Capgemini

PROMPT THE FUTURE

/Prompt   What trends are changing the face of my business?

TECHNO VISION 2024   /Prompt the future

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FOREWORD

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For anyone following the news these past few months, it is impossible to deny the transformative impact of technology around the globe. Generative AI is an obvious example, but it is far from the only one…advances in computing, digital connectivity, biotechnology, and of course Artificial Intelligence reshape our daily lives and sometimes entire industries.

When faced with this avalanche of technology, it is human nature to approach disruptive innovations with caution, as they challenge our understanding of our own roles in the world and bring uncertainties about the future. Today more than ever, it is crucial to recognize that technological innovation acts as a catalyst for progress when it is managed responsibly. It is augmenting human capabilities and not replacing them. It enhances efficiency, creativity, and problem-solving, allowing us to tackle complex challenges more effectively.

But of course, this requires both the willingness and the ability to scan the future, or shall we say today to PROMPT the future. It means that as business leaders and decision makers, we need to have a vision of what's coming next and what will matter tomorrow. And this task becomes increasingly challenging as technologies progress at a breakneck pace and grow ever more complex.

This is the true mindset and the purpose at the core of TechnoVision 2024. TechnoVision serves as a lighthouse in this ever-evolving technology landscape.

It is guiding you through the myriad of emerging technology trends, to focus on those which will make your organization more effective. By articulating a comprehensive view of the world of technology, TechnoVision empowers you to craft your own informed vision of the future, a future where technology is elevating your possibilities to drive innovation and grow in your respective field.

AUGMENT ME!

More than 55 years ago, a crew of three men orbited the moon for the first time ever, cocooned inside a 13-foot by 11-foot capsule. Inside this marvel of breakthrough technology, there wasn't much space. But outside, the infinity of the galaxy boggled the minds and dazzled the eyes of the crew. Bill Anders, the lunar module pilot of Apollo 8, was assigned to photograph the lunar surface to evaluate potential landing sites. On its 4th orbit, the spacecraft was oriented in a different direction. A startling image captivated the crew. Earth, 238,900 miles away, ascended above the barren lunar surface. Compelled by that vision, Anders just had to capture the view with a long lens on color film.

One of those shots became famously known as 'Earthrise', now considered the most influential environmental photograph ever taken. It has since served to educate and inspire. The blue Earth, rising over the battered grey lunar surface looks small and delicate, a magnificent spot of color in the vast blackness of space. Once-distant places appear inseparably close. Borders that usually render division vanish. All of humanity appears joined in this glorious, but fragile sphere. It made Anders realize we're all together in stewarding this fragile treasure.

"We set out to explore the moon and instead discovered the Earth," is the all-telling quote he came up with many years later, expressing that feeling. It took an abundance of new technology to find that out.

Isn't that exactly what we are encountering nowadays, finding ourselves augmented by the latest, breakthrough technologies, such as AI, quantum computing, immersive realities, autonomous systems, and even synthetic biology? The welcome result of this seemingly technology-dominated process is that we rediscover ourselves and our organizational purpose.

AUGMENTED BY AI

Not that it's a new thing. Ever since its existence, humankind has created tools — and other 'technologies' — to augment itself: to increase its muscle power, to extend its reach, to increase its possibilities, to go places and achieve results that were deemed impossible before. Information Technology particularly has had a tremendous impact, in terms of our ability to automate activities, connect and communicate globally with others, store, retrieve, exchange, and analyze data, control devices, and so much more. It has augmented us at an individual, personal level, but just as much it transformed our organizations and business models — over and over again, year after year.

Yet, compared to the past few years, 2023 stands out… With the rapid breakthrough of Generative AI (notably almost single-handedly triggered by Open AI's ChatGPT), innovative technology never touched so many people in such a short time: ChatGPT reached 100 million monthly active users just two months after launch — making it the fastest-growing consumer software application ever (with TikTok and Instagram taking nine months and two and half years respectively, to reach that milestone). And even though realism unavoidably is kicking in — in terms of suitability of use cases, compute cycles, energy consumption, dependability, correctness, security, privacy, and even ethics — AI has firmly acquired its place on the boardroom agenda.

Just look at the facts: our latest industry-focused research reveals that Generative AI is on the boardroom agenda at 96% of organizations surveyed globally. While Generative AI at the time of the survey was in its infancy in terms of scaled adoption and implementation, nearly 60% off executives globally said their leadership is strongly advocating Generative AI. Only 39% were taking a 'wait-and-see' approach to adoption, which is remarkable given how new and unexplored the technology is.

There are likely to be many reasons for this almost rampant enthusiasm; the augmentation force is strong with this one. Generative AI helps to create works of art, compelling stories, engaging dialogues, videos, and audio — but just as much new business concepts, products, services, strategies, and architectures. Assets and brand-new value that we never imagined we could achieve — at least not within the limits of time and means available — seem within reach. True moonshots indeed. Next to that — of course — executives have high (arguably inflated) hopes in terms of increased productivity and cost reduction; promises that never fail to attract attention.

In addition to this, recent history teaches us that when the interface through which we access and consume information changes, a revolution is brewing. Just like before when Microsoft's MS-DOS gave access to information technology to the masses, when Netscape opened the World Wide Web, and when Apple's iPhone changed the way we deal with information in 'Moments that Matter', the simple prompt interface of Generative AI will stir a revolution, although the direction and extent, is difficult to grasp at this stage.

Between the lines of all of this, there is a crucial lesson to be learned. If an innovative technology becomes so easy to access, so democratized, so compelling to use, even hardcore technology luddites go overboard with it, embracing it as their own.

The good news: there's more of that, way beyond Generative AI. A lot. And now, with so many boardrooms having acquired a new appetite for the transformative power of technology, the strategic agenda is destined to keep technology as a key topic. Indefinitely.

HERE TO STAY IN THE BOARDROOM

Technology will find itself in the good company of a variety of pressing business issues.

Compared to the last few years, the topics seem roughly the same, yet more challenging. The world is grappling with a profound strain; its once seemingly abundant natural and human resources are now struggling to support our current standards of living and consumption. The scarcity of nearly everything — including experienced and motivated workers — has become a critical economic and social determinant.

We are furthermore witnessing an unrelenting surge in climate pressure — evidenced by 2023 as the hottest year in recorded history, primarily stemming from the excessive release of emission gasses from wasteful, carbon-dependent manufacturing processes. The Capgemini Research Institute has found organizations that actively pursue sustainability goals achieve more revenue, are more profitable, and enjoy more customer loyalty. Also, the next generation of workers carefully considers the kind of organization they want to

work for, actively seeking compatibility with their own values, such as sustainability, diversity, fairness, and inclusion. This is even more crucial in a time where scarcity of committed skilled people is a given. Doing the right, good things (the main theme of last year's TechnoVision) thus still leads to organizations doing well.

Also, global disparities, food shortages, inadequate access to healthcare and education persist in many corners of the world. These challenges occur against the backdrop of a still increasingly unstable geopolitical landscape. Inflation, floating interest rates, weakening economic growth, and towering global debts further heighten the potential for unprecedented disruptions in this era of continuing Uncertainty[2].

Whichever of these scenarios pan out — or entirely different ones — technology will be a fully infused, ubiquitous part of the solution approach. We like to put this as Technology∋Business (read: 'Every Business is a Technology Business'). And by applying this year's special lens of technology-powered human augmentation — looking for leapfrogs or even completely reimagined ways to address challenges and opportunities — we elevate what is possible, inside and outside the boardroom.

DUAL TRANSITIONS

But how to get there? As some regular followers of TechnoVision may know, we are not exactly bullish on the notion of 'Digital Transformation'. It is a pleonasm, with every Business now indeed being a Technology Business, and thus every Transformation being a Digital Transformation. With the days of the big, 'disruptive', business model changes behind us, we may want to talk more in terms of frequently repeated, more targeted 'transitions'.

And while we're on it, these are 'dual transitions', as organizations now must address both their technology and sustainability objectives in parallel. Clearly, technology can augment organizations in their sustainability journey, beginning with the proper collection, sharing, and reporting of data, all the way up to highly innovative applications of synthetic biology and sustainability technology. At the same time, it can be a 'journey with benefits', as it is a powerful additional driver to clean up the legacy IT landscape, finally get a mature grip on data management and architecture, and improve any other foundational IT capability that is long overdue for improvement.

But there is another series of dual transitions going on as well. With the organization and its people increasingly relying on advanced technology, there must be a continuous, well-aligned change of both the technology components and capabilities needed as well as the humans and the organizational culture augmented by it. Information Technology (IT), Operational Technology (OT), and BioTechnology (BT) are coming together, addressing the great challenges of our time in areas as diverse as sustainability, climate, medicine, health, food, and agriculture. Combined with advances in AI, quantum computing, and immersive realities, one would think that technology increasingly dominates our lives. Turns out that it is becoming so natural, so organic, so entwined with us as human beings that it doesn't feel like domination at all. Instead, it's helping us shape what and where we want to be. Through more technology, more 'artificial', more 'virtual', and more 'synthetic', we rediscover what is 'real', both about ourselves and the organization as a whole.

Put it all together, and we see the horizon of a near future driven by Dual Transitions. Let's dive deeper into what this will mean.

ELEVATING YOUR POSSIBLE

Rest assured, there are many more moons of technology innovation to explore. Just think miniaturization, the Internet of Things, connectivity, process automation, robotics, autonomous systems, synthetic biology, quantum computing — all of these bring potentially infinite, raw augmentation power to our Technology Businesses.

It has been apparent through many of the evolving technology drivers that we have seen in the past few years. And many of these are still an integral part of our TechnoVision framework. But some of the newly introduced trends for 2024 further highlight what's 'possible' surely looks different these days:

OK Qompute acknowledges that breakthrough applications are imminent, building on brand new ways to build semiconductors, alternatives to the classic CPU architectures, quantum computing, neuromorphic computing, and even synthetic biology. They challenge the limiting, binary '0 or 1' view of the von Neumann paradigm, opening up unexplored frontiers that seem much closer to what we are ourselves, as organic, human beings.

Chat is the New Super App explores the increasing impact of AI on applications — all against the backdrop of more organizations wanting to become a 'software company' — as natural language and human dialogue become the preferred way to engage with applications. Also, **When Code Goes Know** shows the progression of developer efficiency, from low- and no-code to AI-augmented development, both a productivity tool and a learning buddy.

In the realm of Data and AI, **My AI Generation** touches on the obvious core of technology augmentation, mentioning scale, ethics, and more diversity in AI solutions as the key topics of 2024. But there is more to data than Generative

AI, as highlighted by the rapid advances in edge computing addressed by **The Thing with Data**. Intelligent devices, products, and other 'things' bring the power of data and AI closer to our individual lives than ever before.

Just as we see in space technology, miniaturization, and standardization bring new levels of agility and resilience to business processes, as described by the **Micro Process Magic** trend. Add up all augmenting technology forces, such as Digital Twins, remote management, touchless automation, and — of course — AI and we see the tantalizing rise nearby of a 'lights out', self-driving and self-optimizing **Autonomous Enterprise**.

Within the realm of user experiences, many innovations enter its space, both around immersive experiences such as by a new wave of Augmented Reality, the Industrial Metaverse, and AI-connected wearables, but also through dialogues in plain language. In any case, the individual user experience becomes so 'natural', so close to us, so seamless, that it doesn't feel like an experience anymore; it becomes **No Experience**.

Interestingly enough, it's also the notion of 'me' and 'us' that drives innovations around collaborative technologies. It's easy to get lost — even be jeopardized — in the confusing, distributed world of online experiences, virtual activities, and devices. By reclaiming and owning our digital identities — as introduced in **My Identity, My Business** — networked ecosystems will work better. And a new **Economy of Things** will arise on top of it as well.

Finally, when augmenting ourselves with technology, we rely increasingly on complex, interconnected systems that no longer fit into our established 'command and control' ways of management. A new balance needs to be established between what we trust from Artificial Intelligence and automation versus what we still deem human. The **AI'll be the Judge of That** principle suggests a new judgment symbiosis between man and machine.

REDISCOVERING OURSELVES

To get back to Bill Anders' famous quote about heading out to explore the moon but discovering the earth: It's through augmentation by technology that we find out more about ourselves. Once asked if computers would ever be truly 'intelligent,' Dutch pioneer computer scientist Edsger Dijkstra famously answered "The question of whether a computer can think is no more interesting than the question of whether a submarine can swim." Artificial Intelligence is decisively **artificial**. It is not organic, does not have a heart, does not have a soul. And neither have any of the other tools and technologies we apply to augment ourselves, or the enterprise.

When exploring and using the phenomenal powers of augmentative technologies, we thus get back to the foundational question of the **essence** — both in terms of what sets us apart as individual **humans** and in terms of the **purpose** of the enterprise. We clearly see how we can raise the corporate Intelligence Quotient (**IQ**), but also realize how to balance this with the (relevant now more than ever) corporate Emotional Quotient (**EQ**), and the Creative Quotient (**CQ**) of the enterprise. We uncover the new, unique role of humans while doing so, just as much as we find the new, differentiating proposition of the enterprise.

This revealing balance act is central to TechnoVision's 2024 analysis of technology trends. Whether it is about technology in user experience, collaboration, process automation, data, applications, or IT infrastructure, we home in on its inspiring, breakthrough augmenting power — illustrated by compelling industry best practices and use cases. At the same time, we keep exploring the evolving role of humans, the purpose of the enterprise, and the nature of change. Because if not for humans, who or what is going to add context, empathy, compassion, meaning, and purpose to the outcomes of soul-less technology? And without the willingness and the ability to change, how can there be new outcomes in the first place?

EPILOGUE

"We set out to explore the moon and instead discovered the Earth." We'll do the same — and more — while exploring the technology that augments us. Wasn't it that other famous space explorer who came to the same conclusion? William Shatner, who in his role as captain Kirk of the starship Enterprise had to boldly go where no man has gone before, finally got into space on Jeff Bezos' Blue Origin space shuttle in 2021. Then 90 years old, Shatner became the oldest living person to travel into space. Instead of being marveled by the wonders of stars, galaxies, and the universe, he was struck by the "overview effect". Quite common among astronauts, this occurs when someone travels to space, views Earth from orbit, and is then struck by a sense of the planet's fragility. "I turned back toward the light of home," said Shatner in his autobiography 'Boldly Go', "I could see the curvature of Earth, the beige of the desert, the white of the clouds and the blue of the sky. It was life. Nurturing, sustaining, life. Mother Earth. Gaia."

We augment ourselves, only to rediscover what is real. Such a rewarding enterprise indeed.
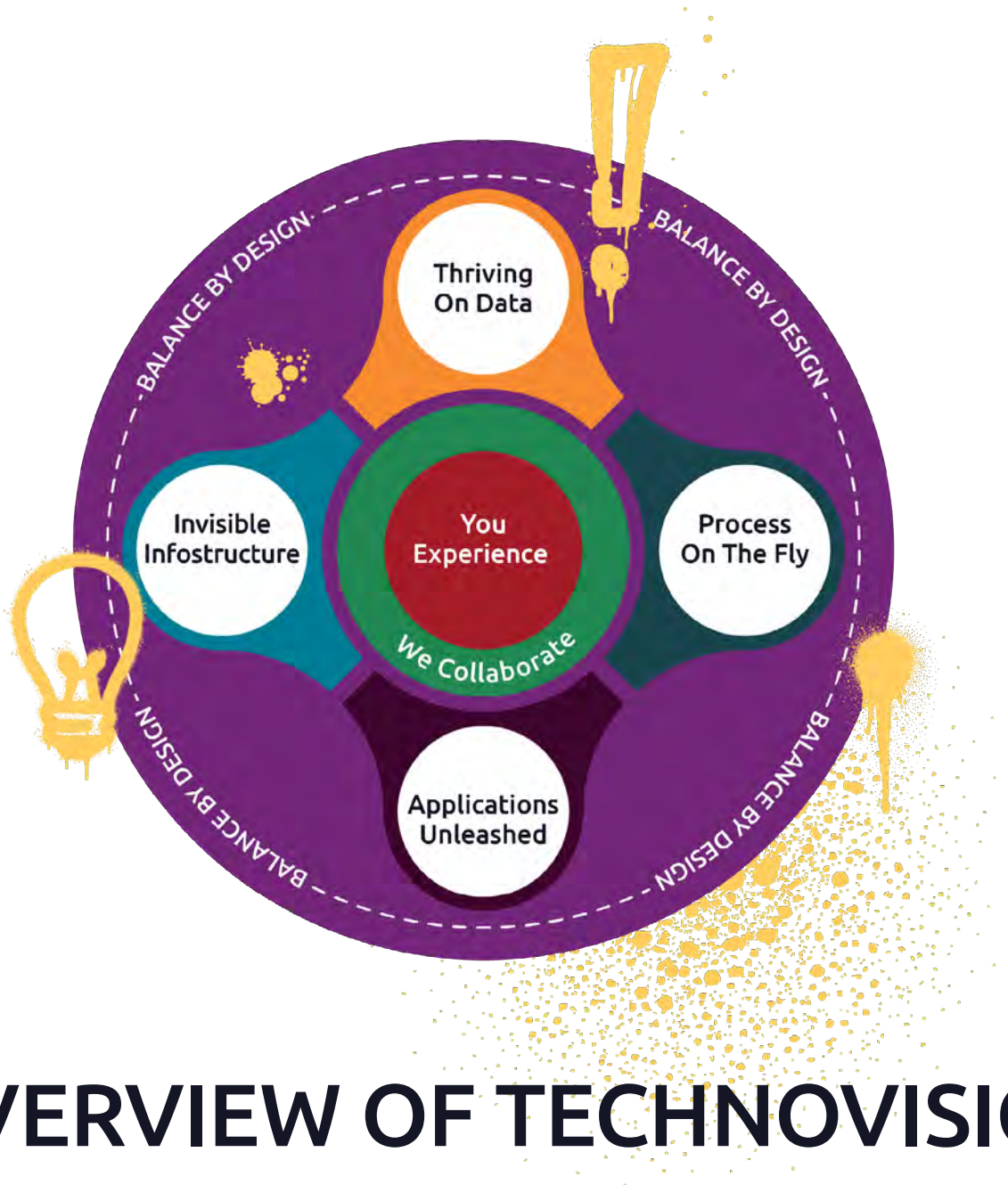
OVERVIEW OF TECHNOVISION

TechnoVision categorizes technology trends into six 'containers', providing a snapshot of innovation from different perspectives (the 'what') – ranging from user experience and collaboration, via data and process automation, all the way to infrastructure and applications. A seventh container offers a series of overarching design principles to successfully apply the trends and create transformational impact (the 'how'). These principles help to build a sharp mindset, ready for any portfolio, program, project, architecture, innovation initiative, or idea.

You Experience and We Collaborate are at the very heart of technology-powered change. This core foundation is surrounded by four enabling containers – Thriving on Data, Process on the Fly, Applications Unleashed, and Invisible Infostructure. This collection of trends is all wrapped up with Balance by Design, as the overarching container to be considered while working with the others.

Within each container, five key trends are presented as one-page summaries, designed to be crisp and to-the-point, yet appetizing enough to warrant further study. They all feature a 'What' section that describes the trend, a 'Use' section with best practices and use cases, an 'Impact' section that exemplifies the change potential of the trend, and a 'Tech' section that provides links to key technologies and standards. Each trend also mentions an 'Expert in residence' with whom anyone can connect if they want to know more about the topic.

Balance by Design – our overarching container – follows a slightly different setup to the other six, offering views of how to shape balance within an organization using seven clear design principles – including 'anti-principles' that are sometimes easier to detect than the principles themselves.

You Experience: immersive, no-touch, natural

The established customer experience is intertwined with employee and partner experiences, achieving common goals of attraction, retention, and engagement. All expect a better experience, with a positive impact on society and the environment. When it comes to providing these superior, compelling experiences, the Metaverse is the place to look at. It shifts retailers and brands from sellers to companions and reshapes the employee's workplace into a new and attractive virtual realm. And what if these experiences extend to industrial and business operations? Enter the Internet of Twins, which is designed to build highly efficient real-world operations in the most sustainable way. With emerging AI and mixed reality technology as drivers, experiences now have become so intuitive and natural that they hardly feel like a separate experience anymore. With that, the augmented You Experience is truly about 'You' and 'Me'.

$Experience^2$

....

Me, Myself and My Metaverse

....

Internet of Twins

....

I Feel for You

....

No Experience

We Collaborate: teamed, distributed, creating

How businesses operate and collaborate has changed irrevocably. Many aspects of value delivery are now entirely independent of location and time. People work together in teams in diverse ways, increasingly at the very edges of what used to be considered the 'core organization'. Consumers and employees expect creative, integrated experiences, which require a new level of cross-organization, cross-sector partnering to meet these expectations. Distribution is the leading design principle, together with mesh-style, loosely coupled collaboration – not only between people and organizations, but also from 'thing to thing'. Organization structures evolve towards a decentralized mode of operation, demanding fewer physical assets, less energy, less travel, less command and control. Within such a thriving ecosystem though, it is increasingly a matter of establishing what and who we are as individuals – owning and governing our identity data exclusively ourselves.

My Identity, My Business

The Team is the Canvas

Taken by Tokens

Your Business is a Mesh

Economy of Things

Thriving on Data:
ubiquitous, shared, fostered

It is no wonder organizations aspire to thrive on data, to be data-powered enterprises. With every business now being a de-facto Technology Business, data is at its core, dare we say, every Business is a Data Business? Data powers superior customer experiences, highly tuned operations, and smart, self-optimizing products and services. Data provides resilience, predictability, and effectiveness, but also enables organizations to achieve their sustainability ambitions. And do we even need to point out the potential breakthroughs Generative AI is bringing? It is, therefore, time to see data for what it is: a first-class product; carefully and sustainably owned, managed, and activated by business domains, close to where it is created and used. All of this while shared in lively exchanges inside and outside the organization.

Data Sharing is Caring

....

Power to the People

....

My AI Generation

....

Net Ø Data

....

The Thing With Data

Process on the Fly:
touchless, configurable, autonomous

Strategy tends to be eaten for breakfast, by culture – but also by a lack of operational execution. Organizational aspirations are simply "blah blah blah" without the ability to turn insight into action, quickly respond to events, overcome business silos, or go with whatever flow the corporate purpose supposes. And all that goodness must be delivered against a scarcity of both human resources and natural resources, plus the drastic need to reduce travel and energy consumption. This is where Process on the Fly comes to the fore and shines ever brighter. Breakthroughs within intelligent automation, digital twins, micro processes, and a taste of touchless execution have firmly placed this container center stage. And do we see the notion of 'lights out', autonomous business processes already looming on the horizon? It might be what a Technology Business ultimately becomes – a confluence of all disruptive technologies. It sure leads to exploring the new role of humans within that future, just as much as rediscovering the corporate purpose.

Process is Mine, Mine, Mine

Silo Busters

Micro Process Magic

Can't Touch This

Autonomous Enterprise

Applications Unleashed: meshed, headless, talkative

At the heart of any Technology Business is its applications portfolio; the thriving heartbeat of the organization – part of the business, responsive to every demand. These applications mirror the new business dynamics, built, and continuously changed at high speed and high quality, and in whatever incarnation necessary. Yet, many applications no longer look like the ones we used to know, as they morph into a connected mesh of lightweight, much more sustainable microservices. With agility and minimum viable products as established concepts, the quality of application services needs to be at an enterprise level, with a continuous, flawless deployment throughout all business operations. But the biggest change in the application landscape may be the way application services are activated by their users: through natural language and an explorative, self-learning dialogue – invoked from a chat, rather than from a menu.

Honey, I Shrunk the Applications
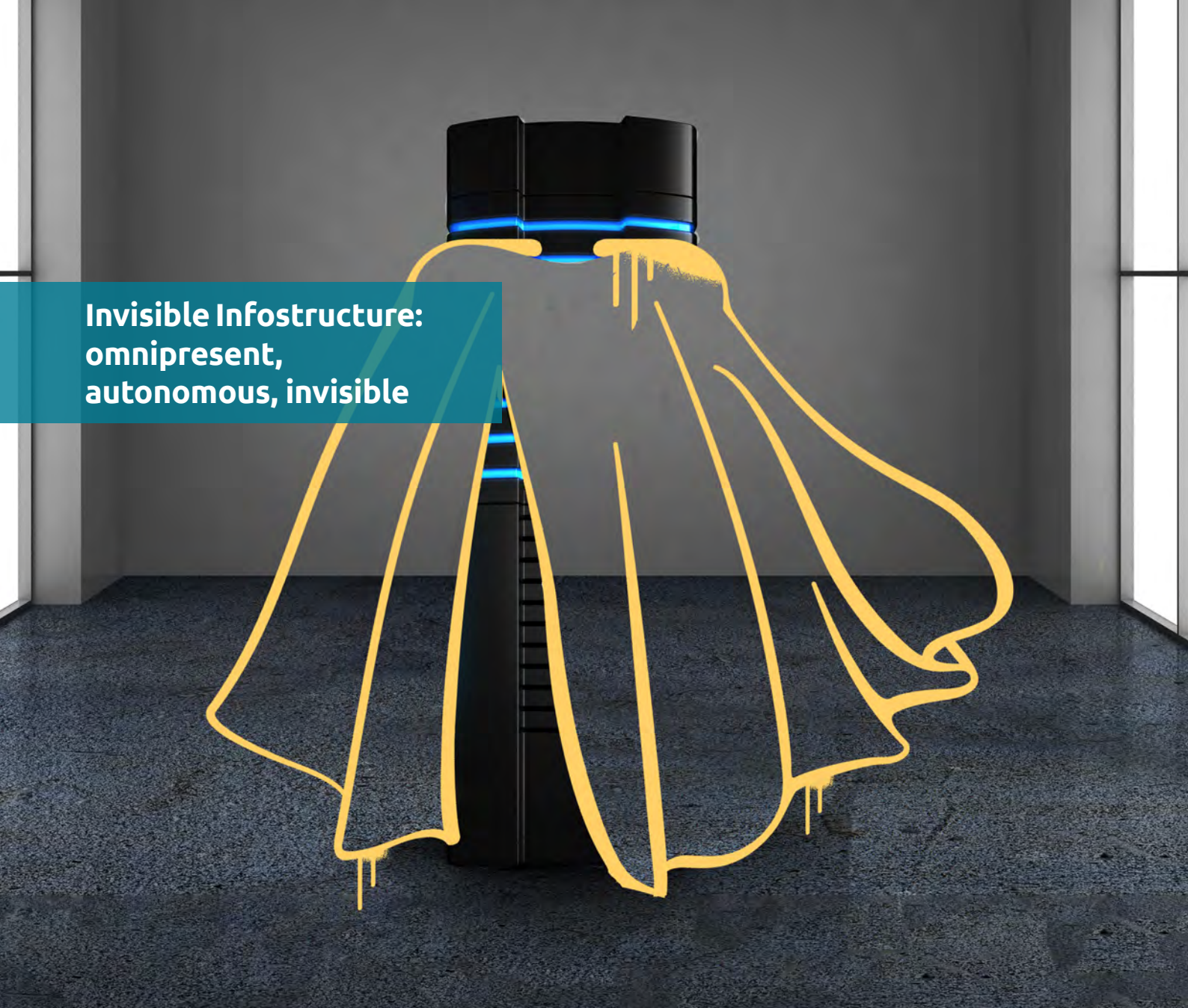
When Code Goes Know

Apps ❤ AI

Little Green App

Chat is the New Super App

Invisible Infostructure: omnipresent, autonomous, invisible

The odyssey towards a truly invisible IT infrastructure is ongoing. The cloud, a signpost of increasing 'invisibility', is the default choice with a diverse range of deployment options. Plain acceleration has given way to a focus on value extraction, sustainability, industry contextualization, technology debt removal, and security, all while maintaining operational resilience. A software- and- AI-driven, nearly autonomous supply chain is key to that, providing an approach to deal with both the scarcity of skilled experts and excess energy consumption and CO_2 emissions. Expanding its practical applications, quantum computing is gradually becoming a phenomenal addition to the IT infrastructure potential, providing yet unheard and unimaginable opportunities. But IT infrastructure also expands its reach, integrating Operational Technology and 'things' at the edges of central IT, bringing technology closer and closer to real life.

Lord of the Clouds

My Industry, My Cloud

Ops, AI did it Again

Simply the Edge

OK Qompute

Balance by Design: overarching, transformative, purposeful

Balance by Design: overarching, transformative, purposeful

The essence of designing a Technology Business is to find and preserve the right balances: between the interests of stakeholders, both short- and long-term, centralized and decentralized, friendly and authoritative, purposeful, and spontaneous, value-delivering, and sustainable, innovative, and trustworthy, fact-driven, and empathic. The balance act becomes even more delicate within the realm of Twin Transformation[2], having to navigate digital transformation and sustainability transformation concurrently with augmentation and human centricity. As a guide for this, besides the 'what' of technology trends, TechnoVision provides a view of 'how' to adapt, to help shape balances within the organization — by purposeful design.

Exploring technology drivers can be an enticing exercise but applying these principles will determine the actual success of the transformation afterwards. Through them, control questions are provided for executives, next to a bouquet of perspectives for architects, or anybody involved in a Technology Business portfolio, program, project, or initiative.

Technology ꞓꙅ Business
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AI'll be the Judge of That!
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Do Good, Do Less, Do Well
···

Be Like Water
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IQ CQ RQ EQ Up
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Trust Thrust
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No Hands on Deck

As will be obvious from some of the trends above, our authors have stayed true to the playful nature of TechnoVision by using references to rock, pop, movies, and other cultural and societal phenomena. It turns out this playfulness makes the trends more accessible, more compelling, and easier to remember. Also, as our authors will testify, it's good, clean fun creating these headings. Readers are challenged to find as many of these 'Easter Eggs' as possible.

The TechnoVision 'expert in residence' community caters to a variety of detailed posts and articles about your favorite 37 building blocks. We encourage you to read the accompanying report 'Applying TechnoVision' for various means of using and playing with TechnoVision in a unique and entertaining way. Finally, to dive even deeper into the TechnoVision universe, watch out for the industry playbooks: released throughout the year as they provide numerous sector cases and best practices, positioned within the TechnoVision framework.

YOU
EXPERIENCE

ALEXANDRE EMBRY
EXPERT IN RESIDENCE

Technology breakthroughs are driving the evolution of the digital experience at an impressive pace. Most businesses have improved their digital presence across channels in fresh and frictionless ways, deepening customer engagement and loyalty. Similarly, they're refining the work environment, giving their enterprise a competitive edge. However, today's digital astronauts — consumers and employees alike — expect to engage through human-centric digital experiences that feel just as real as terra firma. The next giant leap? The convergence of AI, immersive, and Metaverse technologies, setting the gold standard for seamless interactions. It blurs the lines between the physical and the digital worlds. Venturing into this novel 'no experience' frontier promises natural online interactions like never before.

Many businesses have already reaped the benefits of delivering engaging digital experiences, driven by ever-evolving customer expectations, led by digital-native generations. Yet soon, delivering frictionless content won't be enough. Organizations will need to meet rising user expectations: more authentic engagement, more convenience — in short, true seamless, and human experiences. Sounds unachievable? Hopefully not, as technology is now available to be leveraged towards this goal.

Hardcoded into our brains, interacting with machines through 2D screens and physical controllers remains unnatural. We expect interfaces to understand what we're saying, and what we intend — just as in real life. And this is where the convergence of AI and new types of screenless and low-touch interactions such as spatial computing, will set the standard for digital interaction. Imagine a virtual shopping experience where you are guided by a humanized agent, who can understand your language, preferences, and behaviors, triggering hyper-relevant recommendations. And, the level of immersion, rendering, and

interaction of this experience is so natural and realistic that you feel you're physically present. That's what seamless really means.

Users' demand for tailored digital experiences continues to grow, and with AI and ML organizations now know their audience like never before. So where to go next? One route could be a deeper involvement of individuals in the brand journey. This comes down to user-generated content (UGC), magical use-cases activated by the fusion of the Web3 'mesh web' and Generative AI, to effortlessly boost creativity in a democratized and secured internet landscape. UGC allows users to create any products, environments, or content, enabling compelling opportunities to foster creative collaborations and robust relationships.

This digital wave is also transforming the workplace, to achieve increased employee engagement, productivity, sustainability, and inclusivity. This leads us to the evolving Industrial Metaverse strategy, currently shaping the next industrial revolution. The convergence of digital and real worlds is becoming more and more human-centric. What

if workers could experience seamless interaction with data, assets, systems, and co-workers, regardless of location, exactly as on the factory floor? This will be a significant driver when it comes to addressing our current skills shortages and sustainability stakes.

All this transformative potential meets the objectives of business competitiveness, user enjoyment and empowerment, trust, and societal and environmental performance. Good reasons to shape new, juicy ways of interacting with digital content and technology. The ultimate You Experience becomes a frictionless No Experience. Or should we say, a 'Juicy Experience?'

YOU EXPERIENCE

/Prompt   How are digital experiences becoming more human?

/Prompt the future

CHARLTON MONSANTO
EXPERT IN RESIDENCE

EXPERIENCE²

Imagining and delivering experiences as an integrated whole; seamlessly covering the perspectives of customers, employees, and partners, underpinned by the array of UX and interaction technologies

What if we raise user experience to the power of 2? As we come to rely even more on online interactions, our expectations are evolving rapidly. Organizations need to enable virtual, mobile, and touchless interactions to engage, stimulate, and retain customer and employee attention. Consumers constantly seek that 'golden touch', where their personal beliefs are understood and supported. Fail, and their loyalty might be at risk. Employees want to feel a sense of purpose, empowerment, and enablement. Fail, and they might easily change the employer. Addressed through an all-encompassing approach that covers disciplines, channels, business units, and partners, the net effect is differentiating and competitive. Combine this approach with the latest in no-friction UX technology, and the 'Experience Squared' is manifest.

WHAT

- Customers, employees, and partners are much more aware — and critical — of an organization's positioning on key societal themes (such as sustainability). The brand and the delivered experience must embody those beliefs and purposes.

- Virtual, mobile, and distributed user experiences have become the norm. With the pandemic as a hyper-accelerator of both adoption and acceptance, expectations concerning ease of use, value, and effectiveness continue to rise.

- The customer and employee experience jointly and compositely allows brands to be far more flexible in how they deliver experiences. This shift requires a unified experience strategy that approaches user interaction design holistically.

- Designing an experience across the silos of customers and employee experiences requires a deep understanding of the end-to-end journey, involving the feelings, emotions, and associations that determine signature moments along the way.

- An increasingly diverse mix of UX/UI options will power alternative ways to deliver intent-driven, conversational, and low/no touch interactions…and more is on the way, especially in the world of connected 'things' (such as delivery drones and robots, self-driving cars, and autonomous stores) and the Metaverse (including VR and AR) that will shape the future 'Experience²'.

- In a world where the Metaverse and AI are fully integrated, personal AI assistants will act as autonomous agents, proactively curating tailored information from across the digital world. Whether in front of a computer, in a meeting, or driving, the personal AI assistant will deliver real-time insights in the preferred format — audio, visual, textual, or graphical — optimized for the situation and environment. This seamless blend of technology, curated information, and situational awareness will redefine work and personal activities, decision-making, and productivity, creating a symbiotic relationship between humans, their personal AI assistants, and the digital world.

USE

- **Woodforest National Bank** selected Savana to power frictionless 'Universal Banker' experience by unifying its operations and optimizing processes between the core, back-office, and customer channels.

- **Google** unveiled a new Generative AI-powered virtual try-on tool for shoppers searching for apparel, providing customers with a more interactive and engaging shopping experience.

- **ExCeL London,** an international exhibition and convention center, becomes the first event space in the UK to introduce a frictionless checkout-free store, powered by Amazon's Just Walk Out Technology.

- **Abu Dhabi International Airport's** new Midfield Terminal Building (MTB) deployed a Single Token Journey (STJ) solution for verifying passengers' identities quickly through contactless facial biometric screening to provide a secure and seamless experience for travelers.

- **Mastercard** introduced a frictionless payment experience with the Cardholder Verification Code (CVC)-less online transactions for its debit and credit cardholders who have tokenized their cards on merchant platforms. The move aims to reduce the checkout time and make virtual transactions hassle-free and more secure.

IMPACT

- Increased loyalty as customers will return for compelling, personalized, and valued experiences that match their interests as they search for purposeful brands, products, and services.

- Automation and augmentation will support the workers and free their time for higher-value activities, such as customer engagement, field service tasks, etc.

- Maximizing new revenue opportunities by creating touchless and self-service experiences, from finding and selecting products, checking out, payments, and to customer service.

- Attracting and accessing new audiences by harnessing the channel and immersive experience explosion by engaging them in the channels of their choice. This reach will also be possible by providing orchestration across all brand touchpoints.

- Personal AI assistants will expedite decision-making by delivering real-time insights aligned with organization strategy and tactics, allowing companies to adapt swiftly to market changes. Enhanced collaboration and efficiency spanning people, their personal AI assistants, and the digital world will lead to sustainable growth, giving businesses a competitive edge in an ever-evolving landscape.

TECH

- **Customer Experience Management:** Usermind, Highspot, Uxpressia, Invision

- **Real-time journey management tools:** Kitewheel, Alterian, Pointillist, Medallia Experience Orchestration, Usermind, Adobe Journey Optimizer, Salesforce Personalisation, BrazeJourney Optimizer

- **Customer platform technologies:** Salesforce Clouds, Adobe Marketing Cloud, SAP CX, Pega, Usermind, Cemantica, Acoustic, Hubspot, Threekit, Genesys, NICE CXOne

- **Virtual and augmented reality:** PTC, Unity, Meta Quest, HoloLens, Perfect Corp, Varjo, Nvidia

- **Customer data technologies:** Tealium, Salesforce C360/CDP, Microsoft Dynamics 365 CI, Adobe AEP, SAP CDC, Segment, Treasure Data, Bloomreach, Algonomy, Oracle Unity CDP

- **Automation and customer process management:** Microsoft Dynamics 365 and Viva, Salesforce Clouds, Pega, Automation Anywhere, UIPath, ServiceNow

- **Mobile engagement platforms:** Braze, Moengage, Vibes, Airship

- **Generative Artificial Intelligence platforms:** Microsoft, Google, Amazon

SURABHI GAWDE
EXPERT IN RESIDENCE

ME, MYSELF AND MY METAVERSE

Multiple new virtual worlds are augmenting real life, creating a potentially profound impact on the way we live, work, interact, behave, and express ourselves

Metaverse has evolved from a buzzword to a unique medium for individualistic expression and industrial purposes. The Metaverse will be part of the next generation of the internet, also called Spatial Web, deeply impacting our daily lives and a wide range of industries. This shared virtual and hybrid space, accessible by anyone, anytime, anywhere, on any device, reflects a huge improvement in interactions — augmenting real life. This includes realistic embodiment, a sense of presence, space, emotion with rich capabilities; everything that is lacking in legacy, flat, 2D experiences. More than ever, borders are blurring between virtual and physical worlds for business, operations, shopping, entertainment, and social interactions. Yet, accelerated by evolving technology advancements, mainstream use requires the Metaverse ecosystem to collectively assess critical challenges, including accessibility, interoperability security, privacy, ethics, and societal concerns.

WHAT

- The concept of the Metaverse is not new. It has been imagined in fiction, fantasy, history, sci-fi cultures, art, gaming, and so on, thereby impacting realism. After the hype, retail, aviation, manufacturing, and financial services are seeing value in this new plane of existence for both individuals and corporations.

- Industrial Metaverse connects the digital and real world empowering organizations to solve the complex problems of the real world digitally, generating societal and sustainable benefits. Existing Digital Twins can expand their potential in design, engineering, testing, operations, simulations, and training.

- At an individual level, the Metaverse adds a burst of color to personal choices — the choice of self-expression, ownership, identity, visual appearance, expression, entitlements, digital objects, or assets; it opens a new gateway for unmet needs, unexamined human behaviors, unspoken fears, and layered thoughts, irrespective of gender, socio-economic background, class, or color.

- Ownership makes every individual a micro-enterprise to exchange value within nano-cultures, and global pop art cultures. AI and devices can be owners too. Several immersive platforms, applications, AI art tools, and accelerators have been popping up to enable the creator economy.

- Immersive technologies, Wi-Fi/5G connectivity, and interoperability with existing architectures enable businesses and government bodies to communicate and inspire in new ways, and to provide personalized user experiences.

- The Metaverse is still developing, and organizations are looking at unique user-oriented experiences for business value and return on investment. Approaches for data privacy, content moderation, and ethical and regulatory policies — using it for good, positive futures — are to be considered, determined, and socialized.

USE

- **Renault Group** launched its first industrial Metaverse that is projected to generate savings of €320 MN, plus €260 MN in inventory savings, a 60% reduction in vehicle delivery time, a 50% reduction in the carbon footprint of vehicle manufacturing, and a contribution to the 60% reduction in warranty costs by 2025.

- **Siemens** believes in cultivating successful virtual futures by investing USD 1BN for the Metaverse, prioritizing interoperability and an open ecosystem. The convergence of technologies for improved testing, engineering, extensive test validation, and enhanced operations are aimed at profits and more sustainable operations.

- **Airbus** has leveraged its Industrial Metaverse journey in collaboration with Unity to develop a realistic 3D environment for planning, training, and simulation process.

- **Pudgy Penguins** is transforming the toy experience with NFT, zkSync in Pudgy World, abstracted to a QR code on a real-life toy. It was launched in 2000 Walmart stores, after its initial launch on Amazon.

- The **Seoul Metropolitan Government** opened the Metaverse Seoul platform, a virtual world where users will be able to play games, chat, file official forms, get help with taxes, and receive other city services.

IMPACT

- A multipurpose, multi-modal Metaverse will decrease the need to gather large number of people around physical locations, reducing travel and energy consumption.

- The Metaverse enables countless digital manufacturing and production simulations, services, and tests for improved product design and engineering. These experiments with materials and processes can be done without using any physical resources, thus, accelerating the transition to a net-zero future.

- Organizations are focusing on value to end users and combining the Metaverse with the main product, service, and brand strategies to create meaningful, interoperable, all-inclusive experiences.

- Community-driven values, interests, and goals can bring people and experts together to enhance or replace their real-life experience — they can experience events in varied immersive capabilities, ownership, and fandom/residency levels.

- Brands can listen to communities quicker, understand their choices in real-time, and be more inclusive. As the Metaverse is shaping our interactions, fashion trends, bolder choices, new behaviors, and products, in turn, it leads to new use cases and additional creations.

TECH

- **Enterprise the Metaverse platforms and devices:** NVIDIA Omniverse, Meta Horizon World, Microsoft Mesh, Mozilla Hubs, PTC, Microsoft HoloLens, Meta (Quest, Oculus, Rayban), Apple (AR, VisionOS, Vision Pro)

- **Metaverse platforms:** Decentraland, The Sandbox, Axie Infinity, Sensorium, Somnium Space, Cryptovoxels, Sorare, Ethverse, Unity, Upland, Illuvium, Spatial

- **Virtual collaboration tools:** Second Life, AltspaceVR, VRChat, Glue, Party.Space, Yulio, Arthur, ShapesXR

- **Avatars:** ReadyPlayerMe, Soul Machines Digital DNA platform, Microsoft Rocketbox, Wolf3D, Avatarsdk, Reallusion, Genies, GoodGang Labs

- **AI art tools:** Midjourney, DALL-E 2, Stable Diffusion, Deep Dream Generator, DreamStudio, Artbreeder, LimeWire, Stability AI

- **VR trade fairs and conferences:** Virbela, HexaFair, vFairs, Hopin, MootUP, EventX, 6Connex, GTR, Teemew

- **Virtual gaming platforms (non Web3 Metaverse):** Roblox, Fortnite, Minecraft, Blankos Block Party, Sorare

JACQUES BACRY
EXPERT IN RESIDENCE

INTERNET OF TWINS

Digital Twins — virtual representations of real-world entities and processes — deliver better mastery of real-world challenges, with less strain on resources and energy

Definitely no evil twins involved here: the objective of the Digital Twin is to create the most realistic representation of real-world entities and operations — one that is as close to the real experience as possible. It enables different simulations of different kinds of objects that communicate together, such as cars interacting in traffic, a factory with a range of equipment, or a train with a network of signals. These levels of experience require the interconnection of Digital Twins with the right supporting protocols, which turns the Internet of Things (IoT) into an Internet of Twins. This twin network will be key to reducing the complexity of operational challenges, easily exploring, and testing alternatives, and converging virtual and real-world experiences. All while consuming fewer resources and less physical space.

WHAT

- The Internet of Twins will increase collaboration between Digital Twins, so they can capture the most realistic experiences and master the complexity of operations they represent through a global network.

- There are several levels of Digital Twins, which are related to different industries. The combination of virtual and real-world experiences in Digital Twins allows individuals to make better decisions quicker because they can observe realistic and holistic patterns from experiences directly.

- The translation of experiences into a Digital Twin is one of the main obstacles that need to be overcome to maximize the use of resources and the optimization of automation.

- Data convergence is key to managing all kinds of data that are relevant for the Digital Twin. All data sources have not only to interoperate but also to be denormalized to feed the industry standards. For example, the IoT is not a new marketplace or a new way to manage sites on the internet. The IoT must be seen as a fresh approach that can enable the sharing of capitalized experiences dynamically during their lifecycles. Using the IoT in this way will also allow us all to discover new experiences.

- Moreover, twining capability is not just reserved for physical objects but could also be extended to the collaborative processes that simulate collaborative practices in the Metaverse.

USE

- **TRAGSATEC**, a Spain-based company focused on environmental protection, selected Hexagon to deliver Spain's first Digital Twin to provide authorities with a web-based 3D platform to simulate potential environmental issues that could affect the Campo de Cartagena region and the Menor Sea.

- **Mercedes-Benz** is working with NVIDIA Omniverse to create 3D Digital Twins of its factories, in a bid to gain better visibility into its factory operations and optimize production layouts.

- **Vancouver Airport Authority (YVR)** is leveraging Unity-powered Digital Twins to start a transition towards adopting emerging enterprise technology solutions, to improve operations, complete sustainability goals, and meet social considerations.

- **SP Energy Networks** is developing a Digital Twin, ENSIGN (ENergy System dIGital twiN), of the UK's electricity network for modeling and testing digital solutions for managing increased electricity demand.

- **Lockheed Martin** and **NVIDIA** are collaboratively building an AI-driven Earth Observations Digital Twin that will provide the National Oceanic and Atmospheric Administration (NOAA) with an efficient and centralized approach to monitor current global environmental conditions, including extreme weather events.

IMPACT

- We are at the beginning of the story. The impact of Digital Twins will grow step by step, but dramatically. Some actors have started to position themselves as Digital Twin manufacturers and have forecast that this area could represent as much as 25% of their revenues during the next five years.

- This 'alternative IoT' will also combine several kinds of simulations from discreet industries and process industries. This advancement will have a huge impact on sustainability (thanks to simulation), with better predictions at scale that help to ensure resource consumption is always minimized during production.

- Industrial twinning (complex objects like factories, and cities…) should consider IoT as a network where the cloud technology will be the reference of way of working.

- Impact will not be confined to an individual organization. With new levels of realistic collaboration, all members of an industrial ecosystem will leverage their virtual interactions, reinventing how they create and share the value they receive. However, this value-creating process will be possible only if people can adopt those new experiences effectively, both socially and cognitively.

- One of the main benefits of a Digital Twin is being able to test the scope and variability of an object in a short time. This mechanism sponsors a drastic decrease in the consumption of resources. Digital Twins will allow industrial partners to research alternative approaches cost-effectively.

TECH

- **Digital Twin platforms (generic):** Matterport, Microsoft Azure, AWS, IBM Digital Twin Exchange, Siemens, Bosch, Oracle, Dassault Systems, ANSYS, PTC, COSMO TEC, NavVis, General Electric, ABB, Blackshark.ai

- **Utilizing Digital Twin technology to optimize city traffic:** Oak Ridge National Laboratory AutoBEM, Esri ArcGIS, Bentley Systems, Nexar, Hexagon, NVIDIA

- **Digital Twins for sustainability:** Oak Ridge National Laboratory AutoBEM

- **DNA-Based Digital Twin:** ABB

- **Digital Patient Twin:** Q Bio, Siemens Healthineers, CeADAR

KRYSTIANNE AVEDIAN (SHE/HER)
EXPERT IN RESIDENCE

I FEEL FOR YOU

Boosting both the individual and corporate EQ, by creating a more effective, meaningful, and satisfying symbiosis between people and their technology enablers

'New scarcity' has driven us into the hands of technology. Even though technology hasn't surpassed humans in intelligence, it is striding closer and closer. An essential characteristic of intelligent beings, such as humans, is their ability to share different types of ideas, expressions, and feelings. Emotion plays an integral part in our lives. So does technology. Significant progress has been made in the field of user experiences and AI — we see continuous evolution and rapid advancements each day. While technology can interpret and even mimic human emotions to a certain degree, it cannot understand or replicate them — yet. But technology has come a long way, even if it's artificial and based on a cold, silicon heart. Emphatic technology and Emotion AI can benefit humans in so many ways, providing social comfort and inclusion, understanding and expression, as well as a plethora of industrial applications. Now, it's more than a feeling. Technology, I think I love you.

WHAT

- Empathy and emotional intelligence work together, enabled by caring, to produce long-lasting relationships. Together, they form the foundation of trust.

- Now more than ever — as businesses redefine their ways of working, technology set-up, and organization in the aftermath of the pandemic — empathy is in short supply.

  Organizational empathy is moving beyond 'customer centricity' and adding employees to the equation to drive business success. CX and PX/EX are the new top priorities across all organizations today. The focus is on the collective capacity of an organization to demonstrate empathy to all stakeholders, as well as a commitment to develop an understanding of customer needs.

- Emotion AI offers new insights to understand people and customers. Industries are finding ways and identifying areas to integrate emotional intelligence, such as chatbots, virtual assistants, and facial recognition.

- However, Emotion AI requires transparency. For Emotion AI to work and not have the opposite effect, it is crucial to communicate digital ethics and values through humane responsibilities and be transparent about what data is collected, for what purpose, with what access rights, and how long it will be stored.

USE

- Popular QSR chain, **Pizza Hut**, deployed an [AI-enabled mood detection device](#) that detects facial expressions through eye movements, frowns, and other cues, and analyzes these to gauge mood to make pizza recommendations to customers in India.

- The EU-funded **SUaaVE** project developed software for autonomous vehicles that can read and respond to users' emotions. SUaaVE monitors passengers' emotional state with wearable devices and uses the outcomes to develop a model that [predicts emotional state from physiological data](#).

- The **Capgemini** [ASE](#) team uses Chat GPT to design/create our Mindfulness meditations as a starter point along with developing use case examples for our Emotional Intelligence Master Class around scenario planning.

- **BMW's new i Vision Dee** is using [Digital Emotional Experience](#) to create an even stronger bond between people and their cars. With its intelligent, almost human capabilities, BMW i Vision Dee accompanies drivers not only through real-life situations on the roads but also in their digital environment.

- [Copy.ai](#) allows writers to bring the full power of storytelling to light with creative, innovative, and impactful messages that tap into the underlying emotions of the story as well as capture the response of the users.

IMPACT

- Voice-enabled AI technologies actively monitor a user's voice to check emotional well-being through unique vocal biomarkers and predict core symptoms of mood and anxiety disorders: depressed mood, diminished interest, avoidance, and fatigue.

- Companies are leveraging Emotion AI when training call center and tele sales employees. AI analyzes the quality, tone, and pace of the individual, and trains them to speak with more empathy, confidence, professionalism, and efficiency where needed.

- AI-based approaches can easily detect human expressionism, such as joy, surprise, fear, or anger, but will soon recognize traits such as age, race, and gender to understand social dynamics, bringing more personalized experiences to consumers — without bias.

- Ion recognition technology is being used widely to bring benefits in many areas, including health, anti-terrorism, urban security, and road safety.

TECH

- **Emotion AI in learning:** [Entropik](#), [Smile](#), [Proctortrack](#), [LOVO AI](#), [Vier AI](#)

- **Employees management:** [EI Experience](#), [TeamEQ](#), [Amber](#), [Lead Honestly](#), [InsideBoard](#)

- **AI to build resilience:** [Driven](#), [Resilient AI](#), [Resiliency](#)

- **Emotional analysis:** [ENABLEX FACEAI](#), [TypingDNA](#), [Emokit](#), [NVISO](#), [Element Human](#), [Receptiviti](#), [ComapanionMX](#)

- **Facial analysis:** [smileML](#), [Affectiva](#), [Amazon Rekognition](#), [Microsoft Face API](#), [Facia.ai](#)

- **Driving AI:** [drivebuddyAI](#), [Affectiva Automotive AI](#)

- **Retail solutions:** [LilyAI](#), [Entropik](#), [madstreetden](#)

- **Language analyzers:** [Watson Tone Analyzer](#), [Emoshape](#), [Cognito](#), [Amazon Connect](#), [Modulate-ToxMod](#)

NITIN DHEMRE
EXPERT IN RESIDENCE

NO EXPERIENCE

Generative AI and immersive technologies bring controller-less interactions and the merger of the physical and virtual world, leading to a natural, intuitive, and stress-free experience of technology; like there is no experience at all

What if technology could just 'get' what we want, without needing to use 2D touchscreens, buttons, and controllers? What if we could just talk, look, point, and gesture in our digital multiverse, just like we interact in the real world, and move seamlessly between them? High-quality rendering, powerful real-time graphics engines, and immersive displays make us feel physically present in virtual worlds, and vice versa. Combined with the power of Generative AI, these technologies unleash a 'No Experience'. We'll be guided by AI-powered, multi-talent virtual agents – only a few words or a gesture away – that understand our preferences and personalities. They'll deliver personalized experiences, services, insights, and actions, seamlessly blended into our 'real' lives. A no-brainer indeed.

WHAT

- 'No Experience' or 'Zero UI' is a trend that we have been seeing in the past few years, with solutions such as voice assistants, face and biometric identity, smart speakers, fitness trackers, virtual reality glasses, and smart home systems being harbingers of this new era.

- For input and control of digital interfaces, Voice and Natural Language Processing are becoming more advanced and easier to use. Going further, gesture and body tracking are reducing the need for a physical interaction interface. Further out, Brain-Computer Interfaces hold the potential to control technology with our thoughts, completely eliminating the need for touchscreens, keyboards, etc.

- The use of Generative AI for the creation of hyper-realistic virtual agents with personalities and preferences, as well as building high-definition and adaptive immersive experiences, represents a step change in efficiency, accuracy, speed, and cost-optimization compared to traditional approaches.

- High-definition real-time 3D engines and GPUs allow realistic rendering of light and volumes, hyper-personalized and customized to adapt to each user's unique environment and situation. AR and MR technologies blur the boundaries between the real and virtual.

- Future interfaces are expected to be highly context-aware, understanding the user's environment, preferences, and needs. As AI and automation continue to advance, systems will become more autonomous, making decisions, and taking actions on behalf of the user.

USE

- **Apple** unveiled Apple Vision Pro, a spatial computer that seamlessly blends digital content with the physical world while allowing users to stay present and connected to others.

- **Keio University Graduate School of Media Design** has used the Unity game engine and Meta Quest 2 to develop VR Journaling application, a system that allows users to take their journals using body performance to achieve the daily story-telling activity.

- **The MSG Sphere in Las Vegas** is a first-of-its-kind immersive theatre that combines high-end graphics and exceptional sound fidelity to create digital experiences that blur the line between virtual and real and has solutions for both real-time and pre-rendered experiences.

- **Roblox** is offering users Generative AI (Material Generator and Code Assist) creator tools. Users will be able to simply type words into a text box to generate desired assets to build environments and games.

- **Christie Digital** displayed breathtaking imagery of ancient Chinese architecture and deities through projection mapping on a 3D-printed wall using Christie Mystique, an automated camera-based alignment and recalibration solution that enables users to quickly install, align, calibrate, and maintain multi-projection systems.

IMPACT

- The seamless blending of real-world and digital experiences will drive immense change in the digital customer experience industry, redefining the standards of interacting with technology.

- Automated Intelligent characters guiding us through our digital lives will have a profound impact on user behavior. As all our needs will be met by simply talking to a digital character, we won't need to visit existing web platforms.

- On the commercial side, offers across categories will be combined and bundled, focusing on the holistic consumer need rather than the marketing and sales strategies of brands.

- New kinds of consumer data will be available to be leveraged by companies, including social interactions, interests and preferences, behaviors, etc.

- Data security and privacy will become increasingly more important, as such sensitive data in the hands of malicious actors can have profound consequences.

TECH

- **Spatial computing:** Unity, Matterport, NVIDIA, Deere, Microsoft, Meta, Apple, AWS, Qualcomm, PTC, Snapchat, ARway, Magic Leap

- **Gen AI and virtual worlds:** NVIDIA GET3D, Roblox, OpenAI Point-E, Hiber3D, Meta, Stability.ai, RunwayML, Nvidia FlexiCubes, Nextech3D.ai, 3DFY AI, OpenAI Shap-E, DreamFusion, Luma AI, Gsgen, Hugging Face

- **Gestural Interaction Technology:** Leap Motion, Vuforia, Shopify, Meta, Pico, Apple, HTC

- **BCI:** Blackrock Neurotech, BrainGate, ClearPoint Neuro, Neuralink, Synchron

- **Real Time 3D Engines:** Unreal, Unity, Panda3D, Enscape, NeoAxis Engine, Torque 3D, CryEngine 3

- **Projection mapping:** Lightform, HeavyM

WE COLLABORATE

SUDHIR PAI
EXPERT IN RESIDENCE

In a world where collaboration feels like an exciting Star Trek voyage, it's now supercharged with advancements in AI and distributed technologies. It augments the competencies of both individuals and entire organizations. Collaboration may not be intuitive, or even complex to many, but great synergies create new ways of working and new business models. And now, innovative technology is augmenting collaboration itself, reimagining creativity with speed and scale. Who would have thought of pair programming, collaborating with a machine, rather than a human? Or of exchanging both physical and virtual assets in real-time? The scope of collaboration is indeed expanding rapidly between humans, humans to machines, and increasingly machines to machines. This puts the notion of a digital, decentral identity center stage — together with open standards, intelligent automation, and regulatory foundations — all creating a human beacon of trust in a networked reality that's perpetually on the move.

The past few years have shown that hybrid work is essential — and now a given — for businesses to achieve their goals. Organizations have proven that they can deliver results, even in the face of adversity, while working from anywhere. Virtual workplaces have led to the development of new productivity tools and techniques. An always-connected, yet asynchronous, and collaborative workstyle is breaking down barriers of geography and time zones, and redefining what it means to go to work, or even what a 'desktop' means nowadays.

The convergence of the physical and virtual worlds leads to a new, distributed online economy, powered by trust. Digitization of assets is expanding beyond financial services for growth. Distributed ledger technology now finds use in areas as diverse as art, retail, real estate, and identity management. This new economy certainly looks decentralized, with autonomy enabled via peer-to-peer

transactions. As the world moves increasingly online, so does our identity. The rapid pace of change necessitates securing and owning our data and identity online. Re-establishing our identity within a complex, always-changing maze of decentralized players, brings the initiative back to who we really are, as individuals.

Customer demand for seamless experiences across services has given rise to 'meshed', cross-industry business models. It introduces an era of co-opetition, as organizations reach beyond the boundaries of their own industry to develop new value propositions with ecosystem partners, startups, and competitors. What becomes paramount is needs-based production, combined with effective business and technology operation models, augmented by technology to deliver long-lasting value to customers.

Technology augments collaboration, but the ultimate form of collaboration

happens within the technology world itself. Digital Twins, the Internet of Things, Distributed Ledger Technology, AI, 5G, edge computing, and now Generative AI, are all paving the way for an increasingly open, secure, connected, and interoperable world. This 'Economy of Things' accelerates new business models thriving on symbiotic relationships between technologies.

It's collaboration, Jim, but not as we know it.

WE COLLABORATE
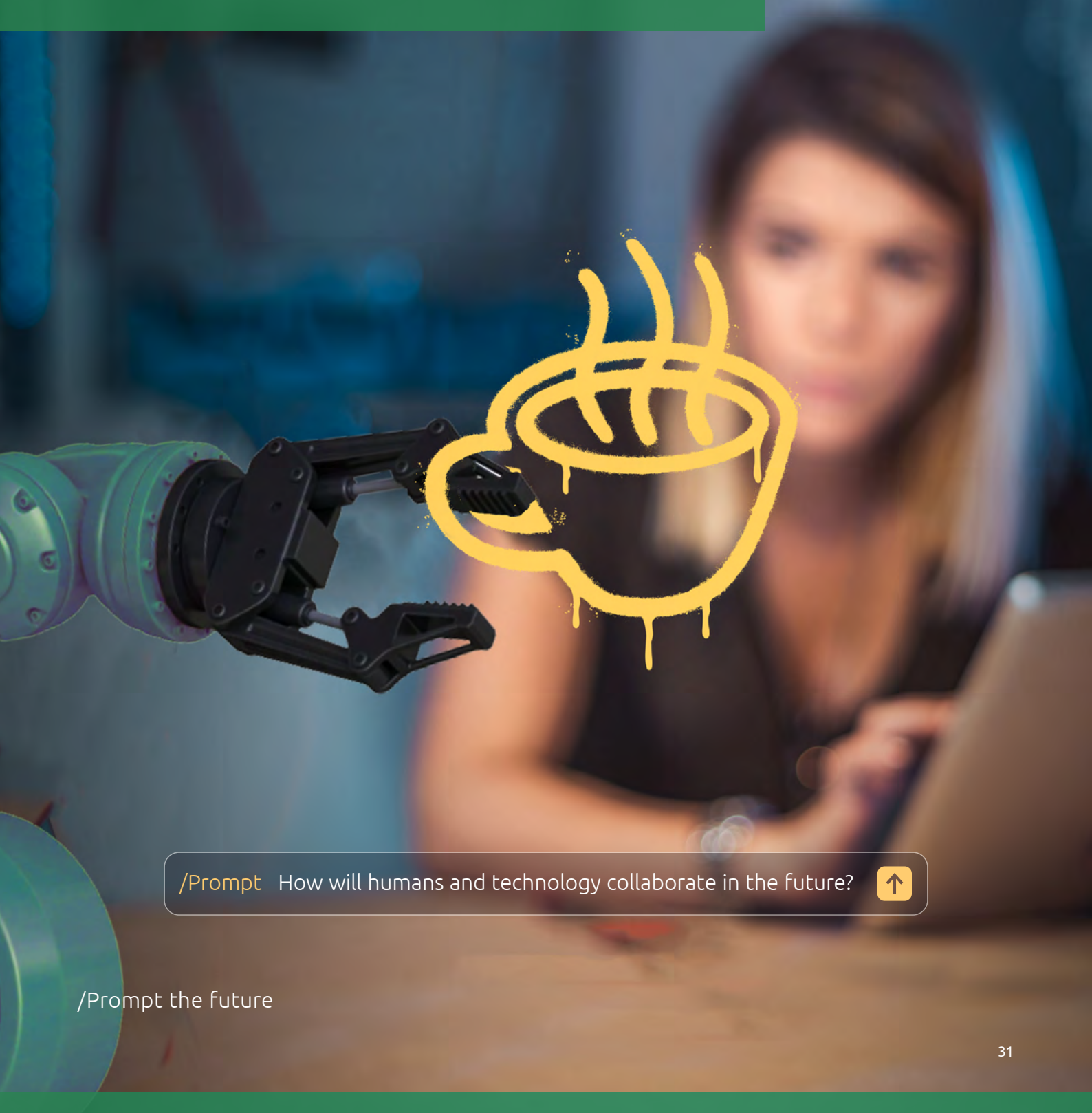
/Prompt   How will humans and technology collaborate in the future?

/Prompt the future

KEERTHI ANANTAPUR GUGGILA
EXPERT IN RESIDENCE

MY IDENTITY, MY BUSINESS

The rise of decentralized identity management, powered by the Web3 'Mesh Web', will empower individuals to reassert control over their own data in a complex, digital network

It's easy to get lost or forget who we are when navigating the complex jungle that online ecosystems nowadays are. The concept of an overarching, central grip on it turns out to be an unrealistic illusion. Cue Decentralized Identity: firmly founded on distributed technologies such as Web3 and blockchain, it thrives on federation, rather than demonizing it. With tools and technologies like Self-Sovereign Identity and smart contracts, we're rewriting the collaborative script, placing the control firmly back in our hands. The results are a tale of bolstered security, the return of personal empowerment, and energized organizations nailing the balance between safeguarding and seamless experiences. Sounds like we're in business.

WHAT

- Digital identity constitutes an online persona that represents an individual when they are active in the online environment.

- Conventional centralized identification systems suffer from vulnerabilities that are susceptible to security breaches and frequently become attractive targets for hackers. Periodically, we come across instances of cyberattacks on centralized identity solutions, resulting in the theft of extensive customer records, making it increasingly difficult, if not entirely impossible, for users to assert rightful ownership of their identities.

- A decentralized identity aims to give people official proof of identity and complete ownership and control over their identities in a secure and user-friendly way. Implementing it involves a combination of Web3 technologies and standards. Distributed ledger technologies and blockchain serve as foundational technology to provide a tamper-proof and decentralized ledger for storing identity information and transaction records.

- Self-Sovereign Identity (SSI) is a decentralized approach to identity management. Instead of maintaining multiple identities across different platforms or relying on a third party to manage a single identity, users will possess digital wallets where they store various credentials like DIDs, verifiable credentials, and private keys which can be accessed through trusted applications. Decentralized identity is a broader term encompassing diverse methods for distributing identity information, whereas self-sovereign identity is a specific subset within the decentralized identity that places a strong emphasis on individual control and ownership of personal data.

- Smart contracts can be leveraged to automate identity-related processes, such as issuing or revoking credentials, and to enforce access control rules.

USE

- **SITA**, an IT provider for the air transport industry, announced a deal with decentralized identity startup Indicio for Digital Travel Credentials (DTC). It will enable passengers to store a digital version of their passport in a mobile wallet in line with standards from the International Civil Aviation Organization (ICAO).

- **Spanish Royal Mint (FNMT)** selected Gataca as the technology partner to implement Self-Sovereign Identity technology in an innovative pilot in collaboration with Spanish universities. It empowers users to create and securely store verifiable credentials, ensuring convenient and reliable access to digital services.

- **Worldcoin** launched the World App to democratize decentralized identities and finance by utilizing World ID to enable users to sign into different websites, and crypto applications, and share personal data in a privacy-focused manner.

- **Ping Identity**, the intelligent identity solutions provider, introduced PingOne Neo, a decentralized identity management solution that supports multiple standards. Neo improves data security, privacy, and control for individuals while reducing resource and compliance burdens for enterprises.

- **Polygon**, a layer-2 scaling protocol for Ethereum launched Polygon ID, a decentralized identity solution that uses zero-knowledge proofs (ZK proofs) to allow users to verify their identity online without having their sensitive information passed or potentially stored with a third-party.

IMPACT

- Decentralized identification systems are secure and reduce the risk of being targeted for cyber-attacks by minimizing the amount of data that they store. User identities are safeguarded from breaches and thefts.

- Decentralized identification systems prevent the spread of user data without their knowledge or consent. Users can choose who they want to share their relevant information with, including the ability to revoke access to the data. In other words, identity owners have complete control of their own digital identity.

- Organizations can go for immediate information verification without delays caused by traditional verification processes that require contact with the issuing party.

- With a decentralized system, organizations no longer must choose between security and customer experience. They can also reduce compliance costs. They don't have to hold troves of personal identifying information about their customers, making them less susceptible to data hacks and making it easier to comply with data privacy laws.

TECH

- **Decentralized Identity:** IDunion, Microsoft Entra, IBM Blockchain Trusted Identity, Trinsic, 1kosmos, Gataca, AU10TIX, SpruceID

- **Self-Sovereign Identity (SSI):** Okta, Infopulse, Walt.Id, Evernym, flexID

- **Web3 Identity Management:** Fractal ID, Polygon ID, Galxe, BrightID, Verite, WIW, ONT ID, iden3, SPACE ID

- **Digital Wallets:** Thales, IDnow, ID.me, AuthenticID, Identyum ID Wallet, GoodID, Idntify.me

GERT HELSEN
EXPERT IN RESIDENCE

THE TEAM IS THE CANVAS

Enabling an agile and adaptable workforce with hybrid team-centric workspaces and tools is the perfect way to combine the power of human collaboration with digital spaces

In today's dynamic landscape, the hybrid workforce isn't just a choice; it's the cornerstone of the future of work. We are shaping the canvas on which we work to ensure that it optimizes both our individual and team requirements. It combines the best of both worlds, offering teams the flexibility to work remotely when needed while fostering a vibrant in-office environment for collaboration, innovation, and synergy. The transition isn't just about physical spaces and flexible schedules: it's about a culture that values both autonomy and teamwork. The fluid workforce thus builds on a hybrid canvas that contains all the tools — and places — needed to create the next works of Technology Business 'art'.

WHAT

- Open and secure collaborative platforms facilitate global teamwork, extending collaboration beyond organizational boundaries. These platforms can be customized with third-party modules, AI support, and learning environments for skill enhancement.

- Hybrid meeting rooms with plug-and-play technologies seamlessly connect both in-office and remote attendees, with the future potential of the Metaverse enhancing connectivity further.

- Our research, 'The Future of Work: From Remote to Hybrid', illustrates that 75% of organizations foresee 30% remote work. While the IT industry stands out as the foremost sector for remote work, Big Tech companies are asking their employees to return to the office on a regular basis.

- Gartner data shows that in flexible work environments, employees are 1.5 to 1.7 times more likely to stay with the organization, experience less fatigue, and perform at higher levels, highlighting the importance of these human-centered qualities.

- The design of the workforce influences not just a company's capacity to attract and retain talent but also its capacity to innovate and adapt to change.

USE

- **Microsoft** launches Copilot, a new AI-powered tool that helps digital workplace teams collaborate more effectively by automating tasks, generating content, and providing insights.

- **Cisco** and **Audi** unveiled plans to enhance mobile car collaboration experiences for hybrid workers. In partnership with CARIAD and HARMAN, Webex will be the first app for hybrid work available in select Audi models as of the 2024 model year.

- **Fairbanks Morse Defense (FMD)** and the **US Navy** partnered to implement a mixed reality (MR) solution, using AR-powered immersive content for real-time engagement with colleagues and remote experts. The FMD FM OnBoard tool facilitates remote collaboration and asset monitoring on military vessels.

- **Al Azhar University**, an Egypt-based Islamic educational institution is deploying Google Workspace for Education (GWFE) as the official learning and productivity platform for more than 24,500 faculty members and 5,00,000 students to collaborate across every step of their educational journeys.

- **SAP** integrated Mural in Teams for hybrid-friendly approach and provide employees with tools that support and drive engagement during meetings and workshops. SAP's implementation of Mural improved overall efficiency by 10% and improved design efficiency by 9.6%.

IMPACT

- Modern collaboration platforms empower teams by shaping flexible workspaces and reducing the need for fixed offices and travel, aligning with sustainability goals. Combined with remote work, this fosters diverse cross-cultural interactions and enhances team diversity.

- Remote work's appeal, akin to an 8% pay increase, prompts resistance to full-time office work. However, declining productivity in the US has led major employers to enforce return-to-office policies. In this delicate balance, leaders play a crucial role in preserving workplace culture and fostering meaningful team connections beyond daily contexts.

- Collaboration platform vendors have recognized the benefits of incorporating Generative AI into their products, pledging significant improvements in collaboration and productivity for their users.

TECH

- **Collaboration platforms:** Humanity Platform, Microsoft Teams, Microsoft Viva, Avaya OneCloud, Slack, Google WorkSpace, Asana, Trello, Unreal Engine 5, Notion, SEMYOU

- **Virtual meetings and events:** Zoom, Google Meet, Cisco Webex, Adobe Connect, GoToMeeting, Remio, Hopin, Hublio

- **Virtual/Augmented Reality and Metaverse:** Horizon Workrooms, Microsoft Mesh, Librestream Onsight, Glue, Fectar, Over The Reality

- **Whiteboard and ideation:** Mural, Miro, Bluescape, Klaxoon, Google Jamboard, InVision, Lucid

- **Surveys and quizzes:** Medallia Crowdicity, PureSpectrum, Typeform

MUHAMMED AHMED
EXPERT IN RESIDENCE

TAKEN BY TOKENS

Reimagining the future of value exchange through 'Token Economy'. Digitize. Decentralize. Democratize

Currency, assets, goods, art, identity, or even votes — tokens are everywhere today. Businesses are focused on value creation and exchange through tokens — through three levers: Digitization is paving the way for a new form of money through central bank digital currencies. Decentralization is shaping the future of financial markets and value exchange through tokenization. Democratization is unlocking new business models through Web3. The decentralized token economy is disrupting business models, fundamentally changing the way we transact and trade. Tokens make transactions more efficient, secure, reliable, and accessible. Tokens: I will look for you, I will find you, and I will leverage you.

WHAT

- Tokenization is the representation of an asset and its ownership on a digital medium using distributed ledger technology. A token is a digital asset, stored securely on the blockchain.

- Tokens have immense potential to augment business models and can be applied to any asset, beyond currencies, tangible or intangible — from identity and access rights to votes and onto ownership of art and music or digital assets, and even carbon credits.

- There are broadly three categories of tokens: payment tokens serve the function of money (digital currency, cryptocurrency, etc.), security tokens represent ownership of an underlying asset (financial instruments, real estate, art, digital assets in a 3D world), and utility tokens provide access to a particular set of goods or services (identity tokens, voting rights, ICOs, collectibles).

- Tokenization accelerates the convergence of the 'real' world with its tangible assets, and the 'virtual' world with its digital assets, giving rise to a decentralized economy, powered by trust. A 'token economy' will enable peer-to-peer transactions and governance without relying on a trusted authority. Decentralized Autonomous Organizations (DAOs) governed by tokens can create a transparent organization to achieve shared objectives.

USE

- **Twenty-four central banks** will have Central Bank Digital Currencies (CBDCs) in circulation by 2030, as 93% of central banks around the world are engaged in CBDC work for retail and wholesale applications.

- Deposit tokenization is growing in prominence as central banks, commercial banks, and financial institutions continue to embrace tokenization of deposits for inter-bank transfers, cross-border transactions, interoperability.

- **JPMorgan** rolled out euro-denominated payments for corporate clients using its native, blockchain-powered digital currency, JPM Coin. Through JPM Coin, the bank's wholesale clients can make dollar and euro transfers to and from their multiple JPMorgan accounts or transact with other customers of the bank.

- Digital asset custody is gaining widespread acceptance among both individual and institutional investors. Major banks like **Standard Chartered** and **Goldman Sachs** have forged strategic partnerships to offer custody services for digital assets.

- **Non-Fungible Tokens** (NFTs) are expected to gain even more utility, as the Metaverse continues to influence adoption across industries such as Gaming, Fashion, Sports, Airlines, Hospitality, Ticketing.

IMPACT

- Tokenization and decentralized technologies will play a pivotal role in shaping the future of regulated markets by helping to bridge the gap between traditional models and decentralized modes of operations.

- Decentralization can improve latency (through peer-to-peer transactions), reduce cost (by eliminating intermediaries through smart contracts), improve security (through cryptographically secure transactions), and increase transparency (through an immutable ledger of transactions).

- Tokenization enables fractionalization of assets, thereby vastly increasing the volume of trade, potentially unlocking trillions of dollars in illiquid assets. Tokens and Web3 technologies democratize access to financial services and reduce barriers to entry to promote inclusion.

- Tokenization has fueled an innovative and currently well-established way of fundraising for early-stage startups through a so-called initial coin offerings (ICOs).

- Smart Contracts can automate transactions and eliminate intermediaries, thereby reducing administrative processes and the dependence on scarce human resources. However, decentralization brings many challenges: fraudulent transactions, scalability, and privacy concerns. These challenges need to be addressed to unleash the token economy in a true sense.

TECH

- **Technologies:** Ethereum, Hyperledger Fabric, Algorand, ConsenSys Quorum, Solana, Cardano, Circle, Ripple, Contour Blockchain

- **Digital Asset Custody and Wallets:** Metaco, Fireblocks, HexTrust, Settlemint, MetaMask, Tokeny, Anchorage, Komainu, Zodia Custody, Taxcryp, Copper, Qredo, Cobo

- **Securitization:** ConsenSysCodefi, Polymath, Securitize, Polygon, Progmat, Chainalysis, Certik, Magic, AnChain.AI, TaxBit, Secretarium

- **Healthcare:** MedicalChain, MediLedger, Chronicled

- **NFTs:** OpenSea, Rarible, Larva Labs CryptoPunks, Decentraland, Sandbox, Unity, Centrifuge, Dapper, Pawnfi, NFTfi, Forte, Magic Eden

NEHA PUNATER

EXPERT IN RESIDENCE

YOUR BUSINESS IS A MESH

Enabled by efficient decentral 'mesh' technology, it's easier than ever for organizations to join forces, even if it is lightweight, just for one day, for one occasion, or for one customer

Caught in a mesh? Businesses can no longer just be digital but must become living, learning, and adaptive. With an augmented enterprise, agile applications, big data capabilities, and hyper-connectivity, it is easier and more efficient than ever to collaborate with others — even if they come from unexpected sides. Thriving, always-changing ecosystem-based business models can drive unique products, services, and customer experiences that were deemed unlikely or impossible before, crossing the barriers of sectors, industries, and regions. Mesh collaboration enables businesses to see, predict, and adapt to market needs in real time; ensuring intelligence and empathy by integrating people, devices, and services to drive efficiency. Exactly the rumble organizations are looking for.

WHAT

- In the modern business landscape, staying ahead of the curve is paramount. Harnessing the power of AI to augment big data, agile applications, and hyper-connectivity empowers our organizations to foster partnerships and collaborate seamlessly. It's possible even within loosely integrated 'mesh' networks, and while supporting sustainable practices that safeguard our future.

- Organizations are confronted with ever more intricate social, environmental, and supply chain challenges that can no longer be tackled in isolation. While governments rely on market dynamics, private sector innovation, and economic benefits generated by businesses to improve people's lives, it is crucial to recognize that the prosperity of each sector is inextricably intertwined with another.

- The dynamic interplay between AI and technology-powered augmentation is revolutionizing how organizations across sectors collaborate by fostering a unique environment where expertise transcends traditional industry boundaries. Interdisciplinary teams can come together seamlessly, leveraging AI-driven insights and augmented capabilities to address complex, multifaceted challenges. The result is a constructive collaboration that not only improves problem-solving but also accelerates innovation.

- As we venture into the era of convergence between technology, collaboration, and human purpose, let us embrace the harmony between technological prowess and humanity of our purpose. In this balance, we can unlock boundless potential — a world where technology elevates our humanity, where collaboration transcends boundaries, and where innovation reshapes the future.

USE

- **Nine prominent UK banks**, including Lloyds Bank, Halifax, Bank of Scotland, NatWest, Monzo, and TSB have teamed up to utilize vast amounts of payment data to identify real-time payment scams. Through its AI-powered cybersecurity solutions, Mastercard has prevented over $35 billion in fraud losses in the past three years. The introduction of Consumer Fraud Risk has proven to be a game changer.

- **Siemens** and Microsoft are collaborating to use Generative AI to drive innovation and efficiency in industrial technology across the entire product development cycle. They are combining Siemens' Teamcenter® PLM software with Microsoft Teams and enhancing it with Microsoft's Azure OpenAI Service and other Azure AI capabilities, making this partnership unique and transformative.

- **Bees360** and Hosta AI have collaborated to transform insurance claims handling using innovative technology. Traditional property inspections face challenges due to diverse data collection and varying inspector methods, with over six million annual home inspections in the US. To address this they will deploy advanced technologies for superior property inspections, ensuring quality, efficiency, and precision.

- **Maybelline New York** has launched the Maybelline Beauty app within Microsoft Teams, offering employees a unique way to enhance their engagement and self-expression during virtual meetings. Developed in collaboration with the Geena Davis Institute, the app provides 12 distinct virtual makeup looks, enabling users to experiment with various styles. Powered by Modiface's AI technology, it accurately applies digital filters by identifying over 70 facial points, offering users a creative means of self-presentation.

- **Cover Genius**, an embedded insurance specialist has teamed up with **Uber** to enhance driver protection in Brazil. This partnership involves the integration of Cover Genius' distribution platform, XCover, into Uber's services. As a result, Uber will be able to offer its drivers embedded insurance with advanced features like automated payouts and usage-based charging.

IMPACT

- Organizations can expand their reach and access new customer segments by leveraging cross sector partnerships. This helps them diversify revenue streams and reduce dependence on single market.

- While shared resources and sustainable consumption and production practices can help organizations reduce their operating and product development costs, utilizing AI, dedicated tools, and data platforms makes it easier for organizations to gain cross-sector collaboration capabilities much more quickly.

- Partnerships across sectors fosters the convergence of diverse expertise and resources, accelerating innovation. AI and augmentation technologies amplify the creative potential of these partnerships, leading to the development of groundbreaking solutions.

- Through the creation of a unified, end-to-end user experience that ties together all players in the product/service delivery lifecycle, AI-driven cross-industry partnerships have the potential to significantly enhance customer experiences by offering personalization, convenience, efficiency, and improved product/service quality.

- Committed private sector partnerships, by leveraging the power of AI, possess the ability to transcend the confines of temporal development investments. Instead, they metamorphose into enduring, market-propelled, and infinitely scalable endeavors. This infusion of AI-driven ingenuity enhances adaptability, optimizes efficiency, and augments the potential for sustained transformative impact, ushering in an era of perpetual growth.

TECH

- **Data sharing:** Automation, AWS Data Exchange, Snowflake, iGrant.io

- **Blockchain and API:** Blockchain, API-fication, Hyperledger, Ethereum, IBM Blockchain, Tributech

- **Identity and access management:** Kong, Ping, Okta, TrustBuilder, MIRACL, Onfido, BehavioSec, Xiid

- **Artificial intelligence and Internet of Things:** AI, Google AI Platform, IOT, Microsoft Azure IoT Platform, Google Cloud IoT Core, AWS IoT, Affectiva, Realeyes

- **Other technologies:** Codefi, IBM Watson, Microsoft Azure, Microsoft HoloLens, MindSphere, OpenAI, TensorFlow

SURABHI GAWDE
EXPERT IN RESIDENCE

ECONOMY OF THINGS

In a digital dance of devices and decentralization, a new Economy of Things emerges; business as usual gets a revolutionary remix

Imagine a world where every tangible and digital entity boasts its unique, sovereign identity, seamlessly interacting through groundbreaking technology such as the Internet of Things, AI, multi-agent computing, 5G, and the Web3 'mesh web.' It's not sci-fi; it's the next digital horizon where people, machines, and gadgets can chat, trade, and even pioneer their own economic blueprints. It's a digital metamorphosis ushering in a realm that's open, secure, and green. A newly invented reality, blending leading practices of decentralized and centralized worlds, people, and physical assets. Meet the Economy of Things, a bold digital-socio-economic landscape. Business as usual just got an extraordinary makeover.

WHAT

- IoT, blockchain, AI, game theory, and digital twins are not new, but they were applied in closed systems or within departments. Openness, cooperation, and interoperability with the latest technologies enable objects to identify themselves, transact, negotiate, or build their own models on decentralized marketplaces.

- Business models and marketplaces will be built on the next iteration of digitalization that will simply harness multiple tech enablers. The quintessential 'Alice and Bob', explained in technology scenarios, need not be fictional people; they can be an IoT sensor, a car, a bot, or any other thing that can negotiate for services on platforms.

- Secured, trustworthy transactions with intelligent agents working on confidential data input and the resulting output, actions require blockchain and Artificial Intelligence to work hand in hand in a fairly decentralized infrastructure, with well-distributed operations, decision-making authority across defined ecosystems.

- Cryptographic-economic tokens, decentralized identity management, encrypted automated multi-party calculations, smart contracts, independent agent actions on behalf of owners, and AI learning collaboration across units and organizations, all work together to enable the Economy of Things.

USE

- **GAIA-X** is a next generation of secured, federated, data infrastructure for open business data ecosystems amongst more than 425 European organizations. Web3 principles fit well for GAIA-X's goals as Bosch, Ocean Protocol, and deltaDAO contribute to an open, sovereign data economy with sustainable business models.

- **Catena-X** is an agile, collaborative, data ecosystem of automobile manufacturers, suppliers, dealers, and equipment suppliers. Bosch, BigchainDB, and Fetch.ai are building the economic aspect of IoTs, implementing token-based ecosystems, smart multi-agent systems, autonomous AI networks, and decentralized machine learning on blockchain infrastructure. These combinatorial technologies aim to create decentralized business models and incentive mechanisms, with efficiency, trust, and security across the automotive value chain.

- **Vodafone**, with its Digital Asset Broker(DAB) of 140 million IoT connections, and **Sumitomo Corporation** have set up a blockchain-based IoT business JV, dedicated to advancing the Economy of Things. Verified, secured, devices such as IoT, electric vehicles, EV charging, and smart street furniture would be enabled to buy and sell digital assets for us, in real time on online marketplaces. These new economic models aim at the automotive, energy, manufacturing, and supply chain sectors.

IMPACT

- Monetization of data necessitates exchange, co-opetition, and collaboration. Economy of Things enables machines to transact with machines, negotiate, and learn from interactions between things to improve processes and everyday life.

- Network effects necessary for the success of digital marketplaces. In contrast to centralized systems, Economy of Things is based on decentralized infrastructure enables businesses and individuals to choose and share what they want to with other partners. Imbalances of power and information can be avoided sustainably.

- Resilient infrastructure in cooperative data models, for co-opetition and collaboration allows all market producers, consumers, and their devices with software agents to transact intelligently, securely, and in a verifiable way. This leads to optimizing products, service design, and consumption to a net-zero or even a carbon-negative future.

TECH

- **IoT devices:** Abeeway, Decent Lab, Dragino, RAK, Netvox, Seeed Studio, Origo
- **Blockchain infrastructure:** Helium, Peaq, Ocean, R3 Corda, Perun-Hyperledger
- **Self-Soverign Identity:** moveID, everID, IDunion
- **Data assets providers and brokers:** Chainlink, BigchainDB
- **Artificial Intelligence:** Fetch.ai, deltaDAO
- **Multi-agent programming:** Fetch.ai, Overdrive

THRIVING ON DATA

ROBERT ENGELS
EXPERT IN RESIDENCE

Organizations aspire to navigate the business cosmos, powered by data. As every business inherently orbits technology, data is its gravitational pull. Dare we say, every Business is a Data Business? Data charts the course for superior customer experiences, optimized operations, and ingenious machines. It ensures resilience, predictability, and effectiveness, while also driving organizations towards sustainability and societal goals. AI complements our human resources and competencies by harnessing this power, co-creating top-tier results with unparalleled efficiency. To achieve all this goodness, however, data must be managed as a first-class product near the spaces in the business where it is created and used the most: easy to find, seamless to share, enjoyable to consume, and trustworthy where needed.

There are many good reasons to be in a continuous state of data-induced euphoria. If only it wasn't so difficult to achieve data mastery. Yes, many organizations create data foundations: managing data sources, implementing technology, setting up governance, and assuring data quality. But activating data at the heart of the business strategy, having people in the operations embrace, trust, and use data for all their business and purposes, is a different ball game.

Sharing and collaborating on data in all sorts of different external (and internal) ecosystems is the way to turn data from 'just' an asset into a first-class product. It gets more value out of data, and also drives achievements in key sustainability and societal goals.

Increasingly powerful, AI-augmented self-service tools bring data where it should be — close to the business — on an enterprise scale. This trend is not only instrumental to creating a data-powered culture, but it also effectively addresses the increasing scarcity of skilled data specialists.

Both trends go together with the move towards federated management of data across the organization, bringing ownership and control of data to the business domains where it belongs, held together through company-wide open standards and rock-solid, automated platform services.

All businesses need clarity on their CO_2 emissions and the impact of their sustainability actions. As our Data for Net-Zero research shows, data is key to delivering on the full scope of ESG ambitions. It exemplifies the need for organizations to become a data master, getting data foundations and behaviors in place. But data itself needs to be sustainable too, as data- and AI-related activities may lead to excess energy consumption and CO_2 emission, adding to a growing heap of E-waste and data waste. 'BIG data?', 'LARGE Language Models?' Think again: frugal data and AI might be the next thing, choosing the right(sized) datasets and models for the right job.

Still, as it is, Generative AI and Large Language Models power organizations with an unequaled abstraction from all the world's available information. Enterprises add their own data, creating a competitive advantage with superior customer experiences and highly tuned operations. On top of that, as we all have witnessed, AI systems now rapidly increase their ability to create and generate text, video, audio, art, test data, 3D models, and program code. Generative AI augments humans in their tasks and endeavors by proposing and co-creating content, saving valuable time and effort.

Add this all up to the abundance of data going around within the Internet of Things — probably even processed at the very edge of both business and technology domains — as we see mundane objects turned into activated, hyper-intelligent, and connected assets. It's a vital and rapidly growing part of a data universe that itself is definitely not done expanding.

THRIVING ON DATA

/Prompt   How can organizations make data enjoyable to consume? ⬆

/Prompt the future

ANNE-LAURE THIBAUD (THIEULLENT)
EXPERT IN RESIDENCE

DATA SHARING IS CARING

Participating, collaborating, or even leading in data ecosystems gets much more value out of data; and what works for the outside marketplace might do miracles for internal data sharing as well

What is not to like about collaborative data ecosystems? These dynamic platforms empower organizations to securely share and leverage data, ignite innovation, supercharge performance, and advance sustainability and societal well-being — all while possibly even involving competitors joining forces. There are many different ways to set up and thrive within a data ecosystem, depending on maturity, market position, and corporate ambitions. Managing data as a first-class, high-quality product, findable on an inviting marketplace, and consumable through a compelling 'consumer experience' are all key to success. The good thing: what works in the outside world might equally well boost sharing and collaborating on data internally. Or the other way around. Forward the message, hit that like button!

WHAT

- Collaborative data ecosystems consisting of different organizations sharing data under applicable regulations to create new value for all participants. These ecosystems occur within one organization as well, all with similar benefits. According to the Capgemini Research Institute, 84% of organizations will launch a new data ecosystem within the next three years.

- Collaborative data ecosystems take many different forms: examples include data brokerages providing aggregate data to their clients, reciprocal data-sharing processes among supply chain partners, and sharing of insights across sector boundaries.

- Collaborative data ecosystems need foundational capabilities – such as privacy, ethics, ownership, trust, compliance, and accessibility. These capabilities are supported by data-sharing platforms, data collaboration platforms, data exchanges, differential privacy, and federated learning.

- Federative approaches — notably Data Mesh — are emerging, pushing business domains to truly own and manage their data and its uses, and actively collaborate with internal and external partners. It propagates domain management of data as a first-class product, not only providing trusted and fresh data but also making data products available to internal and external consumers through a compelling, self-service experience.

USE

- **Pinterest** partnered with **LiveRamp**, a US-based data collaboration platform, to implement data 'clean rooms' for Pinterest's ad partners, which will enable brands to utilize their data, without having to re-share that information with Pinterest.

- China-based **Guiyang Global** Big Data Exchange completed a transaction involving personal data, paving the way for job seekers to profit from their resumes, by selling the information collected by **Hao Huo, a China-based tech firm.**

- **Owkin**, a US-based AI biotech company, built AI models using data kept within four French hospitals to predict the future response of triple-negative breast cancer patients to neoadjuvant chemotherapy using federated learning.

- **Deutsche Börse Group** and **Google Cloud** collaborated to deploy a data mesh to enhance Deutsche Börse's data distribution and data use cases in the cloud.

- **Memorial Sloan Kettering Cancer Center**, a US-based cancer treatment and research institution, accelerated its research efforts to find a cure for the deadly disease by using a data mesh approach to data management from Dremio, a US-based **Data Lakehouse platform.**

IMPACT

- The Capgemini Research Institute estimates that data ecosystems have already improved customer satisfaction by 15%, improved productivity and efficiency by 14%, and reduced costs by 11% annually during the past three years.

- The research also shows that organizations that use external data extensively (making use of more than seven external data sources) exhibit superior financial performance, with up to 14 times higher fixed asset turnover and two times higher market capitalization.

- Collaborative data ecosystems are key to addressing many of the current societal challenges and organizational purposes, for example in health, public and citizen services, energy consumption, agriculture, and sustainability.

- By engaging in collaborative data ecosystems, organizations are likely to find unexpected, new partners – potentially fueling new, data-powered value streams, data monetization, and even breakthrough, innovative business models.

- Embracing ownership and data-product management by business domains is a crucial step towards creating an organization-wide, data-powered culture.

TECH

- **Data exchanges and marketplaces:** AWS Data Exchange, Snowflake Data Marketplace, Dawex, Oracle Data Marketplace, Human Data Income (HUDI) Defi token-driven data monetization, 890 by Capgemini, Siemens Design Data Exchange, Narrative, Harbr Enterprise Data Exchange, Data Interchange, Safe Software, Informatica Data Exchange

- **Data-sharing platforms:** Amazon Redshift Data Sharing, Microsoft Azure Data Share, Snowflake Data Sharing, Databricks Delta Sharing, Google Analytics Hub, IBM Aspera on Cloud, Oracle Blockchain Platform Cloud, Adlink Data Sharing Platforms, Quantiphi Enterprise Data Sharing Platform, Datarepublic, eightwire

- **Data-collaboration platforms:** Harbr, Snowflake Data Cloud, Infosum Data Collaboration Platform, Alteryx Connect, Atlan Data Collaboration, Cinchy Data Collaboration, Omnisient Data Collaboration, Duality Data Collaboration, Oracle Enterprise Data Management, Hex

- **Federated learning:** IBM Federated Learning, TensorFlow Federated (TFF), Xaynet Federated Learning, Owkin for Life Science, OpenMined Private AI, Microsoft FLUTE, Intellegens, Sherpa.ai, Nvidia Flare, FedML

- **Data Clean Rooms:** Snowflake Data Clean Rooms, InfoSum, Habu, LiveRamp, AWS Clean Rooms, AppsFlyer, Databricks, Epsilon

- **Differential privacy and cryptography:** Microsoft Differential Privacy, LeapYear, Cosmian

- **Data collaboration/Data Mesh enablers:** DataPlex, Atlan, Cinchy, K2View, IBM Data Fabric, Talend, Cloudera, Dremio, Nexla, Denodo, Keboola, Informatica Intelligent Data Management Cloud, Infosum, Snowflake, Box, Omnisient, Duality, StarDog, TIBCO, Starburst, Dataiku, Alteryx Connect, Hex, Splunk, Datastreams, Databricks

PADMASHREE SHAGRITHAYA
EXPERT IN RESIDENCE

POWER TO THE PEOPLE

A growing scarcity of specialized skills, the need to activate data as close to the business as possible — plus powerful AI and automation tools — are all driving the unstoppable self-service data revolution

Time to fight the central power! Within a true Technology Business, everyone can take the role of data scientist or data engineer. Data-powered operations may only be a chat away. Powering by data happens best in the closest proximity to the business, at the very edges of central IT and data departments. But the right skills are becoming rarer, and secure, high-quality access to the right data is just as difficult to find. Generative AI and intelligent automation bring easy-to-use, self-service tools that provide the power of data to more people. Self-service offloads the pressure on central delivery, deals with scarcity, and democratizes access and use of data. Something to push through the barricades for.

WHAT

- Within a Technology Business, data needs to be accessed and used — activated — near or right within the business; a Capgemini Research Institute publication shows that true 'data masters' put a strong focus on data democratization.

- Extending data's reach empowers individuals, businesses, and communities, catalyzing informed decisions, sparking innovation, and driving societal progress while addressing historical inequalities in data accessibility.

- This alignment with data democratization is reflected in our customer-centric approach, which places 'people' at the core, centered on understanding and addressing customer data needs, preferences, and overall satisfaction. This includes personalization, data-driven customer experience, and customer performance analytics.

- Sustainability is another vital pillar. Initiatives like the Sustainability Data Hub and Net Zero are of utmost importance now. We're leveraging renewable insights, optimizing intelligent IT operations, and building data trust as fundamental pillars to empower individuals and organizations.

- In the tech landscape, we harness technological advancements, including cutting-edge AI technologies such as Generative AI, advanced data and AI platforms like IDEA, Data Mesh, and the modernization of data and analytics infrastructure to propel innovation.

USE

- **Rolls Royce** embraced scalable low-code Microsoft Power Apps to build digital tools for improving everything from productivity, rapid prototyping, R&D, and testing, to employee engagement and wellbeing.

- **Bayer** built a cross-functional data science platform to provide curated, self-service access to a range of Amazon Web Services capabilities, enabling data scientists to create projects and environments for their daily operations.

- **OutSystems** signed an MOU with Petronas Digital to promote the use of low-code application development in the entire group.

- **Information Services Group** (ISG) launched the ISG Code Quality Analyzer (CQA) platform, adding Microsoft Power Automate to its automation software that citizen developers can leverage to build their own bots.

- **Bournemouth, Christchurch and Poole Council** (BCP Council), in the south of England, is streamlining the labor-intensive administrative tasks and broadening the digital skills of its teams via the drag-and-drop app creation templates using Microsoft Power Apps.

IMPACT

- Empowering people with Generative AI by leveraging workforce impact, evolving model creation costs, and creating competitive advantages while managing risks, fostering enterprise adoption growth, and ensuring trustworthy AI integration and intellectual property protection.

- Preparing people for a sustainable tomorrow by unveiling emerging climate tech data innovations, integrating climate technologies, and shaping the future of sustainable agriculture while recognizing the impacts on industries.

- Self-service of data, through data and model marketplaces, resulting in speedier availability of new insights to the business, improving responsiveness and adaptability.

- Automating the AI supply chain with cost-effective, faster production of high-quality BI, analytics, and AI results, both near or within the business and from a central delivery function.

TECH

- **Data marketplaces:** AWS, Snowflake, DAWEX, 890 by Capgemini, Oracle Data Marketplace, Reply.io

- **Self-service BI and analytics:** AWS QuickSight, Tableau, Qlik, SAS Visual Analytics, Dataiku, Saagie, Google, TIBCO, 890 by Capgemini, Google Analytics, Salesforce Einstein Analytics, SAP Analytics Cloud, Sisense, Alteryx, Microsoft Power Platform, Github Copilot, Amazon SageMaker

- **AutoML:** DataRobot, Google, H2O.ai, Microsoft, AutoKeras, Databricks, Feedzai, Kortical, Oracle, TransmogrifAI, IBM, AWS, JADBio AutoML, BigML

- **MLOps:** Dataiku, Amazon Sagemaker, Azure Synapse, 890 by Capgemini, H2O MLOps, Neptune.ai, MLflow

TIJANA NIKOLIC
EXPERT IN RESIDENCE

MY AI GENERATION

Generative AI enables individuals and organizations to express themselves creatively like never before while boosting productivity — but human oversight and guardrails are key

Talkin' 'bout my AI generation: it seems that almost overnight we have gotten accustomed to having productive and creative AI assistants available everywhere, helping us with a wide range of activities. Large Language Models excel in exactly what their name suggests: interpreting and producing 'language', whether it pertains to text, audio, video, images, test data, or program code. Combined with technology for (private) data retrieval and contextual navigation, Generative AI truly becomes a phenomenal augmentation force for the enterprise. But watch out for the AI 'generation gap': beautifully articulated language can perfectly mask the disinformation it may contain. Guardrails are a must, just as human oversight, wherever — and WHOever — appropriate.

WHAT

- Generative, creative AI is based on the concept that — given enough training data and the right machine-learning approaches — an AI system can not only detect patterns in the said data but also can produce new, synthetic content of all kinds.

- Auto-regressive Large Language Models (LLM) such as GPT-4, Claude-2, Llama-2, Cohere, and Bard build on up to hundreds of trillions(!) of parameters and rely on vast amounts of text to generate convincing, high-quality text, including poems, program code, and songs. We have already seen a quick uptake, not only in generating synthetic content but also in moving beyond that and speeding up innovation in material and life sciences.

- Generative Adversarial Networks (GANs) let two neural networks work together: the 'generator' attempts to produce realistic data, the 'discriminator' assesses how plausible it is, and a feedback loop creates increasingly realistic, synthetic results.

- Many creative AI systems are based on pre-trained models – they only need to be properly 'prompted' to generate results. Training creative models can, therefore, consume a large amount of computing resources, while using them for creative purposes consumes far fewer.

- Generative, creative machines have a multitude of potential applications, from the design of software to interiors of houses and fashion, but also the creation of text, music, medicines, video, audio, books, art, and even test data. Creative machines also assist in co-creating new products such as vaccines and materials.

- Being able to evaluate the quality of these models is more important than ever. Given their impressive capabilities, we must not forget they still need a robust test strategy and humans in the loop to assess the output so they can be used responsibly.

USE

- **Toyota Research Institute** launched a Generative AI vehicle design technique to help designers add initial design sketches and constraints into the process, cutting down the iterations needed to reconcile design and engineering considerations.

- NVIDIA and **WPP**, a UK-based advertising company, partnered to develop a content engine that harnesses NVIDIA Omniverse and AI to enable WPP's creative teams to speed up the production of high-quality commercial content.

- **Moderna** signed an agreement with IBM to explore quantum computing and Generative AI for advancing and expediting its mRNA research.

- **AWS** launched AWS HealthScribe, a new Generative AI-powered service that automatically creates clinical documentation.

- **IBM** aims to help clients tackle talent gaps by using Generative AI LLMs to help migrate COBOL applications to more modern Java application code.

IMPACT

- The ability to deal with the increasing scarcity of human resources and a lack of specialized skills, thanks to augmentation by creative AI in generating, creating, and transforming all sorts of different content and assets.

- Inclusion of more people who can express their creativity, where they did not have the capabilities, skills, or means to do so before. There is also the potential to unleash hidden creative power in the company's (historical) datasets.

- Generating de-personalized, synthetic data from 'real' data to address privacy, quality, fairness, bias, and availability concerns of training and test data used within the organization.

- Exploring models, approaches, and scenarios that would otherwise be too time-consuming or complex for humans to cover or to comprehend, for example in life science and other scientific research areas.

TECH

- **Language transformer models:** ChatGPT, BERT, OpenAI GPT-4, Hugging Face, PaLM2, Claude2, Amazon Titan, Llama 2, Google Switch Transformer, Microsoft Turing, NVIDIA Megatron, Microsoft/NVIDIA Megatron Turing NLG 530-B

- **AI Generated Art and text-to-image generation:** DALL-E-3, Midjourney, Stable Diffusion, Bing Image Creator, Craiyon

- **GANs:** StoryGAN, DiscoGAN, ArchiGAN, GameGAN, StackGAN, Google GAN, GAN Lab, GANImation, HyperGAN, CycleGAN, BigGAN

- **GAN libraries:** TF-GAN, Torch-GAN, Mimicry, IBM GAN-toolkit, pygan, StudioGAN, Keras-GAN

- **Building applications:** LangChain, PromptFlow, FlowiseAI, Gradio, Streamlit

- **Assessing the quality:** EleutherAI, FastEval, HELM, FLASK

- **Guardrails:** NVIDIA NEMO, Guardrails AI

ROOSA SÄNTTI
EXPERT IN RESIDENCE

NET Ø DATA

Data is key to delivering net-zero ambitions. But data itself needs to be sustainable, too: the battle against data waste is on

Zero is everything! All businesses need clarity on their CO_2 emissions and the impact of their sustainability actions. But you can't manage what you don't measure. To build and adjust their net-zero strategies and overcome major sustainability challenges, businesses need to build skills, tools, and culture to measure, forecast — and act on — their emissions levels across the whole value chain. For companies, collaboration with their supply chain ecosystem is critical to access reliable data — especially scope 3, which lies outside the boundaries of an organization. But collecting, storing, accessing, and utilizing data comes with its own sustainability price, too. It's a matter of being smarter about what data is actually needed, picking up the quest against data waste, and realizing that 'big' data is not always 'better' data.

WHAT

- The world created a staggering amount of data, 7 zettabytes in 2022. This is expected to grow to an unimaginable 180 zettabytes in 2023! Energy is needed to create, move, and interpret this data.

- At the same time data is needed, as it is a significant lever in accelerating the journey towards net zero: increasing visibility of baseline emissions and identifying emissions hotspots, improving existing business processes, and predicting and prescribing business outcomes to drive net-zero performance.

- According to a Capgemini Research Institute study, 45% of organizations with net-zero targets only use emissions data for mandatory reporting. In addition, NTT reports that 67% of organizations remain oblivious to the environmental consequences of their data strategies.

- Businesses, therefore, need a sustainability data strategy as well as a robust foundation for emissions data management.

- Although often positive, the impact of data and AI on the climate is two-sided. The development of AI, its interaction with carbon-intensive applications, and its lock-in effects have potential negative impacts on the climate; the same applies to a growing heap of 'data waste'. Therefore, businesses must become smart about their data use, which starts with understanding the data they have, its environmental impact, and ends with getting rid of data having no value.

USE

- **NTT Data** launched a connected car data initiative (proof of concept) to reduce traffic congestion and CO_2 emissions by utilizing connected car data owned by **Toyota Motor.**

- **Catena-X** is a great example of a data ecosystem — the first collaborative, open data ecosystem for the automotive industry of the future, linking global players into end-to-end value chains with the shared goal: a standardized global data exchange based on European values such as transparency, collaboration, and open-source principles — providing an environment for the creation, operation, and collaborative use of data chains along the automotive value chain.

- **Breitling,** the luxury watchmaker from Switzerland, automated carbon emissions data management with the Salesforce Net Zero Cloud solution. It also reduces the workload, increasing the data accuracy associated with these processes.

- **L'Oréal UK** partnered with **Net Zero Now,** a UK-based Environmental Services company, on the initiative Net Zero Salons Programme, which enables hair salons across the UK and Ireland to achieve their net zero goals.

- The **International Air Transport Association** (IATA) and **ATPCO**, a US-based airlines company, have entered a partnership which will see ATPCO use IATA's CO_2 Connect data to help shoppers understand the carbon cost of various itinerary options.

IMPACT

- According to a Capgemini Research Institute report, 53% of organizations have experienced faster progress towards their net-zero goals when embedding emissions data in decision-making processes; on average, companies are seeing a 4.6% reduction in emissions as a direct result of emissions measurement and analytics.

- Innovating for process efficiency and product development is accelerated when organizations are equipped with the understanding of net-zero goals, skills, and tools to implement data-powered business decisions.

- Working in global cross-sector and industry-specific alliances with like-minded organizations is key to developing standardized emissions measurement methods. These approaches will help build more reliability into Scope 3 emissions measurement in the future.

- Building data management capabilities to manage emissions data will greatly strengthen a company's overall data mastery.

- Reducing data waste has a positive impact on the organizational carbon footprint, but also increases the overall level of data mastery needed.

TECH

- **ESG data performance:** IBM Envizi ESG Suite, Microsoft Cloud for Sustainability, Google Carbon Footprint, Snowflake, SAP Sustainability Management, Salesforce Net Zero Cloud, MSCI, ISS ESG Index solutions, Electricity Maps, Ethos ESG, CSR Hub, Refinitiv, SIX

- **Sustainability Data Hub:** IBM Envizi ESG Suite, Microsoft Cloud for Sustainability, Google Carbon Footprint, Snowflake, SAP Sustainability Management, AWS, Oracle Cloud sustainability, Leafcloud, Triggermesh, Edgeworx, Pensando, IBM Cloud Pak for Data, Nasdaq

- **Carbon AI and Analytics:** AWS Customer Carbon Footprint Tool, Normative, IBM Environmental Intelligence Suite, Cloud Carbon Footprint, Google Carbon Sense suite, Anaplan, SAP Product Carbon Footprint Analytics, Seivo, Microsoft Emissions Impact Dashboard, iQSpot, Klimametrix, Equilibrium, Kayrros, CO_2 AI, The Open Group Open Footprint Forum (OFF)

MAYA DILLON
EXPERT IN RESIDENCE

THE THING WITH DATA

An abundance of data going around within the Internet of Things — at the edge — turns mundane objects into hyper-intelligent, connected assets near us

Here's the thing: in the vast ecosystem of technology, data is the lifeblood coursing through the veins of the Internet of Things (IoT) and edge computing. This isn't merely a symphony of ones and zeros being pumped around; it's the harmonious rhythm powering industries and reshaping business landscapes. The IoT is transforming mundane equipment and products into data-powered, intelligent assets, weaving a web of efficiency across factories, supply chains, and our daily surroundings. This evolution isn't just about physical things becoming wiser though; it's about elevating businesses to unparalleled levels of innovation and connectivity. It's also about data and AI becoming intwined with our personal lives.

WHAT

- Gone are the days of stagnant, waiting data. 'The Thing with Data' paves the way for active data dynamics, where data isn't just accumulated but is instantly put to work. This proactive approach ensures unmatched reliability in data-driven processes.

- Why centralize when you can process data at the edge? It's like having your data cake and eating it too! Efficiently and sustainably with immediate insights and no commute needed.

- Transmit compressed and aggregated data, significantly improving the speed of your processes. Forget lugging around cumbersome raw data.

- It is not only about technology; it's about empowering humanity. By redesigning data processes to be more intuitive and responsive, we foster a future where technology seamlessly integrates with human needs, creating a harmonious balance between man and machine — designing data to be human.

USE

- **Vyoma**, a Germany-based space safety company, and **Ubotica Technologies**, an Ireland-based space tech company collaborated to build a space debris detection system using edge AI technology.

- NVIDIA collaborated with **Medtronic** to integrate NVIDIA healthcare and edge AI technologies into Medtronic's real-time AI endoscopy device to help improve patient care and outcomes.

- **Orbital Sidekick**, a US-based startup, is using the NVIDIA Jetson edge AI platform to analyze the data in real-time, collected from a constellation of satellites that capture hyperspectral imagery from space to detect gas pipeline leaks across the globe.

- **Vapor IO**, a US-based provider of network solutions for the edge, through its Kinetic Grid 'platform' will process data closer to the source to empower the City of Las Vegas to deploy applications that require instantaneous decision-making, from traffic management to public safety.

- **MediaTek** and **Qualcomm** collaborated with Meta's Llama 2, an open-source Large Language Model, to enhance their respective on-device Generative AI capabilities in edgedevices.

IMPACT

- Edge-Enhanced Processing empowers businesses with real-time decision-making capabilities, setting the stage for innovative, instantaneous solutions.

- Smart Compression and Aggregation optimize bandwidth and reduce costs, paving the way for sustainable growth and innovative data strategies.

- Reinvented Data Dynamics transform passive data reservoirs into proactive assets, driving reliability and fostering novel business processes.

- Human-centric data design enables a future where data close to the user seamlessly covers user needs and experience, bridging the gap between technology and human-centric innovation.

TECH

- **Edge Platforms:** NVIDIA IGX, NVIDIA Jetson, IBM Edge Computing Platform, Qualcomm Edge AI Box, Azure IoT Edge, Machinemetrics, EdgeX Foundry, Siemens Industrial Edge, Edge Impulse, Gravio – The IoT & Edge Integration Platform, Axelera AI

- **Edge-embedded services:** AI Edge Labs, AI Blox, Avassa, Codesys

- **Edge-embedded UX:** Ericsson D-15, Kroger-Go

- **Edge Processors:** AiM Future

PROCESS ON THE FLY

DR. CARA ANTOINE
EXPERT IN RESIDENCE

Whatever the organizational aspirations may be, they stay hypothetical without the ability to turn insight into actions, quickly respond to events, overcome business silos, and go with whatever flow the corporate purpose needs. It's the Technology Business processes that deliver. In this volatile era of Uncertainty[2], they need to be monitored, adjusted, and re-engineered 'on the fly', in real-time. And all that goodness must be delivered against a scarcity of both human resources and natural resources, plus the drastic need to reduce travel and energy consumption. Advances in AI, intelligent automation, remote 'touchless' management, and increasingly autonomous systems all have a profound influence on the process landscape — triggering a new balance act between the role of humans and the corporate purpose.

We may have a thing for things in this edition of TechnoVision, but in many ways, a business process indeed is just another 'thing'. When it is equipped with the equivalent of 'sensors', it provides a continuous flow of data points about its status and whereabouts — just like the concept of a Digital Twin in the Intelligent Industry domain. With the emergence of the 'Internet of Twins', a full spectrum of possibilities opens up to not only better understand processes, but also to experiment risk-free with alternative scenarios and options and predict — or even prescribe — how processes will run and be managed in the future.

Process management and automation technologies can still act as a powerful silo buster, bridging the gaps between corporate — or intercorporate — processes and systems, without intruding upon them. It's one of the most straightforward, resource-saving ways to bring innovation to organizations: through up-cycling and augmenting what's already there, rather than buying or building solutions from scratch. Add next-generation application microservices to the mix and any process is just an API call away.

And while we are on the topic of micro: redesigning legacy processes into micro-processes — each of them well described with input data, transaction data, and output data — brings simplicity, and thus less complexity, fewer rules, and fewer mistakes. They mark a major shift from bulky monoliths to nimble, independent entities. Leveraging the likes of microservices, APIs, and cloud deployment, these tiny processes interact seamlessly, yet remain self-sustaining.

The powerful cognitive and creative capabilities of AI — together with augmented and virtual reality — increasingly enter the arena of process automation and management. These capabilities challenge what we used to consider as a given, replacing inflexible, human-dependent processes with powerful reasoning and decision-making systems. These augmented processes adjust to whatever situation occurs, anticipating the next best actions and resources required in real-time, on the fly. Increasingly managed remotely, they require less physical space, less travel to and from, and less energy. And while learning from what works, they increasingly become hands-, care- and asset-free, bringing organizations — and their people — on the autonomous road towards a 'lights out', no-touch, net-zero, frictionless enterprise.
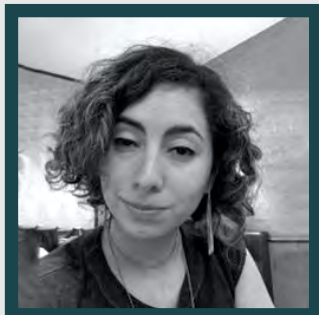
Pretty fly, no?

PROCESS ON THE FLY

/Prompt How can technology make production lines fly?

/Prompt the future

ELLE SANCHEZ CARDENAS
EXPERT IN RESIDENCE

PROCESS IS MINE, MINE, MINE

Using Digital Twins of business processes for continuous innovation, making it the envy of the entire flock

Change can be tough, and at times may feel like trial and error. One step forward, two steps back. An improvement here or there might create a bottleneck elsewhere. But what if you could prototype change in a risk-free environment? Creating a Digital Twin of a business process enables entirely new ways to digitize and reimagine business processes, giving teams more space to focus on identifying, measuring, and prioritizing new ideas for improvements. And when coupled with feedback from the operational side of the business, it really does forge a new path for continuous, enviable process innovation and value realization. You'll be ready for whatever change comes your way, so you can just keep flying.

WHAT

- Modeling techniques can capture both the process and metadata required to describe the characteristics of the business operations.

- Process-mining technology is used to identify possible process variants (paths), bottlenecks, and exceptions.

- Task-mining technology can identify manual activities performed outside core systems that are causing bottlenecks and consuming resource effort.

- Standardization is driven through visualization and evaluation of where you are today, compared with where you want to be.

- Opportunities for process improvements can be assessed risk-free by simulating outcomes to estimate benefits and ROI before committing to any changes.

- Agile management tools boost process improvement to explore, measure, qualify, and manage ideas effectively, enabling the organization to focus on its value-adding and high-priority initiatives.

USE

- **Capgemini, NAIS, Engineering D.HUB,** and **RHEA Italy** will lead the Cyber Italy project for **IRIDE**, an Italian Earth observation satellite space program, to develop a highly accurate Earth Digital Twin. It aims to understand complex interactions between the planet and human activities, supporting civil defense, and administrations, and addressing environmental challenges while providing data for commercial applications and start-ups.

- **Autoliv** China partnered with DataMesh to explore Mixed Reality and Digital Twins to enhance operational efficiencies, reduce resource consumption, and improve training for frontline employees in their manufacturing plants by using HoloLens 2 and DataMesh FactVerse platform.

- **ABB** and Pace CCS are partnering to reduce the cost and complexity of integrating carbon capture and storage (CCS) into industrial operations. Utilizing Digital Twin technology, the solution will simulate and test various scenarios, enabling smoother transitions into CCS operations, and supporting the global decarbonization agenda.

- **Arcwide** and Silico partnered to create Digital Twins of entire enterprises using Silico's business process simulation platform integrated with Arcwide's cloud technology services. This enables organizations to simulate and optimize ERP transformations and make evidence-based decisions on business transformations, leading to increased efficiencies, better outcomes, and real-time monitoring of performance against projections.

- **Mercedes-Benz** partnered with NavVis to create a virtual representation of its global production network. The cloud-based model allows easy access and collaboration with external partners, enabling simulation of changes and process improvements in the production line.

IMPACT

- Accelerated process design with enhanced virtual collaboration and change transparency using digital process-modeling tools to model target processes.

- Higher business case and change impact accuracy by using simulation from Digital Twins to assess process improvement opportunities, without a strain on physical and human resources.

- Evidence-based analytical capabilities to identify process bottlenecks, violations, and exceptions with process-mining tools, resulting in faster root cause identification and pragmatic, focused solutions to improve the process.

- A higher implementation success rate through the prioritization and management of improvement opportunities, enabling resources to focus on the highest value-added initiatives.

TECH

- **Process and Task mining tools:** Celonis, UiPath, UltimateSuite, LiveJourney, UpFlux, Soroco, IBM Process Mining, Skan AI

- **Simulation/Digital Twin tools:** Celonis, BusinessOptix, DataMesh, Silico, LiveJourney

- **BPMN software:** BusinessOptix, Signavio, Silico, ARIS

- **Agile management tools:** Jira, Trello, Monday.com, BusinessOptix, Wrike

PRIYA GANESH
EXPERT IN RESIDENCE

SILO BUSTERS

Busting corporate silos by adding flexible process layers on top of them, rather than breaking or rebuilding established structures

Your aging systems and technology architecture reflect disconnected silo processes. The souls of frustrated business users haunt you in the IT neighborhood. Who you gonna call? Rebuilding core systems is complex, risky, and expensive — both in terms of money and terms of scarce natural and human resources. How about some proper upcycling instead? Business process automation technologies connect existing systems without intruding upon them. They deliver obvious, immediate benefits to the business while buying more time to rearrange and open up the systems underneath, ensuring we have greater tech optimization. Pragmatic processes in action. Nothing supernatural about it.

WHAT

- On top of disconnected applications, APIs can expose core application functions to external technologies and systems, notably in process automation and process management.

- Robotic Process Automation (RPA) enables the automated integration of many siloed applications from the perspective of a human worker, without changing any of the affected systems.

- Business process management tools offer the capability to invoke various application services — offered by different core applications — as part of a modeled and managed process flow.

- Intention-driven user experiences, such as chatbots and voice assistants, can provide an alternative, unified view of disparate core application services.

- While busting them, monolithic process silos can be gradually transformed into 'microprocesses': each simple, consistent, and well-defined in terms of input, transaction, and output data.

USE

- **Avary Holding** leverages Blue Yonder's supply planning solution to enhance its supply chain efficiency and competitiveness by optimizing resource utilization, synchronizing operations, reducing production lead times, and increasing customer service levels.

- **Yazaki-Torres Manufacturing** is leveraging Boomi's automation platform to modernize its legacy systems and integrate with the Bureau of Internal Revenue's (BIR) new Electronic Invoicing/Receipting System (EIS), streamlining tax, and administrative processes in the Philippines.

- **HAECO Hong Kong** is leveraging Boomi's automation platform to modernize its enterprise IT infrastructure, achieving a 300% increase in integration efficiency and eliminating data silos. Boomi's low-code solution enables HAECO Hong Kong to swiftly connect applications, simplify workflows, and turn data into actionable insights, benefiting their bottom line and reducing development effort.

- **Sensedia**'s agile and scalable API management platform enables Cyrano.AI's conversational AI to analyze vast amounts of conversation data and enhance mental health professionals' interactions by building smooth connections to complex data sources and systems.

- Carahsoft partnered with Celonis to provide the Celonis Execution Management System (EMS) to the US Federal, State, and Local Governments. The Celonis EMS integrates data, identifies inefficiencies, and automatically guides teams to optimize processes, benefiting agencies with improved performance, efficiency, transparency, cost savings, and resource utilization.

IMPACT

- Lifespans of aging or dysfunctional applications can be sustained without costly and risky rebuild activities.

- No rebuilding or replacement of existing core systems, but rather up-cycling instead — saves precious natural and human resources.

- 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 landscape of application systems.

- Gradually transforming process silos into 'microprocesses' brings simplicity — and through that less complexity, fewer rules, fewer mistakes.

TECH

- **Analytics and BI tools:** SAP Analytics Cloud, Celonis, Microsoft Automate, PowerBI, Qlik, Sisense, Datapine, Yellowfin BI, TechSee, MicroStrategy, Pentaho, RapidViews, Alation, Toucantoco, Linkurious, Saagie

- **API and web services management:** Salesforce MuleSoft, Google Apigee, WSO2, Akana, Sensedia, Kong, Axway API Management

- **Robotic Process Automation (RPA):** Automation Anywhere, Blue Prism, UiPath, Pega Robotic automation and workforce intelligence suite, NICE RPA, Laiye, Nintex, Infinitus, Leapwork, Arago, Ansible, Eggplant

- **Business process management:** BusinessOptix, Dell Boomi, Oracle BPM, IBM Intelligent BPM, Pega BPM & Case Management, Appian, Blue Yonder, Anvyl, Aurea, BluJay Solutions, Camunda, Bizagi

MANUEL SEVILLA
EXPERT IN RESIDENCE

MICRO PROCESS MAGIC

Miniaturizing processes into micro-sized forms to achieve greater speed, agility, and efficiency — while learning more about daily operations

It's a kind of magic. Imagine miniaturizing processes into smaller and smaller forms, using micro-services, cloud technology, and the Web3 'mesh web'. These tiny, razor-focused micro-components enable rapid adaptation to market shifts and reduce bottlenecks. They also optimize resource usage and minimize waste, while leveraging all goodness from advanced AI and automation. They not only drive cost savings and extreme agility but also keep businesses competitive in a dynamic market. Integrate micro-processes into the corporate workflows to revolutionize operations with precision and adaptability. By escaping the confines of monolithic systems, the finesse of these independent units is harnessed to swiftly adapt and innovate, while rediscovering the essence of each and every process component involved. Enchanting!

WHAT

- Every business process is triggered by an event or another process, has data in, data out, and may generate a transaction or call a process... Yes! A process is like a service and can be organized and implemented with as many microservices as needed. This is the process magic and the native link between business processes and architecture.

- Microservices orchestration platforms enable the decoupling of services, fostering modular and scalable software architecture while streamlining development, accelerating product launches, and enhancing coordination and reliability in microservices-based applications through efficient management and automation.

- Low-code platforms accelerate app development with visual interfaces and seamless integration, supporting scalability, flexibility, and adaptability, and empowering developers to enhance and expand applications in response to evolving business needs.

- Web3 microservices may include the payment of the service itself with no need to add a complex invoicing process, simplifying the access to microservices in SaaS mode to a huge variety of providers, guaranteeing vendor independence, ability to scale and to adapt to country specificities.

- Service mesh solutions enhance miniaturization by providing codeless observability, improving reliability and security for cloud-native apps, and offering efficient, out-of-the-box configurations for high request volumes.

USE

- **National Bank of Umm Al Qaiwain (NBQ)** strategically partnered with Intellect Digital Engagement Platform (iDEP) suggesting a significant focus on utilizing microservices for real-time credit analysis, contextual cross-selling, and customer 360.

- **Grupo Coppel** opted for Blue Yonder's microservice-based order management solutions (OMS) to enhance its supply chain transformation, aiming for seamless orders, accurate inventory, and improved omnichannel orchestration, resulting in higher conversion rates and customer satisfaction.

- Tetrate renewed its contract with the **United States Air Force** (USAF) for over USD 1.7 MN, focusing on microservices including Tetrate Istio Subscription (TIS) to enhance security and implement a Zero Trust model within the USAF's Platform One software development platform.

- **LinkedIn** revamped its microservices architecture by replacing JSON with Google Protocol Buffers (Protobuf) within its Rest.li framework. LinkedIn claims that this transition has led to significant efficiency gains, including up to a 60% reduction in latency and 8% improved resource utilization.

- **Ulta Beauty** is using Google Cloud's microservices and containerized platforms, including Google Kubernetes Engine (GKE) and Anthos, to streamline its digital transformation, enabling quick feature development while ensuring control and security for an improved e-commerce experience.

IMPACT

- Transforming a business process is already very difficult from compliance, business, and human point of view. If it runs on top of a rigid IT solution, change becomes so difficult that it never happens. Using agile microservices makes the change possible.

- Microservices orchestration platforms automate container management, boost productivity, support CI/CD workflows, allow independent scalability, and enhance system resilience by isolating service failures, ensuring a robust and flexible software environment.

- Using microservices is an open door to finding the most efficient provider or solution targeting better cost, better scalability, better quality, respect of new compliance rules, or better UI. By being able to easily improve each sub-part of the process, the whole process keeps improving continuously. Low-code platforms facilitate the development of streamlined, efficient, and nimble processes that can be rapidly created and deployed, often with minimized coding, resulting in cost savings and increased productivity.

- Reactive microservices enable miniaturization through efficient scalability, isolated failure impacts, improved developer productivity, resource efficiency, and reduced failure risks in application development and maintenance.

TECH

- **Microservices orchestration platform:** Temporal, Apache Airflow, Camunda, AosEdge
- **Backend development platform:** Platformatic, StepZen (an IBM company), Encore
- **Low-code platform:** Outsystems
- **Reactive microservices:** Lightbend, Micronaut
- **Microservices infrastructure:** Kubernetes, Claudia.js, VMware Tanzu, communicating event streams such as AWS Kinesis, Google Cloud Dataflow, Confluent, Apache Spark, Kafka, AWS Lambda, KEDA
- **Service mesh:** Tetrate Istio, Linkerd

LEE BEARDMORE
EXPERT IN RESIDENCE

CAN'T TOUCH THIS

A process seamlessly adapting to its environment, delivering optimal performance — all without human intervention on the spot, all remotely managed

When all you have is a hammer, everything looks like a nail. Optimizing processes by cutting out yet another inefficiency, and leveraging yet another lean opportunity, only brings you so far. There is a limit to how classical processes can respond to complex events in real-time and in varying locations, while also serving sustainability. Driven by AI and automation, human-dependent processes can shift to powerful reasoning and acting systems, monitored, and managed from a distance. These systems adjust fluidly to whatever situation occurs, however remote the operation islocated, anticipating the next-best actions and resources needed on the fly. And while learning from what works, processes increasingly become hands- and care-free. Stop! Hammer Time: touchless, remote processes are here.

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 can then be executed by Business Rule Engine (BRE) systems.

- 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.

- Any process can be mirrored and monitored through a Digital Twin, even when this pertains to the 'classic' enterprise (ERP) management processes, such as supply chain, finance and administration, and human resources.

- Provided with enough time series data points, analytics, and AI can increasingly enable descriptive, predictive, prescriptive, and self-learning autonomous capabilities — usually in this specific sequence.

- Combined with intelligent process automation capabilities (as a combination of process automation and AI's cognitive power), these insights can be turned into immediate, 'touchless' actions within business operations.

USE

- GreyOrange is elevating **Apple Express**' distribution by deploying 145 mobile robots, managed through the GreyMatter platform, to enhance their sorting capability from 2,000 to over 10,000 parcels per hour. This leads to improved efficiency, flexibility, and a contemporary transformation of operational and distribution processes.

- NICE helped **ABN AMRO**, a eurozone financial institution, deploy NICE CXone to enhance its digital capabilities, delivering a smarter, faster customer experience across all touchpoints. By migrating to the cloud and utilizing NICE's unified platform, ABN AMRO streamlined its operations, integrated AI for better service, and now plans to leverage chat capabilities and recording solutions to further improve customer interactions.

- **Bank AlJazira** achieved improved security, cost efficiency, and customer experience while saving over 60,000 manual work hours by deploying Automation Anywhere's cloud-native intelligent automation platform. By streamlining operations and focusing on high-return processes, the bank enhanced productivity, quality, and employee efficiency, allowing them to focus on higher-value tasks.

- **The French Ligue Nationale de Rugby (LNR)** optimized game-day and tournament processes using the Appian Platform and Solypse's implementation. The ELLIS application delivered a 50% reduction in fan hotline calls and a 24% reduction in the LNR legal team's workload — streamlining processes, providing data visibility, and offering a better user experience.

- **Mitsubishi Tanabe Pharma Corporation** is using UiPath's Business Automation Platform to improve operational efficiency and productivity in its new drug development and overall business processes. The implementation of more than 500 workflows has saved 70,000 hours, enhanced retiree satisfaction, and added value to their research and development operations.

IMPACT

- Split-second responses to high-volume data streams and events in real time, particularly regarding the IoT (Internet of Things) and online customer channels.

- Providing superior, efficient, and seamless end-to-end customer and employee experiences (see Experience²) that improve satisfaction and loyalty of both parties.

- Dealing with the scarcity of skilled and qualified human resources, not only by simply automating replicable tasks, but also by radically reimagining processes as touchless and handsfree by design.

- Eliminating the need for any human presence in business operations, improving personal safety, but also saving office space and travel – and consequently reducing energy consumption and CO_2 emissions.

TECH

- **Business rules and decision management:** Secondmind.ai, Drools Open Source, Oracle Policy Automation, Pega Customer Decision Hub, DecisionRules, FICO® PlatformSource, Oracle Policy Automation

- **Complex event processing:** Amazon Kinesis, SAP Complex Event Processing, Tibco Business Events, Apache Flink, Esper, Confluent, Axiom, Informatica RulePoint

- **Process flow and automation:** Celonis, Aera Technology, UIPath, Anvyl, QPR ProcessAnalyzer

CAROLINE BALL
EXPERT IN RESIDENCE

AUTONOMOUS ENTERPRISE

Harnessing AI, the autonomous and unattended 'lights out' enterprise continually optimizes itself, bringing harmony and blending capabilities between humans and technology

Incorporating AI into the equation elevates mechanistic automation by not only enabling mimicry but also augmenting human intelligence. AI's proficiency in comprehending natural language, and deciphering audio, video, and images allows it to perceive processes within their broader context, uncovering intricate patterns beyond human perception. This AI-human combo not only jazzes up how we work but also fully reshapes our work processes and organizational structures, fundamentally altering the landscape of business operations and daily life. As AI continually optimizes the autonomous and unattended 'lights out' enterprise, it fosters harmony by blending the capabilities of humans and technology, creating a whole new synergy that propels us into a new era of innovation and corporate purpose.

WHAT

- Autonomous business operations are powered by self-providing, self-managing, self-optimizing, and collaborative systems. These systems prioritize goal attainment, predictive actions, and liberate decision-makers from labor-intensive tasks while contributing to agile product introduction, rapid capacity scaling, intelligent mass production, and environmental sustainability.

- Advanced robots, collaborative robots, and advanced automation systems represent the mechanization of repetitive and physically strenuous tasks, like machine tending, enabling factories to function with minimal human involvement.

- Additive manufacturing or 3D printing enables 'lights out' manufacturing through unattended, autonomous operations, complex customization, production of intricate and complex designs with high precision, and a fully digital workflow.

- Automated production intelligence and processes utilize technologies such as AI, machine learning, and real-time data collection and analytics to achieve autonomous, predictive, and data-driven control over the manufacturing process and maintenance requirements.

USE

- **South Yorkshire Saw & Tool Co (Systco Unilap)**, a UK-based machinery manufacturer, adopted Vollmer's advanced grinding and sharpening machines to achieve lights-out production for its product lines, significantly reducing setup times and increasing productivity.

- **Bison Gear and Engineering**, a US-based manufacturer of highly engineered motion control solutions acquired by AMETEK, installed a Fanuc robot in a lights-out manufacturing cell that can be run without any human interaction — from raw materials to inspected finished parts. The old process required two full-time operators per shift and now one operator keeps an eye on the system while tending to other machines.

- **Athena 3D**, a US-based additive manufacturing company, adopted lights-out manufacturing using a FANUC cobot, automating 3D printer tasks, boosting efficiency, and enabling 24/7 production. This led to a 40% tech utilization increase, enhancing customer response and freeing up time for customer support and advanced tasks.

- **Raymath**, a US-based metal fabricator, turned to **Universal Robots (UR)** for its machine tending automation needs, adding the UR cobot-based ProFeeder machining cells from ProCobots to its two 3- and 5-axis Hurco CNC machines. The lights-out processing gives Raymath more than a 600% productivity boost in machining, getting double the hours with the same number of workers.

- **Additive Manufacturing Technologies (AMT)**, a UK-based 3D-printing technology company, and **OECHSLER AG**, a Germany-based polymer molding company, partnered for a fully automated 3D printing post-processing system, targeting lights-out production to cut costs and enhance efficiency in powder-based 3D printing with minimal human involvement.

IMPACT

- Advanced robotics and automation enhance efficiency, improve productivity, reduce production costs over time, and significantly decrease the risk of worker injury.

- Additive manufacturing or 3D printing transforms business models by optimizing material use, reducing production times, fostering innovation, and enhancing product quality while cutting production, logistics, and inventory costs and speeding up time-to-market.

- Automated production intelligence contributes to heightened productivity, cost efficiency, and enhanced product quality, offering potential advantages such as increased productivity, reduced costs, elimination of human errors, and the ability to produce intricate, precise designs.

- AI-infused processes are unlocking novel possibilities, delivering unprecedented speed, and paving the way for the emergence of autonomous digital-only enterprises that can interact with humans independently, gradually approaching the era of autonomous enterprise.

TECH

- **Advanced robotics/automation:** Universal Robots, Fanuc, Flexxbotics, Covariant

- **Additive manufacturing:** Athena 3D, Additive Manufacturing Technologies (AMT), AXTRA3D, Bigrep One, Dyndrite

- **Automated production intelligence/processes:** Datanomix, MachineMetrics, Scytec, Vollmer

- **Platforms:** SecondMind, Aera, Microsoft, DataRobot, Alteryx, 4Paradigm, H2O.ai, Boost.ai, RapidMiner, SenseTime

- **Artificial solutions:** Teneo, WorkFusion, Amelia.ai, Ambit.ai, Cognigy

- **Loop AI:** Loop Q, Machinify, IBM Watson, Pega, Anaconda, Abacus.ai, Appian

- **Adaptive learning:** Celonis, Abbyy Timeline, Tecnotree, Beyond.ai, C3.ai

APPLICATIONS UNLEASHED

THILO HERMANN
EXPERT IN RESIDENCE

As we enter a software-led, digital era, software has gone from a good-to-have tool to a key asset for competitive success and value creation. Organizations are exploring how to fit into this new reality, shaped by software. Many companies will have to transition to being a 'software company' in order to succeed. And the applications? They sure find themselves in transition as well. They morph into a connected mesh of lightweight, sustainable microservices, increasingly accessed through natural language and chat — all part of a continuously rationalized applications landscape. AI manifests its expanding influence on applications, significantly boosting developers' productivity, while adding touches of 'smart.' The future of software – and software companies – sure looks bright.

According to a recent report by our research institute ('The art of software'), a growing number of organizations already consider themself a 'software company.' And many more believe to be in just a few years, driven by the realization that in today's digital era software is the key asset, rather than an enabling tool. However, to get there, organizations must overcome the challenges of remodeling core aspects of how they operate, both in terms of product/service engineering and organizational structure.

Simplifying, rationalizing, choosing the right solutions, and ultimately decommissioning inflexible, aging applications is a daunting task that no IT expert learns in school. Yet, it is key to leveling the playing field for the next generation of application services, and as the latest Digital Mastery research shows, 64% of organizations are well on their way to migrating their legacy applications to cloud-based replacements.

When new applications are built, they must be done in an agile, continuously deliverable way — where business and IT people are in integrated teams, perfectly in sync with the actual operations. Exactly what we'd expect from a Technology Business. And, to add even more decisiveness and transparency to the mix, adopting open-source principles within the organization can be a phenomenal culture-building tool, too.

The quest for sustainability certainly also extends itself to the realm of software. Applications can be tuned for lower energy use and less CO_2 emission. And it's a journey with benefits too, as reengineering and developing applications for sustainability typically improve the quality and manageability of software while reducing run costs.

Having said that, why develop if you don't have to? Building custom applications is a challenging, complex, and unsustainable undertaking itself — and the scarcity of skilled experts doesn't help. Low code/no code tools provide high productivity and enable more people to develop the apps, increasingly on the business side of the wonder wall. 'Fusion programming' combines the best of both worlds.

Then, with the rapid evolution of Generative AI, 'low' and 'no' code become 'know code': AI acting as a smart buddy – with natural language as the new programming language – that picks up the bulk of the heavy coding lifting, leaving more space for the developer to optimize the quality and functionality of the software. It's a phenomenal learning tool too.

Of course, AI shows itself increasingly as part of the developed applications as well. New, but also existing applications can be augmented with additional functionality, delivered by easy-to-integrate AI API services. It prolongs the life of application services, eradicating the need for early rebuilds or replacement. Natural language and chat have quickly emerged as the preferred way to interact with applications — evolving into unexpected, but high-potential 'Super Apps.'

The countdown has started. The software company is launching. Applications are about to be unleashed!
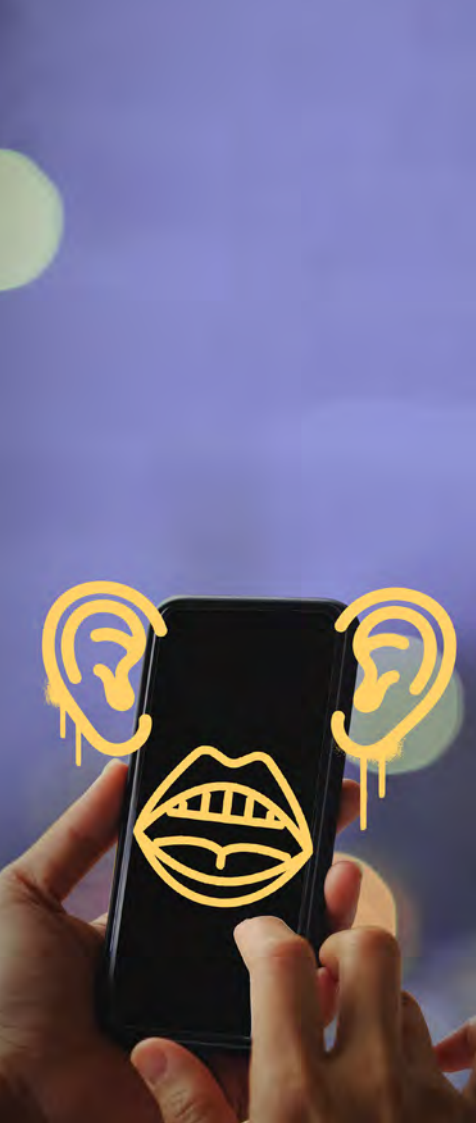
APPLICATIONS UNLEASHED

/Prompt   How are applications evolving? ↑

/Prompt the future

SARAH SAUNDERS
EXPERT IN RESIDENCE

HONEY, I SHRUNK THE APPLICATIONS

Next-generation agile applications, built on the concepts of Microservices, API-first, Cloud-native, and Headless, make up an applications portfolio that is continuously tidied

Applications used to be monoliths, cumbersome, bundled together with traditional user interfaces, and hardcoded business logic. Well, we have big news: the science of application miniaturization is here — building application services that are tiny, stateless, efficient, and scalable. They are flexible, adaptive, and responsive, morphing themselves seamlessly around new situations, needs, and use cases. The key ingredients of applications shrinkage are Microservices, API-first, Cloud-native, and Headless (MACH). Best combined with a miniaturization approach to the entire applications portfolio as well, firmly getting rid of old, inflexible, and costly legacy applications — making space for new ones. Get your magnifying glass ready, huge things are happening.

WHAT

- A Technology Business needs open, agile application services that can seamlessly address both current and future needs. A combination of Microservices, APIs, Cloud-native, and 'Headless' (MACH) design is the blueprint to achieve this result.

- Microservices can be viewed as the result of a marriage between component-oriented architecture and service-oriented architecture. Software-as-a-suite is composed of many small, business-driven components with very specific business-domain responsibilities.

- 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.

- Creating application services to be deployed 'natively' for the cloud means that all well-known benefits of the cloud are built-in by default, such as elasticity, adaptability, scale, security, availability, and efficiency.

- The resulting application services deliver one single business capability in an independent, loosely connected, and self-contained fashion. They do one thing and do it well.

- Few organizations master the art of systematic application rationalization. An end-to-end approach is needed to make room for new applications services, enabled by tools such as Capgemini's Clear Sight IT Decision Maker.

USE

- **Covestro**, a Germany-based manufacturing company, selected Capgemini to deploy a collaborative and iterative strategy to . The team used tools and frameworks to automatically review code, speed up delivery, and set the groundwork for the release process.

- Capgemini was selected by Carrefour, for the implementation of a cloud-based integration platform that provides Carrefour Romania a secure environment for integration service delivery and API traffic monitoring. The new platform also enables features such as analytics and operations automation, API developer management, flexibility, and governance over data exchanged between systems and users.

- **Westech**, a US-based company, adopted a microservices-based application development architecture. It adopted Red Hat OpenShift Dedicated, a fully managed solution that runs in an AWS cloud. Developers can set up new environments in minutes and the company can cut its number of physical servers by 50%, improving operating expenditure (OpEx).

- A **US-based investment company** modernized its systems by migrating data and refactoring business functionality to the AWS Cloud. Using the CAP360 solution, the migration process was accelerated and the firm was able to retire its PCF-based services and standardize everything on Amazon ECS for its APIs.

IMPACT

- Faster, scalable, and intent-driven application services that are modular, sustainable, and fit for current and future Technology Business purposes.

- Faster time-to-market for new business services and products, as the enabling application services can be rapidly selected and integrated.

- Less need for massive, troublesome upgrades of entire application suites, as minimized application services are autonomous and only loosely coupled to others.

- 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.

- Better reuse and upcycling of application services, as they can be used, integrated, and interfaced in many ways, wrapping old legacy systems in peripheral microservices — allowing faster adoption, and saving scarce human resources and energy.

- Freedom to develop custom user interfaces shows that 76% of organizations have realized quantifiable benefits from their voice and chat initiatives in a variety of areas, from reducing customer service costs to increased NPS.

TECH

- **Re-platforming:** AWS Bluage, LzLabs Software Defined Mainframe, Capgemini Clear Sight IT Decision Maker, Capgemini Cloud Migration Factory, AWS Mainframe Modernization, Confluent

- **Agility:** SAFe, LESS (Large Scale Scrum), Scrum@Scale, Disciplined Agile

- **DevOps:** Headspin, OpenGitOps, Confluent Platform, Helm, GitLab, Azure DevOps Services, Capgemini DevOps accelerator - CREATE

- **Microservices infrastructure:** Kubernetes, VMware Tanzu, Kong, Cortex, communicating event streams such as AWS Kinesis, Google Cloud Dataflow, Confluent, Apache Spark, Kafka, AWS Lambda, KEDA

- **Voice assistant platforms:** Microsoft Cortana, Apple Siri, Amazon Alexa, Google Duplex and Assistant, Alibaba's AliGenie, Bixby, Hound, Databot, Voice Qube

- **Text assistant platforms:** WeChat Open Platform, Microsoft Bot Framework, Facebook Messenger Platform, Uipath Druid

LUDOVIC TOINEL
EXPERT IN RESIDENCE

WHEN CODE GOES KNOW

Pair programming with an AI assistant can significantly boost coding productivity and quality while steepening your learning curve — if you know what you're doing

Know what? It was already getting easier to produce high-quality code, through API catalogs, prebuilt templates, automation, and powerful low/no-code systems. And now there is Generative AI, providing both professional and business developers with language models that can produce code as if it was written by the best software engineers on GitHub. It delivers productivity and quality and it's highly educational too. All of this is done through dialogue in plain, natural language. Exactly what an aspiring Technology Business needs. But beware, an experienced eye is always needed before releasing AI-generated apps. As the saying goes: you know it when you see it.

WHAT

- Powerful low-code and no-code platforms are available for DIY, 'citizen' application development, although professional developers may be equally enthusiastic about their productivity and ease of use. 'Fusion development', the combination of 'pro'-code and low/no code to build composable applications, combines the best of both worlds.

- Sharing best practices and collaboratively building on each other's solutions is a crucial success driver, as evidenced by the 'Maker Culture'.

- Generative AI assists in creating powerful applications using Large Language Models that have been trained on vast amounts of excellent, publicly available source code. This enables autocompletion, code and test generation, and high-quality reviews. However, a senior and experienced eye stays crucial to validate and optimize the generated results.

USE

- **Google launched** Studio Bot, an AI-powered coding tool that helps Android developers build apps. It generates code, fixes errors, and answers questions about Android. Accessible from the toolbar in Android Studio, it supports Kotlin and Java programming languages, enabling quick problem-solving for developers.

- **GitHub launched** Copilot X, the company's vision for the future of AI-powered software development. GitHub has adopted OpenAI's new GPT-4 model, and introduced chat and voice for Copilot, bringing Copilot to pull requests, the command line, and docs to answer questions on developers' projects.

- **Rolls-Royce started using** Microsoft Power Apps to provide a way for citizen developers in the business to develop their own applications. Rolls-Royce is running sandboxes where employees can create and test apps to satisfy the requirements of one person, a team, a department, or the entire company. Employees at Rolls-Royce can create business-supporting apps by extracting intelligence from datasets.

- **The New Zealand Ministry of Business, Immigration, and Employment (MBIE)** expanded the use of Immigration NZ's new standardized, digital platform and Microsoft Dynamics 365' no-code/low-code platform. The platform helped boost overall productivity by managing workloads in a better manner through automation and smart technologies, as well as the collaborative framework supported by the new platform.

IMPACT

- Increased application development productivity, on both sides of the business and IT spectrum, by choosing the best approach for the challenge at hand.

- Enhanced organizational agility through a significantly faster time-to-market for new business applications and a faster learning curve for junior software engineers.

- Higher code quality due to Large Language Model based on the knowledge of the huge open-source community.

- A cohesive alignment between IT and business functions through personally involved and committed 'citizen' application developers, using open, digital platforms.

- More innovative and higher-quality, business-facing applications that demonstrate enterprise robustness combined with agile solutions.

- Dealing with a scarcity of specialized software developers by enabling more people in the organization to quickly develop high-quality solutions without the need for deep skills and experience.

TECH

- **AI-based tools:** ChatGPT, Replit Ghostwriter, Salesforce CodeGen, AlphaCode, MutableAI, GitHub Copilot, H20, TensorFlow, MxNet, Amazon CodeWhisperer, Microsoft Cognitive Toolkit, Google Studio Bot, Harness AIDA, Code Llama, Llama 2, Claude 2

- **High-productivity development platforms:** Mendix, OutSystems, Microsoft PowerPlatform, Salesforce Lightning Platform, Betty Blocks, Appian, SAP Build Apps, IFTTT, Thinkwise, Quantum, Pega, Usoft, UiPath Apps, ServiceNow App Engine, Zoho Creator's low-code platform, Retool, AgilePoint, AuraQuantic, Decisions, Lansa Professional Low-Code, Quixy, Airtable

PIERRE-ADRIEN HANANIA
EXPERT IN RESIDENCE

APPS♥AI

Systematically augmenting new and existing applications with AI capabilities, making them smarter, more powerful, and — as a result — more valuable

AI sometimes appears to be the domain of mad data scientists and highly specialized, secretly initiated experts. But actually — through simple APIs and web services — every application can benefit from touches of 'smart', without any black magic involved. AI disrupts every industry with intelligent platforms and solutions. Scan the applications portfolio for components that would profit the most from added AI capabilities, such as image recognition, natural language understanding and generation, automated decisions, predictive analytics, and recommendations. The best thing is that you can use Generative AI to build these to get better and faster. Application users will love all that extra intelligence.

WHAT

- Many AI and cognitive capabilities can be accessed easily through web services and APIs, including image and voice recognition, intelligent automation, natural language processing and generation, 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.

- Applications become 'smarter' and 'ultra-speedy', creating more value for users with enhanced performance and speed.

- To effectively incorporate AI, new and existing applications portfolios need to be systematically reviewed to find added-value opportunities while considering benefits.

USE

- **Helia** utilized the Appian Platform across multiple departments to automate processes and transform operations into an interconnected workplace. Using Appian, Helia automated its claims management workflows and reduced the processing time from two days to less than 10 minutes, dramatically improving its lender customer experience.

- **Eramet**, a mining and metals company, worked with Capgemini to leverage AI for the transformation of the mining operations of its subsidiary 'Grande Côte Opérations' (GCO). Capgemini applied Geospatial AI to support Eramet in the rehabilitation of its mining sites in Senegal.

- **Blue Motor Finance**, a UK-based financial firm, partnered with Zinia, a UK-based AI platform provider, for the implementation of the Decision Intelligence AI platform. The platform improved the in-house AI and machine learning capabilities to further drive towards optimal decision-making for customers.

IMPACT

- Extend the lifespan of existing applications by adding 'smart' functionality.

- Increase the adaptability of applications and automate manual activities that originally required cognitive, 'human' capabilities.

- Equip 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:** Capgemini PerformAI, Azure AI services, IBM watsonx Orchestrate, AWS AI Services, Pega Real-Time AI, Salesforce Einstein Language API, Rainbird, Google Cloud AI, TensorFlow, PyTorch, RapidMiner, Keras, Wit.ai, Vertex AI, H2O.ai, Caffe, Apache MXNet, AutoML, SymphonyAI Sensa-NetReveal, Neural Designer, Oracle AI, Apache PredictionIO, Tangent Information Modeler, Anyscale
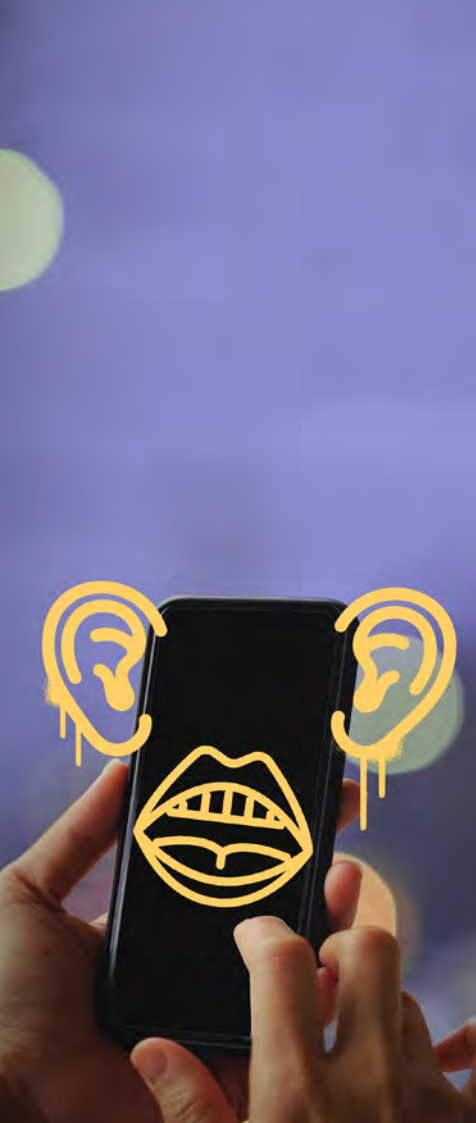
SJOUKJE ZAAL
EXPERT IN RESIDENCE

LITTLE GREEN APP

Engineer applications to be less demanding in terms of resources and energy with superior performance: Get more sustainable, but also better software

There is a mixed bag of 'green' software engineering approaches and tools, all to create long-lasting software that uses less energy and resources while executing faster and more efficiently. Software does not consume energy or emit harmful discharges on its own. The issue is with how software is developed for use — and then how it is used. Companies integrate software into their sustainability efforts by judging its performance on energy efficiency with a focus on security, scalability, and accessibility. Some include green practices and targets as key criteria for CIO performance reviews. Sustainable software engineering principles have been developed to assess eco-friendliness and spread best practices. Because the IT sector is expected to account for 14% of the world's carbon footprint by 2040, green software engineering clearly matters.

WHAT

- Building a 'green' app is always a trade-off, and only experienced architects and developers can both fulfill the requirements of the business and reduce the impact on the environment to a minimum.

- Choose the best-fitting architecture for sustainability requirements. A focus on cloud-based solutions is often sensible and helps organizations measure and reach the sustainability targets they set.

- Microservices are not a silver bullet, so check for the benefits (scaling, best-fitting technology) versus the challenges (network traffic, data replication) — and decide accordingly.

- Invest in algorithms and choose the most efficient ones for the given business challenge but be aware that premature optimization is the 'root of all evil'. Only optimize what you really need to optimize.

- Frameworks and products will add a lot of abstraction and complexity, so choose the simplest ones that satisfy business requirements.

- The most efficient software is the application that doesn't exist. The 'KISS' principle — 'Keep it simple, stupid!' — holds true for green apps, and you should reduce the following dimensions: CPU, RAM, Disk, and Network.

- Don't forget about the lifecycle, as things will change over time and efficiency might also change. Keep an eye on your efficiency by establishing a mechanism for measurement (e.g., with a dashboard).

USE

- **Salesforce** launched Green Code, a new initiative to help reduce carbon emissions associated with the software development lifecycle. The Sustainability Guide for Salesforce Technology offers practical recommendations for designing apps and writing code that has less of an impact on the environment. The guide focuses on four key areas — Design & UX, Architecture, Development, and Operations.

- Capgemini was selected by **Eneco** to accelerate Eneco's transition towards sustainable energy, and help meet its ambition of becoming carbon-neutral by 2035. Both companies will explore the impact of engineering, digital, data & AI, business technology, and platforms on reducing scope 1, 2, and 3 CO_2 emissions.
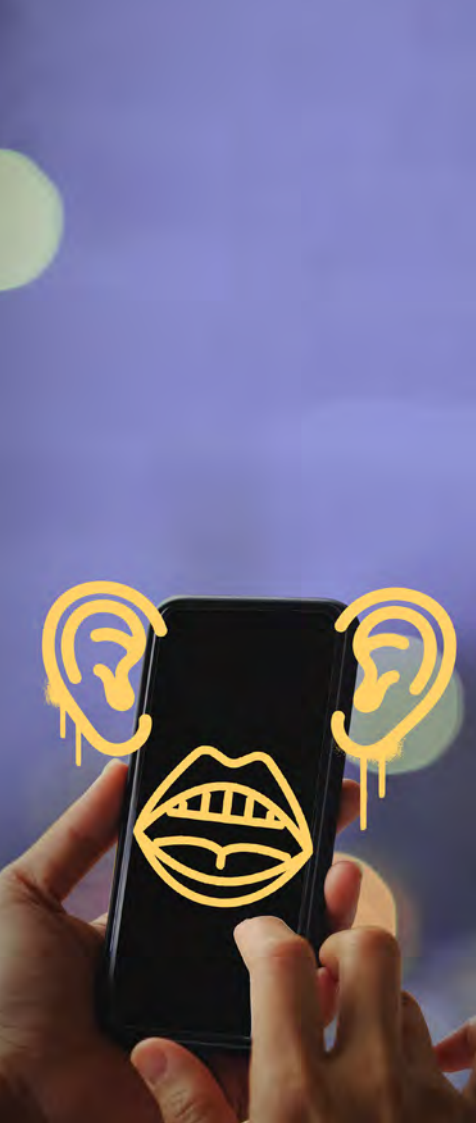
- **Digital Realty** is using the IBM Envizi ESG Suite to collect, analyze, and report on its environmental, social, and governance (ESG) performance across its portfolio of over 300 data centers in more than 50 metros across 27 countries on six continents.

- **Fédération Internationale de l'Automobile** (FIA) implemented the Siemens Xcelerator portfolio to enable the design of vehicles and regulations that reduce energy consumption and emissions.

- **UBS** partnered with Microsoft and WattTime to develop and implement a carbon-aware SDK. It provides carbon-aware functionalities to a UBS risk platform enabling them to calculate carbon intensity.

IMPACT

- Contributing to the corporate sustainability agenda by engineering applications for less energy consumption, fewer CO_2 emissions, and less environmental impact.

- Attracting scarce, skilled development resources as more people prefer to work on solutions in a sustainable, responsible way.

- Through the focus on efficiency, applications will not only be greener but also better performing — leading to higher satisfaction with users.

- Green applications are optimized for efficiency and use of resources. Therefore, run costs are lowered across the entire lifecycle.

- A thorough assessment, which focuses on simplifying and cleaning up application services, is beneficial for maintainability and overall quality of the software.

TECH

- **Development tools:** Greensight - Capgemini's sustainability and efficiency plugin for SonarQube

- **Eco-friendly apps:** Ecosia, Carbon Aware SDK, Cloud Carbon Footprint, Microsoft Emissions Impact Dashboard, CodeCarbon, JoularJX, INRIA PowerAPI, Cirrus Nexus TrueCarbon, Avarni, AWorld, Sustaira, ESG Playbook, ClimatePartner

- **Frameworks:** Principles of Green Software Engineering

KHAMBAMPATI SAILU
EXPERT IN RESIDENCE

CHAT IS THE NEW SUPER APP

AI-augmented chatting and talking in plain, natural language becomes the new app to rule them all

It has been the ambition of quite a few captains of IT industry: creating one Super App that can be used to manage and launch whatever application service one could possibly need. But it would still be an app, with an interface that needs to be mastered and a logical flow that must be followed. What if all of that would simply disappear and be replaced by a simple dialog in natural language? The rapid breakthrough of AI-augmented chat systems, combined with an infinity of multi-modal, subject matter-specific plug-in models, is making this a reality. It will democratize access to applications, driven by a radically new design concept for software engineers. Supercalifragilisticexpialidocious!

WHAT

- A Super App is an application (typically envisioned as a mobile app) that provides many different applications services through one, integrated platform interface, eradicating the need for managing and launching multiple applications.

- Many industry players have aspired to provide and own such a Super App, as it secures a central place in a diverse application services ecosystem.

- With the rapid evolution of chat-based, natural language interfaces (triggered by OpenAI's ChatGPT) a new, preferred user interface emerges — possibly further strengthened by voice capabilities.

- With most of these chat systems having an open, 'plug-in' extensions mechanism for application-and subject matter-specific contents and actions, it becomes interesting to provide application services through the chat system. This renders a chat system into an unexpected, but undeniable Super App.

USE

- **Walmart** is implementing Generative AI to enhance its search capabilities so that it better understands context and allows customers to prioritize product attributes, aid with complex purchases, and display review summaries.

- **Goldman Sachs** is experimenting with Generative AI tools internally to help its developers automatically generate lines of code and test the codes.

- **Morgan Stanley** is rolling out an advanced chatbot, powered by OpenAI technology. The Chatbot has been tested with 300 advisors, to ultimately aid its 16,000 advisors in making use of Morgan Stanley's repository of research and data.

- **Klarna**, a global retail bank worked with OpenAI to use its protocol to build an integrated Plugin for ChatGPT, which offers a highly personalized and intuitive shopping experience by providing curated product recommendations to users who ask the platform for shopping advice and inspiration.

- **Instacart** has added ChatGPT chatbot technology to power a new search engine designed to respond to users' food-related questions, such as asking for recipe ideas and ingredients, or healthy meal options. The new search tool will tap data from more than 1.5 million products stocked by 75,000 grocery stores in Instacart's partner network.

IMPACT

- Leveraging the superior dialogue qualities and consumer reach of chat front ends such as ChatGPT will lead to better connect to the market and serving customers in a better way.

- There won't be any need to work on — or manage — own, proprietary application interfaces.

- It will be easy and fast to enhance at business speed. One can be the front runner in the integration of new services either from yourself or partners and ecosystem.

- It can also be the motor for disruption on traditional businesses by combining different service to offer a much better and simpler user experience. It's empowering to have the first point of contact.

- Chat Super Apps can collect vast amounts of data on user behavior and preferences. Use this to improve services, personalize user experiences, and provide valuable insights and data for business decisions and marketing.

TECH

- **AI-based tools:** Replit Ghostwriter, MutableAI, IBM Watson Studio, H20, TensorFlow, MxNet, Microsoft Cognitive Toolkit, Harness AIDA

- **Super apps:** Alipay, OMNi, Rappi, Grab, Troop Messenger, Gojek

- **AI-based Chatbots:** ChatGPT, Google Bard, HuggingChat, Zapier AI Chatbot, ChatSpot, OpenAI playground, Poe, DeepAI Chat, Claude

- **For searching the web:** Microsoft Bing AI, Perplexity, YouChat, KoalaChat

- **Content writing:** Jasper Chat, Chat by Copy.ai, ChatSonic, ZenoChat

- **For coding:** GitHub Copilot, Amazon CodeWhisperer, Google Studio Bot, Salesforce CodeGen

INVISIBLE INFOSTRUCTURE

BERND WACHTER
EXPERT IN RESIDENCE

The odyssey towards a truly invisible IT infrastructure continues — and the sky is not the limit anymore. The cloud, a signpost of increasing 'invisibility' is the default choice with a mixed range of deployment options. Acceleration technologies boost early value, sustainability, industry contextualization, technology debt removal, and security — all this while maintaining operational resilience. AI-powered autonomy is key, providing an augmented approach to deal with the scarcity of skilled experts, reduction of CO_2 emissions, and the staggering complexity of IT operations. But there's the 'infostructure' side of IT infrastructure as well, bringing augmenting technology power closer to humans, 'things', and their surroundings. And entering our atmosphere, we see new computing paradigms — such as quantum and neuromorphic — promising yet unheard-of innovation opportunities.

The cloud is now the default IT powerhouse, epitomizing innovation, elasticity, and sustainability. Hybrid options, mixing multiple deployment scenarios, are the norm. With standard industry clouds on the rise, Telco clouds shine particularly bright, marking a 50% CAGR trajectory, as revealed by our Cloudification-of-Networks research. And it's not just about a shift; it's about strategic direction. Capgemini's research illuminates the ascent of regional sovereign clouds, orbiting within regulatory boundaries to ensure data safety, proper ownership, and usage.

Imagine the optimal IT platform as an interstellar hub: robust, agile, bolstered by AI, automation, and fortified cybersecurity. It integrates cutting-edge technology, such as sensors, 5G connectivity, and edge computing —

moving close to the ground, to people, to things. It bridges different realms, integrating operational tech within our daily orbits, augmenting our daily lives.

Yet, there's a black hole in our perception. Our Sustainable IT research points out an awareness gap: a mere 43% of decision-makers recognize their IT's carbon footprint. Enter 'FinOps', which aligns both sustainability and financial prowess, guiding our course towards a more eco-conscious future.

On the horizon, new computing stars arise. Radical new ways are coming for semiconductor chips to work and to be produced. Quantum and neuromorphic technologies promise to expand our tech universe, addressing global challenges head-on, and moving towards a more human-like, more organic approach to technology

solutions. Our Quantum Technologies report indicates that 43% of pioneers foresee quantum advancements in the forthcoming few years.

It's no rocket science indeed: in the vast, rapidly expanding tech universe, the Invisible Infostructure platform anchors innovation, availability, and resilience.
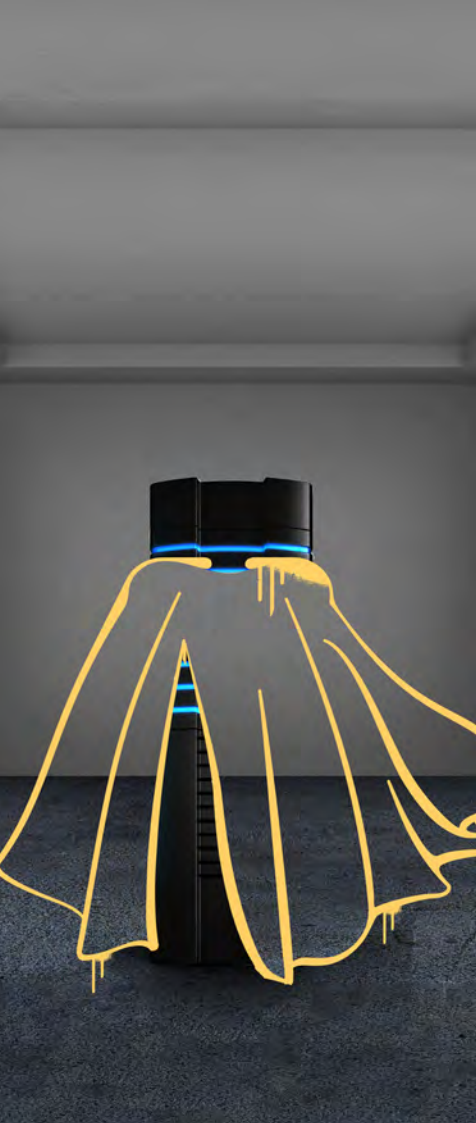
INVISIBLE INFOSTRUCTURE

/Prompt   What does the IT infrastructure of the future look like?

/Prompt the future

DANIEL KOOPMAN
EXPERT IN RESIDENCE

LORD OF THE CLOUDS

Cloud adoption moves far beyond the middle-earth realm of cloud migration, now also driven by sustainability, distribution, sovereignty, 'FinOps', multi-cloud options, and even autonomy — all for that precious, better business flow

The cloud cannot be commanded to turn back. It has set out on a journey, building strength and velocity. It infuses all areas of an organization, weaves its way to the core, and applies itself through varied interconnected, distributed, multi-cloud options. A static, eternal place around the central throne is no longer a given for the cloud. The edges of the realm turn out to be equally, and even more exciting. To flow with the business is a matter of seamless fusion between technology and operational capabilities — driving innovation, growth, agility, trust, financial transparency, and sustainability. Now there's a quest worth embarking on.

WHAT

- Regulatory requirements, the need for unique services, and the emergence of more loosely coupled, 'mesh' business ecosystems drive the move towards genuinely hybrid, multi-cloud, and non-cloud mixes.

- With connectivity infusing every aspect of business, a single cloud and network is bound to be flooded. Workloads must be more distributed to industry-focused platforms, sovereign clouds, and operational technology edge devices.

- Empowered edge devices, with access to distributed information, computing, and decision-making capabilities, need a similarly distributed organization structure that enables high-performing local teams.

- Augmented 'FinOps' leverages AI to implement cost optimization strategies and provide real-time feedback to developers on the impact of their design and implementation decisions.

- Established data centers consume a growing proportion of global electricity. In contrast, cloud-native suppliers see significant carbon emissions reductions, leading to a more sustainable, net-zero computing future.

USE

- **TSB, the British banking institution,** selected Lacework Polygraph Data Platform to help secure its cloud infrastructure by utilizing cloud-native application protection platform features to identify and eliminate vulnerabilities across multi-cloud configurations.

- **Proximus**, a Belgium-based digital services and communication provider, selected Google Cloud to provide sovereign cloud services in Belgium and Luxembourg to help with the secure deployment of sensitive and mission-critical workloads.

- **Bridgestone** uses AWS Internet of Things, machine learning, and analytics/business intelligence services, to accelerate the creation of digital platforms for new customer solutions, improve data analysis, and streamline IT operations.

- **Deutsche Lufthansa**, a Germany-based aviation group, selected the Datometry virtualization platform to accelerate the modernization of its on-premises data warehouse to Microsoft Azure Synapse, enabling cloud re-platforming without disrupting existing business processes.

- **Phillips** deployed Microsoft Dynamics 365 and Dynamics 365 Field Service, which helped to increase the operational efficiency and accuracy of field resources, providing the company with real-time insights into them.

IMPACT

- A multi-cloud setup — combined with software-driven Site Reliability Engineering (SRE) — delivers agility and boosts cloud user satisfaction, easy access, and versatile changes of scale when the business dictates.

- Significant cost reductions can be achieved through cloud financial management ('FinOps') — primarily when performed in conjunction with AI — and to deliver substantial savings in energy consumption and reduce carbon emissions.

- A hybrid mix of cloud options provides sovereignty, trust, and data ownership. This mix enables an agile, unified cloud and data services ecosystem, whatever data protection regulations apply.

- Open access to sustainability data allows machine-learning models to be tuned to include the whole cloud value chain, including power efficiency, cooling efficiency, and performance predictions.

TECH

- **Application platforms:** Fly.io, platform.sh, Accelario, Vercel, IBM OpenShift, Koyeb

- **Data platforms:** starburst.io, Atlan, WebEngage, Snowflake, Dataiku, CockroachDB

- **Observability:** Cisco-AppDynamics, chronosphere.io, Coralogix, Dynatrace, Datadog, Grafana Labs, Sentry

- **Sustainability tools:** Microsoft Sustainability calculator, Google Carbon Sense suite, AWS Sustainability Tools, Blonk Sustainability Tools, Google Environment APIs

- **Hybrid, multi-cloud tools:** Google Anthos, Azure Arc, Backstage, Crossplane, Isovalent, Kubevela, Lacework, WingLang, Port, Cortex, Flightcontrol

- **Sovereign Cloud:** GAIA-X, T-Systems, Oracle, OVH Cloud, TieToEvery

- **Cost management ('FinOps'):** Azure Cost Management, AWS Cost Explorer, Kubecost, Apptio, Spot.io, ServiceNow, Cloud Zero, Harness, Tenacity

- **Cloud IDE:** GitPod, Gitea, Coder, Github Codespaces
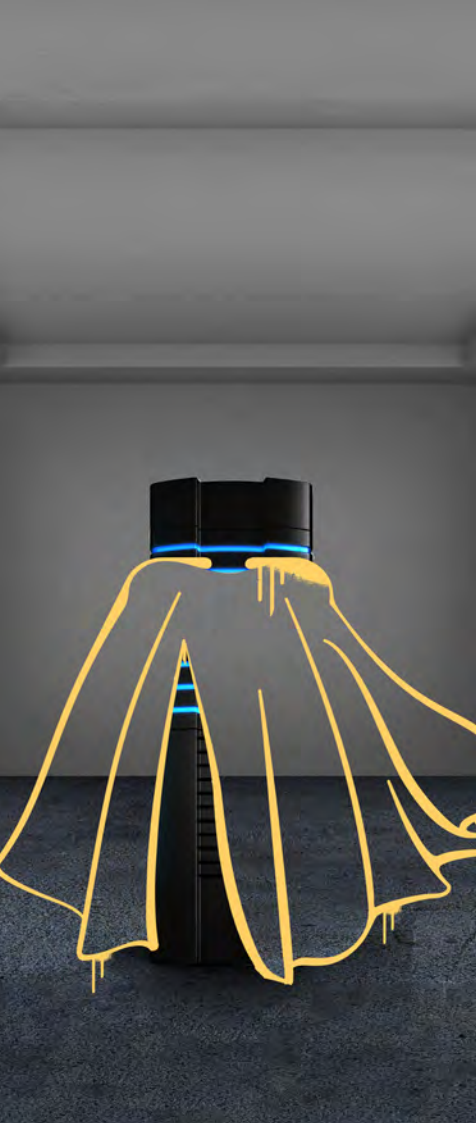
JENNIFER MARCHAND
EXPERT IN RESIDENCE

MY INDUSTRY, MY CLOUD

Industry-specific clouds — focusing on data and solutions for a particular industry, domain, or even region — realize the value of cloud faster and focus on business outcomes rather than technology

You don't want to get off this cloud! Industry clouds bring together sector-specific accelerators tailored to an organization's business drivers, neatly packaged as ready-to-use, yet adaptive data, solutions, and infrastructure services. Gradually replacing custom-built, proprietary systems, they capture best-fit use cases, industry best practices, and regulatory compliance. When harnessed in a stepwise way, industry clouds leverage proven solutions, reducing risk and bringing benefits such as speed-to-market, lower cost, and less pressure on resources. They also accelerate growth, and ensure regulatory compliance, while driving collaboration between industry partners.

WHAT

- An industry cloud contains the composition of multiple cloud services, business applications, data, and tools, contextualized to provide vertical, sector-specific capabilities.

- Some of these services, applications, and tools can be generic; others might be purpose-built for the sector. These services can be configured and composed, in all cases, for more adaptivity.

- Industry clouds make industry best practices available 'off-the-shelf', without the need for extensive customization.

- Elements of an industry cloud can result from a joint initiative between technology providers, separate — possibly otherwise competing — businesses, and sector-specific consortia; they can also provide industry reference models.

- Industry clouds provide built-in support for local or sector-specific regulatory and sovereignty requirements.

USE

- **Wendy's** and Google leverage conversational AI and Generative AI at takeout windows to automate the ordering process (billions of possible order combinations, special requests, ambient noise, miscommunication, and inaccurate orders) and allow employees to focus more on the customer experience.

- **Sony** launched SFA(i) - Life Sciences Cloud Platform, a flow cytometry data analysis cloud solution that can quickly identify rare cells, such as cancer cells and stem cells, from a wide variety of cell populations, using data obtained from flow cytometers.

- **SAP** Datasphere's integration with Google Cloud's Architecture powers efficient supply chains making AI/ML capabilities accessible on data from customers' SAP ecosystem with over 250 public data sets in Google BigQery, Google Trends, and Google Ad Tech.

IMPACT

- Rapid availability of industry best practices and innovative solutions from the cloud, increasing speed to market.

- New ways for organizations to monetize their solutions, possibly through partnering with technology and cloud providers.

- An accelerated route to modernize and migrate the existing, legacy IT landscape to the cloud, benefiting from the scale and sustainability advantages cloud providers deliver.

- Rapid compliance with sector- and-region-specific rules and regulations.

- More standardization within the sector (also through industry reference models), which makes it easier to exchange data, collaborate on joint purposes, and optimize for efficiency.

TECH

- **Microsoft:** Microsoft Cloud for Finance, Microsoft Cloud for Healthcare, Microsoft Cloud for Retail, Microsoft Cloud for Manufacturing, Microsoft Cloud for Nonprofit

- **Google:** Google Cloud for Retail, Google Cloud for Consumer Packaged Goods, Google Cloud for Manufacturing, Google Cloud for financial services, Google Cloud for Healthcare and Life Sciences, Google Cloud for Media and Entertainment

- **AWS:** AWS for Automotive, Telecommunications on AWS, AWS Energy, AWS for Health

- **Sovereign Cloud:** Oracle Sovereign Cloud, Microsoft Cloud for Sovereignty, Azure Germany, GAIA-X, IBM Satellite, VMWare Sovereign Cloud, T-Systems Sovereign Cloud powered by Google Cloud, Tietoevry Sovereign Cloud

- **Other Industry Clouds:** Salesforce Manufacturing Cloud, Lumen platform, ONAP, SAP Industry Cloud, Oracle Industry Solutions
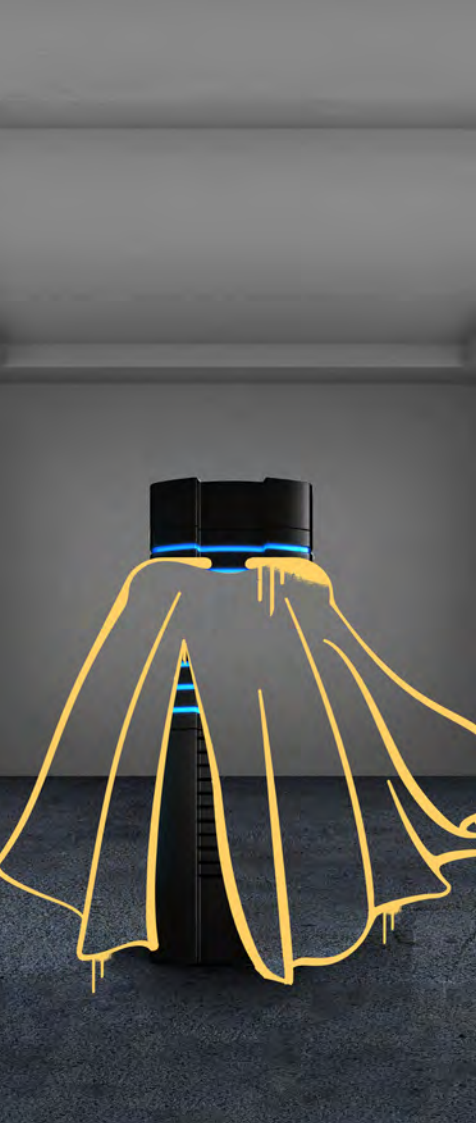
INDU MALHOTRA
EXPERT IN RESIDENCE

OPS, AI DID IT AGAIN

AI renders IT operations fluid, proactive, and resilient, improving efficiency, sustainability, and reliability while it learns — on its way to a handsfree, 'NoOps' autonomy

So many platforms, applications, services, industrial assets, and edge devices to take care of securely. And all of that in an increasingly hybrid, multi-cloud context. Enough to lose your senses. It's the perfect playground for AI to take charge of the complexity. AI recognizes patterns, generates insight, and detects disturbances in real time. Then it looks through even the opaquest of systems, predicting what will happen to allow for timely measures, and suggesting what should be done. And all the while it learns, becoming more and more autonomous in running its IT operations. Oops, is that infrastructure taking care of itself?

WHAT

- AI for IT Operations ('AIOps') collects and analyzes data, from sources such as system log files, incident tickets, network traffic, and sensory data – all in real-time – to continuously improve observability, security, performance, and resilience. Anomaly detection models can detect abnormal human and system behaviors and avoid any critical issues such as system breakdown or malicious intent.

- AIOps can replace traditional monitoring tools, driving a cross-domain cohort of observability across complex application landscapes and multiple platform services hosted in hybrid, multi-cloud environments.

- Organizational change management is essential. Cross-functional teams must be set up to integrate AIOps with DevSecOps, quality assurance, and Site Reliability Engineering (SRE). AI algorithms can predict, allocate, and adjust resource allocation based on capability and business criticality, to allow for efficient and powerful cross-functional teams.

- Generative AI can create Infrastructure as Code (IaC) for complex and specific IT platforms, simply triggered by prompt engineering. Best practices will be generated by LLMs for a consistent and reliable setup of cloud infrastructure and immutable services, all integrated into modern application delivery via continuous integration and continuous deployment (CICD) processes.

USE

- **Pulumi Corp**, an Infrastructure-as-code startup, is using OpenAI LP's large language model GPT-4 to automate cloud infrastructure management. The AI smarts are embedded in a new command-line tool known as PulumiGPT, which uses Generative AI to enhance the productivity of cloud engineers.

- Capgemini worked with **Chevron Phillips Chemical** designing and building a modern data and AI platform on Microsoft Azure to allow scaling of operational AI.

- **Banco Bilbao Vizcaya Argentaria** (BBVA) selected AWS to leverage its cloud-based broad portfolio of AWS analytics and AI services across its operations and create a new data platform that will be deployed globally, delivering a secure repository of BBVA's operations and customer data.

- **The Oil and Gas Holding Company**, a Bahrain-based company deployed Oracle's Fusion Cloud Applications Suite to help automate the organization's core business processes and streamline its operations across all operating companies.

- **Ericsson and Ooredoo Qatar** successfully deployed cloud-native cognitive software on Microsoft Cloud. Ericsson's solution uses advanced AI techniques to proactively provide mobile network optimization recommendations and resolve specific network performance issues.

IMPACT

- Routine, repeatable IT operational tasks can be automated to provide a frictionless service while reducing costs and enabling a focus on strategic, value-adding activities.

- Complex events can be handled in real-time in a converged IT operations and cyber-threat prevention framework, ensuring business resilience, continuity, and stability.

- A rapid diagnosis through prompts and context-based resolution of IT operations issues, ensuring higher customer and employee satisfaction and retention.

- Dealing with the scarcity of skilled SRE and DevSecOps resources, AIOps reduces the number of experts required to run critical services. This means SRE and DevSecOps engineers can focus on 'Infrastructure as Code' and end-to-end self-service cases that enhance the customer experience.

- Extending beyond IT, AIOps can predict customer behavior and proactively deal with cyber threats, contributing to business resilience and growth.

TECH

- **Generative AI:** GitHub CoPilot, ChatGPT, CodeWhisperer, Code Llama

- **Observability:** AppDynamics, Splunk Enterprise, Datadog APM, Sumo Logic, Dynatrace, TrueSight Operations Management, New Relic One, BigPanda, Helix Platform, DX Operational Intelligence, StackState

- **AIOps:** MoogSoft, Splunk Cloud, Aisera, ScienceLogic, AIOps, BigPanda, Sumo Logic, Helix Platform, PagerDuty, Ignio AIOps, Interlink Software AIOps Platform

- **Hyperscalers:** Amazon DevOps Guru, Amazon Bedrock, Amazon Monitron, MFST M365 Copilot, Azure AI Infrastructure, Azure AI Bot Service, Github Copilot, Google Cloud VertexAI Tensorflow, Vertex AI Pipelines

- **Chaos:** Reliably, Steadybit, VMWare Mangle, Harness, Gremlin, Proofdock

- **SRE and Application Operations:** PagerDuty, ServiceNow, FireHydrant, Honeycomb.io, Splunk On-Call, Buoyant.io, MSys, Futurice
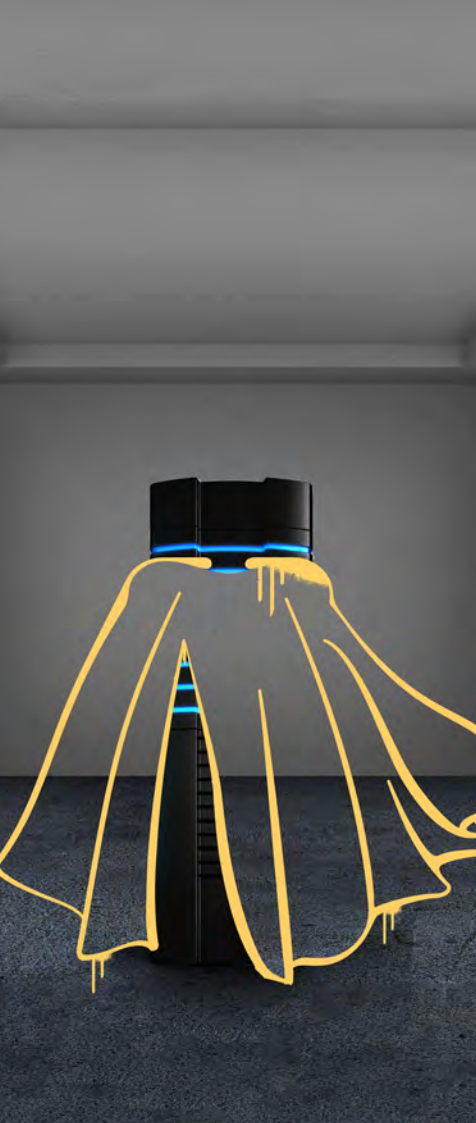
CORNELIA GÖRS
EXPERT IN RESIDENCE

SIMPLY THE EDGE

Intelligent devices, at the 'edge' of central IT and close to operations and OT, add a powerful dimension to the existing IT infrastructure — merging virtual and 'real' worlds

It's quite the page-turner. We move beyond limits, reach the edge, and discover new worlds. Edge core technologies — such as 5G, IoT, and embedded AI — are pushing the boundaries of central IT infrastructure further and further, closer to the 'real' world of business operations, and real people. Technology is hitting the ground, embedded in our surroundings. And the tipping point is right here; where compute, storage, and processing power join at the source of data collectors, sensors, and actors — that's where innovation ignites. It's where the cloud meets its edge cousins of 'mist' and 'fog'. Simply put, with IT infrastructure now turning into a genuine 'infostructure,' it's so much better than all the rest.

WHAT

- The emerging paradigm demands a new kind of talent – the IT-OT specialism in all facets of technology, with skills as well as the ability to credibly bridge capabilities across IT and OT domains.

- The infostructure, oiled by real-time data, needs to be fluid, enabling data at the devices and sensors ('mist') to flow seamlessly to its periphery, at the edge ('fog'), all the way to the central cloud.

- The interfaces between Operational Technology (OT) and Information Technology (IT) keep improving, easily connecting physical assets and devices to IT systems. Data is processed in the devices that aggregate the data.

- Technologies such as virtual and augmented reality, autonomous driving, smart cities, and building automation systems require fast data processing at the network edge. To survive and thrive today and in the future, enterprises must be able to act quickly with intelligence.

- 'EdgeOps' will evolve to guarantee a secure, continuous delivery of up-to-date solutions and services up to — and beyond — the edges of the existing IT infrastructure to support AI, sensor-based applications, or control data.

USE

- **Ericsson** is working with AWS and **Hitachi America R&D** on the private 5G infrastructure trial at Hitachi Astemo Americas' electric motor vehicle manufacturing plant in Kentucky, USA. The focus is on smart factory potential real-time digital video, artificial intelligence (AI), and edge-to-cloud technologies across the plants.

- **Audi's** [Edge Cloud 4 Production (EC4P)](Edge Cloud 4 Production) — a new method of IT-based factory automation used in series production. A local server cluster controls worker guidance at two production cycles for the Audi e-tron GT quattro, RS e-tron GT and Audi R8 models.

- One of the key challenges faced by those operating on the moon is limited bandwidth for data transmission back to Earth. To tackle this issue, **Astrolab** has formed a strategic partnership with HPE to leverage its edge-computing capabilities.

- AWS signed an agreement with **OneWeb**, a LEO satellite internet provider,bundling connectivity with cloud services and edge computing services, virtualization of Mission Operations, Space Data Analytics, and deploying seamless cloud-to-edge solutions with LEO-connected user terminal.
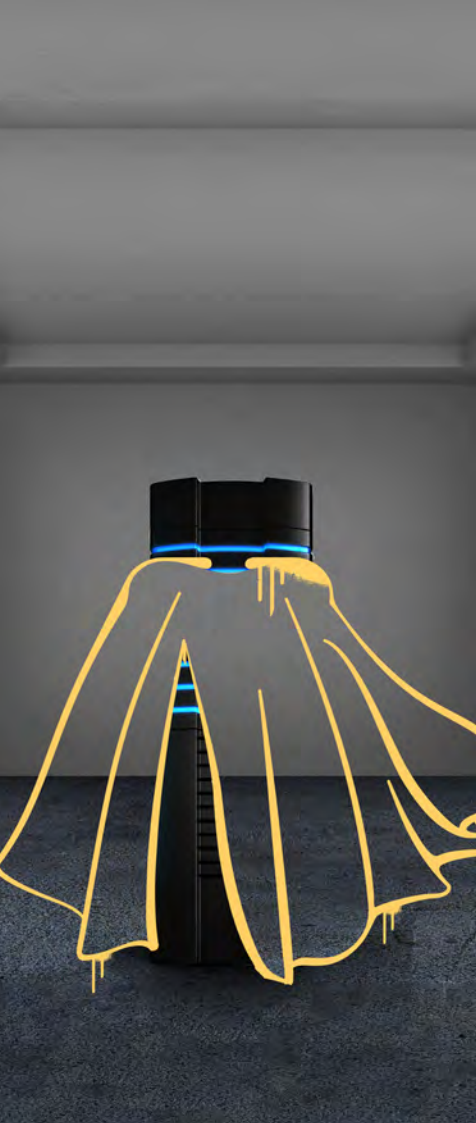
- **StarHub** piloted the Google Distributed Cloud Edge and Nokia 5G Standalone Core to create a multi-access, software-based 5G cloud core network. StarHub will be able to break down information silos and drive insights from this new interoperability.

IMPACT

- The edge is where IT and OT continue to merge, enabling the 'Internet of Digital Twins', blurring the boundaries between the virtual/digital and real worlds.

- Edge computing reduces the latency and increases the network speed. Data can be converted into valid information for real-time decision-making. Every millisecond is crucial for success. As a result, latency is measured in microseconds instead of milliseconds.

- Edge computing platforms collect sound and vibration data from sensors, the data is sent to the cloud, and big data analysis detects anomalies. Once patterned, the data that shows signs of anomalies are fed back to the edge, notifying those on site and increasing the accuracy of maintenance.

- Intelligent IoT and edge services, such as sensors, smart devices, and meters, push the development of energy-efficient manufacturing plants, smart cities, in-orbit virtualized data infrastructure and so much more.

TECH

- **Building the edge:** Fastly Edge Cloud, VMWare Edge Compute Stack, Intel Edge Cloud, Lumen Edge Cloud, Cloudera Edge Management, Roving Edge Infrastructure, NVIDIA Enterprise Edge Computing, Microsoft Dynamics 365 Field Service Mobile, FOG Project, NVIDIA Omniverse

- **Merging both worlds:** thin-edge.io, Belden Horizon, MQTT Sparkplug, EdgeIPS Pro, TensorFlow on Databricks, ServiceNow OT Management

- **Connecting the orbit:** Axiom Space, Virgin Galactic, Sateliot, OneSat, OrbitsEdge

- **Standardizing the new:** The Metaverse Standards Forum, CDISC, Open Geospatial Consortium, NIST SP 800-82 Rev. 3 Guide to Operational Technology (OT) Security, The Industrial Internet Reference Architecture

JULIAN VAN VELZEN
EXPERT IN RESIDENCE

OK QOMPUTE

New horizons of more organic computing are emerging, driven by Quantum and neuromorphic chips — breaking the spell of bits and bytes, opening up entirely unexplored opportunities

To address some of the most significant challenges of our time, such as improving healthcare and the race to net zero, there is a demand for much more computational power. With Moore's law finally outpaced, the time has come to explore alternative computing methods. Welcome to the realm of bits, neurons, and qubits. We have already moved beyond the classic CPU processor architecture — with GPUs, TPUs, NPUs, LPUs. But their roles will be shaken up by the new kids on the block — Quantum and neuromorphic chips. They operate on fundamentally different principles, more closely modeling our own, organic reality. That promises extraordinary, quite OK capabilities.

WHAT

- A new industry emerges that looks beyond silicon, beyond bits, and beyond von Neumann architectures, to build radically new solutions, comprising bits, neurons, and qubits.

- Quantum computing offers exponential speedup for certain problems. Computations that would have taken thousands of years, could be solved in mere hours. Chemistry would be a natural application, however, on the flip side, breaking cryptography would be too.

- Prior to Quantum computers getting commoditized, many engineering challenges remain. As the principles of Quantum computing have been demonstrated, the challenges remain in scaling the hardware and finding the right use cases.

- Neuromorphic computing mimics the human brain. Applications range from low-energy computation on the edge to next-gen AI.

- Together, bits, neurons, and qubits will be shaping the future heterogenic compute landscape, in a redefined infostructure. Allocating the right processor at the right time for the right use case will be a formidable challenge, but one that's worthwhile.

USE

- Capgemini and **GSK** collaborated to predict the reactivity of covalent inhibitors using computed Quantum features for drug discovery.

- **Airbus, BMW Group**, and Quantinuum have developed a hybrid Quantum-classical workflow to speed up future research using Quantum computers to simulate Quantum systems, focusing on the chemical reactions of catalysts in fuel cells.

- **Bayer AG** collaborated with Google Cloud to drive early drug discovery that will apply Google Cloud's Tensorflow Processing Units (TPUs) to help accelerate and scale Bayer's Quantum chemistry calculations and demonstrate fully Quantum mechanical modeling of protein-ligand interactions.

- **Lorser Industries**, a US-based system-level manufacturing company, is using BrainChip's Akida technology to deliver neuromorphic computing solutions for software-defined radio (SDR) devices.

- **QMware** and **QuiX Quantum** collaborated to develop a fully integrated, hybrid Quantum-classical platform in Enschede, the Netherlands. The hybrid architecture integrates high-performance computing (HPC) infrastructure with native Quantum computing technology onsite.

IMPACT

- The future of computing holds the promise of the emergence of novel products like real-time optimization of energy grids. As often with groundbreaking endeavors, the most exciting applications may be the ones that have yet to be envisioned.

- Introducing fundamentally new types of processors necessitates a re-evaluation of significant portions of software engineering. Attracting the right talent will prove challenging, and building the required expertise will be a gradual process.

- Deciding on an appropriate course of action requires careful timing. Regardless, inaction is unlikely to be a viable strategy, especially in matters concerning Quantum security.

- Governments are allocating billions of dollars to drive Quantum innovation, nations are in a competitive race to construct the next generation of exascale computers, and stringent export controls are being implemented.

TECH

- **Hyperscalers:** Azure Quantum cloud service, Amazon Braket, AWS High Performance Computing, Google Quantum AI, Google Quantum Virtual Machine, TensorFlow Quantum

- **Quantum hardware:** IBM, QCI, Rigetti Computing, PASQAL, Quantinuum System Model H2, IQM, IonQ, Xanadu

- **Quantum Cloud Services:** IonQ Quantum Cloud Service, Xanadu Quantum Cloud, Forest / Quantum Cloud Services (QCS), QANplatform cloud service, Strangeworks Quantum Computing Platform, PASQAL Quantum Processing Unit (QPU), Zapata Computing Orquestra, IQM Quantum Computers

- **Quantum Software Stack:** Classiq, D-Wave Quantum Ocean, Xanadu Pennylane, QCWare Promethium, Zapata Computing Orquestra

- **Neuromorphic Computing:** IBM, Intel Loihi 2 and Lava, Brainchip Akida, SynSense, GrAI Matter Labs, Innatera Nanosystems, Prophesee, General Vision NeuroMem

BALANCE BY DESIGN

MICHIEL BOREEL
EXPERT IN RESIDENCE

The transformative, augmenting power of breakthrough technologies is obvious. With disruptive trends such as Generative AI, edge computing, and mixed realities now becoming operational at the enterprise level, we are witnessing more than ever how Technology Businesses can achieve their goals in new ways. Goals that may have been considered unreachable or even impossible before. But to get there, keeping multiple balances and adhering to design principles that consider the interests of all stakeholders is crucial in technology decision-making and implementation. This is about finding a balance between short and long-term, centralized and decentralized, friendly and authoritarian, purposeful, and spontaneous, value-rich and frugal, expanding and sustainable, technology-powered and human-centered.

This quest for balance in so many different dimensions is more than a necessity; it's a call to action. TechnoVision not only identifies emerging technology trends (the 'what') but also crafts a vivid roadmap to foster this delicate equilibrium within organizations (the 'how'). This roadmap — 'Balance by Design' is built with purposeful design elements, and promises to guide executives, architects, and technologists on a transformative journey.

Presented on a single page, each **principle** is deliberately contrasted with an **antiprinciple:** the opposite of the principle — a statement that may strike the reader as uncomfortably familiar. **The context** then positions the principle, before living the principle shows how to apply the principle on a continuous basis, and the openings propose the potential first steps for any organization, like the opening moves of a chess game.

As always in TechnoVision, the first design principle reflects the overall theme of this year's edition. the ever-crucial **Technology∈∋Business** (pronounced as 'Every Business is a Technology Business') principle makes a case for not 'just' aligning business and technology but fully unifying the two — achieving full transformational impact across the entire organization.

Then we look at the new, profound principle of **AI'll be the Judge of That!**, addressing the need to change our traditional views on the notion of knowledge, understanding and — ultimately — judgement. We've come to increasingly rely on technology to analyze, decide, and act on behalf of us. This technology is often based on patterns in unimaginable amounts of distributed and connected data, to the extent that we can no longer absorb, let alone understand its workings. This requires on one hand not over-relying on passion-killing control mechanisms of the past; but on the other hand, it stipulates the need for a new balance — a symbiosis even — between man and machine in applying proper judgement.

The next principle **Do Good, Do Less, Do Well** acknowledges the reality of a dual transition of the enterprise (technology-powered and sustainable) being at the top of corporate agendas. The principle suggests doing the 'right' things in terms of activities that contribute to societal good and sustainability, but also to 'right' the technology that enables it. So, saying 'yes' to initiatives that create a positive, purposeful impact, and saying 'no' to activities that are energy-wasting or non-essential. Striking the right balance will make the organization thrive as never before.

We continue with **Be Like Water** which — after being the overall theme of an earlier TechnoVision edition — is now elevated to a well-understood design principle that combines the earlier principles of 'Adapt First' and 'With Open Arms'. In a world ruled by Uncertainty[2], adapting to whatever changing circumstances might occur inside and outside the organization becomes key to survival; technology should always contribute to the strategic maneuverability of the enterprise. It should power a fluid organization that takes the form of whatever is needed to be successful and persist.

To deal with the irresistible ascension of data-fueled Artificial Intelligence and automation, **IQ CQ RQ EQ Up** promotes a proper balance between relying on data, algorithms — increasingly for creative purposes — and (robotic) automation versus the emotional curves of all involved. We're only humans, after all.

As trust levels may all too easily ebb, Technology Businesses must respond with a powerful **Trust Thrust**, which unifies business and technology strengths to cherish trust, protect the corporate foundation, and live up to ethical standards — all to propel responsible growth.

Then, our last design principle of **No Hands on Deck** tantalizes us with the disruptive prospect of a fully automated, hands-free, 'lights-out' business, while proposing a stepwise approach to get there.

It's tempting to think that simply selecting a few breakthrough technology trends will transform the organization, but in fact, the success of technology-powered change is more often dependent on the mindset, culture, and balanced considerations of the organization. This is why many practitioners of TechnoVision have found that the Balance By Design container is the most pivotal to success.
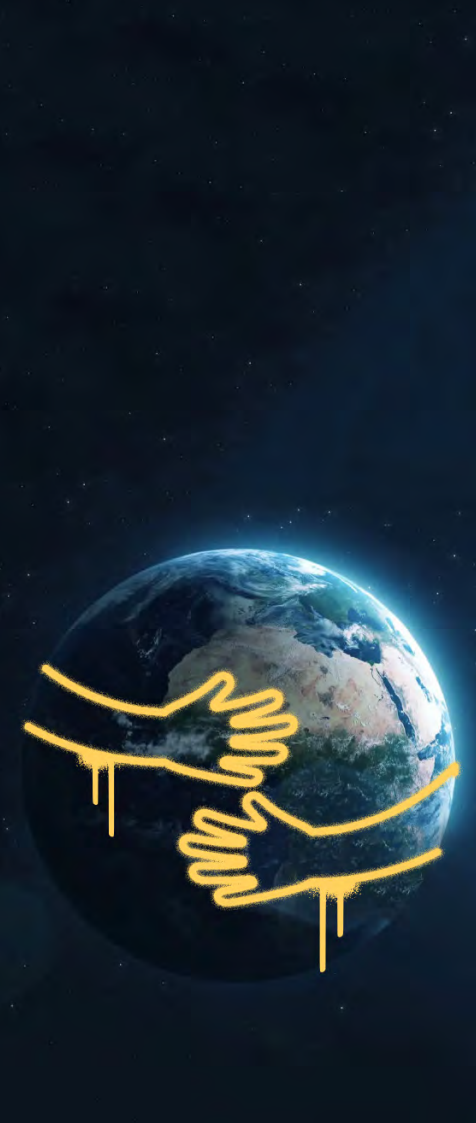
BALANCE BY DESIGN

/Prompt   How to build a brighter, better future?

/Prompt the future

KARY BHEEMAIAH
EXPERT IN RESIDENCE

TECHNOLOGY ЄƎ BUSINESS

THE PRINCIPLE

Move from alignment to unity of business and IT, creating a seamless Technology Business of strategy and operations.

'Every business is a Technology Business' is how our odd, slightly misused mathematical notation should be read. With the ever-growing dependence on technology, the worlds of IT and business have migrated — sometimes reluctantly — from isolated compartments to fully-aligned entities. But now, an 'All Ops' approach is required with full, mutual, and deliberate convergence of business and IT without friction or middle persons. They move and act as one.

THE ANTIPRINCIPLE

Clinging to outdated communication channels, which can hinder the fluid exchange of ideas between business and IT, poses a considerable pitfall. Relying on the conventional periodic business and IT alignment by translating an enterprise's strategy into an IT strategy and priorities is simply too slow and harms an organization's maneuverability so desperately needed in times of fast, unpredictable changes.

THE CONTEXT

The responsiveness, speed, and adaptability needed to thrive in today's Technology Business context does not allow any obstruction, delay, or noise between the stakeholders involved. Any Technology Business strategy should be deployed, both fluidly and rapidly, in both business and IT operations, connected as one, as it evolves and iterates repeatedly and continuously.
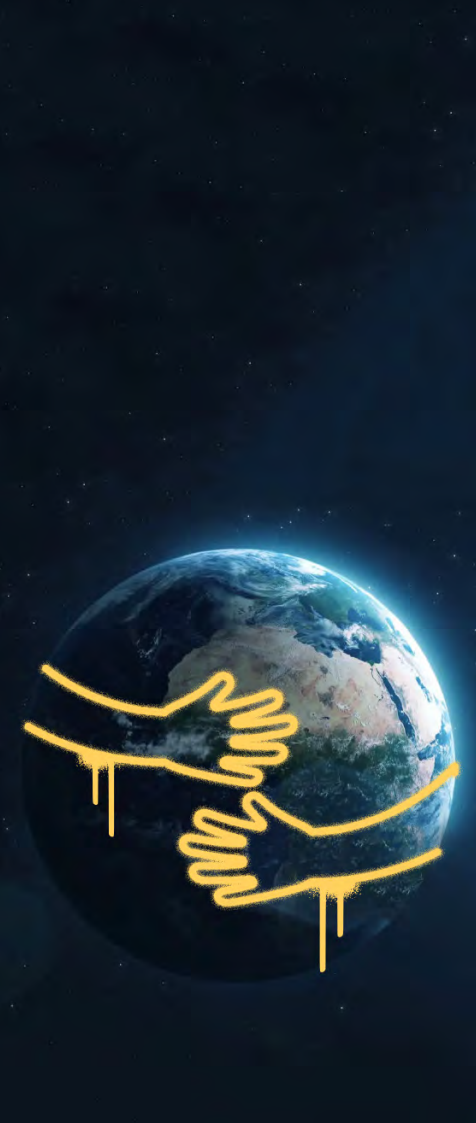
This 'All Ops' approach — continuously adjusting and delivering on strategy — cannot afford any loss in translation along the way. Cross-disciplinary teams work jointly on products — rather than on projects that think of creating experience and outcomes — with a potentially unlimited lifecycle, guided by shared budgets and tangible business value streams. Technology becomes more democratized— and internalizedas all involved learn from each other's roles, perspectives, and skills.

LIVE THE PRINCIPLE

1. **Empower the business:** Shift ownership of — and responsibility for — Technology Business solutions, products, and change towards the actual business domains.

2. **Create Technology Business product teams:** Move to continuous product delivery, driven by cross-organizational, autonomous, 'All Ops' teams with allocated budgets.

3. **Democratize technology:** Make self-service of IT capabilities by the business the default, for example in areas such as data, application services, and process automation.

4. **Go beyond conventional governance:** Enable Technology Business product teams to act quickly and autonomously on top of predefined policies and authority levels.

THE OPENINGS

- Build generic, enabling platform services but make absolutely sure one or more business domains sponsor, adopt, and apply each service right away.

- Transition incrementally, introducing Technology Business product teams one at a time — considering the availability of relevant platform services.

- Make Technology Business product teams the default for new corporate products and services, especially when innovative technology enables them.

MICHIEL BOREEL
EXPERT IN RESIDENCE

AI'LL BE THE JUDGE OF THAT!

THE PRINCIPLE

Leverage rapidly emerging forms of AI-driven knowledge and insights, even in the absence of complete understanding and transparency — applying a symbiotic form of judgment between humans and AI.

AI is enlightening us about the inherent complexity of the world around us, revealing that it cannot be neatly encapsulated within rigid frameworks. This is evidenced yet again by breakthroughs in Generative AI and multi-modal agent-based systems. Increasingly becoming reliant on these systems, the question arises to what extent we trust them to provide knowledge and take actions on our behalf – with our established ways of command and control becoming both irrelevant and passion-killing. If we aim to address some of our most pressing business and societal challenges, we must embrace the evolving forms of augmentation; even sometimes if it is in the absence of complete understanding and control – but while always being responsible and ethical. The ideal outcomes arise at the intersection of human and machine intelligence. Sound judgment then, is the key feature of this symbiotic, co-creation process.

THE ANTIPRINCIPLE

Over-emphasize the importance of clarity and openness in AI-generated insights and consider conclusions trustworthy only when the algorithms used for their derivation are transparent, reproducible, predictable, and subject to human oversight. Alternatively, fully trust any AI-driven decision or action.

THE CONTEXT

The vast reservoir of information and data accessible through the internet, coupled with the emergence of infinite machine intelligence and deep learning algorithms, is challenging the traditional concept of knowledge. Gone are the days when analysis outcomes were only considered knowledge if they could be encapsulated in universally applicable principles or, preferably, expressed in unbiased scientific equations. Navigating the modern digital realm is akin to exploring the vast expanse of space. Traditional knowledge repositories, like books, are now overshadowed by the intricate web of the Internet. As we shift to 'hyper-linked thinking', it becomes apparent that the immense complexity of AI-enhanced networks can be challenging for mere human comprehension. Yet, while daunting, this depth offers businesses a dynamic, multi-layered understanding that mirrors the intricacies of our ever-evolving world.
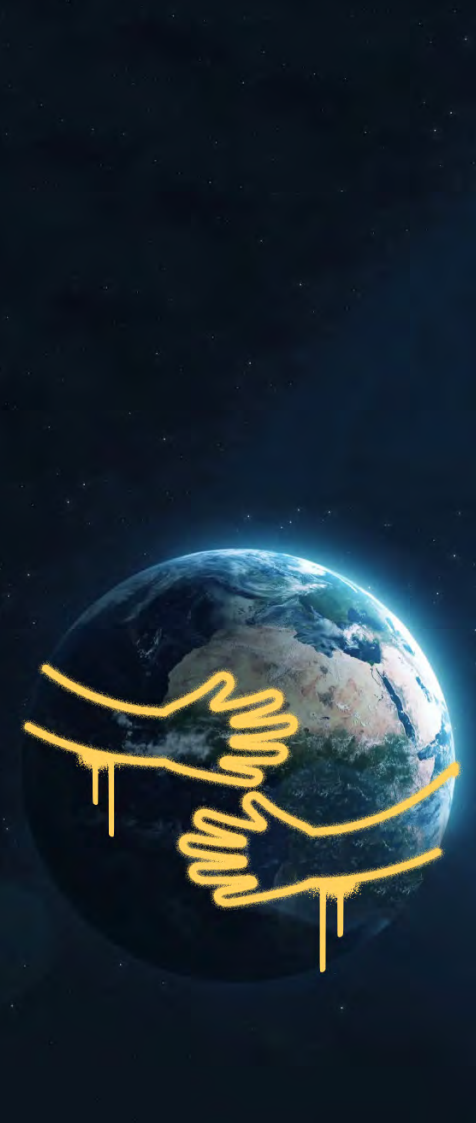
The traditional methods of control are therefore quickly growing out of date: strict top-down oversight will stifle agility in this new paradigm. Yet totally unconstrained autonomy poses its own risks if ethical AI development and deployment principles are not ingrained across organizations. It demands an enterprise-wide approach to good judgment, as a symbiotic collaboration between humans and their AI systems. This is a shift that mandates a comprehensive people change, equipping workers with the judgment prowess essential for the AI era.

LIVE THE PRINCIPLE

1. **Built-in trust and responsibility** — founded on a code of ethics for a fair, safe, and sustainable usage, preventing AI from producing inaccurate information (unless this is acceptable for certain use cases) or generating responses that contradict the company's values and purpose.

2. **Leave micro-approving choices** — as leadership should focus on empowering workers with mentioned skills at all levels, acknowledging the continuous evolution of AI and other breakthrough technologies is necessary.

3. **Make a clear distinction between the 'unknown' and 'unknowable'** — for unknown areas, new knowledge incessantly needs to be found. Whether it comes through deterministic data or probabilistic synthetic data, it does not matter.

4. **Keep the human in the loop** to double-check and validate AI-generated content, especially where potentially inaccurate AI models (such as Large Language Models) are involved.

THE OPENINGS

- Revisit your existing code of ethics for AI (if any) to filter out unnecessary 'business-preventing' elements, while sticking to non-negotiable ethics foundations.

- Assess new or existing local or international rules and regulations (such as the EU AI Act) for guidelines on how to categorize AI knowledge and applications in different risk categories (including minimal risk).

- Consider tools to audit AI systems for transparency and manageability, even if the internal workings of these tools themselves may be 'too big to know'.

- Provide training on how to set the right context for human-AI decision-making — this involves explaining appropriate boundaries for prompts and framing inquiries responsibly.

JAMES ROBEY
EXPERT IN RESIDENCE

DO GOOD, DO LESS, DO WELL

THE PRINCIPLE

Make your organization thrive by embracing initiatives that create a positive social and environmental value alongside economic value, while rejecting activities that damage the biosphere or destabilize society and compromise humanity.

Technology is a remarkable thing —without the innovation we've seen over the past 200 years, we would be living very differently — if indeed we'd be living at all. Certainly, there wouldn't be nearly 8 billion of us on planet Earth! However, modern technology operates at such a staggering scale, that for the first time humanity is altering the very planetary systems critical to our well-being. So large is this scale that scientists have defined our era as the Anthropocene — the era in which humanity's impact is the dominant. Now is the time to apply the remarkable capabilities of technology to create a future for the benefit of every human being.

THE ANTIPRINCIPLE

Unleash technology to maximize economic growth whatever the social and environmental costs. Businesses should focus only on profit. Social and environmental concerns should only be considered if they enhance short-term profit.

THE CONTEXT

Our biosphere is sick — of the nine planetary boundaries critical for humanity's survival on planet Earth, six have been broken and two are almost broken! Furthermore, of the 17 Sustainable Development Goals (SDGs) set by the United Nations and which cover both social and economic outcomes, only 15% are on track to be met by 2030.

In this context, IT has immense potential — GESI (Global Enabling Sustainability Initiative) has identified that technology can positively impact all 17 of the goals and over 50% of the 169 specific targets sitting under the goals. Technology can improve crop yields, design medicines faster, improve the efficiency of almost every process, make supply chains more resilient, and simultaneously less carbon-intensive. At the same time, technology is also enabling individuals to learn and families to connect instantly across the globe.

Whilst this is positive, it must be acknowledged that IT also has its own impact consuming energy, natural resources, and creating carbon emissions. Current estimates suggest 3.7% of global CO_2 emissions are associated with IT. Indeed, if the IT industry was a country, it would be the third largest electricity consumer in the world. Clearly, IT itself must be delivered in an optimized way alongside making its societal and environmental contribution.

LIVE THE PRINCIPLE

1. **Understand your current position** by assessing your sustainability footprint. Where are you making negative environmental or social impacts — how can you eliminate these while maximizing the positive impacts of your business?

2. **Identify areas where IT can contribute** to reducing environmental impacts (ideally against all nine planetary boundaries):

   – Firstly, how you can optimize your IT estate to minimize its operational impacts — e.g., consolidating your application portfolio or migrating to new technology to reduce environmental impacts.

   – Secondly, consider how IT can reduce the impact of your wider business — e.g., leveraging Digital Twins to identify efficiencies or applying intelligent routing to your logistics.

   – Finally, investigate how your application of technology can help your customers reduce their impacts — e.g., providing smart meters to help domestic energy consumers reduce their consumption.

3. When designing new products and services, assess their benefits against the **17 Sustainable Development Goals**. If it's not going to make a positive contribution across the goals, consider redesigning.

4. Ultimately, **reject non-sustainable business ideas and technology**. Align your business initiatives so that they create positive social and environmental value alongside economic value.

THE OPENINGS

• Educate your teams on the SDGs and encourage active debate about how your products and services are making a positive contribution.

• Undertake a systems audit to identify marginal or obsolete applications.

• Focus on creating positive social and environmental value alongside economic value.
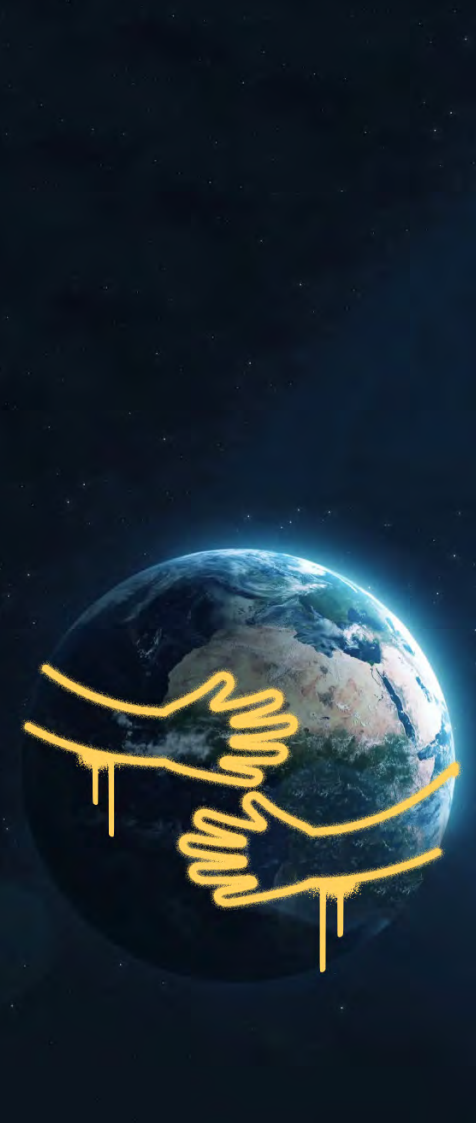
THILO HERMAN
EXPERT IN RESIDENCE

BE LIKE WATER

THE PRINCIPLE

Ensure the built-in 'water-like' capabilities of agility, flexibility, responsiveness, resilience, and openness.

The idea of being adaptable and flowing, like water, is a powerful metaphor in today's uncertain times. A Technology Business must embrace continuous, unexpected change.
It involves rapid adaptation and ongoing experimentation by design. The technology infrastructure and applications landscape need to be upgraded to a flexible digital platform, ready to adapt to whatever requirement, opportunity, or challenge that arises. The organization must live and breathe agile principles, not only as the forte of the IT department and a few business representatives but as the overall enterprise mindset. Furthermore, adopting open standards allows the organization to harness external innovation effectively, offering an array of attractive services that invite collaboration, both internally and externally.

THE ANTIPRINCIPLE

Continue to invest in the monolithic, unruly, intractable, closed, rigid applications that severely limit the strategic maneuverability of the enterprise and refuse to solve the technical debt.

THE CONTEXT

The reality is that today's world is more uncertain than ever for organizations striving for success. We dub this era 'Uncertainty²'. The near future may be marked by a series of crises and opportunities. Whether it's environmental issues, energy crises, disrupted supply chains, geopolitical turmoil, or technology breakthroughs, the world is defying predictions, characterized by brittleness, anxiety, non-linearity, and incomprehensibility.

In this landscape, traditional prediction becomes futile, giving way to the importance of experimentation and swift adaptation. Organizations must take on various forms, being resilient, adaptive, and creative. In the realm of a Technology Business, agility hinges on technology adaptability and seamless connections with internal and external stakeholders. Providing a unified experience for customers, partners, and employees necessitates effortless connectivity across industries. Applications should be designed for disruption and change, featuring open connectivity as a standard. Various technologies enable this adaptability, including 'mesh API-first' application services, self-improving IT operations, cloud-native infrastructure, open data-sharing capabilities, distributed networking, AI augmentation, and autonomous systems.

This approach allows continuous corporate reinvention, enabled by technology. But, as we all know too well, transformation will not come through technology only. Neither will it come from implementing agile methodologies and having passionate gurus to drive it. A widely carried corporate mindset is needed that embraces and expects change — rather than demonizing it.

LIVE THE PRINCIPLE

1. **Consider your IT infrastructure as digital assets:** Manage them just as carefully as you manage your physical assets.

2. **Architect to adapt:** Follow architectural patterns that enable an agile, distributed mesh, such as microservices; look for AI to drastically improve responsiveness. Re-architect your platform to evolve easily and integrate new partners, outside resources, providers, clients, and new services in the shortest time possible.

3. **Constantly evolve practices** like agile solution delivery, advanced analytics and AI, and Hyper Automation Drive on top of the unified digital platform.

4. **Systematically adopt** open standards and state-of-the-art technologies — as a standing invitation card.

5. **Augment** the business value of your APIs and data-sharing services — evolving from technology-coupling systems into business-partnering vehicles.

6. **It will break:** Assume processes and systems will be disturbed — even break. Build in measures to deal with failures and learn from them to improve resilience.
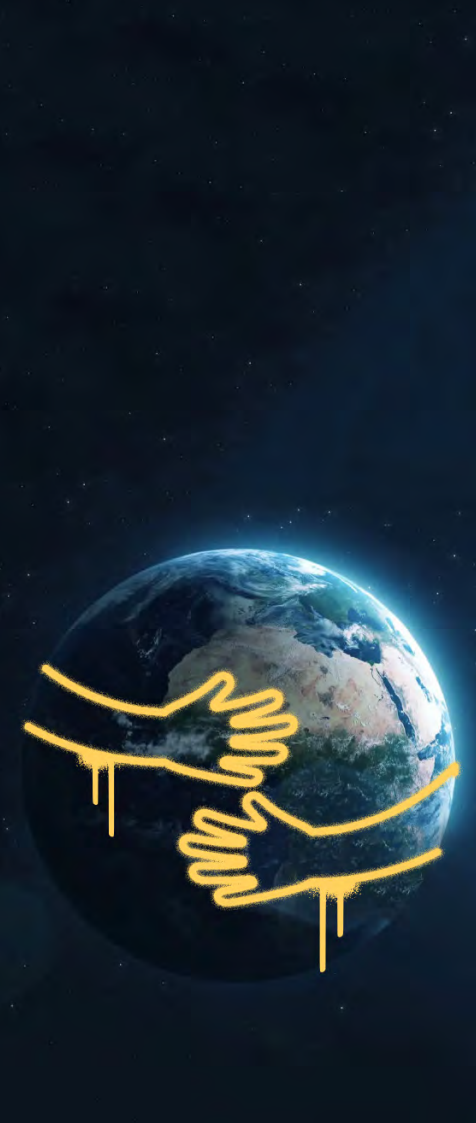
7. **Search the sweet and sour spots:** Maintain a heatmap of potential changes, for example, due to legislation, future products and services, or new partners.

8. **Prepare your Change A-Teams:** Set up unified, cross-organizational teams that can absorb continuous change and act right away, especially when it's not planned.

9. **Re-name your platform to Unified Technology Business platform** — designed, developed, and operated with, and for technology-driven business purposes.

THE OPENINGS

- Move from project to product thinking: realizing that operations and applications always evolve — rather than end up in a final state — trains the adaptability muscles.

- Move from solution to platform thinking: a solution becomes only a temporary aggregate, built on a catalogue of agile platform services and capabilities.

- Promote your Technology Business platform's capabilities and attractions as you would when promoting the glamour of a new product.

- Introduce objectives and key results that speak the language of open connection: business value, time-to-react, fluid workforce, and environmental contribution.

- Become irresistible to the scarce human resources out there: not just by providing security and comfort, but by offering a great work-life balance.

- Bridge strategy and operations: apply an integrated, DevOps-style mindset to continuously operationalizing strategy in business and IT systems.

RON TOLIDO
EXPERT IN RESIDENCE

IQ CQ RQ EQ UP
THE PRINCIPLE

Ensure a properly measured and monitored balance between four — sometimes conflicting — assets: the corporate Intelligence Quotient, Creativity Quotient, Robotic Quotient, and Emotional Quotient.

The only way is up! On the road to becoming a data- and AI-powered enterprise, every initiative should increase the corporate IQ, noticeably through new knowledge, insights, algorithms, and automation. Also, AI now increasingly generates new, unique content from organization data, bolstering creative powers (CQ). Automation technologies, from AI to RPA, physical robots, and more, make it possible to automate everything that is done more than once, increasing efficiency, and more importantly, increasing the adaptability of an organization. The Robotic Quotient (RQ) captures the readiness of an organization — technologically and culturally — to successfully engage in transformative process automation. However, humans stay at the center of the enterprise's raison d'être more than ever: a demonstrably growing corporate EQ will prove it.

THE ANTIPRINCIPLE

Harvest and use data to the max, automate at will, leverage AI for cognitive and creative purposes; don't worry about the people, they will adjust — as always.

THE CONTEXT

It doesn't take much convincing for organizations to focus on extracting more value out of data. Data is shared — both inside and outside the organization — for specific purposes, and to foster better, fact-based decisions and actions. Data is also increasingly used to train AI models that bring additional predictive, prescriptive, and even autonomous capabilities to the business. And this data melting pot becomes all the richer with Generative AI, which builds on (organizational) data to produce synthetic, creative content.

Automation technologies, from AI to robotic process automation (RPA), physical robots, and more, are transforming business processes and operating models. The outcome is not only efficiency but more strategically important, increased adaptability.

So far, much of this creative thinking has been considered the exclusive forte of humans. All the more reason to not focus on the organization's intellectual and creative capital alone, but responsibly — and measurably — balance it with the emotional curve of every individual and the organization as a whole.

LIVE THE PRINCIPLE

1. **Understand your data assets**, assuring all data, whether coming from inside or outside the enterprise, is continuously identified and cataloged for easy access and reference.

2. **Activate data through insights, algorithms, and AI** — focusing on putting data at the very core of business strategy, objectives, and daily operations.

3. **Take advantage of data**, applying a systematic framework to identify external (and possibly internal) monetization opportunities for corporate data assets.
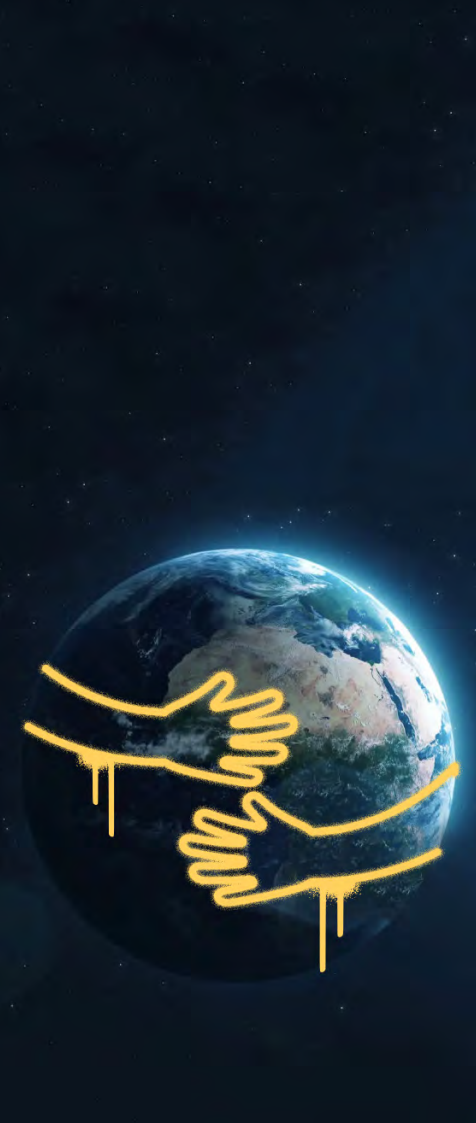
4. **Unleash human creative energy** by scanning data for creative potential, building new content, or augmented innovative products and services through Generative AI.

5. **Automate everything you do more than once** but realize that it is not the technological know-how but the handling of sociological factors that will determine success.

6. **Adapt to emotion**, ensuring the right emotional curve of all stakeholders involved in the (data-powered) transformation is recognized and respected.

THE OPENINGS

- Publish an alternative Corporate Intelligence annual report that describes data-powered measures and achievements, including a financial value analysis of data assets.

- Mine existing data assets and knowledge bases — structured or unstructured — for the first compelling opportunities to generate new synthetic, creative content.

- Emphasize the sociological change process that comes with any automation initiative. Meet the Pavlov reaction of 'This will steal my job' head-on and educate your people that automation will not lead to job loss, but to the emergence of new, more interesting, and more meaningful jobs. The machine can address the routine, but humans with their emphatical and emotional skills are especially geared towards handling exceptions, if only we are willing to empower them to do what is good for the customer.

- Consider technology solutions that help monitor, analyze, and improve the commitment and motivation of humans involved in all transformation initiatives.

RAJASHREE DAS
EXPERT IN RESIDENCE

TRUST THRUST

THE PRINCIPLE

Power up the entire trust ecosystem — from the organization's core to its edges — securing your existing business and pushing forward to its next permutation.

Technology Businesses must be trusted by customers, clients, shareholders, employees, partners, networks, and authorities alike — or there is no business. Period. Simply put, trust is imperative. It must permeate business and technology operations alike. Trust and distrust have an important role in calibrating a person's behavior as an economic actor. And trust us on this one: when applied well, with transparency, reliability, and ethical practices, it also becomes an innovative business accelerator leading to positive brand recall and relationships.

THE ANTIPRINCIPLE

Trust your ability to fix issues only as they arise, kicked around by security, privacy, and ethical circumstances; or alternatively, hide behind an impenetrable wall of distrust.

THE CONTEXT

All for trust, and trust for all. With newer disruptive technologies breaking new grounds like Gen AI, trust becomes even more paramount — whether to trust systems/contents blindly or combine them with solid guardrails. Trust pertains to cybersecurity, guaranteeing users uninterrupted access to secure and trusted data. It also pertains to data privacy, where the proper, transparent use of personal data is always under scrutiny. And don't forget the ethics of AI is a serious part of the trust equation as well, ensuring it is human-centered and serves positive futures. When using AI technologies, checking for bias, plagiarism, and fair use is a MUST to avoid inaccurate solutions/copyright/IP concerns. It is tempting to delegate the enforcement of trust to technology (such as zero-trust platforms, AI, and even quantum computing), but in the end, trust only creates a differentiating thrust if it is entwined with all aspects of Technology Business change, humans included.

LIVE THE PRINCIPLE

1. **Embed trust:** all business strategies and initiatives fully embed and address technology-supported trust, as well as the human-centered dimensions of it.

2. **Go full lifecycle:** trust is an integrated part of the solutions lifecycle, architected, designed, and deployed throughout — rather than check-listed at the very end of a lifecycle iteration.
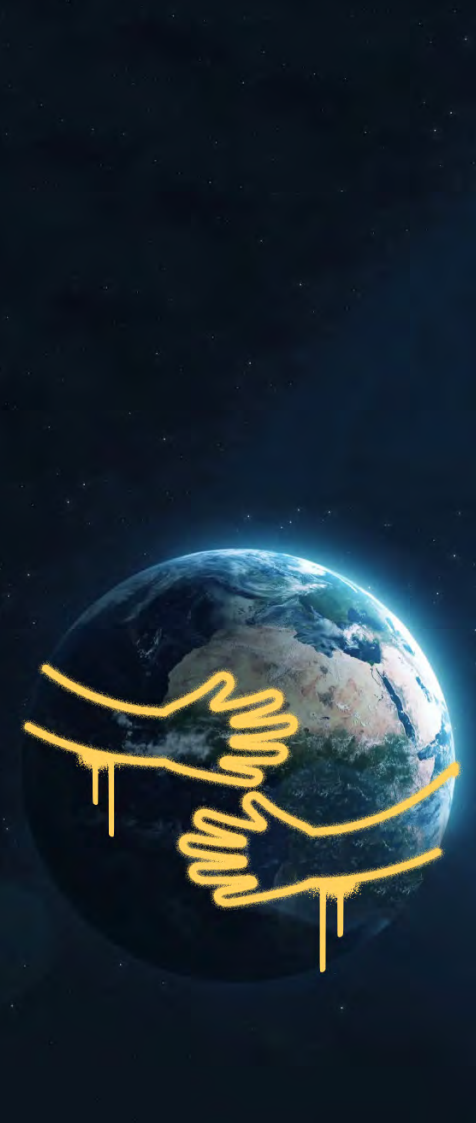
3. **Trust in the team:** all solutions development 'A-teams' contain cybersecurity/privacy/AI and ethics experts, ensuring the other team members appreciate and embrace trust topics as well.

4. **Evolve the model:** establish a continuously evolving trust model with principles, guidelines, training, and communication to all levels, using impactful narratives.

5. **Differentiate with trust:** use the organization's built-up trust as a differentiating quality towards the wider business ecosystem, clients, consumers, and potential employees.

THE OPENINGS

- Expand the solutions development teams to include experts in cybersecurity, data privacy, AI specialists, and ethics, promoting a cross-fertilization of skills.

  1. Bust your biggest distrust generator, whether it is in cybersecurity, data privacy, Traditional AI, Gen AI, or ethics — and ensure its resolution is widely communicated.

  2. Find an organizational system that can safely pilot zero-trust technologies, to try a radically different approach to trust and learn from it.

- To take it one step further, contextualize trust solutions to address industry-specific challenges and regulatory compliance.

ALIASGAR MUCHHALA
EXPERT IN RESIDENCE

NO HANDS ON DECK

THE PRINCIPLE

Assume full, hands-free, zero-touch automation as the default for all new Technology Business processes.

Advances in AI and intelligent process automation make us fundamentally challenge the human factor in any aspect of business, while the scarcity of human skills and resources adds a renewed sense of urgency to the pursuit. The immense possibilities drive us from automation to autonomy — dreaming of an entirely hands-free enterprise. But we should not move so fast — just yet. For now, let's benefit from autonomous technology: make it your first choice for all new processes and learn about a renewed 'hands-off-deck' approach, by not doing. However, organizations must take their RQ (Robotic Quotient) as an organizational, leadership, change-management, and cultural measure of readiness for automation into account.

THE ANTIPRINCIPLE

Leverage siloed datasets to apply AI and intelligent automation for marginal improvements across existing manual, human-dependent processes; firmly keeping all hands on deck!

THE CONTEXT

By all means, let's take Copernic's advice, and reverse our perspective. We should no longer add snippets of automation and AI to established, human-driven processes, only pretending to enjoy the meager benefits of stepwise optimization. It would be like creating the ultimate horse and cart, applying innovative technology to it (maybe the latest lightweight carriage), and then being genuinely disappointed when it loses in a drag race with a Tesla. Grafting human intervention onto fully automated, AI-centric business processes should be the exception — not the rule. We need to design for autonomy, not automation — from day one!

That way, we get the maximum impact out of intelligent automation. And it may be the only way too, as human resources and skills are scarcer by the day. Hire AI as your main resource while virtualizing and augmenting your human talent. Business needs to learn from their IT teams, who are already surfing the wave of AI-boosted automation for their IT systems, and extend that experience across all their Technology Business processes.

A cautionary remark must be made here. These kinds of transformative automation projects seldom fail because of the underlying technology platform or the lack of technological skills. It is the cultural resistance, fear of job loss, and failed change management that destroy any hopes of reaching the promised benefits. Ample attention needs to be given to the RQ or Robotic Quotient, the relative readiness of an organization and its people for automation.

LIVE THE PRINCIPLE

1. **Transform** your IT automation platform into a fully connected **business operations platform**, bringing together all underlying business events.

2. **Mine your processes:** Insights enable action; by capturing and analyzing process data, you find the best opportunities for breakthrough automation.

3. **Challenge the heritage:** Even the most established business rules and best practices should be reconsidered for relevance in the era of autonomous systems.

4. **Think autonomy levels:** Like the five levels of autonomy for self-driving cars, you can apply different ambition levels in the move towards a hands-free enterprise.

5. **Keep it human-centered:** Even if no humans are involved, the ethical and emotional checks and balances of the organization must be carefully managed at all times.

THE OPENINGS

- Start by looking at the Technology Business as a whole, rather than getting siloed views of different systems and layers that make up the process — and mapping it back to the key business metrics to help align your automation pursuit with business value.

- Processes that are unsafe to humans, consume excess energy or are particularly error-prone might be viable early candidates for a hands-off-deck initiative.

- Use hands-free technologies for processes that require scarce skilled resources, not only to have a viable pilot ground but also to effectively deal with the challenge.

A FEW MORE THINGS

By design, in TechnoVision, we keep our feet firmly on the ground, exploring the innovations you can bet on for immediate or near-future gains. Now, as we venture into 'A Few More Things,' consider this as the part where we let our feet dangle a little bit more over the edge, indulging in the 'what-ifs' that are just beyond arm's reach. Here, we'll engage with ideas that might require a leap of faith or a moon-shot mindset — technologies that are not quite ripe for today's harvest but may soon be budding on the branches of innovation. It's a nod to the thinkers and dreamers who are mapping the terra incognita of tech, where the next giant leap for mankind awaits, wrapped in the promise of tomorrow's science.

Space: New Horizons

Space — it is truly a frontier of endless possibilities. These days, the space sector is booming, not just for launching satellites but much, much more. Quantum computing takes a leap into space, aiming to solve complex physics problems and making un-hackable communication possible. Blockchain technology, also, finds a new playground in space, enhancing security like never before. And not to forget, the concept of limitless energy through space-based solar power, a dream that might soon turn into reality.

Cybersecurity is getting a new layer of protection with Inter Satellite Links, while research and manufacturing benefit from the unique conditions of space, such as microgravity and radiation. These advancements are pushing the envelope of what's possible, bringing down the cost of deploying communication services in orbit to even less than doing it on Earth. Truly, space is becoming a ground for mass-scale innovation.

However, with growing numbers of satellites, from a thousand a decade ago to ten thousand now, the risk of collision and space debris is real, potentially leading to the dreaded 'Kessler syndrome.' Regulation at international levels is tricky but inevitable.

Space: full of opportunities but accompanied by risks that could echo for centuries. Therefore, as we look to the stars, we must remember to tread carefully, respecting not just scientific boundaries but also the cultural and natural significance of the celestial sky.

Hybrid work: If I Could Turn Back Time

Hybrid work, the unexpected offspring of the pandemic, turned living rooms into boardrooms and pajamas into work attire. Management pats itself on the back for this 'innovation,' while workers revel in their newfound freedom. But whispers of discontent suggest that Zoom calls and home offices might be chipping away at the once-sacred corporate culture. Tech giants are already beckoning workers back to their cubicles part-time, hinting that the remote work honeymoon might be over.

Yet, as we hum Cher's "If I Could Turn Back Time," we're reminded that a bigger wave is on the horizon — climate change. It's the new boss in town, dictating terms more stringent than any CEO. The corporate world's fling with remote work is nothing but a prelude to the larger opera of environmental challenges ahead. So, should companies cling to a sepia-toned past or forge a new path? Instead of yearning for the 'good old days,' it's time for businesses to embrace change and join the fight against our real common enemy: climate catastrophe. The question hangs in the air — will our corporate cultures be the heroes or the villains in this epic? The irony is, while companies plan the rescue of their 'culture,' the planet politely knocks, reminding us that perhaps the culture needing saving isn't just corporate.

Technologies Crossroad: AI, Quantum and Cybersecurity

In our present days, the intersection of Artificial Intelligence (AI), Quantum Computing, and Cybersecurity forms a crucial crossroad for technological progress. Cybersecurity is no longer an option but a necessity, as cyber threats grow in complexity and volume. Here,

AI becomes a tool of vital importance, capable of facing the speed, complexity, and volume of attacks, while also helping to recognize new threat patterns. Yet, as with many technology innovations, AI can play a good cop or a bad cop. It's also being used by cybercriminals for automated phishing, vulnerability discovery, and even AI-driven malware that can adapt and go undetected.

On the other side, Quantum Computing threatens to make current encryption methods obsolete, jeopardizing the integrity of everything from password systems to digital signatures. Imagine a future where today's secure data becomes easily decryptable; hackers are already preparing for this reality by stealing large amounts of encrypted data today as an investment for future exploitation.

And let us not forget that as AI gets integrated into safety-critical applications like autonomous vehicles or facial recognition systems, the stakes for cybersecurity rise exponentially. A small manipulation, like altering a few pixels in an image, could lead to catastrophic outcomes in real-world scenarios.

In summary, AI, Quantum Computing, and Cybersecurity are tightly interwoven in a complex web that will shape the technological landscape for years to come. The symbiotic yet precarious relationship among these technologies will require careful navigation, as they hold the promise of unprecedented advancements while posing risks that could unravel the digital threads of society.

2024: Scaling, Specializing, and Securing AI's Brave New World

In 2023, Generative AI really took off, paving the way for scale in 2024. Smaller is the new big, it seems! Companies are making leaner, more efficient models that won't break the bank. They complement, not replace, the larger models. Generative Agents are the next cool thing — think of an army of specialized AIs for specific tasks. Even the big tech giants are jumping on this bandwagon. Then there's the boom in AI platforms.

Although billions are poured into AI, actual enterprise use is lagging. The roadblocks? Trust, integration, and finding the right talent. But these platforms aim to fix that, bridging old and new AI worlds. 2024 will be a year of 'expansion and consolidation,' possibly influenced by new 'trust and explainability' rules. So, hold onto your seats; it's going to be an exciting ride!

Earth 2.0: Where the Real Cost Isn't What You Think

Welcome to Earth 2.0, where the price tag isn't the full story. Consider this: churning out an app now costs less than your monthly coffee habit. But let's not get carried away in a tech-induced high without considering the bill that comes later. Have you ever thought about what 'cost' really means in our digital era? Sure, your latest gadget didn't break the bank, but it's chipping away at something far more precious — our planet. The old 'spend to get' adage is getting a green makeover. We're not just consumers anymore; we're stewards of a bigger, more complex budget. Our new balance sheet? It's not just about cash flow, but about our ecological footprint. Earth has turned into a currency we can't afford to devalue. Every 'click to purchase' is an investment in

our planet's future. So, the next time you're tempted to hit 'buy now,' remember you're also dipping into Earth's finite resources. Time to recalibrate our spending, because Information Technology and Operational Technology might just be the calculators for our planetary budget. And trust me, you don't want to see Earth's late payment fees.

Synthetic Biology: Pioneering the Convergence of Tech and Life

Synthetic biology is transforming the lab scene into the frontier of innovation, where DNA is the newest medium for computational mastery. This isn't merely tweaking life's blueprint; it's overhauling the entire operating system. Envision data storage that dwarfs our current capabilities, making traditional computing look archaic.

The canvas of creation is being repainted with organisms engineered for bespoke tasks. These living solutions are poised to revolutionize industries, from cleaning up our oceans with plastic-munching bacteria to brewing biofuels with algae. The impact? A potential overhaul of the production and energy sectors, driving towards a more sustainable future.

Healthcare is shedding its one-size-fits-all attire for a wardrobe of precision medicine. Medications are becoming as individualized as the patients they treat, leveraging genetic insights to tailor treatments. This paves the way for an era of personalized care with unprecedented efficacy, reshaping the pharmaceutical landscape.

Synthetic biology's reach extends into the arts and agriculture, envisaging a world where creativity meets crop production, and where fields are both intelligent and autonomous. And in the quest for sustainability, synthetic biology offers a beacon of hope — microorganisms designed to ingest pollutants and purify our environment, potentially resetting our ecological footprint.

Looking ahead, the convergence of Information Technology (IT), Operational Technology (OT), and Biotechnology (BT) heralds a new paradigm in tackling our world's most pressing environmental and social challenges. This triad synergizes data analytics, machine efficiency, and biological systems to innovate solutions for a more sustainable and equitable planet. We're on the brink of a technological renaissance where these interdisciplinary advancements could redefine how we address climate change, resource scarcity, and health disparities.

In this emerging narrative, synthetic biology is not just a subplot; it's a leading character, driving the plot toward a climax of integration and innovation. The fusion of IT, OT, and BT promises to script a future where technology is not only inspired by life but is integrally woven into its very fabric, offering a transformative approach to our global challenges. This is the promise of a bio-brilliant tomorrow — where biology, technology, and industry converge to create not just a sustainable world, but a thriving one.

'A Few More Things' is our annual, collective moment to peek through a telescope rather than through a microscope. We have entertained things 'maybe' and 'could be' that sit on the fringe of today's tech landscape. It's a nod to Martian ambitions that may fuel tomorrow's blueprints. As we put a pin on it, let's keep an eye on that tech horizon. After all, the next big thing might just be a rocket ride away.

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ADDITIONAL TECHNOVISION DOCUMENTS

TechnoVision 2024 Executive Companion
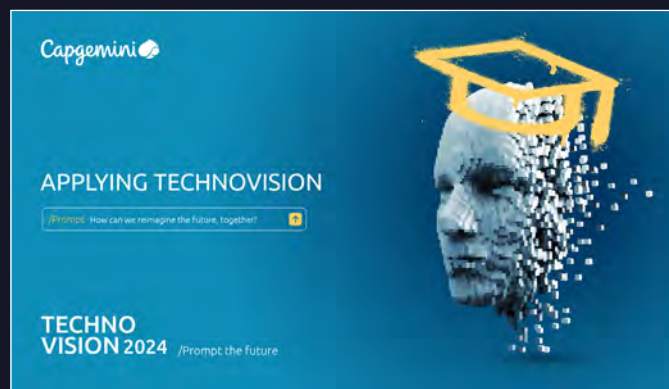
Applying TechnoVision 2024

TechnoVision 2023-24: Public Sector

FURTHER RESEARCH

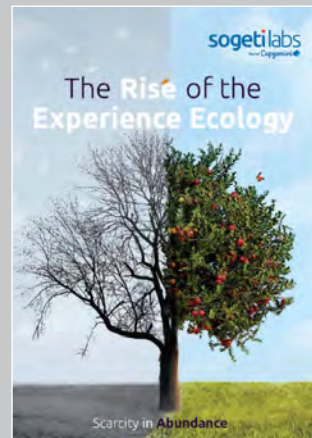**Data-Powered
Innovation Review**

**Quantum Safe
Cryptography**

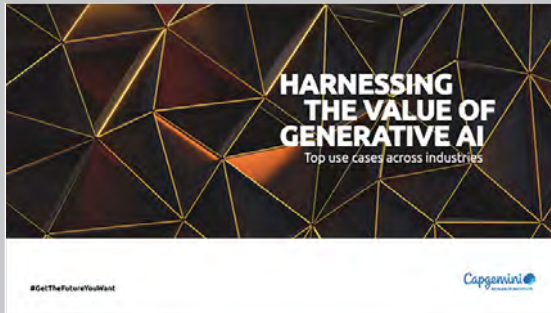**Immersive
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**The Great AI
Experiment**

**The Rise of the
Experience Ecology**

**High Time for Low-Code
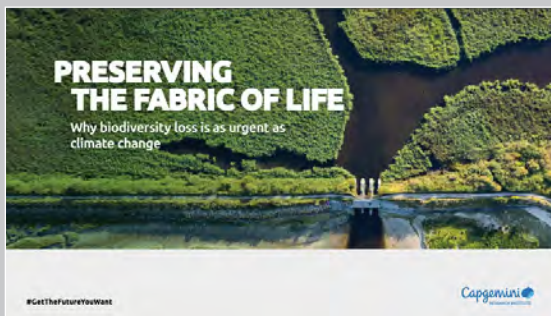in Industrial IT/OT**

GenAI in Organizations

Climate Tech

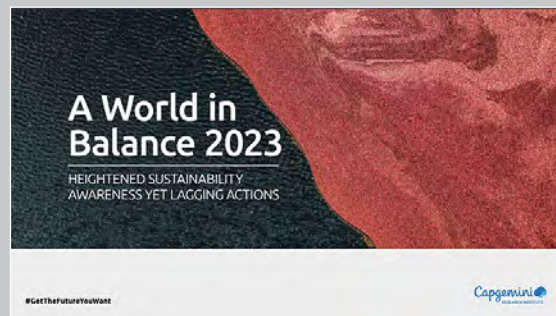**Softwarization**

Open Innovation

Biodiversity

Sustainability Trends

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Capgemini

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