reliable engine powering business technology. As simple as that.

# Kondo My **Portfolio**

**Thilo Hermann**
*Expert in Residence*

## Tidying up the applications portfolio in a systematic, decisive way to bring headroom for innovation and the next generation of powerful application services

**Getting rid of the burden of an existing legacy applications landscape will bring a breath of fresh air to any IT household. But to actually get it done, requires the mindset of a specialized tidying up guru. First of all, it's a matter of commitment, aligning the need for decluttering throughout the organization, and envisioning the benefits of a new applications portfolio. Tidying up really is about respectfully discarding applications that no longer provide value. Architecture and new platform technologies then hold the key to systematically clean up - in the right order - and move forward to the desired state; a simpler portfolio of application services, that all spark pure joy.**

### What

- Existing applications portfolios often commit large amounts of available budget, resources and capabilities, contrary to business value delivered. They may also be challenged with a substantial technical 'debt' of outdated or over-customized technology and architecture, causing liabilities for continuity and maintainability.
- Tidying up the applications landscape reduces risk and costs, as much as it increases and enables innovation. Yet in practice, few organizations can master the art of systematic application rationalization. Whilst many IT experts are taught how to build new systems, few know how to decommission them.
- There needs to be an end-to-end approach of replacing (or retiring) both traditional and mission-critical applications, including:
  - The alignment of business and IT stakeholders, including the agreement on the need for application rationalization, its financial parameters and key success indicators.
  - The selection of a new platform and definition of the migration strategy.
  - An understanding of the metrics and migration scenarios, using tools such as eAPM.
  - Speedy transformation towards a more Agile and DevOps way of working.
  - The use of highly industrialized and standardized teams to modernize a traditionally complex and extensive task.
  - The leverage of the existing treasury of data as part of the modernization.

### Use

- Automotive OEM in Germany are utilizing high performance teams from the Capgemini ADCenter in Bangalore, moving from the proprietary AppServer to Free and Open Source Software (FOSS), hosted on a private PaaS (Platform as a Service) through an incremental approach. Re-platforming and moving to FOSS resulted in a reduced time to market, from two releases a year to monthly deployments, and reducing the license and infrastructure cost by more than €500k per year.
- Joe Gribb, Head of Enterprise Advice Technology at The Vang uard Group stated that modernizing IT was one of the critical aspects in the journey to becoming Agile.
- 58% of the insurance sector's digital masters have migrated their legacy IT systems to cloud-based applications, compared to an average of 35% in non-financial services organizations. (Capgemini Research Institute)
- GE Healthcare's own 'GE Infrastructure Exchange' (GEIX) is a remotely managed OpenStack private cloud, which enabled GE to move 530 legacy apps to the cloud in under two years, delivering a 49% footprint reduction and annual savings of over €30-million.

### Impact

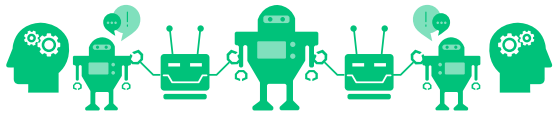
Tidying and modernizing the legacy applications landscape is a key prerequisite to becoming a Technology Business, as it leads to:

- Unification across the enterprise, enabling new business functionality and models,
- Lower cost of software development and maintenance combined with higher software quality and reduced time to market,
- Faster development and change cycles due to the slimming down and reduction in complexity of the entire application portfolio,
- Simpler operation, faster error identification and root cause analysis, due to reduced overall complexity,
- Headroom for innovation, both in terms of budget and available skills.

### Tech

- Re-platforming:
  Bluage, LzLabs Software Defined Mainframe, Capgemini eAPM, Capgemini Cloud Migration Factory
- Platforms:
  AWS, Azure, OpenShift, force.com, Mendix
- Agility:
  SAFe, LESS (Large Scale Scrum)
- DevOps:
  CP Onnovate (e.g. DevOps-PaaS, API Management), Production Line, Industrialization, Standardization and Shoring: ADCenter

# Bot is the **New App**



**Gwendolyn Graman**
*Expert in Residence*

## Providing compelling, conversational, frictionless access to application services, with the user's intentions at the core – not the application

**Say what? Every day, new and exciting applications pop up that don't look like traditional applications. Often you can't even see them at all. Building on powerful artificial intelligence (AI), it's just a matter of stating an intent in natural language and an application service will be activated. Application bots may involve spoken dialogue or messages and emoticons. Bots will seriously diminish the number of applications on desktops and mobile devices. Or at least, they will shield the user from their complex interfaces. Close your Windows – the bots are here.**

### What

- A bot, known as a web robot, robot or just bot, is a software application that performs tasks. There are many different types of bots; web bots, botnet as well as social bots and chatbots.
- More than half of internet traffic is created by web bots. By far the "biggest bots", they fetch, analyze and react to web server-based information.
- Used from any device such as the desktop, smartphone, car or a dedicated device such as Amazon's Alexa, virtual assistants apply artificial intelligence to recognize and produce natural language, acting as a front end to application services.
- Messaging apps apply technology to recognize and produce text and even emoticons, which can be integrated with existing chat platforms or built as stand-alone applications.
- Bots can provide a more natural means to automate workflows; Google Duplex can make appointments and Siri suggests workflows based on phone usage. Enterprise software providers will soon follow with similar functionality.

### Use

- During the December holiday season, Swedish retailer H&M's voice capability allowed consumers to browse their entire gift catalog and order products using voice assistants.
- The customers of German-based online retailer, OTTO can interact with their voice assistants on a range of queries, from sales to recent campaigns.
- In the UK, Marks & Spencer's website-based virtual assistant helps customers use discount codes correctly, driving a sales increase of $2.5 million.
- Bank of America's virtual assistant, Erica reached one-million users in three months, offering voice, chat, and gesture capabilities. Consumers predominantly use it to browse their spending history and obtain account balances, numbers and bill payment details.
- When one of France's largest banks, Société Générale launched their chatbot, SoBot, 80% of users expressed their satisfaction after testing it, whilst SC deputy director Bertran Cozzarolo stated it will never replace the expertise of a human advisor.
- More than one-million orders were placed through Tmall Genie (Alibaba's smart speaker) on Singles Day (11th November) 2019.

### Impact

- Over the next three years, 70% of consumers on average will replace their visits to a store, bank or dealer with voice assistants. (Capgemini Research institute)
- Bots are more popular for use in Retail Banking and Insurance, Consumer Products and Retail sectors, followed closely by the Automobile industry. (Capgemini Research institute)
- In the next two years alone, the uptake of voice technology is expected to increase by more than 15% for each key activity within the consumer retail journey. (Capgemini Research institute)
- Tally robots in Schnucks stores traverse the floors three times per day, scanning approximately 35-thousand products each time. By increasing to at least 15 stores, the Tally robots will scan over 1.5 million products in an average day, giving Schnucks more accurate, frequent and comprehensive insights into product flow and in-store operation.

### Tech

- Customer Service interaction:
  IPSoft Amelia, Capgemini Odigo, Genesys, ServiceNow
- Voice assistant platforms:
  Microsoft Cortana, Apple Siri, Amazon Alexa, Google Duplex and Assistant, Alibaba's AliGenie
- Voice assistant devices:
  Amazon Echo, Google Home, Apple HomePod, Alibaba Tmall Genie
- Text assistant platforms:
  WeChat Open Platform, Microsoft Bot Framework, Facebook Messenger Platform
- Conversational design:
  Conversational Academy

# When Code **Goes Low...**

**Desiree Fraser**
*Expert in Residence*

## Low-code and no-code platforms make building next-generation application services a high-productivity matter, for both IT and business specialists

**When code goes low, business gets on a high! You may be blessed with brilliant ideas for killer application services, but you'll need to deliver them blazingly fast and with the right quality. Classic software delivery based on manual work, complex programming languages and more mythical man months will only get you so far. It is now easier than ever to construct applications without huge coding efforts. The secret is in powerful, AI-enabled tools that leverage API catalogs, prebuilt templates and automation to the fullest extent. And these tools are so powerful - yet easy to use, that they get the popular vote of both business and IT people.**

### What

- Powerful low-code and no-code platforms are available for DIY, 'citizen' application development, although IT people may be equally enthusiastic about their productivity and ease-of-use.
- Platforms depend on the availability of robust, enterprise-scale API and web service catalogs (both internal and external), open data sets, and tested and proven template galleries.
- Sharing of best practices and collaboratively building on each other's solutions is a crucial success driver, as also evidenced by the 'Maker Culture'.
- AI will quickly assist in creating even more powerful DIY applications without any need for coding.

### Use

- An online optical products retailer chose to rapidly custom-build its entire stack of core applications with its senior managers on the low-code Mendix platform, rather than implementing a more expensive, less flexible ERP system.
- The Dutch city of Zaanstad used the Betty Blocks no-code platform to build a prototype in a matter of days, that rapidly convinced 13 surrounding municipalities of an innovative concept around youth care services, enabling them to use the same platform to easily adapt to their own, local needs.
- Individuals from all over the world routinely create and exchange 'applets' on IFTTT, based on thousands of web services that give access to the world's most popular applications and data collections.
- LANSA (a division of Idera Inc.), a provider of low-code application development platform tools, has announced their latest release of Visual LANSA.

### Impact

- Increased application development productivity, on both the business and IT sides.
- A cohesive alignment between IT and business through personally involved and committed 'citizen' application developers, and the open, digital platforms that IT supplies to help these citizens along.
- More innovative and higher-quality business-facing applications.
- Enterprise robustness combines with agile solutions.

### Tech

- High productivity development tools:
  Google App Maker, Mendix, OutSystems, Microsoft PowerApps, Salesforce Lightning Platform, Betty Blocks, Wordpress website builder, Zoho Creator, Appian, Google AppMaker, Trackvia
- Visual web service and API composers:
  If This Then That, Appian, Microsoft Flow

# API Economy

**Leon Smiers**
*Expert in Residence*

## Manage APIs as the core asset that makes both the internal organization and the outside world fully benefit from your application services – and vice versa

**May the best API win. Unleash the power of your applications portfolio through easy-to-use, standardized interfaces to application services. This will allow both the business and IT sides to quickly build flexible solutions that feel like their own, even if they are not. And by exposing your carefully managed API catalog to the outside world, it doesn't just open up your business in new ways to customers and partners, it might also give way to a platform for innovative ideas and solutions that you never envisioned yourself. Come to think of it, you may want to intimately know and use the APIs of others as well. Your digital breakthrough may be just one API away.**

### What

- An application programming interface (API) provides standardized, open access to an application service or data set, decoupled from the actual user interface of the application.
- Successful API subjects are dependent to fully understanding the consumers, the use cases and the load.
- APIs provide the building blocks for developers to compose and enrich their application, leveraging data from multiple sources. As more and more companies open their data sources using APIs, the need to build bespoke services is reduced.
- APIs can be managed as a product through API management platforms, incorporating scalability, quality, and monitoring of actual use.
- APIs can be built on top of existing applications in order to provide more flexible access; new applications typically come by default with a set of accompanying APIs.

### Use

- To maintain their competitiveness in the market, fast food companies plug into the rapidly-growing delivery services, such as Grubhub, Deliveroo and Uber Eats.
- The New Zealand Post provides a special developer resource center that enables its customers and partners to implement digital solutions by integrating their applications with the New Zealand Post's APIs.
- To change the traveling habits of Dutch commuters, the Dutch railroad exposed their ticket services to other companies, such as lease companies and tour operators, enabling them to enrich their tickets with insurance and travel advice offerings.
- Liberty Mutual recently launched a developers' portal called SolariaLabs, to create driving apps using the company's proprietary insurance data, as well as public data on auto theft, parking citations and crashes, to provide customers with recommendations on the safest driving routes and places to park in major US cities. (Capgemini Research Institute)
- Google changed is price policy for using the Google Map APIs. Developers now have to pay for usage of these APIs, turning their unique map information into a cash cow.

### Impact

- Simplification of the application portfolio, as well as better and more flexible access to existing and new application services for both business and IT.
- Monetizing and enriching application services through the publication of APIs to customers, partners and external developers.
- Leveraging external API catalogs for ready-to-use application functionality, AI capabilities and very specific IT services.

### Tech

- Dedicated API management platforms:
  Mulesoft, Dell Boomi, Microsoft Azure API Management, Oracle API Platform, WSO2, Kong, Tyk, Apigee, IBM API Connect, CA API management, AWS API Gateway
- API management open standards:
  The Open API Initiative
- API marketplaces:
  ProgrammableWeb, AWS Marketplace

# Apps ♥ AI

**Rajashree Das**
*Expert in Residence*

## Systematically infusing new and existing applications with AI capabilities, making them smarter, more effective and valuable

**AI sometimes seems to be the domain of mad data scientists and highly specialized, secretly initiated experts. But actually - through simple APIs and webservices - every application can benefit from touches of smart, without any of the black magic involved. Go through the applications portfolio, step-by-step, to find the application moments that would profit the most from added AI capabilities such as image recognition, natural language understanding, automated decisions, predictive analytics and recommendations. Use benefits logic to prioritize the cases and leverage a catalog of ready-to-implement AI services. Application users will love all that extra intelligence.**

### What

- Many AI and cognitive capabilities can be easily accessed through web services and APIs, including; image and voice recognition, intelligent automation, natural language processing and understanding, conversational systems (bots), plus predictive and prescriptive analytics.
- Often, these capabilities come with pre-trained models, eradicating the need to acquire training data and build algorithmic models.
- Instead of building AI and analytical solutions from scratch to leverage these capabilities, existing applications (whether 'classic' or mobile) can be augmented with them; this relates to both the applications that are already in use, as well as applications that still need to be delivered.
- Applications become 'smarter', creating more value for users with enhanced performance and speed.
- To effectively incorporate AI, the new and existing applications portfolio needs to be systematically reviewed to find the best opportunities for added value, whilst considering the benefits.
- Metrics-based portfolio management tools such as eAPM can enable creating this 'Apps ♥ AI' shortlist.

### Use

- Google added Smart Compose to its Gmail applications, using natural language processing capabilities to assist in effectively writing e-mails.
- Microsoft's Anomaly Detector embeds anomaly detection into apps, to quickly identify potential problems, select the best-fitting detection model and ensure accuracy.
- Big Fish Games adds Microsoft's Content Moderator capabilities to its games, ensuring proper profile and dialogue content to provide a positive player experience.
- IBM Watson Tone Analyzer can be added to customer service applications, responding to customers appropriately and at scale, detecting if they are satisfied or frustrated.
- The restaurant chain, Subway uses Amazon Personalize to deliver personalized recommendations for ingredients and flavors to guests using the Subway app.
- Google's Cloud Vision Product Search can be added to any commercial website, allowing users to upload an image of what they want, for it to match products in their catalog.
- Tesco and French retailer, Monoprix are leveraging conversational commerce systems such as Alexa and Google Home together with machine learning capabilities. (Capgemini Research Institute)
- An insurance company added a cognitive application to 'understand' information from thousands of news feeds to reduce time in analytics, resulting in a reduction in risk assessment time by 70%, whilst reducing cost to serve individual claims.

### Impact

- Extend the life span of existing applications by adding high-value functionality.
- Increase effectiveness and productivity of applications and automate manual activities that originally required cognitive capabilities previously considered unique to humans.
- Equip the larger population of software developers with a toolset to build powerful cognitive capabilities, without the need for a deep background in data science and analytics.
- Create a more compelling, personalized user experience in both business and consumer-oriented applications and mobile apps.

### Tech

- Toolkits and platforms:
  Microsoft Cognitive Services, IBM Watson APIs, AWS AI Services, Pega Real-Time AI, Rainbird, Google Cloud AI Building Blocks
- Bots:
  Azure Bot Service, Siri, Cortana, Google Assistant, Alexa, ELSA Speak, Socratic, Fyle, DataBot, Hound, Youper, Robin

# Thriving on Data

# Thriving **on Data**

**Ron Tolido**
*Expert in Residence*

**The corporate IQ depends on data, as does the very purpose of many companies that have already declared themselves on a journey to become "data-driven". In order to thrive on data, data needs to be managed as a key corporate asset above anything else –with the same passion as with any other asset in the organization. Then, sources and outlets of data need to be mastered, as they are the essential powerlines to any organization energized by data. In any case, data means perfectly nothing, unless it is activated for business through algorithms, insights, decision support and intelligent automation. And as there are no clear separations anymore between consumers and providers of data in a Technology Business organization, many may need to up their game and become a bit of a data scientist and data engineer. Finally, the raw potential of data needs to be carefully handled, as it may have many good and bad sources and equally, many good and bad ways to activate it.**

Technology innovations from the open-source community have created what the entire world has come to know as 'Big Data', already an almost archaic name for a common set of technological capabilities to ingest, store, access and analyze data from many different sources, in all sorts of different formats with all sorts of different timings.

With that technology playing field now firmly established, it has triggered enterprises to realize data may be at the very heart of their Technology Business ambitions, not seldomly leading to becoming a self-declared 'data-driven' company. So, it becomes crucial to understand where data comes from; not only from internal but also external sources, and maybe even as synthetic, generated datasets.

In Technology Business organizations, the best insights are created in the closest proximity to the business and to do that, data must be discovered, prepared, analyzed, and visualized right there – and nowhere else. Unfortunately skills are rare, and secure, high-quality access to the right data is far from a given. Both AI and automation, together with powerful, high-productivity self-service tools come to the rescue, making potentially everybody within the organization more data-savvy.

In order to actually activate data and bring it to life within a Technology Business organization - it's all about data science and next-generation algorithms too. An eclectic catalog of high-performance analytics is destined to be a key component, whether it's built inhouse or mindfully acquired from elsewhere. New, sometimes highly unconventional, AI ways of creating insights from data (such as deep learning and reinforcement learning) open unexplored opportunities for tackling challenges or innovating radically.

The explosive nature of data makes it highly compelling for an organization to work with, but it can be equally devastating when it is not trustworthy or used in the wrong way. Hence, Thriving on 'good' Data is at the bottom of Maslow's pyramid for Technology Businesses, and Thriving on Data 'for good' is at the very top, where the organization is activating data to fulfill its purpose in society.

# Crazy Data Train

**Anne-Laure Thieullent**
*Expert in Residence*

## If data is the corporate asset, treat it as such - by deeply understanding its sources and mastering all ways of the enterprise to leverage it

**With enterprises jumping on the bandwagon of data being the corporate gold, it's more crucial than ever to understand where it comes from; not only from internal, but also from external and maybe even as synthetic, generated datasets. This requires a sharp market eye that is typical for procurement to get the right data. It needs an R&D-like vision to design how it will produce value. And it taps into the external mindset of marketing to envision how to market and monetize data, internally and externally. And if data can be put on the corporate balance sheet, it will even activate the CFO and CEO perspectives. All aboard!**

### What

- For any organization aspiring to become data-driven, the use of machine learning and AI to create an inventory of data assets across the company is a must do task.
- Mapping external marketplaces, including brokers of open data and industry consortia, is equally key to identify data sources that – combined with own data – can lead to value-creating insights.
- Specialized suppliers of (tagged) training data can provide crucial input for machine learning purposes, especially when the organization does not hold such data itself.
- New ways of accessing training data without invading privacy – such as Google's Federated Learning – open up opportunities for collecting data from previously unavailable sources.
- Simulated environments and reinforcement learning can provide crucial (synthetic) training data in cases where real-life data is insufficient or unavailable.
- An increasing amount of pre-trained models can be purchased on the market, eliminating the need for collecting high volumes of training data in the first place.
- Data becomes a corporate asset when it provides measurable economic benefits, increases shareholder value or adds to the corporate purposes; therefore, there is a reasonable case for measuring its economic value on the corporate balance sheet.

### Use

- Airbus' 'Skywise' cloud data platform allows airlines to store, manage and analyze their data and that of their ecosystem more efficiently. It maximizes the availability of a fleet of aircraft, increasing both operational and economic performance.
- Chevron, Schlumberger and Microsoft launched an initiative to create a shared platform for 'petrotechnical' data and AI, aligning with the Open Group's Open Subsurface Data Universe (OSDU) Data Platform standards.
- One of the largest automotive parts suppliers, Continental has developed an AI-based virtual simulation program, which generates 5,000 miles of vehicle test data per hour. The same test data would take over 20 days of physical effort. (Capgemini Research Institute)
- 890 by Capgemini offers public, private and community marketplaces for curated datasets, providing companies 'as-a-service' access to data from external and internal sources. Through their new project 'Support Center for Data Sharing', the European Commission wants member states to become more effective at sharing data securely with other governments and organizations, whilst respecting intellectual property and privacy.

### Impact

- Creating the foundation for becoming a data-driven organization, serving many different potential objectives and purposes.
- Improving effectiveness and value-creation of existing business intelligence and analytics by adding external data.
- Shortened time to market for new analytics and AI solutions by tapping into external sources of (industry) training data.
- Monetization of own data and aggregated data.

### Tech

- Data exchange platforms:
  Amazon Data Exchange, Oracle Data marketplace, 890 by Capgemini Data Exchange, Snowflake Data Exchange, Data Republic data sharing governance platform, Google Dataset Search
- Data brokers:
  Nielsen for consumer data, Bloomberg for real-time market data, Dun & Bradstreet for credit risk, Data.gov and European Data Portal for governmental open data
- Data exploration:
  Informatica Enterprise Data Catalog, Cloudera Navigator, Apache Atlas, Waterline Data Catalog, Microsoft Data Catalog, Collibra Collaborative Data Platform
- Data creation:
  Mighty.ai training data for autonomous cars, Appen data annotation, Scale AI labeled, Lionbridge enterprise-level training data, Foxintelligence consumer intelligence, Mostly.ai synthetic data
- Data monetization:
  Gartner's Information Asset Valuation Method Framework

# Power to the People

**Mukesh Jain**
*Expert in Residence*

## A lack of specialized skills, the need to leverage data close to the business - and some powerful AI - are igniting the self-service data revolution

**In a data-driven organization, everybody needs to be a bit of data scientist and data engineer. The best insights are created in close proximity to the business and to do that that, data must be discovered, prepared, analyzed, and visualized right there. But real skills are rare; and secure, high-quality access to the right data is far from a given. AI and automation fuel a new category of easy-to-use, augmenting tools that provide high productivity to a much wider range of people. It offloads the pressure on central delivery while democratizing access to data and algorithms. Data for all, right on.**

### What

- Within any Technology Business, insights need to be adapted in almost real-time with a 'DatOps' delivery approach - the DevOps-inspired, integrated way of continuously providing data-driven solutions to the business.
- This needs to be driven by an automated, AI-augmented, factory-style data pipeline to ingest, select, transform and prepare data – making the right data available with the minimum of specialized (and increasingly scarce) human intervention.
- Creating insights from data - whether as business intelligence, analytics, algorithms or AI – also benefits from automation and AI-augmentation, putting data-driven power in the hands of more users, even if they lack the deeply specialized skills typically needed. Conversational interfaces may be used to further ease the process.
- Automated Machine Learning ('AutoML') allows non-experts to make use of machine learning models and techniques without being an expert in the field, with some providers even claiming to provide 'driverless AI'. The most promising insights that are therefore created in the work field, may then align with data science and engineering experts for validation and scaling.

### Use

- A consumer products company created 'data science on demand', enabling the business to work with data experts on specific challenges to rapidly have the first proof of solutions - then production versions - reaping early business benefits.
- A financial institution turned its data assimilation into a highly industrialized, automated, managed service, making new data and insights available in a matter of days rather than months.
- A US airline supplied business users with intuitive self-service data tools, creating much more data exploration, innovation, and a true 'self-service movement'.
- A bank's marketing department identified a surprising wealth management segment using AutoML, whilst their businesspeople built algorithmic models that reduced loan defaults in microfinance by 5%.

### Impact

- Cost effective production of BI and analytics results, reducing manual effort and increasing quality.
- Speedier availability of new insights for the business.
- Better access from the business to more relevant data from various internal and external sources.
- Increasing cultural and practical awareness on the business side of the potential for turning data into insights, algorithms and AI.
- A true fusion of the business and IT sides - crucial for a Technology Business.
- Automation and AI-augmentation also frees up time for specialized data scientists and data engineers to work more on their actual models and business results.

### Tech

- Continuous, agile delivery:
  Jenkins, Bamboo, Git, Subversion, Puppet
- Data pipeline technologies:
  Alteryx data science and analytics platform, Informatica Data Engineering, Talend Data Fabric, AWS Data Pipe Line, Trifacta Data Wrangling, Microsoft Azure Synapse Analytics
- Self-service BI, analytics and AI tools:
  Tableau, IBM Cognos Analytics, Microsoft Power BI, Qlik QlikView, SAS Visual Analytics, Dataiku Collaborative analytics platform, Saagie collaborative DataOps
- AutoML:
  AutoML on DataBricks, DataRobot AutoML, Google Cloud AutoML, BigML, H2O driverless AI, Microsoft AutoML research

# Good Taimes

**Fabian Schladitz**
*Expert in Residence*

## AI solutions require privacy, security, fairness, transparency, 'explainability', auditability and ethics to hit success – with the very best AI radiating the company purpose

**With all of us increasingly relying on data and algorithms in both personal and business lives, it's not that simple to just leave our cares behind. Consumers are much more open to products and services if they trust that their privacy is respected, and security is guaranteed. Workers will embrace support from AI earlier when its mechanisms are transparent, its training data is unbiased and it augments them in their daily work. Regulators will demand AI solutions that can be audited and explained. And all of society expects ethical AI, driven by compelling purposes for positive futures. So, it's about doing AI good, but also doing AI for good. Such a funky perspective.**

### What

- With data and AI at the heart of Technology Business initiatives, organizations find themselves under increasing scrutiny to not only comply with data protection regulations such as GDPR, but also to ensure proper, ethical use of data and algorithms.
- From an executive perspective, a strong foundation for ethical AI is vital - plus policies that define acceptable practices for the workforce, awareness and suitable governance.
- AI systems need to be transparent and understandable. Explainable AI (XAI) leverages approaches and technology to achieve this, even with 'black box' algorithms that have been created with deep learning and reinforcement learning.
- Potential biases in training data need to be monitored and addressed as an addition to high-standard data management practices.
- (AI) Technology helps to build ethical AI solutions in areas such as bias detection, transparency, 'explainability', auditability and continuous monitoring of accuracy.
- In contrast to being closely monitored for ethical use, AI lends itself to address challenges in societal areas as diverse as climate change and CO2 reduction, digital literacy and inclusion, environmental protection, health improvement and sustainable food production.

### Use

- ZestFinance, a company that helps lenders use machine learning to deploy transparent credit risk models, developed its ZAML Fair tool to reduce disparity affecting minority applicants for credit.
- Using an AI model control platform such as IBM's Watson OpenScale, credit lenders can monitor risk models for performance, bias and transparency, to limit the risk of exposure from regulations, creating more fair and explainable outcomes for customers.
- Similarly, insurance underwriters can use machine learning to consistently and accurately assess claims risks, ensuring fair outcomes for customers and explain AI recommendations for regulatory and business intelligence purposes.
- Scotiabank has set a vision for its interactive AI systems to improve outcomes for customers, society and the bank. The bank also monitors systems for unacceptable outcomes to ensure there is accountability for any mistakes, misuse, or unfair results.
- Created by an independent group for the European Commission, the Ethics Guidelines for Trustworthy AI, had a positive impact on both public and private organizations inside and outside Europe.
- In this TechnoVision edition, our editorial Being Architects of Positive Futures suggests many ways of using data and AI for positive outcomes.

### Impact

- By addressing ethics issues upfront, organizations stand to gain additional benefits as well as avoid regulatory, legal and financial risks that may result from a market or public backlash on AI.
- When consumers believe an organization offers ethical AI interactions, over half said that they would place higher trust in it, share positive experiences, be more loyal, and purchase more. Organizations whose AI systems consumers perceive as interacting ethically, enjoy a 44-point Net Promoter Score (NPS®) advantage.
- Nearly two in five consumers would complain to the company and demand an explanation if they experienced an unethical interaction. In the worst case, a third would stop interacting with that company altogether.
- Using AI for responsible, 'positive' purposes is not only an additional way to boost the ethical use of AI, it also provides an engaging and safe training ground for getting hands-on AI experience.

### Tech

- AI Model management and control:
  IBM Watson OpenScale, LIME and SHAP open source projects for explainable AI
  Google Explainable AI, What-if for visual inspection of data and models
  Skater for model interpretation
  CognitiveScale CertiFai for management of AI business risk
- Industry standards:
  The European Commission's Ethical Guidelines for Trustworthy AI, DARPA's Explainable AI (XAI)program

# Data Apart **Together**

**Fiona Critchley**
*Expert in Residence*

## If the organization is distributed and data is everywhere, it is best to manage data in a federative way - balancing local ownership and a central platform drive

**The single source of truth in corporate data is like the Holy Grail; great to pursue yet destined not to be found. Many different sources, uses, and perspectives of data typically exist both inside and outside the organization. Why not fully embrace that diversity and create a federated business take on data? Advanced tools – more and more enabled by AI – help to keep a grip on a variety of data sources, data stores, definitions and consumption patterns, wherever they are and whoever owns them. It empowers local units to mind their own business with data yet, be an integral part of the organizational robustness and direction. The best of both worlds, really.**

### What

- The increasing need to leverage data both internally and with external partners, means that data needs to be connected and collaborated on in a highly federative way, even if it involves different, potentially unaligned perspectives and views on that data.
- A centrally managed, 'single source of truth' datastore (even when it's not called a 'data lake'), does not typically cater for a complex (cross-)enterprise situation with diverse stakeholders, unaligned definitions and viewpoints, and different ways of storing and accessing data.
- A realistic approach to this situation no longer assumes an undisputed 'golden record', just the minimum to enable people and systems to connect the dots and stay synchronized. Quality can sometimes wait, but collaboration cannot.
- Master Data Management is a well-established way to ensure alignment. But meta-data management, process management and automation, self-service exploration and integration, data virtualization and AI all enable 'thriving on federation'. Graph databases and other 'NoSQL' systems bring yet more powerful ways to access and search distributed, fragmented and multi-format data.
- On the one hand, next-generation data platforms help to bridge the worlds of too centralized, monolithic data architectures and too isolated, fragmented data initiatives on the other.

### Use

- A leader in healthcare and life science wanted to open-up distributed data for self-service analytics, creating a data catalog that automatically inventoried every field of data from several data lakes and data stores to maximize the business analysts' time.
- A global beauty products company spent far too much time finding and aligning its data, with product information residing in multiple systems, with different definitions of standards across regions. Through the implementation of federated MDM, it reestablished its handle on mastering complexity, while freeing up time to work on insights-driven product management and marketing.
- A global consumer goods company, which is disjointed by nature due to its many brands, uses smart integration technologies to keep the accessibility and usage of data orchestrated, despite being held at different places and varied formats throughout the organization.

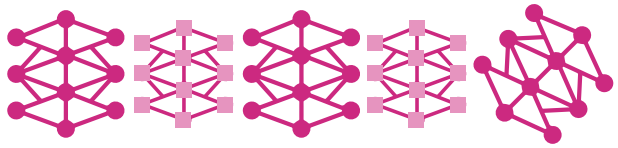
### Impact

- Agile access and ownership of data as close as possible to the business, without giving up on enterprise-scale qualities.
- Better inventory of what data assets are available within the organization means increased leverage of data for value creation.
- Enabling owners and users of internal and external data stores to collaborate more effectively to, and provide better business outcomes for all parties.
- Quick results and time to market without lengthy, often unrealistic and overly complex unification and standardization efforts.

### Tech

- Master data management:
  IBM Master Data Management, Informatica Intelligent Master Data Management, Talend Master Data Management, SAP Master Data Governance
- Data exploration:
  Informatica Enterprise Data Catalog, Cloudera Navigator, Apache Atlas, Waterline Data Catalog, Microsoft Data Catalog, Collibra, Alation, Ataccama metadata management and data catalog
- Data virtualization:
  Datometry Hyper-Q, Tibco Data Virtualization, Informatica PowerCenter, Denodo Data Virtualization, Red Hat JBoss Data Virtualization, Microsoft PolyBase, SAP HANA data access and virtualization
- Data integration and platform:
  Microsoft Azure Synapse Analytics, Snowflake Cloud Data Platform, SnapLogic Intelligent Integration Platform, Trifacta Data Wrangling
- Graph and search:
  Neo4j graph db, MarkLogic multi-model DB, Amazon Neptune graph db, ThoughtSpot Search & AI-driven Platform

# How Deep is **Your Math**



**Padmashree Shagrithaya**
*Expert in Residence*

## Challenge everything you've tried so far with analytics and algorithms, AI brings alternative, awesome ways to solve problems

**Much of the current love for AI arguably comes from deep learning on neural networks. These are essentially brute force, pattern recognition machines that – if provided with enough training data – can go where more traditional data science (often based on statistics and mathematics) stops. Deep learning can be combined with other technology-enabled approaches, such as reinforcement learning, in order to provide even more raw, unmatched problem-solving power. Its simplicity is appealing, as it functions as a black box that simply needs lots of training data to become accurate. But as we live in a world of tools, it is now more than ever a matter of finding the right balance between man and machine powers.**

### What

- Many of the current breakthroughs in AI are due to deep learning machine learning models on neural networks; a way of detecting and classifying features through multiple layers in raw input.
- Provided there is abundant training data as input, deep learning neural networks can recognize patterns much more effectively than traditional (typically statistics and algorithm-based) data science approaches, increasingly more effectively than humans.
- Advances in the ability to collect, store and access large amounts of training, together with the emergence of powerful graphical processing units (GPUs) and other hardware accelerators have been instrumental to the current success.
- Deep learning neural networks prove to be useful in cognitive areas such as image, audio and speech recognition, natural language understanding, robotics, and in many complex analytical areas where traditional approaches are not sufficient, including drug discovery, customer behavior analysis, bioinformatics, medical applications, fraud and risk detection, predictive maintenance and notably Cyber Security and IT operations.
- Reinforcement learning uses an action/reward approach to learn from actual interaction (often in a simulated environment with synthetic data) to find optimized strategies and next steps. Combined with deep learning, it creates even more powerful AI applications in areas such as robotics, scheduling and gaming.

### Use

- The German retailer, Otto uses an unconventional deep learning algorithm (originally developed by CERN for particle-physics experiments) to predict what customers will order. Finding hidden patterns across 3 billion transactions, it considers over 200 variables reducing product returns by 2 million per year.
- Using data features, including time stamps on transactions, American Express found deep learning - such as long short-term memory and temporal convolutional networks - can enhance fraud detection results.
- UCLA researchers have developed a deep learning, GPU-powered device that can detect cancer cells in a few milliseconds, hundreds of times faster than previous methods.
- Using AWS Rekognition, an AI system was built for retailers to analyze real-time footage of foot fall within a store – to improve customer engagement, thereby increasing sales.
- AWS's DeepRacer uses reinforcement learning on simulated, 3D virtual tracks to train models for fully autonomous 1:18 scale racecars; they can then compete on a real-life track without having been there before.
- Google's AlphaGo Zero made the South Korean Go world champion Lee Se-dol retire from professional playing, after he was conclusively beaten by the system. Considered otherworldly complex, the game Go was believed to be beyond the reach of even the most sophisticated analytical systems, with an almost infinite number of configurations.

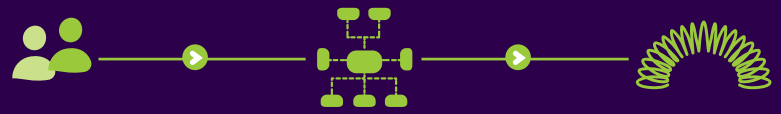
### Impact

- Solving problems that were deemed impossible to solve – or insufficiently successful – with more classic data science approaches.
- Creating powerful, complex autonomous systems, even with an occasional lack of sufficient volumes of training data.
- Building next generation predictive and prescriptive analytics going beyond human (or statistics-based) approaches in their capability can detect patterns in seemingly unmanageable volumes of unrelated data.

### Tech

- Deep learning / neural networks:
  TensorFlow, Microsoft Cognitive Toolkit, Theano, MXNet, Keras, Chainer, PyTorch, Gluon, Horovod, AWS Deep Learning, Deepomatic computer vision
- Reinforcement learning:
  AWS DeepRacer, Facebook Horizon, Gym on OpenAI, Microsoft Project Malmo
- AI infrastructure accelerators:
  NVIDIA deep learning, AWS Deep Learning AMIs, Google Cloud TPU, Intel AI and Neural Compute Stick, Apple Neural Engine

# Process on the Fly



# Process **on the Fly**

**Manuel Sevilla**
*Expert in Residence*

**As we all know, a high IQ is not always a recipe for crushing success. In the end, it's all about execution. Corporate speed depends on the ability to turn insights into action, to quickly respond to events, to overcome business silos, to rapidly change our ways if circumstances so dictate. This is where process management technologies deliver. Having consistently caught less of the shine than its complementing concept of Thriving on Data (ever heard of 'Big Process'?), breakthroughs with intelligent automation and a taste of autonomous decision-making have firmly planted 'Process on the Fly' center stage - underpinning the latest Technology Business experiences.**

There are many different flavors of process that can be supported and enabled by technology. Organizations can apply a range of options to support stable, predictable workflows, automated sequences of user interactions with systems, ad-hoc configurable responses to spontaneous events, and even 'no processes' at all. Delivered as a crucial component of a next-generation business IT platform, process technologies bring a new pulse to literally any process in the organization.

As a certified silo buster, it bridges gaps between corporate – or intercorporate – systems without intruding upon them. As a next-generation solution builder, it's the glue that binds microservices and APIs together into something that we might have called 'applications' in the past. Combined with AI, cognitive systems and agile, it is making business processes more automated and intelligent, driving both decision-making and execution to boost corporate performance and create better places to work.

The move to this new perfectly paved process runway is for many no mean feat, as legacy and traditional applications implemented their own baked-in 'process way'. On top of this Commercial off the shelf (COTS) products were extensively 'customized', ensuring that every process implementation was unique and therefore almost impossible to effectively manage and change. But in a world where cloud native, 5G, agile and microservices tears down the once well-defended boundaries, every Technology Business must ensure that their process landscape covers the entire technology business enterprise in a truly holistic, agile, secure and value for money way.

In their ultimate incarnations, processes become self-optimizing and autonomous, as the silent companions to a self-driving Technology Business.

Not exactly a Mayfly.

# Processes 101


**Elle Sanchez Cardenas**
*Expert in Residence*

## Creating a deep understanding of corporate processes as a prerequisite for simplification, standardization and – ultimately – intelligent automation and innovation

**First things first. Process understanding is the path to standardization. Standardization leads to simplification. Simplification leads to automation. Automation leads to intelligent, innovative processes. Standardization is indeed the key to process simplification, as it becomes so much easier to define how the process is executed. And simple processes that are thus clear and rule-based, facilitate the introduction of intelligent automation solutions. In any case, process standardization across global operations will also ensure cost effective and easy maintenance. Getting a grip on the basics, a key priority it is.**

### What

- Using strong process policies to identify performance metrics that require monitoring (Service Level Agreements and KPIs), then process orchestration and process mining to facilitate the auditing and compliance monitoring.
- Drive simplification and standardization using process orchestration, process mining and digital twins to support the identification and impact assessment of business exceptions.
- Automate activities and digitize end-to-end processes to improve the user experience and analyze performance with smart digital workflows.
- Perform continuous issue resolution and root cause analysis using data visualization and natural language generation.
- Accelerate transaction processing times using AI and ML to cognitively generate next best action recommendations (that can be fully automated in the future).

### Use

- An American bottling company is using process mining to identify bottlenecks in the process, presenting positive financial impact and improvement opportunities.
- A consumer goods manufacturer uses digital workflows to improve the customer experience with user-friendly electronic forms, capturing approvals electronically (rather than via email) and automating actions on multiple systems.
- A German Telco utilized the Pega platform to create a 360-degree customer view across all digital channels while drastically simplifying its daily operations.
- Using RPA (Robotic Process Automation), a global drinks manufacturer is identifying and managing duplicate invoices, reducing confusion in the process and ensuring their suppliers get paid on time and in full.

### Impact

- Automation provides enhanced process efficiency and clear, defined processes.
- Enabling resources to focus on value-added activities such as business partnering or issue resolution, results in a reduction in manual effort of up to 80%.
- Improved process effectiveness through empowered compliance monitoring and tracking, proactively resolves issues as they happen.
- Improved processing times results in a material impact to customer service.

### Tech

- Process mining tools:
  Celonis, Minit, Business Optix
- Digital workflow tools:
  Pipefy, Boomi Flow
- AI and ML platforms:
  Salesforce Einstein, SAP 4 Hana
- Natural language generation:
  Arria
- RPA software:
  UiPath, BluePrism, AutomationAnywhere

# Rock, Robot Rock

**Miroslaw Bartecki**
*Expert in Residence*

## Robotic Process Automation (RPA) delivers quick process benefits without elaborate and troublesome re-engineering

**The robots are amongst us... though they sure don't look like robots. Rather, they emerge as powerful software solutions that target the mechanistic and repetitive processes of the human workforce, typically interacting with screens and applications. Robotic Process Automation looks at this interaction and aims to automate it as much as possible. The mission of RPA is not to fix underlying technical problems, or flawed process and application logic. It is simply to maximize the efficiency of process execution, in spite of inherent shortfalls. So, while RPA may not involve shiny robots that walk around and carry your stuff – it's more like R2-D2 - it sure will speed up your routine business activities, 24/7/365. Robots rock.**

### What

- Robotic Process Automation (RPA) utilizes a software system to mimic the actions of a human worker interacting with the user interface of a computer system.
- This 'software robot' can be trained to work with the user interface just as a human would; virtually initiating actions - such as mouse clicks and keyboard inputs, interpreting display output and automating activities according to predefined rules.
- Cognitive technologies make a robot's operation easier and more accurate through enhanced identification of the user interface elements to which they operate, supported by the cognitive power of AI for the assessment and consistency of results.
- Robots can operate much faster when Artificial Intelligence (AI) is used in the discovery phase of business processes performed by humans.
- Additional RPA management software manages resource allocation, systems usage, and compliance.
- RPA solutions can carry out actions much faster - and more reliably - than their human counterparts, especially when cognitive certainty measures are included.

### Use

- Process implementation and transformation becomes simplified and more accurate with the reduction of unnecessary activities using RPA deployment.
- The Russian gas giant, Gazprom used RPA to automate verification of meter readings. In the first two weeks after the automation went live, an employee was able to validate about 130 invalid meter reads, saving 10 hours of work per employee.
- The UK's largest water utility company, United Utilities recently tested an AI platform to analyze large data sets on factors such as weather, demand for water, pump performance and electricity prices. The information helps to make decisions on the most cost-effective and efficient ways to run the pumps. The trial saw energy savings of 22%.
- US-based electric and gas utility, Xcel Energy, uses data from sensors on wind turbines to develop high- resolution wind forecasts through predictive analytics and AI, resulting in a cost reduction to end consumers by $60 million.
- A large services organization automated its cash collection management process using RPA, reducing the manual work of 650 full time employees to 45 software robots, reducing the average handling time with an 85% cost reduction.
- RPA is used extensively within a government department to automate clerical tasks, resulting in a 40% improvement in the average handling time for customers and an 80% reduction in processing application costs.

### Impact

- In the future, RPA can be used for fuzzy logic, machine learning, deep learning and NLP to achieve top-level simplicity in implementation and processes.
- Creative management of the augmented workforce, where RPA robots cooperate with humans, to deliver fast and more accurate services.
- Routine human tasks are executed more simply, quickly and reliably across a multitude of applications, saving time, money and resources.
- Due to its non-invasive nature, no applications need to be changed. Benefits are delivered quickly, effectively and without additional risk.

### Tech

- RPA platforms:
  Automation Anywhere, Blue Prism robotic process automation, Jacada Integration and Automation, Kofax smart process applications

  Nice robotic process automation, Pega robotic automation and workforce intelligence suite, UiPath robotic process automation

  WorkFusion intelligent automation, Kryon discover, analyze, automate, Redwood, OliveAI, JIDoka, Contextor

# Pleased to Meet **You, Process**

**Dave Laud**
*Expert in Residence*

## Busting corporate silos by adding flexible process layers on top of them, rather than break solid, established structures

**Ever wanted to break on through to the other side? Process-specific applications are creating seemingly impenetrable walls between processes. Data within these systems are stranded on their own splendid islands, unable to see each other, much less interact. Workarounds and exception processes only serve to push them further apart. Thankfully, new technologies avoid the need to replace process specific applications that you've customized and grown dependent on. Bridging the divide through data aggregation and cross-silo process flows not only break the walls towards enterprise-level unification, but also towards the outside world. Hi, other process. Hope you guessed my name.**

### What

- Data mining and analytics spanning the enterprise can identify opportunities previously unseen by disparate databases. Process mining has come of age and generates valuable insight into operational bottlenecks.
- Robotic Process Automation (RPA) enables the automated integration of multiple siloed applications without seemingly changing any of the affected systems. Not shy, these robots expose themselves as web services for ease of incorporation into other silo-busting technologies.
- Business process management tools offer the capability to utilize various application services offered by different systems, as part of a modeled and managed process flow.
- APIs and web services can be created on top of disconnected applications, to expose crucial application functions to process modeling and system development tools.

### Use

- A global retailer increased its catalog revenue by 75%, through business intelligence analytics to mine customer behavior, buying trends and payment patterns.
- A medical equipment manufacturer used RPA and cross-tower workflow to quickly and seamlessly integrate all processes and data of an acquired company, creating a unified view of both businesses, enabling a global view of credit risk and customer payment behavior, resulting in a 4-day reduction in overall DSO (Day Sales Outstanding).
- The UK Cabinet Office is aiming to accelerate the take-up of Robotic Process Automation (RPA) in government and is developing an RPA CoE. Chris Hall, deputy chief commercial officer, UK Cabinet Office says: "RPA is an excellent opportunity for public sector organizations to realize significant productivity gains and focus on more value-added services".
- Boeing predicts when a part needs maintenance, repair, or replacement by utilizing artificial intelligence and machine learning, and deciphering usage patterns such as flight conditions, location, temperature, altitude, wind speed and direction.

### Impact

- Revenue probability is increased through deep analytics of unified data across disparate databases.
- A two-speed transformation is now possible, enabling numerous smaller initiatives to coexist alongside longer-term mega-change.
- Aging or dysfunctional applications can be sustained without costly and risky applications management activities.
- Siloed applications are connected inside and outside the organization to create new, outside-in, end-to-end processes serving customers' and companies' digital needs.
- A high level of process flexibility and agility can be provided, without intruding on the affected application systems.

### Tech

- Analytics and BI tools:
  SAP Analytics Cloud, Celonis, Minit, PowerBI, BOARD, Qlik and Sisense
- API and web services management:
  MuleSoft, Google Apigee, IBM Connectivity & Integration
- Robotic Process Automation:
  Automation Anywhere, Blue Prism, UiPath, Pega Robotic automation and workforce intelligence suite, NICE RPA, Kryon Systems
- Business Process Management:
  BusinessOptix (modelling), Dell Boomi, IBM Intelligent BPM, Pega BPM & Case Management, Appian

# Can't Touch This

**Priya Ganesh**
*Expert in Residence*

## A process seamlessly adapting to its environment, optimizing itself without human intervention – is that even a process anymore?

**When all you have is a hammer, everything looks like a nail. Optimizing processes by cutting out yet another inefficiency, leveraging yet another lean opportunity, only brings you so far. As the need for radical business agility continues to accelerate, there is limit to the classical process way of responding to complex events in real time. Driven by AI, fixed and inflexible processes can be replaced by powerful reasoning systems. These systems fluidly adjust to whatever situation occurs, anticipating next-best actions and resources needed on the fly. And as they continuously learn from what works and what doesn't, they increasingly become hands - and care - free. Stop! *Hammer Time*: the self-driving enterprise is coming.**

### What

- Business Rules Management System (BRMS) solutions externalize decision logic from applications, allowing both IT and business experts to define and manage decision logic. This logic is then executed by Business Rule Engine (BRE) systems.
- Structured methodology adapts to the new ERP (Enterprise Resource Planning) roll out, creating bespoke levers to help organizations maximize the business case from platform investment.
- Dynamic case management systems capture and process business events across process silos, providing end-to-end intelligence and optimized outcomes on a case-by-case basis.
- An AI-powered cash collection agent who understands the pain of waiting in line for a simple query to be answered, combining the power of intelligent automation with best practice process understanding.
- Amalgamating ESOAR methodology (Capgemini's approach to automation), DGEM process knowledge (Capgemini's approach to achieving operational efficiencies), HANA (a SAP in-memory database) expertise and competency model supports a greenfield client to setup their enterprise.

### Use

- A large consumer goods company used the power of DGEM, ESOAR and HANA environments to set up their finance back office support services around the world.
- In Australia, a large utilities company leveraged HANA as a powerful tool, using DGEM for HANA as a design shop to engineer their process landscape quickly and effectively.
- Utilizing the AI-powered cash collection assistant, a large retail company improved their customer satisfaction ratings by reducing the dependency on their helpdesk agents to resolve vendor queries quickly.
- PayPal managed to reduce its fraud rate to just 0.32% of revenue using a sophisticated deep learning system that analyzes transactions in real time.
- A transport company used AI-based case management to streamline and automate the management of customer correspondence, leading to an 85% reduction in manual case preparation and handling.

### Impact

- Collaborative working across business units delivers detailed process mapping on the new HANA environment, ensuring the Target Operating Model fits the new HANA design roll out.
- Identifying platform optimization opportunities as part of transformation advances the benefits case from the tools landscape.
- Reducing the turnaround time for the collections process improves customer satisfaction.
- Impact process efficiencies and opportunities to setup, design and grow the client environment.
- Split-second responses to high-volume data streams and events in real time, particularly regarding the IoT (Internet of Things) and digital customer channels.

### Tech

- Case management:
  Appian case management, Pega case management, IBM Case Manager, Celaton InStream
- Technology:
  HANA
- Business rules and decision management:
  Prowler.io, Drools open source, Oracle Policy Automation, Pega Customer Decision Hub
- Complex event processing:
  Amazon Kinesis, SAP Complex Event Processing, Tibco BusinessEvents, Apache Flink, EsperTech Esper
- Methodology:
  ESOAR, DGEM

# Augmented Me

**Lee Beardmore**
*Expert in Residence*

## Adding AI to business processes speeds up decision-making and creates the essential companion for symbiotic business operations

**"Taking the robot out of the human" is an established first step towards automation of work processes. But what if we bring AI into the equation? It can mimic human behavior, and perhaps better still, augment human intelligence. This is apparent from AI's mastery of natural language and its understanding of audio, video, and images - but also from its ability to observe processes in their broader context, detecting complex patterns that humans cannot even see or absorb. The resulting symbiotic relationship between humans and their AI minions will change the way we work, the way we organize ourselves, and ultimately, the way we do business and live our lives.**

### What

- Cognitive systems are mastering human conversation; processing natural language with interpretation and understanding of context, generating natural language where narratives are created to describe raw data, or even using computer vision to recognize images or analyze video footage. These capabilities enhance existing processes by augmenting human work, replacing parts of it, or more frequently both.
- AI has utilized unsupervised reinforcement learning to win games – such as Go, Dota 2 and Atari classics – by simply observing how they are played and won, without even knowing the rules. This technology can also be applied to operational processes; learning from the way humans do their work, finding means of improvement and then providing them with automated, highly intelligent support.
- They can watch how users interact with applications, to automatically generate deterministic robots to deliver the work items.
- An exciting area of development lies with reinforcement learning and multi-agent systems working. They focus on goal seeking and collaborative decision making to augment the human process, liberating them to focus on the direction and orchestration of autonomous business operations.

### Use

- A European mobile communications retailer leveraged cognitive technology to radically improve back office processes, leading to a 70% reduction in operating costs and up to an 80% improvement in operational efficiency.
- A trade finance organization digitized and categorized unstructured documentation and extracted relevant data with thousands of complex daily transactions, all managed by cognitive software and bots.
- A Microsoft social chatbot in China, 'Xiaoice,' already has over 660 million users 450 million third-party IoT devices and 900 million content viewers.
- PetSmart, a US-based specialty retailer, was able to save up to $12 million by using AI in fraud detection. The company implemented an AI/ML technology that aggregates millions of transactions and their outcomes.
- Capgemini Business Services works with Celaton, Abbyy and WorkFusion to automatically handle incoming structured and unstructured correspondence through a variety of digital channels, improving efficiency by over 50%.

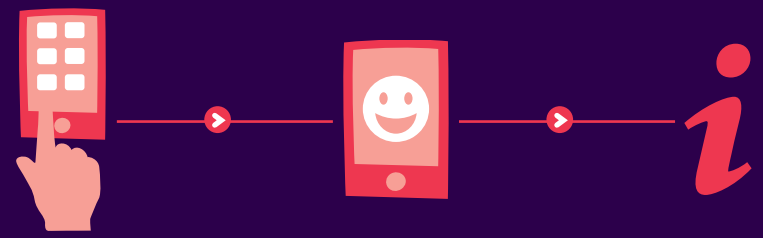
### Impact

- The creation of an AI augmented workforce can take on more through smart assistance.
- Dramatically improved productivity and effectiveness through automated decision-making and the availability of real time, predictive insights.
- Human-like cognitive capabilities in end-to-end processes enhance the consumer experience.
- Mitigating the risks of attrition, aging workforce and dependencies in areas of specialized or scarce knowledge.
- Enabling new capabilities where AI infused processes deliver at a previously unimaginable speed, gradually approaching the era of autonomous processes and even the autonomous enterprise.

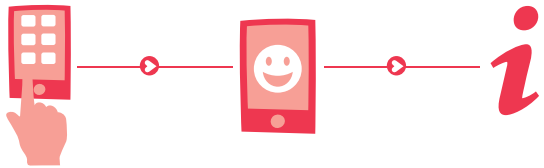
### Tech

- Cognitive and AI solutions and platforms:
  Prowler.io Autonomous, Decision Making, DataRobot, Celaton InStream, iManage, Artificial Solutions Teneo, WorkFusion, Abbyy Flexicapture, Loop AI Loop Q, Machinify, IBM Watson, IPSoft Amelia, Pega Customer
- Adaptive learning:
  Kryon Process Discovery, Celonis Process Mining

# You Experience



# You **Experience**



**Alexandre Embry**
*Expert in Residence*

**No area of technology is changing as rapidly as that of the user experience. As spoiled, easily bored and simplicity-seeking consumers of the latest technology platforms, we expect nothing less than compelling IT experiences offered by the organizations we do business with – or work for. Interaction with technology should be a seamlessly connected string of 'happy' and 'simple' signature moments – to the extent that we do no longer notice them as separate interactions, they are just part of one and the same Technology Business experience.**

To make customers and employees truly happy through their use of technology, there should be no modesty in creating the next generation of user experiences.

Creating an excellent customer experience first of all requires a Design Thinking mindset; envisioning the customer journey from an outside-in perspective, putting equal amounts of compassion, empathy, and factual analytics into the equation, finding these signature micro-moments in which key decisions are made and long-lasting associations with a brand are built.

With technology becoming ultra-interactive, understanding the nature of the real-time conversation with the customer or employee paves the road to success. Then it's no longer a matter of creating the next killer mobile app. It is now the quest for finding – or building – the platform where supply and demand will naturally come together, in which intentions hardly need to be expressed anymore, because they are already anticipated.

It's also a matter of keeping up with the rapid change of pace in user experience technologies. The now classic user interfaces of desktop and laptop computers are replaced by chatbots, voice agents and wearables that understand and speak your language. Smart glasses and augmented or virtual reality headsets create a fascinatingly immersive experience. Tomorrow, Neural Interface or eye-tracking technology, coupled with BCI (Brain Computing Interface) will totally unleash the power of these technologies with enhanced 'think-and-play' interfaces, no longer in need of a manual controller. Many AI-driven systems can pop up on your phone, in your car, on your watch, on your clothes, through a speaker in your living room, even in your contact lenses (in the not too distant future). These technologies will completely merge the real and digital worlds, disrupt the nature of consumer and worker experiences and how they interact with their near or virtual environments.

And now (thanks, 5G and Cloud Computing), there is an increasingly strong location-related aspect to it as well. We expect these seamless, immersive and simple experiences to be delivered any time, any place, with any 'thing' involved.

# Signature **Moments**

**Jessica Leitch**
*Expert in Residence*

## Using technology for better understanding of the customer's journey – creating the magical, standout moments that form a long-lasting connection with your brand

**Want to live more in the moment? Don't forget the business perspective then, where it is highly rewarding to focus on the moments that provide seamless, satisfying, simple experiences to customers. These are standout moments in time of emotional connection - actually culminating to important outcomes for the customer and a creative, differentiating brand experience for the company. Empathy and deep understanding are key to interaction with the customer, and technologies as diverse as predictive analytics, bots and customer journey platforms can be instrumental to achieve this. Sing for the moment: signature moments make the difference that customers will remember.**

### What

- Every time a person uses a smartphone, micro-moments occur. With the growing use of virtual assistants, wearables, bots and even virtual and mixed reality tools, there are even more opportunities to interact, engage and delight.
- Across the consumer journey, every moment in time should delight the customer, yet some special moments viscerally connect the customer to the brand.
- We need to think in terms of Signature Moments, identifying those singular interactions that brands will set out to own, where their brand promise and character can be most significantly conveyed through digital interaction.
- The process of identifying, designing and delivering Signature Moments engages capabilities from customer research, customer strategy, data, design and technology.
- Brands are given the opportunity to connect with their customers, creating a standout moment of emotional connection that runs far deeper than just the transactional level.

### Use

- McDonald's created the first digital version of the Happy Meal gift to engage the younger digital generation, connecting a new customer to an established brand. A perfect signature moment.
- Whole Foods' recipe readouts to Macy's Alexa Skill provides daily affirmations and wishes customers a "good morning".
- H&M's Kik chatbot presents users with different photos of outfits helping to narrow down style choices.
- Bank of America's Erica App will soon offer conversational, bot-driven financial advice.
- Alexa, Siri and Google skills all offer ways for brands to offer value in innovative hands-free experiences.

### Impact

- Differentiation that drives preference, drives growth.
- Thinking this way allows brands to allocate resources more effectively.
- Increased understanding of the role data and technology play in enhancing experiences; where AI can be used instead of humans and where AI should supplement humans.
- Machine learning, natural-language understanding and natural-language processing help analyze customer sentiment and feedback at scale, isolating key moments by segment.
- Conversational interfaces enable brands to behave more like humans; interacting, listening, empathizing and engaging through a deepening contextual understanding, within a purely digital channel.
- Not always, but often, signature moments need to occur between humans. RPA and automated bots can help remove processing tasks from contact center agents, allowing them to spend more time on problems that require a human touch, enabling them to be the best ambassadors for the brand that they can be.

### Tech

- Customer Platforms Technologies:
  Adobe Marketing Cloud, Salesforce Marketing Cloud and Service Cloud, SAP C/4 Hana, Pega, Usermind
- Customer Data Technologies:
  Salesforce Customer 360, Microsoft Dynamics 365 Customer Insights, Adobe Experience Platform, SAP C/4Hana Customer Data Cloud
- Customer Process Management:
  Microsoft Dynamics 365, Salesforce, Pega

# Reality **Bytes**

**Gagandeep Gadri**
*Expert in Residence*

## An engaging mixed reality environment potentially makes for far more compelling, effective interactions between man and machine

**Is this the real life? Well, look up to the skies and see. Almost any pocket-sized device can now create a completely 3D virtual (VR) or augmented (AR) reality, dramatically changing the way technology engages with us. It's mostly thanks to the gaming industry, which has delivered tons of tech innovations to the masses. It makes you rethink the user experience from the ground up, mashing up the real-world perspective of the user with unique, digital 'realities'. This mixed blend of realities has radical change potential in areas as diverse as healthcare, training, maintenance, defense, R&D and collaboration. Buckle up: bits are about to get real.**

### What

- Take in what the lens sees and augment it with digital data, visualizations, experiences and interactions anchored in the real world. Whether a game, an application or content – it's there, in the real world, superimposed and inherently tied to its counterpart. It's a true, contextual and in-context computing experience.
- Often perceived as a distraction from the real world, simulated realities have become part of mainstream society, available from high-end VR immersive environments to a simple mobile phone app. They are now the new reality.
- From basic cardboard virtual reality headsets to the high-tech Oculus Rift, displaying truly immersive, high-resolution environments; technology advances with smaller, more powerful devices, even in a contact lens.
- AR technology develops at a rapid pace with new content and use cases evolving daily. From capturing creatures on a mobile phone, like Pokémon Go, or viewing dynamic directions on a car windscreen, potential applications are limitless.

### Use

- Potential visitors to a UK city are offered a free app and cardboard VF headset to experience a fully immersive tour without even leaving their house, with the aim to encourage real visits.
- Capgemini collaborated closely with Schneider Electric's IT teams to measure, track, and visualize data at an unprecedented level of detail. This helped provide a baseline energy consumption and carbon footprint for Schneider's global IT operations giving visibility from enterprise level down to individual sites and applications.
- A leading Italian retailer uses 3D visualization to superimpose furniture into a customer's room, bringing the 'try before you buy' experience to a whole new level.
- VR is used at Airbus to integrate digital mock-ups into production environments, giving assembly workers access to complete 3D models of the aircraft under production, reducing time required to inspect by 86%.
- Boeing uses augmented reality to provide airplane technicians with instructions for wiring schematics in their field of view, allowing them to be hands-free. This reduces wiring time by 25%, increases productivity by 40%, and eliminates error rates.
- Immersive technologies are emerging as an enabler of operational efficiencies, for example, workers can view dynamic instruction diagrams through a headset resulting in reduced set up and maintenance time.

### Impact

- Reality combines with the virtual to create 'live' and unforgettable experiences for consumers, and valuable support and training tools for workers.
- Regardless of physical location, users can immerse themselves in another world, facilitating highly advanced remote collaboration, design and modelling.
- A new source of 'real' behavioral data, which can be leveraged across all sectors from training workers to consumer research, user testing and marketing.
- By transforming knowledge into experiences, learning is revolutionized, driving more efficient and cost-effective outcomes across industry, education and leisure.

### Tech

- Virtual reality devices and toolkits:
  Oculus Rift S and Go, Samsung Gear VR, HTC VIVE, Sony PlayStation VR, Google Cardboard, Leap Motion, Amazon Sumerian, Unity for VR
- Augmented reality devices and toolkits:
  Layar for smartphones, Microsoft HoloLens 2, Magic Leap, Vuzix Smart Glasses, Epson Moverio, DIOTA, Google ARCore, Apple ARKit, PTC Vuforia, Wikitude, Unity
- Motion and image sensing, 3D scanning:
  Microsoft Kinect, Structure 3D scanning, Bridge mixed reality and sensor system

# Own Private Avatar

**Gabe Weiss**
*Expert in Residence*

## Creating an active, well-aligned marketplace of digital assistants that can act on behalf of customers, employees and organizational entities

**Alexa, run my business! With our voice and bot assistants - whether they come from Amazon, Google, Microsoft, Samsung or Huawei - evermore entwined in our personal lives, it's time to get down to business. As consumers or employees, we want our digital intermediaries – our own, unique avatars – to represent our individual needs with brands, services and systems on our behalf. From a service or product provider's perspective, we want to understand, engage and interact with these avatars – in order to secure the right, signature moments with customers and employees alike. Avatars can make life seductively simple and effective, provided they truly act as our digital twin 'dæmon'.**

### What

- From personal digital assistants to purchase tendencies auto-replenishment and travel preferences, an entire layer of personal representation is out there deciding things on our behalf.
- Where platforms like IFTTT and Apple Shortcuts already enable us to program routines to wake us up, turn on the lights and tell us the weather - or start a chronicle job backup of a database - we will group increasingly complex sets of routines and sequential functions and tasks.
- We are assigning personalities and human characters to these complex algorithms through avatars. General purpose, generic personas embodied by named routines from Siri to Alexa and even Samsung's Bixby represent early examples of these capabilities.
- Our digital intermediaries – our avatars – living out in the digital world are representing our individual needs with brands, services and systems on our behalf.
- Graphics, CGi, 3D and VR design tools enable avatars to come to life in photorealistic ways.

### Use

- We will rely on avatars that reduce all complexity of the digital ecosystems that surround us and transfer existing metaphors – personal assistants, financial advisors, personal stylists – to these algorithms. They offer advice, negotiate and decide on our behalf and we offload task assignments that become increasingly complex to manage all aspects of our daily lives.
- From auto-replenishing groceries, to ensuring a new winter wardrobe is ready, or even managing a personal calendar - we will have many personalized and named avatars to operate on our behalf in many differing situations.
- Alexa will monitor our homes, a digital assistant will research data for our consideration at work, a chatbot will book travel and Bank of America's Erica will manage our banking relationships and responsibilities.
- Amazon's Alexa now features actor Samuel L. Jackson as a 'celebrity voice', acting as your very special personal assistant - with or without profanity.
- Avatars will become like personal employees and collaborators to simplify our new connected landscape, who facilitate our personal, familial, social and economic responsibilities.

### Impact

- Surprising sales swings will be a result of avatars reacting to cultural fads and trends rapidly and at scale on our behalf. Exponential sales increases or decreases will occur due to avatars chasing or avoiding trends whilst trying to beat others to get the next must-have limited edition or dodge a brand that messed up.
- Blatant and increased predictable loyalty will ensue as avatars commit our preferences to repeatable purchases, propensity to choose one brand over another, and seasonal habits. Brands will find deeper commitments from the avatars that codify preferences for them.
- Rise of 'Personal Information Management' systems or PIMs (not to be confused with 'Product Information Management' PIMs), will manage privacy and consent preferences on behalf of individuals and organizations, evolved over time from today's social media and messaging platforms.
- 2020 will be the year that CDP (Customer data Management Platforms) solutions emerge in force from SAP, Oracle, Salesforce, Adobe and others.

### Tech

- Chatbots, conversational and personal avatars:
  Alexa and Siri, Ok Google, Bank of America's Erica, Sephora's personal assistant, Lemonade's Insurance sales agent

  Slack bots in business, Facebook messenger, Apple's iMessage and WeChat
- ML/AI:
  Microsoft Cognitive Services, IBM Watson APIs, AWS,
- Cloud and SAAS models that engage at the edge:
  Adobe, Salesforce and SAP

# I Feel for You

**Ronan Souberbielle**
*Expert in Residence*

## Boosting both the individual and corporate EQ, in order to create a more effective, meaningful and satisfying symbiosis between man and machine

**Voice assistants and chatbots are becoming ever smarter. AI makes it possible to mimic our language and understand our intentions, sometimes to the point that we prefer interactions with technology – as it provides convenience, instant support, easy communication and is always available. AI also takes its place next to us at the workplace, augmenting us with powerful, intelligent capabilities and automation. But AI-based systems still lack two basic yet important qualities: empathy and emotional intelligence. It's a call to seriously boost our own EQ, both to make our systems and bots more sensitive to emotion, but also to simply complement AI with the unique capabilities that only man possess.**

### What

- As stated by the Capgemini Research Institute, 74% of executives believe that emotional intelligence will become a 'must-have' skill within the next five years.
- Non-verbal components of communication are the key to its effectiveness, with vocal and facial cues contributing 38% and 55% respectively to the delivery of the message as a whole.
- There are three specific situations where emotional intelligence is required for a more successful outcome: Dealing with anger and impatience, dealing with disappointment and frustration, and dealing with surprise, happiness and gratitude.
- As brands work hard to 'digitalize' their customer service operations, they need to ensure their efforts don't drown out the emotional context.
- 59% of misunderstood requests over chatbots are due to a misunderstanding of the nuances in human dialogue, due to lack of conversational intelligence and empathy.

### Use

- The main conversational assistants' providers, Microsoft (Cortana), Amazon (Alexa), Google Assistant, IBM Watson Assistant, all provide empathy driven AI features through API.
- In the healthcare industry, Replika is a personal companion for mental wellbeing, with 2.5 million users turning to Replika anytime, day or night, when they are feeling down or anxious.
- Tabatha, a Facebook Messenger-based AI helps people who are displaying symptoms of asthma pursue further medical advice in an empathetic and informative manner.
- In the retail industry, H&M has created a chatbot that acts as your sales guide taking into account gender, style preference and mood to adjust the way it interacts.
- Contact Center solutions, such as Odigo or Genesys provides ability to detect emotions and mood across voice and written channels.
- Together with the UK Charity Action for Children, Capgemini developed an AI app called elf.ai. It allows a more meaningful and exciting way of choosing a gift for Christmas, by visiting Action for Children's Secret Santa Pop-Up Store at Covent Garden in London.
- Since 2017, the number of automotive companies deploying AI at scale has grown from 7% to 10%. (Capgemini Research Institute)

### Impact

- Personalized and tailored customer experiences build better customer relationships.
- AI is significantly improving the driving experience in the automobile sector, by optimizing the ride based on who is in the vehicle, their mood, and how they are interacting with others.
- Brands can improve the user experience and boost customer loyalty.
- Positively affect the customer's perception to receive positive feedback and build a satisfied customer base.
- By understanding how people react and why, businesses can enhance the customer experience, communicate more effectively and build stronger, more meaningful brands, all of which leads to happier customers and business growth.

### Tech

- Conversational assistants:
  Microsoft (Cortana), Amazon (Alexa), Google Assistant, IBM Watson Assistant, Spot and Loris
- Text analysis:
  IBM Watson's Tone Analyzer services, Nuance, Amplify.ai, Kore.ai, Perceive and bitext
- Voice analysis:
  Beyond Verbal, Nuance
- Facial analysis:
  Affectiva, Kairos, and Microsoft

# No **Friction**

**Gabe Weiss**
*Expert in Residence*

## Autonomous technology can create a user experience that is so fluent and adaptive, it's almost not experienced anymore

**Still a fraction too much friction? The fully autonomous user experience is closer than you think. Tapping into the Internet of Things and omnipresent data, AI systems can be contextually aware of surrounding physical environments, as well as of the emotional states of the humans that are interacting in it. Intelligent, automated and individualized decisions and actions can remove bottlenecks and steps in a process – if indeed a process is still needed. The ultimate user experience is an almost psychic, 'no user experience'. It has systems, intelligence, data and devices that morph themselves proactively and fluently around the intentions of the user - no questions asked.**

### What

- The biggest drivers of change in autonomous technology growth includes Artificial Intelligence, the Internet of Things and intelligent automation.
- As these systems become capable of carrying out complex tasks, anticipating our deepest intentions and understanding our context in real-time, it paves the way to greater freedom to pursue enhanced safety, less drudgery and more simplicity.
- Autonomous experiences seemingly appear to 'happen'. Technology combines individualized preferences, behaviors and propensity models at scale and speed, in micro real-time to simplify experiences. Complexity therefore disappears into micro real-time, leaving only signature moments along the way.

### Use

- Security lines at airports, busy intersections in cities, complicated financial transactions between distributed parties will all be able to take advantage of the speed, security and simplicity provided by advancements in autonomous systems.
- Using autonomous scenarios to support an individual's personal preferences, brands can provide numerous differentiating scenarios by appealing to shared values.
- Technology can simplify life management across eight major categories, including; career and business, finance and wealth, friends and family, fun, recreation and entertainment, health and fitness, love life, personal and spiritual.
- It can also manage your physical environment, as you leave your house lights will turn off, doors will lock, and security systems armed. There will be an autonomous Uber outside, that recently charged itself on a concrete inductive charging station, and upon entry will whisk you off to your predetermined destination.
- Robo-advisors such as Betterment and FutureAdvisor can manage finances and wealth management to drive lower costs and increase returns overtime.
- Food manufacturers use IoT and micro-consumption to understand consumer preferences, reducing food waist and ensuring the right food is available in relation to regional tastes, made in a sustainable manner with organic ingredients, delivered via drone that replenish when you need it, aligned to your personal values.

### Impact

- The simpler experiences become, the more invested consumers are in the brands that offer them, locking into ecosystems of providers that support their values, driving loyalty, monthly subscriptions, ongoing use and upselling.
- Opted-in subscriptions to services and innovative dynamic pricing models allow brands to offer micro value, maintaining customer satisfaction and receiving payments in micro real-time.
- Brands shift to separate API-fed service ecosystems that support their products more efficiently, becoming not only technology companies, but incredibly efficient logistics and service companies.

### Tech

- App development platforms:
  IBM Cloud, Microsoft Azure development tools, Mendix rapid development, Salesforce Platform
- API management and micro-services:
  Mulesoft, Google Apigee, AWS API Gateway
- Analytics and AI:
  IBM Watson, SAS Viya, Microsoft Azure AI, SAP Cloud Platform
- IoT:
  Microsoft Azure IoT, SAP Leonardo, Capgemini XIoT, PTC Thingworx

# We Collaborate

# We Collaborate

**Michiel Boreel**
*Expert in Residence*

**Humans, organizations and nowadays 'things' find their meaning and value in being connected to others. With all becoming intimately networked – through superior, simpler and ever more ubiquitous technology and an abundance of social platforms – it's key to tap into the phenomenal power of collaborative Technology Business, even with connections and entire ecosystems seemingly changing overnight.**

Being able to navigate any business ecosystem, with its characteristics, dynamics, key players, standards, preferences and unwritten rules, is a prerequisite for social mastery. It gives access to possibly otherwise scarce resources, unexplored markets and channels, plus agile, possibly asset-free business models. It also taps into a crowd IQ that goes way beyond what even the brightest enterprise could develop on its own.

It also requires particularly flexible technology options, as connections may come and go in an instant. The IT platform needs to provide services to leverage a new breed of connections at top speed. Blockchain is an example of a technology framework that substantiates the notion of smart, collaborative contracts; these are distributed, open, transparent, and rock-solid safe.

The latter capability cannot be emphasized enough; being successfully connected depends on mutual trust. And trust is based on an equally divided mix of clarity about what's to be expected at both sides, and the measures that have been taken – both in terms of technology and governance – to ensure the right outcome.

5G is another example of a technology that will change the way we collaborate. This new and amazing network bandwidth will provide a further boost to a truly virtual and augmented reality, possibly even augmented with holograms sooner than later. But the very low latency, plus the ability to connect more devices concurrently will also enable us to connect to billions of sensors and interact with the entire planet. Being connected everywhere, with less need of travelling, decreasing our carbon footprint: it's a whole new collaboration experience.

Finally, established business rules tend to change the moment AI really kicks in. It's no different in the area of Technology Business collaboration, where even the most subtle ripples in ecosystems can be anticipated and leveraged at the earliest stages – enabling potentially "handsfree", networked business models that were previously unthinkable. And what can we expect when AI systems start to work with humans – and even with each other – to unleash spectacular, yet unexplored waves of creativity?

You, Me, Us, We, It, AI, our Planet. All together now.

# The Team is the Canvas

**Judith Kennes**
*Expert in Residence*

## Leveraging teams-oriented workspaces for collaboratively creating joint business results

**It's nothing more than appropriate that in the era of the Personal Computer, we have been doing our IT work from the metaphor of a desktop; a workspace that arranges applications and information from a highly individual perspective. Now, with everybody and everything connected in real-time, the canvas on which we produce is much more shaped by the teams we are in, the social graph of people inside and outside these teams, the way teams collaborate to achieve common goals, and the information that is needed and produced while doing so. Our preferred palette of technology tools in business changes accordingly, equipping us with a predominantly Team state-of-mind when creating our next starry nights.**

### What

- Easy to use, collaborative tools provide a shared workspace combining many of the previous collaboration and communication solutions into one; these tools evolve into full-fledged collaboration platforms, but are also popping up as plug-ins at all places where collaboration is needed – for example, when creating a document or handling a service request.
- Typically, these tools are cloud solutions that start to incorporate automation and artificial intelligence to further augment collaboration, for example, in terms of automatically scribing meetings, identifying key people, or finding exactly the right information needed by the team for the task at hand.
- More collaboration platforms become 'programmable', in the sense that they become a canvas for mini-applications and services, aimed at supporting specific collaboration tasks; in a way, collaboration platforms become the new desktop – the starting point for all activities.
- Being able to connect to and navigate through the 'social graph' of co-workers, partners and clients provides unmatched, fine-grained opportunities to work together.
- Collaboration platforms and tools do not only provide generic ways of working together; some are geared towards very specific team-driven activities, for example defining, monitoring and achieving joint KPIs or brainstorming and selecting innovative ideas.

### Use

- A Dutch cosmetics and lifestyle brand built all of its internal collaboration and communication between head office and stores on a cloud-based collaboration platform. This involved training, product information, floor plans and marketing, but also included point of sales systems. Staff in the store is connected in real-time to the platform through tablets.
- Sport retailer, Finish Line noted that after deploying a collaboration tool, emails between store operations and corporate departments to the stores have been reduced by 90%, because they now communicate through Finish Line Connect, their internal collaboration platform.
- The Farmers Insurance Group brought all 20-thousand of its American workers onto Workplace by Facebook, in order to keep each other connected in real time benefitting from sharing information when needed most, for example during a weather crisis. As Workplace by Facebook is simply a version of Facebook but for businesses, employees needed next to no training.
- Companies such as Workday use the WorkBoard platform to collaboratively work on defining and achieving Objectives and Key Results (OKRs) throughout their organization.
- TechnoVision 2020 was entirely created using Microsoft Teams.

### Impact

- Higher productivity of teams, with more focus on creating specific results, achieved in a shorter time and involving less infrastructure.
- Optimal leverage of available team members, even when not physically at the same place, connected at the same time, or part of the same organizational unit.
- Information workers save hours per week from improved collaboration and information sharing.

### Tech

- Collaboration tools:
  Atlassian Suite (Trello, Confluence, Jira and more), Slack Enterprise Grid, Version One, Microsoft Teams and Office 365, Microsoft Project Cortex, Hubstaff, Facebook Workplace, Salesforce Chatter, WorkBoard
- Communication tools:
  Yammer, Cisco's Webex, Skype, Zoom
- Dynamic resource matching:
  Capgemini People Analytics, IBM Talent Management, Workday HCM, SAP SuccessFactors

# Fluid Workforce

**Isabell Schastok**
*Expert in Residence*

## Adaptive orchestration of skills to beat complexity and thrive on unpredictability

**Under pressure, everything becomes fluid. And pressure is there, given the highly volatile and complex ways of the economic landscape. Businesses need to be highly adaptive in how they orchestrate their workforce. They must become anti-fragile, fluently accommodating evolving market demands and needs for skills. Agility, learning culture and staffing flexibility are at the core. Peer-to-peer platforms increase transparency and connectivity across any role or organization, making organizational boundaries irrelevant. AI supports the dynamic matching of skills and interests with jobs to be done. In a future that seems certain to be swarmed by Black Swans, a technology-enabled fluid workforce is the new default.**

### What

- Organizational adaptability becomes a critical factor of survival to be flexible enough to respond quickly to changing market situations and client expectations.
- Requiring the adaptability of individuals, teams and even the entire organization to engage in an agile culture and flexible ways of working, workforces are built on new leadership models, behaviors, revisited organizational structures and processes.
- Automation and AI will impact an organization's existing workforce's job roles and skill requirements.
- Future workforces will no longer focus on an organization's employee base, but will combine digital and human talent; employees, contracted external workers, part-timers, temporary workers, consultants, freelancers and robots.
- HR becomes a talent broker, managing AI and human relationships with AI-based platforms and dynamic resource matching tools; enabling skill-based staffing, on-demand allocation of work and a real time reaction to changing business needs.
- AI-supported workforce planning tools facilitate organizations in strategic workforce transition, to allow fluctuating capacities and more flexibility job allocation.
- Digital communication tools and cloud-based platforms enable cross-functional teams working across organizational boundaries to engage with each other.

### Use

- A bank applied people analytics on their workforce to improve skill demand and supply by identifying roles that were in demand and at risk, as well as shaping skills development initiatives to close respective skill gaps.
- A large HR service provider used geo-based analytics to create a new recruitment strategy by proactively anticipating upcoming opportunities and matching job seekers with relevant openings.
- An electronic goods retailer established a diagnostic, data-based people assessment to reorganize their IT department for an agile operating model.
- An electricity company designed a technical solution for knowledge management to break down siloed structures and establish a culture of sharing and collaboration.
- A large biotech company built a collaborative digital workplace to eliminate information silos and enable self-organizing teams for better collaboration and faster decision making.

### Impact

- People analytics and AI-powered tools allows proactive HR workforce planning, including skill-based staffing and supply and demand management.
- Increased efficiency to further manage capacity freed up by automation and AI.
- Increased adaptability, faster reaction times and increased customer satisfaction.
- By identifying employees with predefined potential needs can reduce costs and unnecessary investment in re-skilling and upskilling the workforce.
- Increased employee engagement with higher levels of team productivity and efficiency.

### Tech

- Dynamic resource matching:
  Capgemini People Analytics, IBM Talent Management, Workday HCM, SAP SuccessFactors
- AI-powered workforce transformation optimization:
  Braincities, Faethm
- Intelligence SaaS platform, powered by AI:
  Team EQ
- Cloud-based platforms to support and improve self-managed teams:
  holaSpirit, glassfrog
- Team performance visualization tools:
  Trello, Monday, Amplifai

# New Chain on the Block

**Sudhir Pai**
*Expert in Residence*

## Using distributed ledger technology to drive next generation trusted business ecosystems

**Excellent connections create excellent results. What if being connected and carrying out transactions in an ultra-safe, transparent, and effortless way comes to you as a fluent platform capability? Well, there's a new kid in town that seems determined to stay - even if her street-credibility is being questioned every now and then. The blockchain underpins next-generation ecosystem platforms that act as public ledgers for open, collaborative transactions and 'smart' contracts. It provides trustworthy connection capabilities that speed up transactions, cut out the middleman, and provide full transparency, while ensuring data integrity, privacy, and security. It seems we're in the middle of a chain reaction!**

### What

- A basic principle where each transaction on a network is recorded as a 'block' and each block chained to the previous, which is immutably recorded using cryptographic trust and assurance mechanisms.
- The building blocks of the enterprise blockchain, 'Smart Contracts' can remove intermediaries by executing trusted, verifiable and tamper-proof transactions, building decentralized applications.
- There has been a rapid uptake of blockchain projects with enterprises moving from proof-of-concepts to deployments, with rising investments in blockchain startups and several industry consortia being formed.
- Major technology providers – such as Microsoft, AWS and IBM - have made significant investments in developing 'blockchain-as-a-service' platforms, linking to their broader product portfolios and revenue streams.

### Use

- Financial Service firms such as Marco Polo are leveraging blockchain to radically reengineer business processes, streamlining trading process and removing barriers to plug the trade-financing gap.
- Global Currency Organization (GCO), a project spearheaded by J.P. Morgan, Intel and TrustToken, launched USD backed stablecoin, called the USD Digital (USDD). By opening up the stablecoin model to a global network of partners, GCO can provide end users with multiple gateways to move between fiat and crypto-currencies around the world.
- TradeLens and Food Trust use blockchain in their supply chain to leverage traceability and immutability for anything from large shipments to bananas.
- The Blue Catalyst initiative demonstrated the great potential for blockchain, carrying out transactions around Know Your Customer (KYC) and Know Your Supplier (KYS).
- The Whiteflag protocol – built on blockchain – enables entities protected under humanitarian law to make themselves known in real-time, preventing collateral damage and casualties in conflict zones.
- The Australian Security Exchange ASX digitized multi-party agreements through 'Smart Contracts', automating and securing the transaction and settlement process.

### Impact

- Cutting out the middleman improves value chain efficiency by building trust in an open, secure platform for collaborative transactions.
- Blockchain enhances data security, privacy, and auditability; all crucial with ever-stricter data protection regulations (such as GDPR).
- Blockchain facilitates low cost, instantaneous peer-to-peer transactions for cross-border payments, eliminating financial intermediaries and reducing waiting times.
- The added value to business from blockchain can also be seen in how the technology integrates with other breakthrough technology drivers such as AI and IoT, for example as done by UNICEF for tracking vaccines.

### Tech

- Blockchain Platforms:
  Hyperledger, Ethereum, Corda by R3, IBM Blockchain Platform, arcblock.io, stellar
- Business-focused consortia:
  R3 (banking), B3i (insurance), CBSG (telco), MOBI (auto)
- Technology-focused consortia:
  Hyperledger, Enterprise Ethereum Alliance

# Use the 5G Force, Luke

**Patrice Duboé**
*Expert in Residence*

## Tapping into the potential of 5G networks to create brand new, highly collaborative business propositions

**5G is so fast and agile, not even a Jedi light saber can beat it. But the huge improvements in bandwidth and latency are not the only drivers that spark the revolution. With so many more people, devices, things and entire organizations soon connected in real time, there are so many brand new, collaborative business opportunities. Whether it's on the road, in the air, at sea, in cities, factories, in warehouses or at home; the phenomenal ecosystem power of 5G enables man and machine – or machine and machine - to work together in previously unthinkable ways. So, don't just get blinded by the blistering speed: look at the much broader potential of a hyper-connected world. May the force be with you.**

### What

- 5G will have a massive impact – not just because with 5G you will get 1GByte/s at your fingertips, it is also because latency will be significantly lower (the "ping" time) as well as the number of handsets that can use the network at the same time in one square kilometer is 450 times higher than with 3G or 4G. In other words, there is more data, faster and constantly available.
- But 5G won't just improve the bandwidth. Reaching the 1Gbs, the 10Ggbs will boost the streaming business for gaming and video conferencing.
- 5G will also allow for more concurrent connections; 4G supported max 4,000 concurrent devices per square kilometer; 5G will support up to one million concurrent devices
- 5G will serve both IoT and broadband services through several requirements, including specifically energy efficiency.

### Use

- Some cities have already begun their 5G experience. San Marino deployed a 5G network with Ericsson, and as of July, Beijing had already constructed more than 7,800 5G base stations.
- Huawei Technologies, China Eastern Airlines and China Unicom have joined forces to introduce a 5G-based smart travel system at the new Beijing Daxing International, which supports the facial recognition technology.
- Audi started testing 5G as a solution for robotic motion control use cases. Though the trial is ongoing, results thus far have been "very satisfying," according to Henning Löser, the head of Audi's Production Lab. (Capgemini Research Institute)
- Situation monitoring trial of blue-green algae conducted on trial basis with the help of drone, 5G network and computer vision.
- Doctors in a Beijing Jishuitan hospital conducted the successful remote orthopedic surgery using robotic and 5G technology on a patient at Tianjin First Central Hospital, which was 136 kilometers away.

### Impact

- The impact of the 5G network is vast, including massive streaming bandwidth and ability to connect billions of objects (IoT), delivering low latency and high availability services for autonomous cars to name a few.
- But we cannot deny the impact on the environment through energy consumption. Downloading gigabits of data through game or video streaming is increasing our Carbon Footprint drastically and connecting billions of objects to fulfill data lakes centers requires a new way of architecting our digital world.
- Edge computing and AI could be an answer by computing data on the cloud edge, onboarding AI within IoT chips will avoid sending so much data to the cloud. After the Mainframe architecture, the 2 tiers and 3 tiers, Edge AI Computing could become the new architecture standard.
- But the most valuable answer is to come from us, the end consumers. Do we need to use so much bandwidth just because it is there? Or do we want to move to a leaner digital world? Only time will tell.

### Tech

- Papers and Specifications:
  Capgemini Research Institute: 5G in industrial operations, ETSI: Why do we need 5G, ITU: 5G Requirements , 3GPP 5G specifications
- 5G handsets:
  Samsung Galaxy S10 5G, OnePlus 7 Pro 5G, Moto Z3 and Z4, Huawei Mate X, LG V50 ThinQ, iPhone 12

# Creative Machine

**Menno van Doorn**
*Expert in Residence*

## Unleashing a new wave of man-machine creativity by letting AI do the heavy lifting of producing it

**5What if AI writes your haikus? It seemed the final frontier; where technology would automate our repetitive, mind-numbing tasks, we would find our new forte as humans in creativity – an area where AI could never match us. Turns out that Generative Adversarial Networks (GANs) – in which AI systems collaborate in creating and testing results – can create spectacular results in areas as diverse as images, video, audio, text, art, products, medicines, games, and even entire business models. When done well, AI and humans can together unleash a new era of great creativity. But the boundaries of what is real and what is fake are stretched, and it takes more than a poetic mind to deal with that.**

### What

- The basis of GANs is synthetic data - data generated by machine algorithms. Yet, this data is becoming as real as real data.
- The trick lies with creators and discriminators. Part of the system generates the output, the other part tests it on how credible it is compared to the 'real' counterpart.
- Many different GANs generate many different things. StyleGANs can generate certain 'styles' of human faces, creating an image of what you'll look like in 20 years.
- GAN technology is used to design certain attributes in games such streets, cars, houses and even people. It has a multitude of applications, from design of software to interiors of houses and fashion, even creation of music, books, paintings and art.
- Over the last 12 months alone, there has been an explosion in the number of scientific papers on GAN technology, we are only scratching the surface on the technology's future capability and function.
- It can be used to design computer generated humans to be used in film and screen. Yet it has a darker side in the creation of 'deep fakes'.

### Use

- To test autonomous driving cars, synthesized cities are created – a digital representation of a non-existing city.
- In the health industry, generated synthesized data improves the data quality of health screening such as MRIs and brain scans.
- Swedish Mackmyra uses an AI system, coached and augmented by human experts, to created optimized recipes for whiskey.
- The outdoor field game, Speedgate is entirely imagined and created by an AI system, verified by humans, created by analyzing hundreds of different existing games.
- Researchers at University College London used human input with AI to recreate one of Picasso's most famous (and currently lost) paintings from the Blue Period, The Old Guitarist. After the project, the researchers explained that the human-AI collaboration not only broadened their insight into an artists' creative process, but gave an understanding as to the creative potential of AI as an artistic tool.
- NVIDIA researchers in collaboration with University of California, Merced developed a deep learning-based, generative model that can automatically create a dance video with new, diverse and style-consistent dance moves that match the beat.

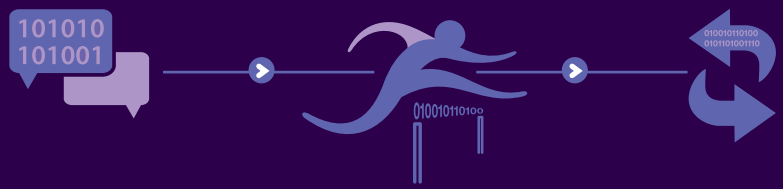
### Impact

- Automation of human creativity represents huge possible cost reductions.
- A whole new human to machine interaction, where creative human processes have input from creative machines.
- GAN technology enables an enhanced speed of working, including activities such as the invention of new medicines.
- The use of synthesized data in testing leads to a substantiated improvement in quality of products and processes.

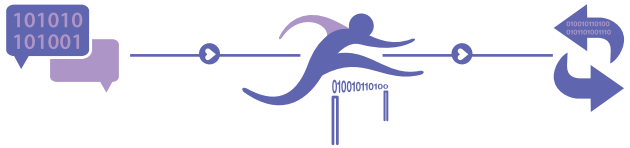
### Tech

- Face generation: NVIDIA StyleGan Github
- Anatomically-aware facial animation from a single image: GANimation
- Play with Generative Adversarial Networks in your browser: Ganlab
- Google Typology of GANs
- Text to image: StackGan
- Adobe Sensei for AI-enabled creation of marketing and creative content

# Design for Digital



# Design **for Digital**




**Pierre Hessler**
*Expert in Residence*

**In TechnoVision, tangible trends are presented though six containers, providing the 'What': what is happening, what might happen and what we only dare to dream. These containers should be consumed wholeheartedly, as there is no substitute for a healthy technology appetite in the world of a Technology Business. However, here in the Design for Digital container, we look at the 'How'.**

Why do we need this container? Well, in the 12 years of applying TechnoVision, we've noted time and again that culture, mindset and ways of working help to determine the success of technology-driven change, often more so than the technologies themselves. Technology Businesses – on their way to a full symbiosis with what we still call 'digital' – are governed by new rules, and these rules of technology apply as a matter of course.

The principles of Design for Digital reflect seven of these rules:

- Simplicity is a must for speed – measured both in business and technical terms.
- As organizations need to be open, platforms and APIs can make it happen.
- Technology Businesses see virtual and physical worlds as one; a real symbiosis.
- Trust in business requires trust in technology.
- What is Corporate IQ, if not the combination of human and artificial intelligence?
- The Technology Business's narrative is supported by technology-enabled stories.
- Elements of a business may soon be as autonomous as self-driving cars.

Focusing on the How, this container is different from the others in that it presents the principles of technology use, not the technology trends themselves. We therefore describe and visualize its elements differently too.

Each principle is an action; a definitive, self-explanatory action with an anticipated consequence. It is followed by a thoughtful checklist, before KPIs – Key Principle Indicators – are proposed to track the way you apply the principle in business. And with the theme simplicity running through our minds, all of that is delivered in fewer words than ever. You're welcome.

Your challenge (should you choose to accept it) is to look at the Design for Digital principles as 'meta-requirements' on your journey to becoming a Technology Business. Whether you are creating an architecture or solution, developing a portfolio of initiatives or brainstorming innovations, you should use these principles as your guiding light. We're not saying you need to implement all of them every time, but think through the principles and decide which ones apply.

Through Design for Digital, our hope is to make each one of TechnoVision's 'checks' practical for the reader and practitioner. Simplicity is key.

# Simply **Speed**

Once upon a time, in a cloud not far away there was a promise of freedom, standardization and simplicity. But in the real world it was more like the opposite; dealing with lock-ins, dependencies and heterogeneity. A Technology Business wants to be agile, fast and well-integrated, not bogged down in complexity. A simple mindset makes for speedy business. And just around the corner the three musketeers of automation, AI and user experience technology are waiting to assist. Be gone complexity. Hello simplicity.

## Principle

SIMPLIFY:

- To master complexity
- To increase speed of action and reaction

## Checklist

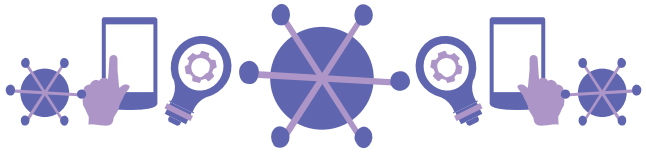
Apply development objectives, which, compared with the current situation:

- ✓ Eliminate, streamline, or circumvent complexity
- ✓ Kill all duplications
- ✓ Decrease integration needs and touchpoints
- ✓ Provide simpler, seamless user experiences
- ✓ Ease the flow of data and improve data legibility
- ✓ Provide transparency as an antidote to complexity
- ✓ Accelerate and automate development steps
- ✓ Contribute to a decluttered applications landscape

## KPIs

- **TIME GAIN OBJECTIVE(S)** compared to existing timings (interactions, responses, time to market and end-to-end lifecycles)
- **DECREASED COST OBJECTIVE(S)** of managing the Technology Business solutions portfolio

# Open For **Business**

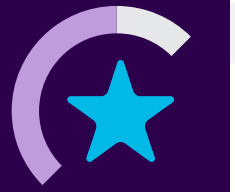


As we live in a connected world, business success thrives on the ability to be open. Open to new opportunities, collaborations and business models - as and when they arise, not only as planned. But, just like the disappointment of finding yourself in an area without a decent network connection, point solutions are simply no longer enough. A real Technology Business needs real platforms. The ones that provide stakeholders with all the technical capabilities, connectivity, datasets and APIs they could possibly wish for. But let's not stop there; offering more than what's on the wish list is a real trick to Technology Business mastery.

## Principle

OPEN UP:

- For new business relations
- For greater reach, internally and externally



## Checklist

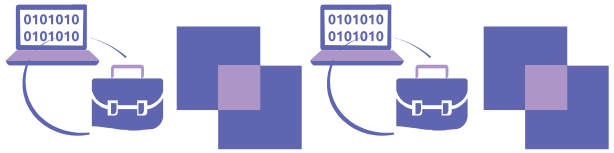
Apply development objectives, which, compared to the current situation:

- ✓ Build on the collected analysis of key business relations
- ✓ Develop more 'API bandwidth' by defining new interfaces, and broadening the existing ones – for richer dialogues
- ✓ Establish a boundaryless flow of data between key stakeholders
- ✓ Create additional shared corporate intelligence
- ✓ Share assets to achieve leverage
- ✓ Build and leverage platforms for known and yet unknown needs

## KPIs

- **BUSINESS RESULTS** to be achieved from new and improved business links
- **EXTENDED CAPABILITIES** of technology platforms

# Joined **at the Hip**

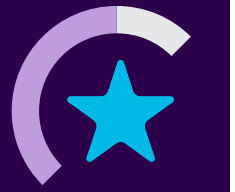



The words say it all. In a Technology Business, it no longer makes sense to distinguish between technology and business. They are in interdependent, conjoined, inseparable. What's more, the difference between virtual and 'real' worlds is becoming blurry as they merge into a larger augmented reality – effortlessly, systematically and with no return ticket. Anything less is lost in translation. Technology. Business. Virtual. Real. Let's get them all joined at the hip.

## Principle

AUGMENT:

- Reality as users perceive it
- For Business Technology symbiosis



## Checklist

Apply development objectives, which, compared to the current situation:

- ✓ Place users more in their personal and business contexts
- ✓ Augment all visualizations with optional data context
- ✓ Augment all data with optional visualization context
- ✓ Pair up all 'real' objects with their 'digital' twins and vice versa
- ✓ Establish joined-up business and technology development teams
- ✓ Ensure the joined-up teams cover the entire Technology Business landscape

## KPIs

- **DESCRIPTION** of all targeted augmentations to solutions, human roles and physical objects
- **MEASURES** to create a seamless collaboration between business and IT, before symbiosis

# Trust **Thrust**

Trust. The Technology Business must-have. Without trust there is no business. Technology Businesses must be trusted by customers, clients, employees, partners, networks and authorities alike. In summary, by everyone. Trust isn't gained overnight. Slow to earn, quick to lose, a lapse in cybersecurity or the careless use of data and boom, trust gone. Just like that. Now, with added pressure on corporate ethical and responsible behavior joining the equation, the stakes are even higher. Yet we know when leveraged, trust becomes an engine for business success, rather than a liability. Give it the respect it deserves.

## Principle

BUILD:
- On existing trust
- New trust assets

## Checklist

Apply development objectives, which, compared to the current situation:

- ✓ Ensure organized trust checks across all relevant constituencies
- ✓ Designate selected employees as trust referees
- ✓ Create competing trust and distrust teams to help analyze and build trust
- ✓ Systematically probe key trust issues with regulators
- ✓ Verify trust in all data, for both data used and for data created
- ✓ Build and maintain more elaborate (cyber) defense measures
- ✓ Ensure 'explainability', 'auditability' and fairness for evolving AI solutions
- ✓ Demonstrably build on the corporate ethical code of conduct

## KPIs

- **LIST** of trust contributions and risks in each solution
- **CHECKS AND BALANCES** to ensure the desired level of trust

# IQ up, **EQ up**

It's no surprise that a key driver for Technology Business is data. But, data needs a purpose, its own raison d'être. Data should raise the bar of an organization's IQ measurably, leading to better business outcomes. In that pursuit, quality might well prime quantity. As humans, we know that IQ without a side of EQ is never enough. And so is it in business with customers and partners: emotional intelligence – the corporate EQ –will be at least equally relevant to success. After all, nobody puts data in the corner.

## Principle

BOOST:

- Corporate IQ through higher quality data
- Corporate EQ through context-sensitive responses

## Checklist

Apply development objectives, which, compared to the current situation:

- ✓ Include systematic, tool-supported data quality measures
- ✓ Help better understand - and more effectively own - your data assets
- ✓ Create more tangible value on top of data, through insights and algorithms
- ✓ Map the value added by data to corporate assets, services and products
- ✓ Move towards targeted insights, from the existing situation
- ✓ Capture and leverage emotions-related data points
- ✓ Use real time data for emotional, context-sensitive responses and dialogues
- ✓ Enrich products and services with emotional dimensions

## KPIs

- **ASSESSEMENT** of effectiveness of data strategy and data architecture to boost Corporate IQ and EQ
- **LIST** of emotional assets used for context-sensitive responses

# What's **our Story?**

A long time ago, storytellers mesmerized every audience. Their faces wrinkled in deep crevasses as they smiled, with starlight sparkling from their eyes in kindness. Technology inherited the power of those storytellers. It plays a pivotal role in our lives, not just in business and administration. It conveys messages and motivates; it inspires change – all within the era of the diminishing attention span. But in Technology Business, we have come to expect more than the storyteller can offer; we want to be part of the story, to play an active role. The story evolves into a never-ending dialogue. "What's your story?" becomes "What's our Story?". Now there's a happy ever after.

## Principle

DIALOGUE:

- Tell your part of the story
- Listen and respond
- Weave in your enterprise purpose

## Checklist

Apply development objectives, which, compared to the current situation:

- ✓ Reshape interactions into balanced dialogues
- ✓ Build joint solutions in a "hothouse" setup, on the work floor
- ✓ Ensure more conversational and intention-driven design
- ✓ Favor natural language across solution designs
- ✓ Turn dense documents and A0-size diagrams into learning exchanges
- ✓ Engage and mobilize, rather than educate and inform

## KPIs

- **REPOSITORY** of Technology Business stories and dialogues
- **OPPORTUNITIES** to bring in interaction, playfulness and applied innovation

# No Hands **on Deck**

It wasn't that long ago when the prospect of a self-driving car seemed implausible. Yet much like the self-driving car, the ultimate version of many products, services or processes will become autonomous, sooner or later. Even if – like the self-driving car – it takes a bit longer than originally anticipated. But unlike the Black Pearl, there will be a time when 'all hands on deck' becomes a captain's nightmare. Hands off, it's time to learn about autonomy through not doing.

## Principle

TEST-DRIVE:

- Applications of autonomous power for objects, processes, solutions and organizational elements

## Checklist

Apply development objectives, which, compared to the current situation:

- ✓ Identify the right entities within the organization that could benefit from autonomous capabilities
- ✓ Identify the data which makes autonomy possible
- ✓ Identify the processes that are most suitable for autonomy
- ✓ Create learning opportunities within automation, AI and other levers of autonomy (while reaping their early benefits)
- ✓ Balance the role of humans (and their EQ) with the roles of autonomous systems

## KPIs

- **MAP** of identified autonomy opportunities matching the Technology Business transformation agenda
- **LEARNINGS** to be gained from 'test-driving' autonomous solutions

# Applying **Technovision**



# Applying **TechnoVision**

**There are many ways to apply TechnoVision, like brainstorming entirely new ideas, systematically crosschecking an architecture, design or invent on innovation potential, using it as a playful dialogue tool between all involved in technology business change, or just trusting on good old serendipity to find an unexpected angle when tackling a tough challenge.**

Above all, TechnoVision is a tool to tell a Technology Business story; a story that shapes an opportunity, answers a question, gives direction, resolves an issue, or simply delights an audience. It is always a story to be told between people, from both the business and IT sides of an organization (if there are still different sides, that is). Choosing the right building blocks – studying them, interpreting them, discussing them with others – is already part of the storytelling. Then, the blocks are woven together with other views, considerations and scenarios to create a unique Technology Business story that addresses a specific need, challenge, or opportunity.

There are of course more ways to getting a rough cut of relevant technologies, for example through a trend radar or S-curve 'hype cycle', or other complementary approaches that may prove useful. In short, anything that triggers the need for a compelling technology business story will do – as long as it's a simple story.

In 12 years of shaping yearly editions of TechnoVision, we've spent a considerable amount of time getting rid of complexity in the approach. We introduced icons, visual metaphors, storytelling, and (hopefully) intriguing trend names to compel the reader. We cut down on the content volume, forcing ourselves to focus on the essentials within a minimal, structured format. We are living in an era of limited attention span, and if we urge users of TechnoVision to be crisp and to the point, we should to apply it to our own ways as well.

The TechnoVision boxes certainly helped with that ethos as well; 37 trends turned into colorful, real-life cardboard boxes, each box containing a short elevator pitch of a trend and with a QR code for more detailed content. These boxes can be picked up, carried away for study outside in the sun, discussed with others, and stacked as digital 'totem poles.' Together, they can tell a technology-enabled customer story, a day in the life of an employee, a breakthrough in a process, or a new, disruptive product.

Our Technology Business 'building boxes' turned out to be an easy, attractive language spoken by both IT and businesspeople. We have put them in our Applied Innovation Exchange (AIE) labs and Accelerated Solutions Environments (ASE), our agile development zones, and our office lobbies. Rumor has it that a certain TechnoVision author even glued a full mini-set to his wall at home – talk about dedication! We have also made the graphic designs publicly available for free, so that the boxes can be printed out on plain cardboard (or processed in any other way - we welcome creative best practices and will be happy to share them with the outside world). The boxes feature in several of the examples we gathered about applying TechnoVision. There's already a VR version of the TechnoVision theater – developed within our AIE network - enabling teams to work together in a session from different locations.

## The full list of ways to apply TechnoVision is as follows:

- TechnoVision Theater (with boxes)
- Business Model Canvassing (with boxes)
- Repositioning
- Digital Picture
- Storytelling
- Grab a Box (with boxes)
- Applying TechnoVision Virtually
- #TweetMyArchitecture

We have also added a page addressing the role of TechnoVision within architecture, a major context for technology business change.

Again, we welcome hearing about other best practices and are most happy to share any additional format you have pioneered yourself around applying TechnoVision.

# Applying **TechnoVision**

## TechnoVision Theater

### Aims

Create digital stories that address business challenges, opportunities, potential innovations, digital strategies, or architecture with TechnoVision Theater. Used as an introduction to general technology trends or as a teambuilding and alignment tool for business and technology delegates, it helps familiarize a team with TechnoVision's capabilities. You can even apply it as a hands-on 'ice breaker' during transformation workshops.

### Who's it for?

TechnoVision Theater lends itself well to representatives with no requirements in terms of knowledge, expertise, or experience. This session can be completed with one team of three to five people, but it is more effective with multiple teams reporting out to each other and building on each other's stories. Sessions of up to 50 attendees, spanning seven teams, have been successfully conducted.

### Preparation

Participants will preferably already have some basic knowledge of TechnoVision., although it has proven to be difficult to gather a team consisting of equally informed members. Before starting the session, make sure you have built up the TechnoVision 'wall' with boxes, positioning the cluster areas and boxes in the right sequence. The cluster 'header' should be on top of its pile and the five trends – if possible – sorted according to their sequence in the TechnoVision document. This facilitates the process, as the wall can be used to explain the TechnoVision framework.

Documenting the sessions is a must. This can be done through video recording or supported by a live cartoonist.

The session also needs a credible problem-owner that:

- Can express the challenge crisply and convincingly
- The teams report out to
- Supplies feedback to the team and provide an overall summary at the end

### Introducing the workshop

The workshop opens with a short, high-level introduction of the TechnoVision framework, the structure of the clusters (the 'what') and design principles (the 'how') and relatable examples. Rely on the attendees to study the content of the blocks themselves after selecting them and provide just enough information to help them make the right choices for the building blocks. Then, describe the process of forming teams, building a technology business story, and reporting out. The problem-owner describes the challenge at hand; it can be a strategic question, a conundrum, a quest for ideas, a process redesign, service, or product.

### The format

Form the teams. Team size will depend on the time available (more report-outs take more time) and the number of people attending.

The teams select a few building blocks that they deem particularly interesting for the challenge at hand. A technology business story should typically consist of a minimum of three building blocks and a maximum of seven (five seems a good average). The 'header' building blocks should not be selected (although quite a few teams have been known to break the rule with positive results).

The blocks are selected in turn. However, if while building a technology business story a team decides a block is not as useful as anticipated, another box may be selected. Of course, the rejected block needs to be put back into the pile for potential use by other teams.

Next, the teams start to study the building blocks, reading the elevator pitches on top of the boxes and maybe scanning the unique QR codes with their smart phones for more information. The team members can explain the boxes to each other, provided each box is individually examined.

By building on each other's ideas, the digital story gradually comes together through the combination of building blocks from several colored clusters. It is worth mentioning that focusing on one cluster per team has been a successful, early format as well. Teams can choose to combine technology building blocks from the six clusters along with the 'mindset' building blocks of the Design for Digital cluster; a good story often involves both the 'what' and the 'how.'

Take 15 to 30 minutes to build a technology business story, depending on how much time is available.

### Reporting back

Each team reports out to the problem owner in their own way. The blocks are typically stacked while telling the story to illustrate the enabling role of each building block within the storyline. Some teams prefer to simply create a pile, but we have also seen more creative constructions like totem poles or arcs. The report-out should not take longer than five minutes per team, to keep the story crisp and to the point. A cartoonist may capture the story, or each story can be recorded. Teams should photograph the final box construction for later use. The other teams provide initial feedback to the story, followed by the problem owner. A feedback round should be time-boxed to five to ten minutes each, depending on the time available.

The problem owner gives a final summary and assessment after the last report-out, possibly selecting stories or story elements and suggesting potential future steps.

# Applying **TechnoVision**

## Business Model Canvassing

### Aims

Create insight into how technology can change the business models of organizations with two compelling approaches: the Business Model Canvas (BMC) method and the TechnoVision building boxes. At the end of a session, participants will garner a working knowledge of these approaches and create a list of potential business model improvements or changes. We suggest taking a picture of each idea and having a separate meeting (after about two weeks) to validate the feasibility of the idea within the organization and to identify some potential next steps.

### Who's it for?

Participants are business and technology representatives, with no specific requirements in terms of knowledge, expertise, or experience.

### Preparation

Preferably, participants have already familiarized themselves with both TechnoVision and the Business Model Canvas approach (many instruction videos are available on YouTube for the latter). Before starting the session, make sure you have built up the TechnoVision 'wall' with boxes, positioning the cluster areas and boxes in the right sequence. This facilitates the launch process as the wall can be used to explain the TechnoVision framework. Then, draw a large BMC model on the ground using painter tape.

### Introducing the workshop

The workshop starts with a short introduction on both models. For TechnoVision, introduce the framework (the seven building blocks), the structure of the five elements within the building blocks and the seven design principles. Do this on a high level and provide some examples. No need to dive into the details yet. For Business Model Canvas, explain the origin (notably how Ostenwalder used the model to write his book) and the different elements of the Business Model Canvas.

### The format

After the explanation, take one example of a company that;

- most people will be familiar with, or
- is bankrupt or highly successful.

Then, take some boxes and explain which elements the successful company put in place so they stand out from their competition, or move boxes into the BMC model to illustrate what the bankrupt company could have done differently.

Next, ask the participants to consider their own organization or a specific part of their business (organizational unit or product). Let them generate ideas about how the technology building blocks can be used to improve business performance or even entirely change the organization. Let them physically place the boxes in the model on the ground. Encourage discussion, play for about ten minutes and ask for a report-out.

### Reporting back

If you have a large group, you can split it up into groups of four or five and have them report out to each other. Depending on the time, you can have multiple rounds. You will see that the stories improve with each round.

Take a picture of each model and write a one-sentence description. If possible, print it out. At the end of the workshop, these prints can put on a two by two matrix, labeling the axes as "impact of the idea" and "ease of realization". The big impact ideas that are easy to realize are the ones the participants should take with them to elaborate on later.

Let the participants give a short statement on the insights they gained. Then, let them all take one box that they found particularly interesting and take a group picture with the boxes.

# Applying **TechnoVision**

## Repositioning

## Aims

Examine existing development projects, and operational applications, to boost their technology business orientation and role, by first checking if and how they make use of innovative technologies, and secondly, tuning, amending, enhancing or repositioning these applications to take better advantage of new technologies.

As a result, existing and past investments are not wasted on the path to becoming a Technology Business. They are updated, pruned and rejuvenated for faster progress.

For example, an on-going Customer Relationship Management project will be re-oriented towards a series of smartphone applications and bots with a radically different distribution of roles between customers and employees.

## Who's it for?

Project teams, together with two kinds of challengers - one or two with knowledge of the application field, and one or two with knowledge of the new technologies.

## When?

Timing of initial positioning:

- For developments: soon enough to make changes with minimum effort
- For operational applications: after six or 12 months of run, depending on estimated rate of change of functionality and technology

Repeat after 6 months for developments, 12 months for operational applications.

## The format

Depending on complexity, repositioning takes between two hours and two days.

The repositioning steps are as follows:

- Walk-through the application in development or as is.
- Comparison of the application with state-of the-art thinking.
- List potential adjustments with a rough estimate of corresponding efforts; list potential simplifications or eliminations with rough estimate of corresponding savings.
- Go through the TechnoVision-based checklist and create three categories:
  - Used already
  - Not used and relevant
  - Not used and irrelevant.
- Combine functional changes and "not used and relevant" technologies to create a list of potential repositioning actions.
- Decide on actions based on impact and effort required.
- Plan actions in relation with the original schedule.

# Applying **TechnoVision**

## The Digital Picture

### Aims

The Digital Picture is a Capgemini methodology used to produce an accurate image of an enterprise's Technology Business position. It is produced by combining the points of view – expectations compared with reality and experience – of various stakeholders, from top management to customers of the enterprise. The Digital Picture can be usefully completed and detailed with a TechnoVision-based image of the enterprise's position in Technology Business.

### Who's it for?

All people with a thorough knowledge of the technical position of the IT department and of other holders of information technology in the enterprise, as well as one or two connoisseurs of TechnoVision.

### Preparation

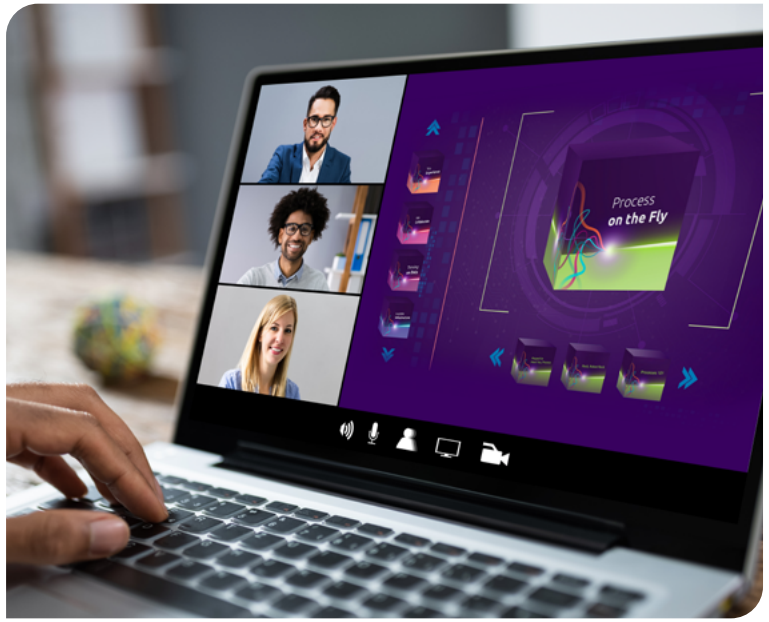
None, except having available the pictures or forms needed to capture status.

### The format

The work takes the form of a dialogue between the TechnoVision connoisseurs and the people with the technical knowledge, including:

- The connoisseurs of TechnoVision give a description of a cluster's content, starting with the Design for Digital principles and continuing from left to right along the framework with the content clusters.
- After the description of each cluster, people knowing the technical position of the enterprise describe it for this cluster's principles or technologies.
- Collectively, the positioning is completed with the color-coded attributes:
  - green: adequate knowledge and capabilities, solid actual and planned uses
  - orange: significant gaps between technology's potential and actual mastery and use
  - red: technology's potential ignored and therefore not used or envisaged.

This work can, of course, also be done at a lower granularity level, by design principles and trend individually.



# Applying **TechnoVision**

## Storytelling

### Aims

Use TechnoVision to tell a Technology Business story. Of course, TechnoVision is just one of the ingredients of your story, but it adds structure and content. For example, to discuss the accelerations the digital world requires and enables, you can start with the cluster You Experience. To understand the speed expectations of digital people, move to We Collaborate. If you want to explain the speed components of social networks, Process on the Fly will help show how external speed gets translated internally, or make use of real time data availability with the help of Thriving on Data.

You can find inspiration in the Design for Digital principle, What's our Story, which prescribes that each application should tell an attractive story.

### Who's it for?

Anybody with the will to tell a digital story. A working knowledge of TechnoVision is needed and can be acquired by practicing the development of stories.

### Preparation

A thorough scripting is needed to give the story structure and avoiding getting bogged down into anecdotal details.

### The Format

Monologue is feasible, but all forms of dialogue and conversation help with the actual understanding through participation.

Using the TechnoVision boxes is a proven way to make the content more alluring and tangible.

# Applying **TechnoVision**

## Grab a Box

### Aims

Get an ultra-fast benefit from TechnoVision in just a few minutes. Create a long-lasting memory (if nothing else) through a picture. Acquire your first taste of working with TechnoVision. Have a quick icebreaker between workshop sessions.

### Who's it for?

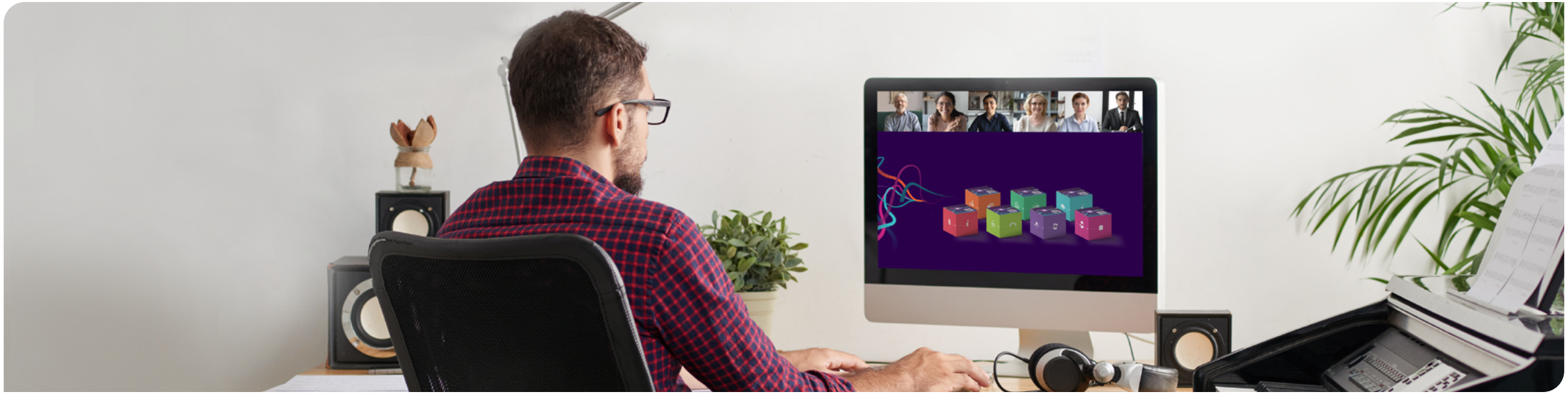
For anyone, including people that happen to be visiting an innovation center or office space that feature the boxes.

### Preparation

Make sure you have the 'wall' of TechnoVision building boxes set up.

### The format

Don't explain TechnoVision. Just ask all participants to have a brief look at the 'wall' of TechnoVision building blocks and choose a box that – on its title alone – intuitively matches their interests or ambitions. Ask every participant to give an elevator pitch on why they selected this particular box and if applicable, what personal next step they assign to it. Take a picture of every individual showing their box. Finally, take a group picture. Distribute to all participants for later reference.



# Applying **TechnoVision**

## Applying TechnoVision Virtually

**As a rule of thumb, we prefer to apply TechnoVision in a lively workshop setting. Usually, this takes place in the context of our Applied Innovation Exchange (AIE) labs, or our Accelerated Solution Environment (ASE) environments. However, the COVID-19 crisis requires us to think differently, and, for most of us, working from home and social distancing are part of the new normal. While there is no real substitute for human contact, the nature of TechnoVision means it can be applied virtually.**

TechnoVision is typically applied according to the following steps: the team is introduced to the different containers and trends mentioned in the report; business challenges are described; selected components are studied and discussed, either individually or in groups; digital storylines are crafted; finally, the findings are reported out. These steps can all be achieved using virtual tools.

Web conferencing software – including Webex, Zoom or Microsoft Teams – can be used for most of the presenting duties, such as introducing the business challenge, educating the attendees on key TechnoVision components, and the final reporting out.

Online group discussions can also be organized with collaborative brainstorming and ideation tools, such as Stormz, Klaxoon and Mural. Some can be preconfigured with TechnoVision components (for example as Kanban-style "cards") to get a team kick-started. All TechnoVision components are publicly available online, and we invite everybody to set up their own virtual TechnoVision co-creation environment.

Alternatively, we have found that a set of Microsoft PowerPoint (or similar application) templates and pre-filled slides can do the job well. The advantage of using these tools is that most people are very familiar with them. Moreover, many cloud-based environments allow teams to work together on the same document or slide concurrently, which makes collaboration straightforward.

Equally, one of the team members can get in presentation mode on the web conferencing tool and build up the slides (for example a 'digital story', consisting of several selected TechnoVision components) while discussing with – and guided by – the other team members. We have found that, generally speaking, the more tailored the materials, the more successful the virtual session is likely to be.

Of course, some methods of applying TechnoVision – such as creating a 'digital picture', or shaping parts of a to-be architecture – are more offline by nature, and may take days, weeks or even months. Even then, there may be a cadence of offline activities – such as desk research and requirements gathering – and online report-out and feedback sessions. As a matter of fact, we are already finding that the virtual ways of working, with less constraints on unity of location or time, also enable innovation 'workshop sessions' to take longer than the typical few hours; for example spread out throughout a week with short online sessions, combined with offline work and collaboration.

And for those who really can't imagine applying TechnoVision without manipulating and stacking these fabulous, colorful boxes, some of our Applied Innovation Exchange labs have been known to play around with 3D boxes on TechnoVision 'islands', all in virtual reality.

# Applying **TechnoVision**

## #TweetMyArchitecture

**It's a tall order for IT and Enterprise architects to balance the paramount, crazy complexity of changing technology and systems with the need to create a calm oasis of simplicity on top of it. And even if they manage to do so, they need to explain their architectures in a way that creates trust and just enough insight – plus lots of enthusiasm - for all involved to embrace and adopt it.**

Following up with architectural perspectives on an inspiring TechnoVision workshop (or even during a workshop) is a matter of keeping the same playful, explorative state of mind. For years, we have known that huge, multi-layered schematic diagrams are not fit for this purpose – other than as a secret language among architects themselves. And no, even storytelling may not be an efficient enough alternative anymore, because – you know – attention span (oh, hi again, Goldfish).

Maybe we could try to resort more to what currently turns out to be the most powerful communication tool available: the 140-character tweet.

If you can't tweet it, it won't cut it.

We have been experimenting for some time now with a training workshop format, to which we call 'Tweet My Architecture': bringing back the essence of an Enterprise or IT architecture to tweet level and then taking no more than 30 seconds on a soapbox – possibly during or at the end of a TechnoVision workshop - to explain the rationale behind it and win the audience over.

If nothing else, it is a humbling and refreshing learning experience to be at the tweet level. But it can be so much more than that, as we are delicately balancing simplicity, complexity and trust.

So, hashtag tweetmyarchitecture it is. We'd love to see a little wave of shared tweet architectures out there. When it comes down to it, what would your #tweetmyarchitecture statement look like?

# Applying **TechnoVision**

## TechnoVision in Architecture

**Kai Schroeder**
*Expert in Residence*

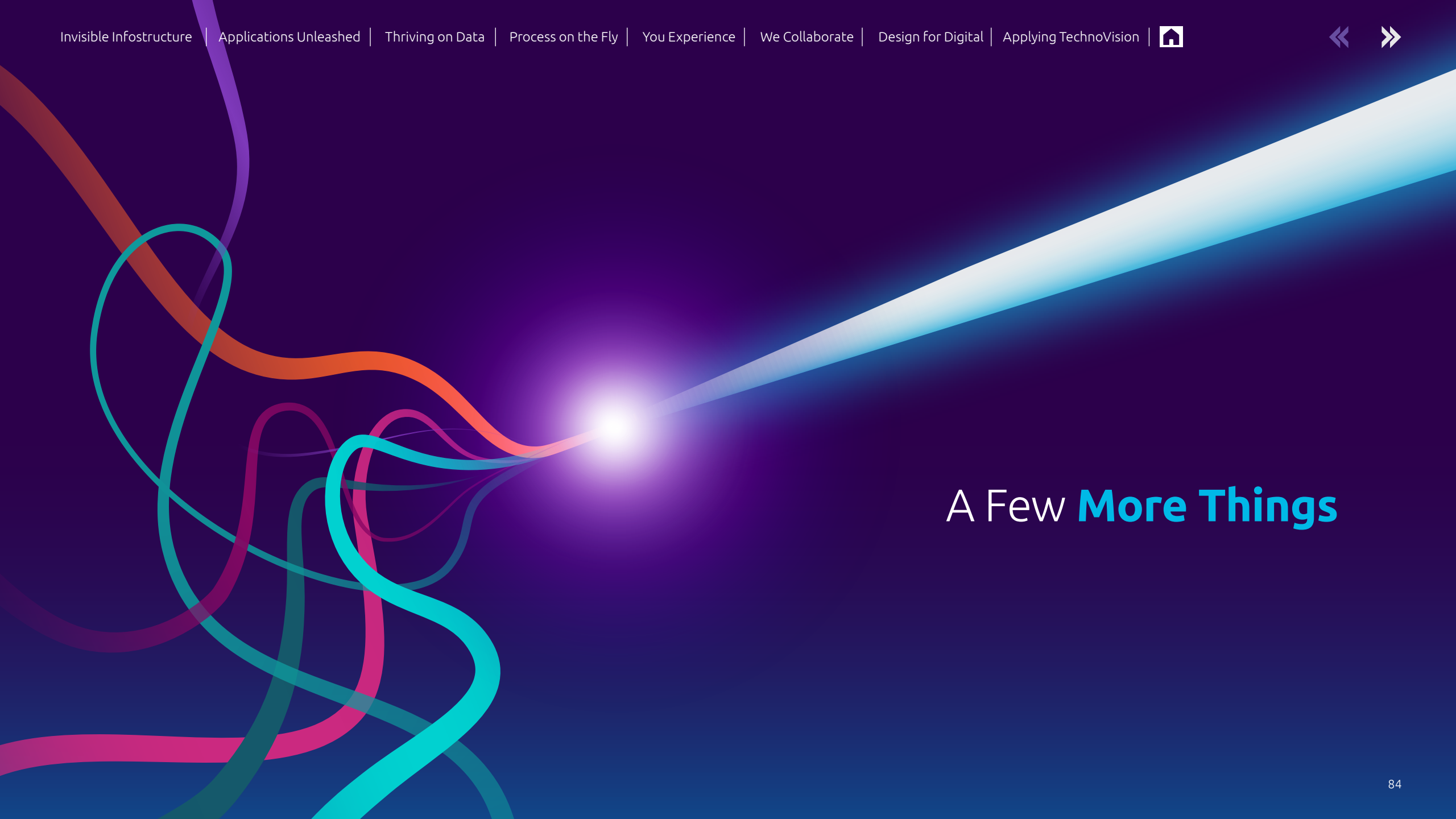
**As Architects, we face challenges on a daily basis. We take pride in the work we do and always go beyond the obvious technology choices. We make a difference for our clients by understanding the business challenge, the complexities around it and our ability to guide the business and technology stakeholders towards building and applying the right solutions. This is exactly where TechnoVision comes in.**

For any business challenge, TechnoVision provides a unique way of framing the business domain. It structures its elements in an engaging and intuitive manner for everyone, whilst leaving plenty of room for creative, meaningful and insightful interactions at all levels of business and technology. It is flexible to explore, build up and home in on all sizes of Technology Business initiatives, changes and transformation – just what architects enjoy and relish.

TechnoVision enables us to conceptually and structurally decompose any challenge so that the relevant factors become obvious to everyone. It's the first step in understanding and finding solutions – in as much of an interactive manner as required.

Using TechnoVision, we can build up different business and technology insights with diverse lenses and viewpoints, something that we as Architects value highly. The ability to easily assemble those views and configure all or parts of the components provides us with invaluable ways to find a solution, related solutioning options, modularity and traceability.

It enhances our architectural capability to deliver the best possible outcomes, across business and technology. It creates a simple clarity for business and technology whilst sharpening the architectural ingenuity that supports the creation of the desired business impact. TechnoVision is fundamental to architectural success. It enhances the interaction and dialogue with our clients and solution teams, sharpening our collective understanding and enhancing the solutions we develop as architects, project and solution teams.



# A Few **More Things**

# A Few
# More Things

**Technology is no longer a prerequisite for change, neither is it driving change. Technology simply is change. Hence – as we suggested earlier – there seems little point in holding on to the concept of 'Digital Transformation'. With the imminent death of digital, the question is what comes after it: AI is encroaching on areas previously considered the indisputable domain of human beings; 5G redefines the very notion of connectivity; autonomous systems herald the final stages of innovation; and quantum computing may completely change the underlying compute model.**

**Meanwhile, organizations recognize that both customers and employees expect a new sense of purpose from them. This requires companies to take a deep, soul-searching look into their own enterprise mirror.**

Environmental sustainability will be an integral part of this enterprise purpose. Even with the obvious shift in priorities as a result of the pandemic crisis, it is still a no-brainer to act positively on the climate and the environment. The question is whether organizations will seize the opportunity to transform their business models towards energy sobriety, and greater frugality in the use of natural resources.

As we noted in 'Being Architects of Positive Futures', technology innovation and sustainability are inextricably linked. In short, this means we will need to leverage new and innovative technology to help achieve a sustainable future.

WWF is defining 2020 as the "Super Year" for environmental sustainability. So, just as we know precisely the carbon footprint of our vehicles, we will now need to gauge the environmental footprint of the IT services we produce and consume. Such services already exist; who knows, maybe soon there will be an Albert for the IT industry.

What, then, about IT's own Schrödinger's cat: Quantum Computing? Since its inception, the technology has taken several decades to get anywhere near production. Moreover, the quantum computers of today – and tomorrow – are crippled by errors in the form of noise, faults and a loss of quantum coherence.

Of course, the question is not whether the industry can address this, but, rather, when we will see quantum computers replacing our beloved binary companions. With the exception of certain areas (notably cybersecurity), we do not expect quantum computing to be driving the Technology Business agenda anytime soon. One to keep on the TechnoVision radar for future issues.

When the internet was invented by Sir Tim Berners-Lee, he noted that it was simply "a system for sharing and distributing information, not just within a company, but globally", without censorship and surveillance, allowing anyone to publish anything on the web. We've now been living with an almost unrestricted internet for more that 30 years, and perhaps it's time for these founding ideas and principles to be revisited.

In his acceptance speech for the Leadership Award of the Anti-Defamation League, the comedian (sic) Sacha Baron Cohen noted that "...it's as if the age of reason, the era of evidential argument is ending, and our knowledge is increasingly delegitimized and scientific consensus is dismissed". Almost in the same week, Tim Berners-Lee outlined a "global action plan to save the web from political manipulation, fake news, privacy violations and other malign forces that threaten to plunge the world into a digital dystopia".

Today, more than four billion people use the internet (52% of the Earth's population) with Google, YouTube and Facebook being the three most visited websites in the world. And the numbers keep increasing. Now more than ever, we need to rethink the purpose of online technologies in a way that means we can trust facts, and that allows the truth to prevail. Only in doing so can we overcome online hate, fake information and manipulation.

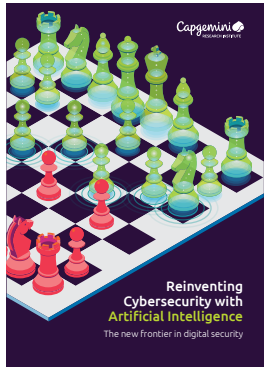
That said, 2020 has reminded us that one Black Swan can eat a great many predictions for breakfast. We don't know what impact the COVID-19 crisis will have on technology and business. We also don't know how relevant our future thinking will prove to be, once the renaissance we've anticipated takes place.

In any case, we hope that TechnoVision provides some fresh thinking to help you address the challenges of today and prepare for what comes next – whatever that may be.

# More **Insights**

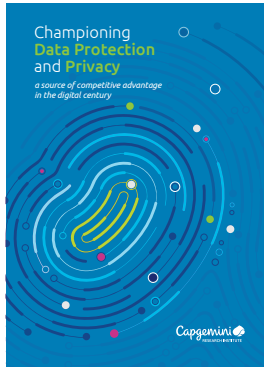
## Read related research and points of view to further inspire you on your journey to becoming a Technology Business:


Where are banksand insurers on their digital mastery journey?

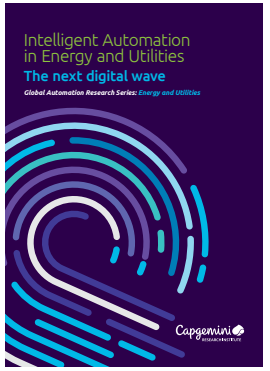



Reinventing Cybersecurity with Artificial Intelligence

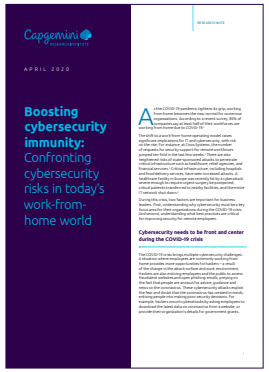

5G in industrial operations




Championing
Data Protection and Privacy

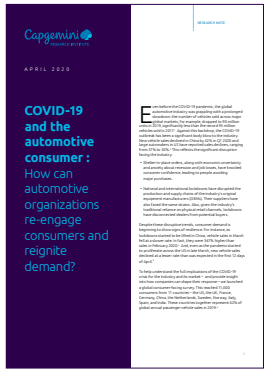



Intelligent Automation in Energy and Utilities




Boosting cybersecurity immunity


The great Supply Chain Shock



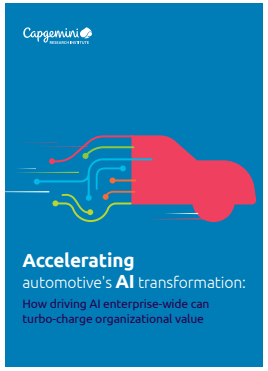

COVID-19 and the automotive consumer

Capgemini invent

Touchless Retail: What the Rest of the World could learn from China's new ways to shop

# More **Insights**

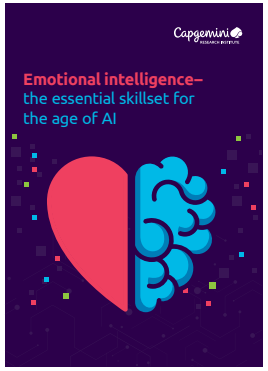
## Read related research and points of view to further inspire you on your journey to becoming a Technology Business:




Accelerating Automotive's AI Transformation


Smart Talk - How organizations and consumers are embracing voice and chat assistants


Smart Factories at Scale




Emotional Intelligence – The Essential Skillset for the Age of AI


Why addressing ethical questions in AI will benefit organizations


Voice on the Go


Autonomous Cars


Agile at Scale – Four recommendations to gain enterprise-wide agility

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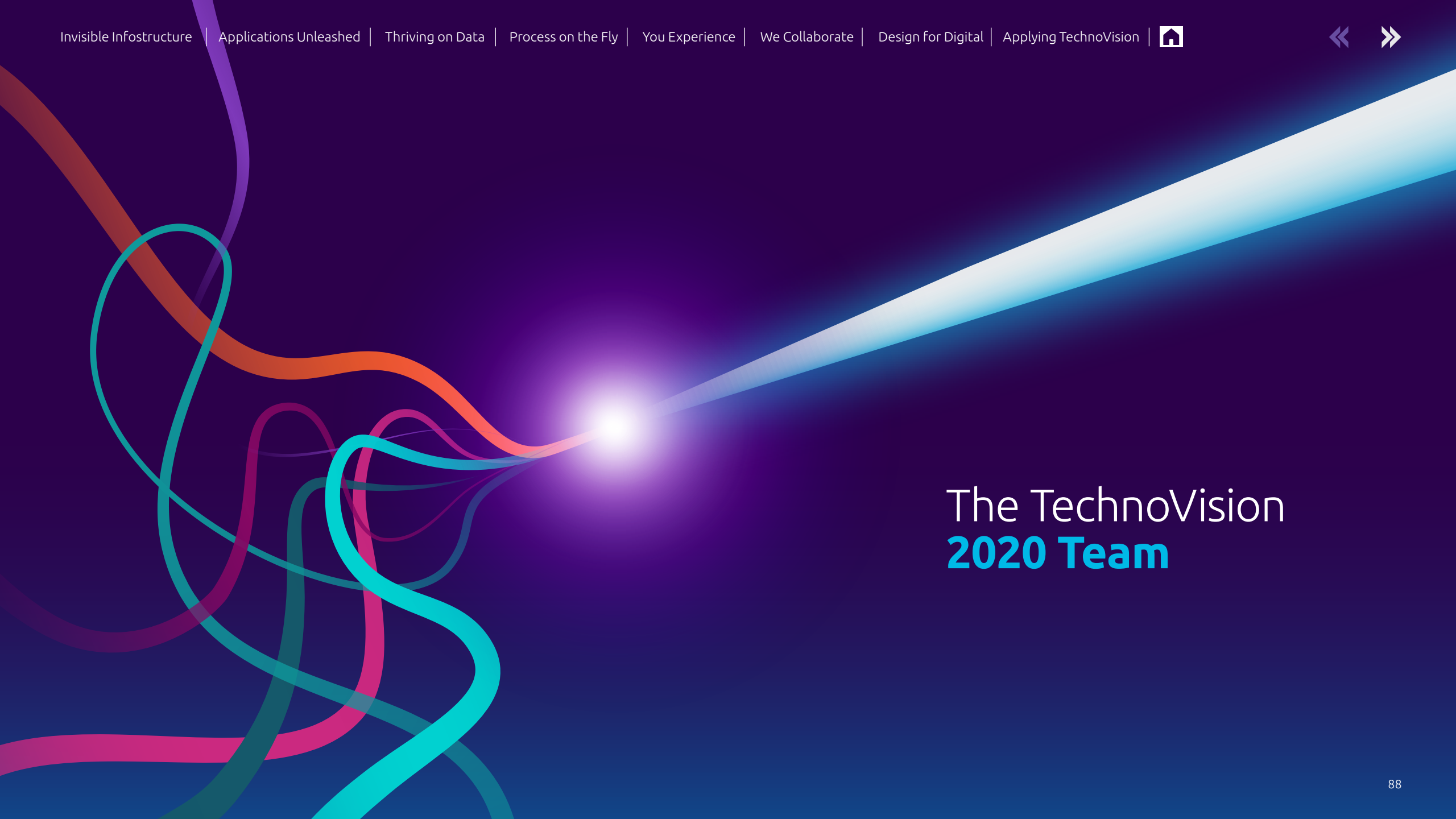

# The TechnoVision 2020 Team

# The TechnoVision **2020 Team**

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