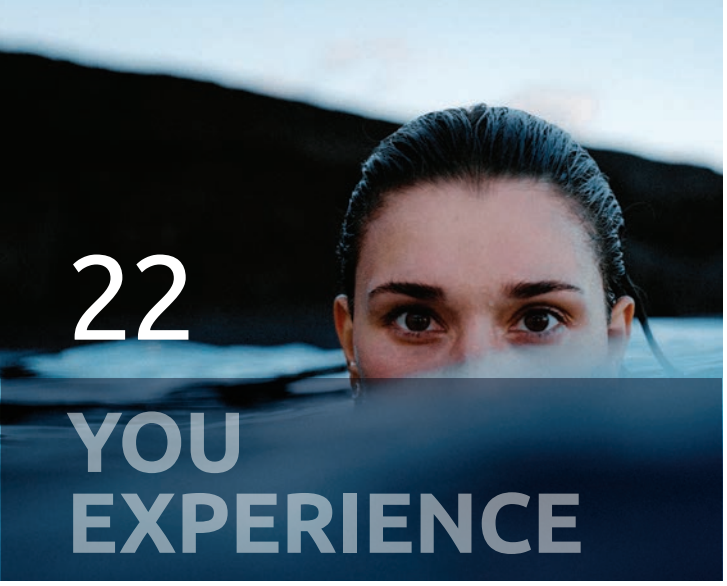
Capgemini

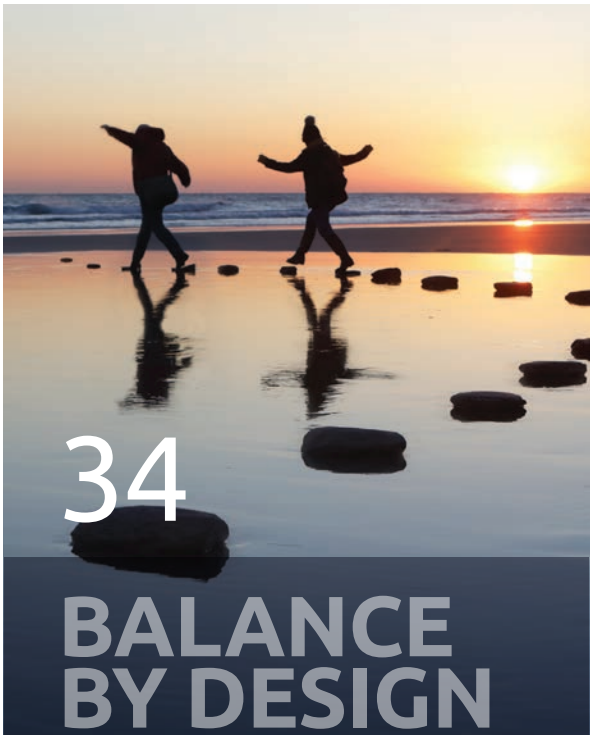
TECHNOVISION
2022

BEING LIKE WATER

TRENDS FOR BUSINESS DECISION MAKERS

Table OF CONTENTS





Foreword

In a world where "normal" seems to be just a metaphor for something vaguely familiar but by no means permanent, recognizing and responding to a rapidly changing environment is paramount for any organization. Society, governments, and businesses alike need to adapt as rules of engagement change: where a shifting demand curve, technological acceleration and dynamic business evolutions all require a different strategy and set of tactics.

To be successful, businesses must determine which technologies will benefit their organization. Yet amidst the flood of technologies consuming the market, it can be challenging to determine what will matter most. Executives require increasing tech savviness to address the huge scale of change, with the ability to apply both short and long-range views, together with fluidity to react in the dynamic environment to which their business operates.

At Capgemini, we pride ourselves in understanding Technology. As demand changes, and technology innovation continues to accelerate, we see a plethora of opportunities to respond to this vast scale of change. Being fluid – like water – helps to prepare our mindset, and plan for the future.

It is one thing to say, "we understand," but another thing to walk the talk.

TechnoVision is a culmination of months of work, and hundreds of people – across industries, domains, continents, and job roles – working to understand technological advancements and translating them into cognitive technology themes:

- Our global networks and communities monitor, assess and synthesize technology evolutions across ten technology domains – activated by architects worldwide, and led by the Technology Innovation and Ventures (TIV) CTIO Network.
- Tech Radars – coordinated by our Technology Assessment Service (TAS) – distill this tidal wave of information to track the evolution of emerging technologies, assessing their relevance and readiness in the marketplace.

The result – in our humble opinion – is a trusted and insightful technology guide for business leaders, CIOs and Tech practitioners to help formulate enterprise strategies and transformation plans.

But TechnoVision is more than an annual trends document; we don't just stop when the annual report is published. TechnoVision is an entire collaborative ecosystem of technology experts, continuously monitoring and sharing what is happening on the horizon, and what impact it will have on the organization of the future.

For a more sector-focused viewpoint, look forward to the series of industry-specific playbook releases throughout the year, or learn how to use TechnoVision, to drive success in your organization and enjoy Being like Water!

Pascal Brier
Group Chief Innovation Officer,
Capgemini

Introduction

In the years since TechnoVision's inception in 2007, our dependency on technology has increased exponentially. Technology brings us closer, allowing us to operate – facilitating collaboration, creativity, and community. So much so, that the very notion of a business not using technology seems incomprehensible. What may once have been perceived as a superfluous luxury, is now wholeheartedly part of the package. And it pertains in equal parts to what we, at least so far, call "business" and "technology."

The technological universe continues to expand, augment, and adapt at a phenomenal rate. Physical and virtual worlds merge, robots teach themselves, and the quantum realm looms ever nearer. Meanwhile, the time that organizations have to adjust to this accelerated technological development is compressed. More is demanded now, with a need to respond faster than ever before. All of this can be daunting: to know what to do, where to go, and how to adapt, all for the benefit of the organization. To respond successfully, it requires more dialog than ever, between everyone in the organization, regardless of business unit, role, or technological affinity.

This is where TechnoVision shines. Designed as an accessible, well-structured framework, it describes 37 technology trends – based on the contributions of Capgemini experts all around the world, from many different domains. There's something in each trend for everybody, whether you are an IT expert looking for new angles, or a tech-curious businessperson wanting to understand the buzz.

This TechnoVision 2022 edition contains many inspiring use cases and stories that underpin each trend. And to refine our focus even more, we've extracted "how to apply TechnoVision" as a standalone publication, enabling access for those who need it and keeping the attention well and truly on the trends for this – now condensed – edition. But because technology is ever changing, and as a response to the rapids of technological innovation, we plan for a steady, continuous release of Sector Playbooks, showing the impact of technology trends and their sector and industry-specific challenges and opportunities throughout the year.

Of course, TechnoVision wouldn't be the same without its slightly left-field, playful approach to technology trends, using a rich, ever-expanding palette of different techniques and a distinct way with words. We hope this year's edition doesn't disappoint. If nothing else, it should bring you some fresh thinking to address the technology business issues of today, and helps you design, plan, and ultimately, get the future you want.

Come on in, the water's fine.

Ron Tolido

Gunnar Menzel

Pierre Hessler

Being Like Water

Sitting in his makeshift shed, the man wields his knife around a plastic bottle, forming the perfect water feeder for his allotment. "Waste not, want not," he whispers to himself in the quiet acknowledgement of a lifelong mantra to repurpose, reuse, and recycle.

In India, they call it *"Jugaad"*: a flexible and pragmatic way of problem-solving, using limited resources in an innovative way. This frugal innovation approach – which may go by another name in different parts of the world – is now more relevant than ever, for many reasons.

We see the world straining its natural resources, no longer able to sustain our current levels of living and consumption. We must be more inventive with what we have, rather than spending too much of our scarce resources on energy-wasting, polluting, "build-from-scratch" activities.

Jugaad Masters skillfully control their tools and materials. Part of their way of life, their chosen "technology" is always with them, always available, always ready to innovate. These masters have become one with their tools and materials, *they are Jugaad.*

Sounds like something we need in today's world of digital technology and business as well.


ASPIRATION
IS NOT
ENOUGH

For the turbulent year of 2021, we recognized the role technology played to deal with the flurry of unpredictable events, challenges, and opportunities. We created the leitmotiv, "***Be Like Water***" inspired by martial artist movie star, Bruce Lee and his most famous quote:

Be like water making its way through cracks. Do not be assertive, but adjust to the object, and you shall find a way around or through it. If nothing within you stays rigid, outward things will disclose themselves. Empty your mind, be formless. Shapeless, like water. If you put water into a cup, it becomes the cup. You put water into a bottle, it becomes the bottle. You put it in a teapot, it becomes the teapot. Now, water can flow, or it can crash. Be water, my friend.

- Bruce Lee

This fluent mix of using whatever comes in handy to deal with the situation would become a trademark of Lee. In TechnoVision, we iterated the importance of crafting technology strategies, architectures, and solutions that are shapeless and formless, yet always flowing. It was a plea for agility, adaptivity, responsiveness, creativity, and resilience, all enabled by technology.

This year however, aspiring to be like water is no longer enough. It is time to extend the adjective far beyond the realms of the vessel to which it is held. It is time to become our own Jugaad Master – to walk the talk. It is time for actively ***"Being Like Water."***

In Capgemini's Digital Mastery research, we see how organizations are building more digital and leadership capabilities – two crucial facets of a thriving Technology Business. They are also addressing culture – another success factor – and promoting the exploration of new, innovative technologies and platforms. Yet, while organizations focus more on upskilling employees than ever before, the increase is much less significant in soft skills areas such as emotional intelligence, adaptability, and collaboration.

If we indeed acknowledge that every Business is a Technology Business (or "Technology ⇔ Business" as we like to call it), then technology can no longer be kept within the walled garden of centralized IT, or whatever other sub-construct it is delegated to. Technology needs to be internalized, embraced, and utilized throughout the organization, regardless of business unit, activity, or individual role.

To aspire is no longer enough. It is vital for organizations to upskill scarce talent, embrace IT and build on the corporate objectives.

Objectives are changing

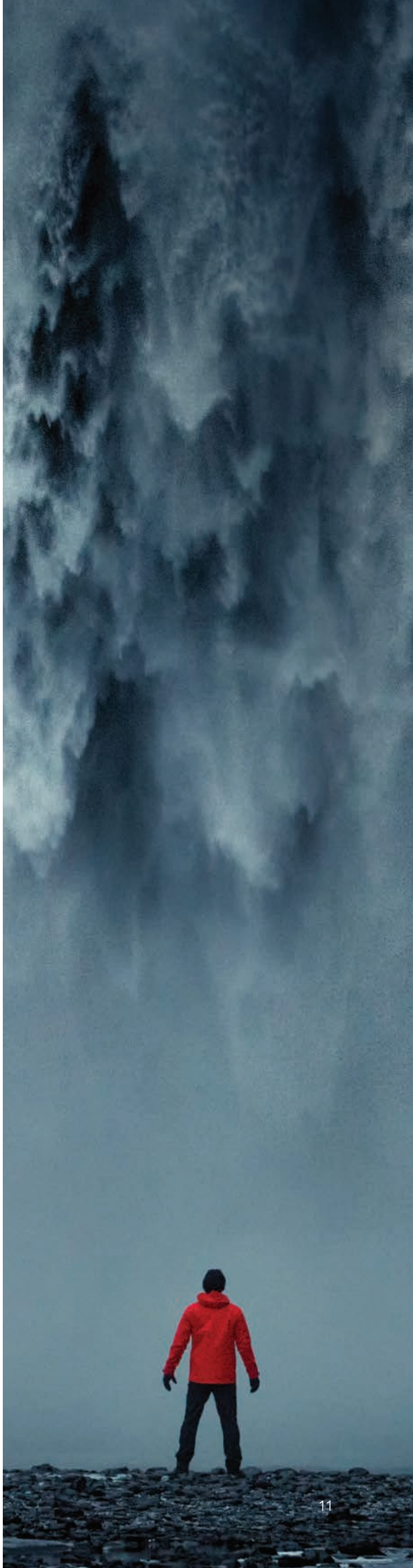
Sustainability returns to the top of the strategic priority list, after having taken an involuntary backseat during the pandemic. An organization's success may soon depend on its contribution to decreasing net-carbon emissions. How we operate, collaborate, travel, even function at the most basic of levels, will have an impact on the organizational carbon balance sheet. And all of that is scrutinized wholeheartedly by customers, employees, and shareholders alike.

Then, scarcity is rapidly turning out to be a new, determining factor for economic success – or failure. This not only relates to scarcity in terms of natural resources (although we must certainly apply caution here), but also human resources: it is increasingly harder to find qualified, skilled, and motivated talent in almost every branch of business, including technology. Furthermore, the next generation of workers is increasingly critical of what organization to work for, actively seeking compatibility with their own values, such as sustainability, diversity, and inclusion.

And finally, the next-level of digital playing field has swiftly emerged over the last two years, triggering a whole new wave of innovation initiatives – whether by cautious challengers sensing unexplored opportunities, or inquisitive incumbents wanting to catch up on a new reality. Capgemini's Digital Mastery research illustrates how innovation leaders still focus on a superior "customer-first" experience and highly effective operations. Yet, combine that with talent innovation and an "employee-centric" experience, and the reimagined business model could really excel.

StratOps: always be changing

While the world returns to some shade of normalcy, we have come to accept the era of Uncertainty[2], where uncertainty for tomorrow has become part of our daily lives today. To thrive, businesses must fluently adjust their strategy to the challenges and opportunities they encounter, transforming both business and technology in a continuous, operational flow. Such a "StratOps" enterprise will embody this fluidity, living and breathing – being like water – and using technology to reboot the organization in this dramatically different world, successfully facing whatever challenge or opportunity it comes across, yet with a powerful and directional flow to fulfill its corporate purpose.



Technology is entwined

Whatever the business and societal challenges and opportunities are, they all have one commonality: they rely on technology to address them as an integral part of the change equation. Most apparent in ***Intelligent Industry***; we see software-driven cars, autonomous factories, and smart products as testament to the raw, transformative power of technology. But this is quickly rippling through other sectors and domains too, such as the smart concepts of "Society 5.0" in the Public Sector, taking its inspiration firmly from "Industry 4.0" (technology still craves version numbers it seems). Technology and business operations have become so entwined, it is increasingly blurry where one ends and the other begins.

And it shows when looking at technology trends in 2022. Whether it pertains to infrastructure, applications, data, process automation, user experience or collaboration, three big Technology Business concepts clearly stand out:

EDGE:

"Edge computing" emerged from Intelligent Industry and the realm of the Internet of Things (IoT). As we watch Information Technology (IT) and Operational Technology (OT) fuse, devices are increasingly enchanted with sensors, storage, networking, intelligence, and automation. Innovations appear magically ever closer to the distributed edge, further away from central IT. But this isn't just a one trick pony, as we see areas such as "headless" application services morph themselves into diverse, individualized user experiences (maybe one day in the looming "metaverse"), entirely dependent on the needs at the edge of the business. The edge is there for a reason, it pushes past our comfort zones, making us think about what's beyond. Exciting innovation happens at the edge – where the rubber meets the road – not at central IT or business units – bringing more applicable technologies to the places where it really counts.

MESH:

Originating in the world of loosely coupled, lightweight networks of autonomous nodes, "mesh" has expanded to the world of applications: a new way of weaving together small, independent application services ("service mesh") for all sorts of – ad-hoc – purposes. Now, it is rapidly conquering the world of data ("data mesh"), as a radically different, federative way of redistributing the ownership of data products to the business domains that are closest to them. And of course, in the multi-faceted user experience world of the Metaverse, mesh appears here as well, illustrating the variety of ways we can collaborate in online spaces. Not to mention the mesh-like characteristics popping up within distributed technologies such as blockchain. Mesh emphasizes the power of decentralization and federated ownership, rather than monolithic command and control.

AUGMENT:

AI and intelligent automation manifests powers across the full spectrum of technology. From smart products and services, intelligent applications, and killer algorithms, to "self-driving" business processes, the potential seems limitless. AI can even be applied for spectacular creative purposes, augmenting humans in ways that were previously considered their eternally exclusive forte. While the discussion on how AI will replace humans – versus augment them – may go on for some time, the increasing scarcity of talent in all major business areas, certainly shows AI and intelligent automation as powerful, sustainable fixes. Ultimately, technology enables us to produce better digital solutions with fewer people. And when provided directly to the business – for example through self-service tools – it serves the technology democratization ambitions any Technology Business should be aiming for.

A Need to Upcycle

Sustainability is finally a business priority. What once might have been just a line item for boardroom consideration is now right at the top of the corporate agenda. Every executive must help their organizations deliver on sustainability targets – and CIOs must play a fundamental role in a shift towards a "circular economy." By transforming the linear take-make-waste system to a more regenerative process, everyone can benefit, not least the corporate agenda. But we must address how much technology consumes and wastes finite resources. Millions of tons of electronic waste are generated worldwide every year, yet less than one-fifth of that e-waste is recycled.

Rather than rip and replace, we should recycle and reuse. Jugaad should become a way of life in IT, finding ways to tease more life out of the technology products used in our businesses. We need to think much more creatively about the hardware and software we discard. We must acknowledge that precious resources are finite. As an industry, and as businesses that consume these IT products, we have a responsibility to do better. We must find ways to extend the life, to reuse, or maybe even upcycle the technology we already have.

In India, Jugaad is often due to necessity: to innovate to find a solution for a problem. Elsewhere, organizations ignore making such choices: when something breaks, simply replace it. That attitude is now an anathema. The world demands change. But aspiring to change is only the starting point. Customers, and employees know that actions speak louder than words – and they will spot any attempts at uncommitted pretend and "greenwashing."

Jugaad should become a way of life in IT. Rather than rip and replace, we should recycle and reuse. We need to think more creatively about the hardware and software we discard and must find ways to extend the life, to reuse, or maybe even upcycle the technology we already have.

Epilogue

The man picks up his knife again. For him, Jugaad never ends. Everything has its place in this shed; each element unique, serving a bespoke purpose, doing its job perfectly. But there is always something new to achieve, some fresh creativity to apply. As a Technology Business, we can learn from that attitude: by no longer just talking about plans, but by walking the talk, living the mantra. By mastering our digital tools seamlessly within the organization, we can use technology to innovate, adapt, and achieve our corporate and societal goals. And by integrating technology with business so fluently that one no longer works without the other, they become essentially one and the same; being – and flowing – like water.

Questions to Ask

Mastering a Technology Business is not only about understanding trends and their overarching themes. It's about making it work, to move from articulating aspirations to actually "***Being Like Water***" in a Technology Business. Applying a Balance by Design mindset, we recommend asking seven questions at any signature digital juncture – when assessing a strategy, a portfolio, program, project, or architecture, or simply any time a promising innovative idea pops up:

Are business and technology the same?

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

Are systems and processes designed and built for change?

Move adaptability from afterthought to prime time.

Are systems and processes open by default?

Upgrade your technology platform to the ultimate Technology Business platform: a superior, open set of attractive services, acting as a magnet for active collaboration, internally and externally.

Do plans and actions contribute to societal good?

Boost the organization's societal purposes by saying "Yes" to technology that boosts sustainability and say "No" to what is energy-wasting or non-essential.

Is trust at the foundation of the organization?

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.

Is the data and AI applied human-centered?

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

Are all hands-free perspectives considered?

Assume full, hands-free automation as the default for all new Technology Business processes.

OVERVIEW OF TECHNOVISION

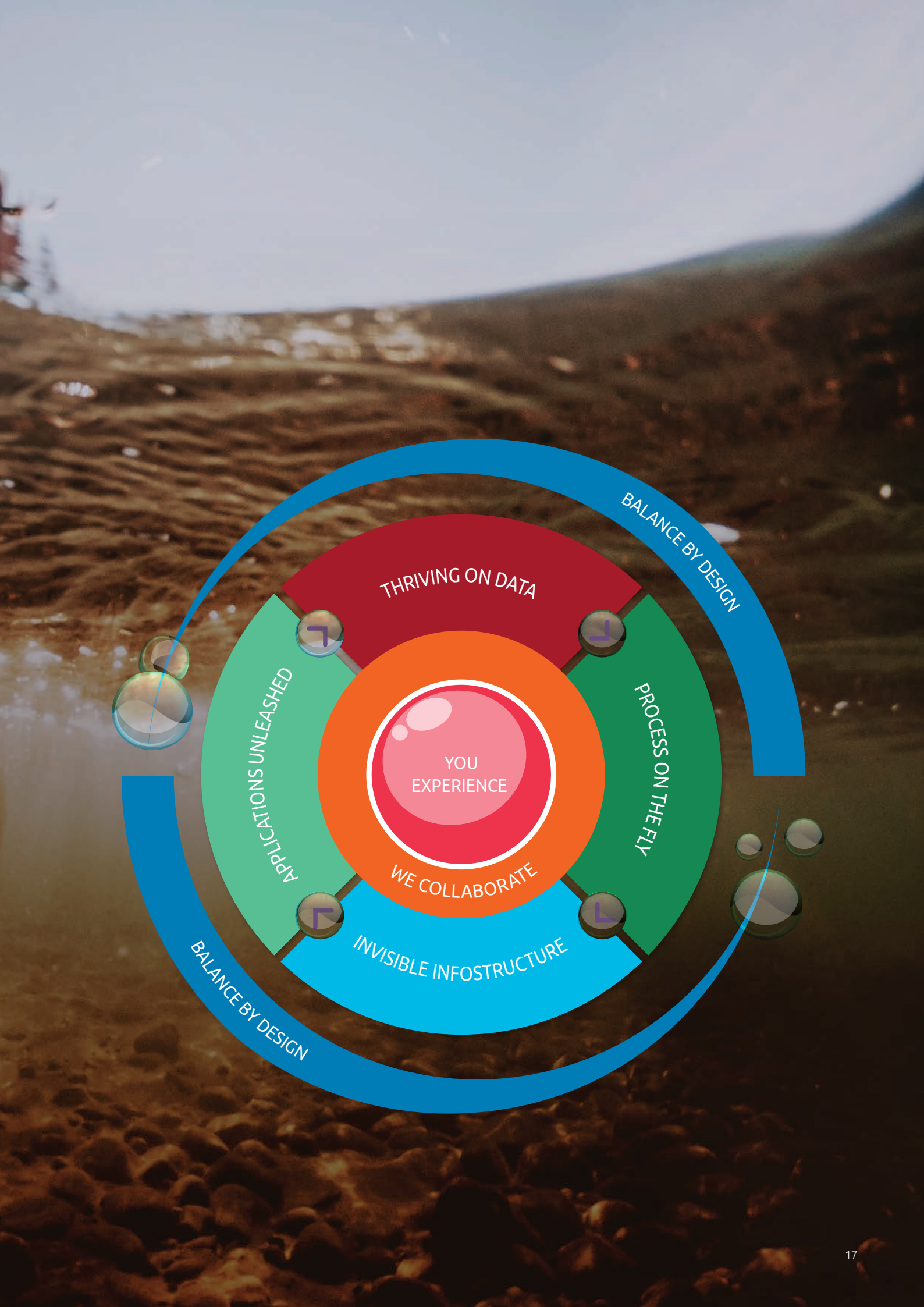
TechnoVision categorizes technology trends into six well-defined containers, offering a snapshot of innovation from different perspectives (the "what") – ranging from user experience and collaboration, via data and process automation, all the way to infrastructure and applications. A seventh container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

Those familiar with earlier versions of TechnoVision, will notice that we have discontinued the framework picture we have been using for years, which to some – unintendedly – suggested a sequential transformation from the more systems-orientated (infrastructure and applications) to the human-centered side (user experience and collaboration). Others thought they saw an architectural diagram.

To stay true to one of the key themes of this year's edition, we upcycled a somewhat older framework: a holistic, circular version, firmly placing You Experience and We Collaborate at the heart of the technology-driven exchange. This core foundation is surrounded by the more functional containers – Thriving on Data, Process on the Fly, Applications Unleashed and Invisible Infostructure. All wrapped up with Balance by Design, as the overarching container to be considered while working with the others.

Within each container, trends are presented as one-page summaries, designed to be crisp and to-the-point, yet appetizing enough to warrant further study. Balance by Design follows a similar format, offering a view of how to shape balance within an organization using easy to digest one-page principles.

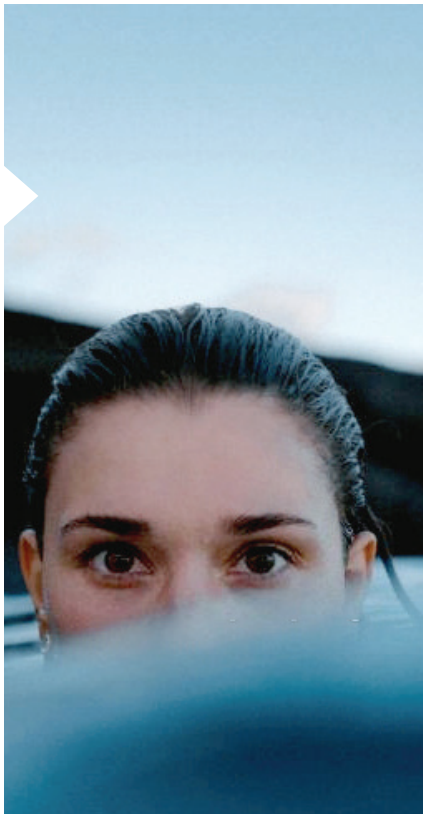
Read on for the summaries of the seven TechnoVision containers:


BALANCE BY DESIGN
THRIVING ON DATA
APPLICATIONS UNLEASHED
PROCESS ON THE FLY
YOU
EXPERIENCE
WE COLLABORATE
INVISIBLE INFOSTRUCTURE
BALANCE BY DESIGN

You Experience:
immersive, low-touch, emphatic

You Experience forms the very definition of a highly personalized, seamless user experience. As technology entwines itself in our daily lives, the user experience is no longer a separate discipline. Fully immersive, it is now an integral part of life: at home, at work, or even in leisure time. Organizations can no longer take the well-loved "customer-first" route, but must consider "employee-first," and even "partner-first" routes too, emphatically considering user experiences from a holistic, end-to-end perspective. Loyalty, advocacy, and satisfaction remain buzz words, joined by talent retention, engagement, emotional connection, sustainability, and inclusiveness to boot.

- Experience[2]
- Me, Myself & My Metaverse
- No Friction
- I Feel for You
- My Own Private Avatar



We Collaborate:
teamed, distributed, creative

Many realities have changed irrevocably since the pandemic – how businesses operate and collaborate being one of them. Many aspects of value delivery are now entirely independent of location and time. People work together in different ways, increasingly at the very edges of what used to be considered the "core organization." Consumers and employees expect creative, integrated experiences. It requires a new level of cross-organizational, cross-sector partnering to meet these expectations. Distribution is the leading design principle, together with mesh-style, loosely coupled collaboration. And as the physical and digital fuse, it's no longer clear where technology ends, and business begins.

- Fluid Workforce
- The Team is the Canvas
- Taken by Tokens
- Your Business is a Mesh
- It's All Connected

Six well-defined containers offer a snapshot of innovation from different perspectives, ranging from user experience and collaboration, via data and process automation, to infrastructure and applications.

Thriving on Data: algorithmic, federated, shared

It's 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 equally enables organizations to achieve their sustainability ambitions. It's tempting to declare data to be the new, corporate asset. But assets tend to be stacked, isolated, and safely put away. It's much better to see data as a first-class product; owned, managed, and activated by business domains, and shared in lively exchanges inside and outside the organization.

- Data Sharing is Caring
- Power to the People
- Data Apart Together
- Era of Algorithms
- Creative Machine

Process on the Fly: binding, portable, self-driving

Strategy tends to be eaten for breakfast, by culture – but also by a lack of operational execution. Organizational aspirations simply "blah blah blah" without any ability to turn insight into action, quickly respond to events, or go with whatever flow the corporate purpose supposes. And all that goodness must be delivered against a scarcity of skilled resources and a need to reduce travel and energy consumption. This is where Process on the Fly shines brighter. Having been less in the spotlight than its complementary container, Thriving on Data (ever heard of "Big Process"?), breakthroughs within intelligent automation and a taste of touchless execution, firmly places this container center stage.

- Process is Mine Mine Mine
- Rock, Robot Rock
- Silo Busters
- Can't Touch This
- Augmented Me

Applications Unleashed: meshed, headless, augmented

At the heart of any Technology Business is its applications portfolio. A 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, to a 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 microservices. With agility and minimum viable products no longer the "new normal," but the "well and truly established," the quality of application services needs to be at enterprise level, with a continuous, flawless deployment throughout all business operations.

- Kondo My Portfolio
- Honey, I Shrunk the Applications
- When Code Goes Low…
- Mesh Up Your Apps
- Apps ❤ AI

Invisible Infostructure: omnipresent, autonomous, invisible

The odyssey towards a truly invisible IT infrastructure remains ongoing, but progress is being made. For many organizations, the pandemic accelerated a move towards the cloud; a signpost of increasing "invisibility." To keep up with the pace of a Technology Business, IT infrastructure needs to be omnipresent, fluently adjusting to the whimsical ways of the time. A software and AI-driven, nearly autonomous supply chain is key – reliability built in. It also deals with the scarcity of skilled experts and excess energy consumption. But IT infrastructure also expands its reach, integrating Operational Technology and "things" at the edges of central IT, showing yet again that "Infostructure" is not a spelling mistake.

- Lord of the Clouds
- Crouching Tiger, Hidden Container
- Simply the Edge
- Ops, AI did it Again
- Silence of the Servers

Balance by Design: overarching, transformational, purposeful

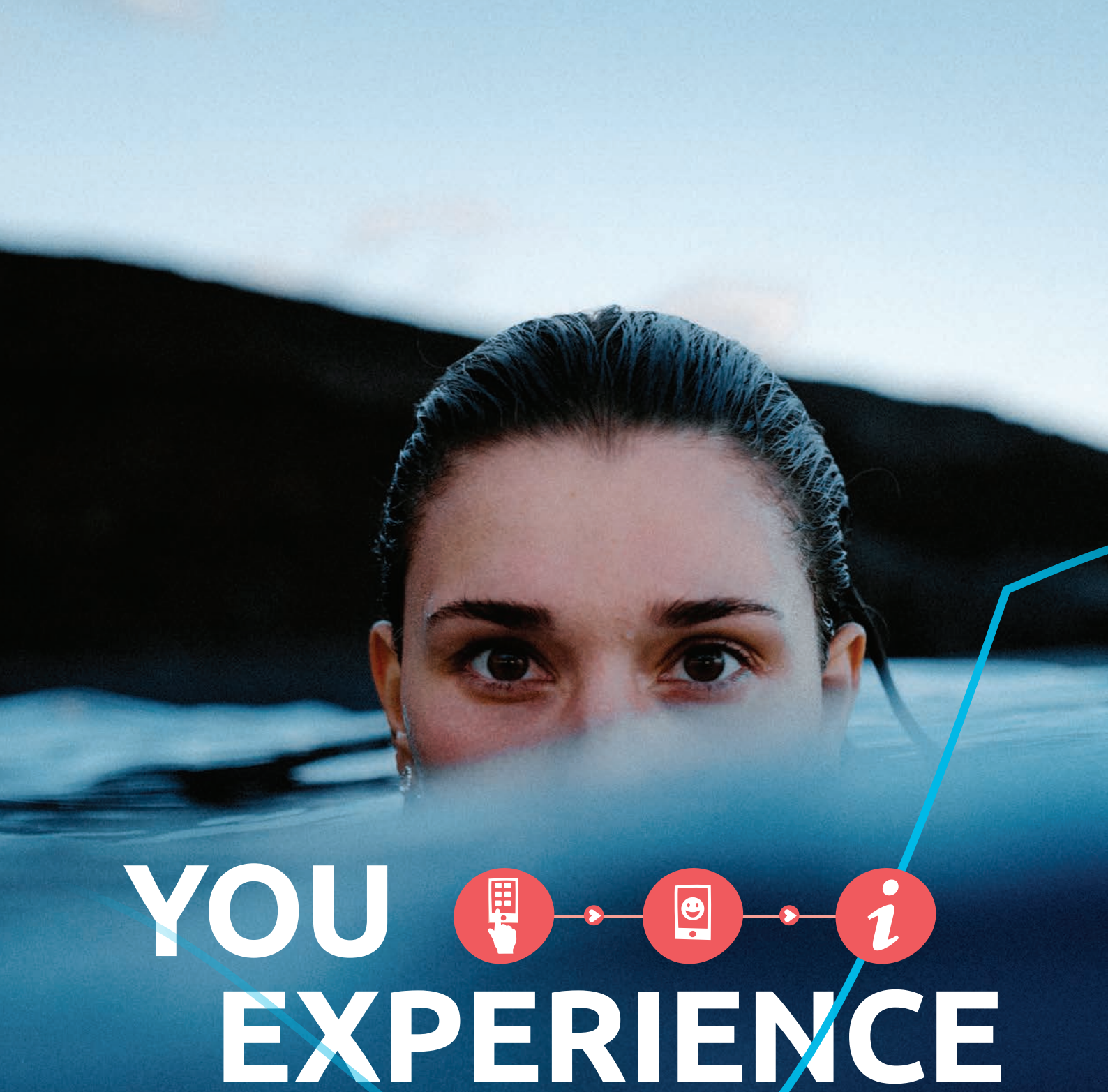
The essence of designing a Technology Business is to find and preserve several balances in parallel: balance between the interests of stakeholders, between short and long term, centralized and decentralized, friendly and authoritative, purposeful and spontaneous. Besides the WHAT of technology trends, TechnoVision offers a view of HOW to shape these balances within the organization – by purposeful design. The principles within this container aim to provide control questions for executives, a bouquet of perspectives for architects, and a systematic checklist for anybody involved in a Technology Business portfolio, program, project, or initiative.

- Technology∈∋Business
- With Open Arms
- Adapt First
- Do Well, Do Good
- Trust Thrust
- IQ EQ CQ Up
- No Hands on Deck

As always, the authors have had their way hiding copious references to rock, pop, movies, and other cultural and societal phenomena. The reader is invited to find as many of these "Easter Eggs" as possible. It should not be ruled out however, that Generation Z and their "OK, Boomer" colleagues – blessed as they are with quite different frames of reference – may find completely different hidden gems.

If you still possess an appetite for more, the TechnoVision Expert Connect community offers a variety of detailed posts and articles about your favorite 37 building blocks. And by all means, read our sister report "Applying TechnoVision" for various means of using, applying, and playing with TechnoVision in a unique and entertaining way. Finally, to dive even deeper into the TechnoVision universe, watch out for our sector and domain specific TechnoVision Playbooks to be released throughout the year.

A seventh container offers a series of overarching design principles for transformational impact. They help to build a sharp mindset, ready for any program, project, architecture, innovation initiative, or idea.



YOU EXPERIENCE

The definition of a highly personalized, seamless user experience – literally, a You Experience – has been included in our TechnoVision dictionary for some time. Yet, as technology entwines itself in our daily lives, the user experience is no longer a separate discipline. It is now an integral part of how we experience life: at home, at work, when shopping, traveling, or even when enjoying leisure time. Organizations can no longer take the well-loved "customer-first" route, but must consider "employee-first," and even "partner-first" routes too, considering user experiences from a holistic, end-to-end perspective. Loyalty, advocacy, and satisfaction remain buzz words, now in the company of talent retention, engagement, and emotional connection to boot. Here, we should take the principles from the School of Positive Computing to heart and apply well-being factors such as self-awareness, mindfulness, empathy, and compassion too. Call it *Us Experience*, **if you like.**

Having successfully busted corporate silos to infuse technology in all its business operations, a Technology Business recognizes that a user experience does not solely relate to the front-end of digital customer channels. It's a matter of living and breathing the user experience across all aspects of the corporate value chain, including the innovative technology that enables it. This Experience² mindset is no longer just applicable to the customer but pertains to the employee experience just as much. And it's not only bringing benefits in terms of better integrated service delivery to customers, it also helps to boost performance and productivity – even with a scarcity of human resources – and keeps employees motivated, inspired, and engaged with the organization's societal purposes.

Having said that, have we mentioned the innovative technologies that enable a whole new wave of digital interaction and immersion?

AI continues to advance, making conversational chatbots and voice assistants worthy, emphatic partners. Our research into the art of customer-centric AI shows that customers are increasingly using AI-based systems to interact with organizations. Already more than half (54%) of customers have daily AI-enabled interactions with organizations, including chatbots, digital assistants, facial recognition, and biometric scanners – three quarters of whom fall within the 18-35 age category. Unleash the power of machine learning on all the data points gathered through this emerging "Internet of Behavior," and the ingredients are at hand to create a truly frictionless, low-touch experience. One that seems to sense the intent – and the emotions – of the consumer or the employee even before she expresses them herself.

Next stop: the notion of virtual avatars and the Metaverse, heralded as the next incarnation of the mobile internet. It signals a further blurring of the boundaries of what we consider physical or digital, real, or fake. Originating from the world of gaming – where younger generations already make little distinction between their online digital and offline analogue identities and experiences – the phenomenon is now quickly spreading to more consumer and business contexts. It's fascinating to envision what ***You, Me, and Us*** will look like in this brand new, unexplored experience theater.

WE COLLABORATE

Back to life, back to reality. The world may return to some semblance of what it looked like before the pandemic, but many realities have changed irrevocably – how businesses operate being one of them. Many aspects of value delivery are now entirely independent from location and time. People work together in different ways, in different setups, increasingly at the very edges of what used to be considered the "core organization." Consumers and employees expect integrated experiences, with their latest online endeavors fresh in mind. It requires 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. And with physical and digital worlds fusing, it's no longer clear where the technology network ends, and the business network begins. Oh, it's back to life. But not as we know it.

As employees transitioned from office spaces to their homes, organizations have seen unprecedented changes in value creation and delivery, critically without compromising on productivity. The transformation is only not limited to the change in physical location but is also evident in how the workforce is compiled. Permanent employee teams are increasingly augmented by the "gig economy," as enterprises look for more adaptive, more resilient sourcing models.

Virtual workplaces have necessitated the advent of new productivity tools and techniques, bolstering the team as the default entry into the workday. An always connected – yet asynchronous – collaborative style of working is breaking barriers of geography and time zones, redefining what we call "just another day at the office" now and in the future.

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 yes, even competitors. It's also by far the best way to achieve joint targets for sustainability and areas of social good.

The convergence of the physical and virtual worlds leads to a new, distributed online economy, powered by trust. Digitization of assets is spreading, from Financial Services to other sectors as well. Distributed ledger technology now finds use in areas as diverse as art, retail, real estate, and the upcoming Metaverse. This new economy certainly looks decentralized, with autonomy enabled via peer-to-peer transactions.

At the very foundation of it all are the ever-evolving technologies, such as IoT and AI, enabled by ubiquitous (5G) connectivity. The sheer volume and speed of connections and data demand more intelligence and actionability at the very edges of business and IT. That way, technology becomes business, business becomes technology.

Sound familiar?

THRIVING ON DATA

It's no wonder organizations aspire to thrive on data, to be data-powered enterprises. With every business now being a de facto Technology Business, data obviously is at its core. Dare we say, every Business is a Data Business? Look at the facts: data powers superior customer experiences, highly tuned operations, and smart, self-optimizing products and services. Data provides resilience, predictability, and effectiveness, but equally enables organizations to achieve their sustainability ambitions. It also helps their potentially scarce human resources to achieve the best, most satisfying results. With that, it's tempting to declare data to be "just" the new, corporate asset. But assets tend to be stacked, isolated, and safely put away. It's much better to see data as a first-class product; owned, managed, and activated by business domains, and shared in lively exchanges inside and outside the organization.

When dealing with data, it's good to start with proper definitions. Data is the digital representation of an organization's past and present, encompassing its processes and interactions with customers, ecosystem, and the market. Also, a "data-powered enterprise" is an organization that creates, processes, and leverages data proactively to achieve its business objectives, drive innovation, and fulfill its corporate purpose.

It is certainly advantageous to be one. Our Capgemini Research Institute noted in its Data-powered Enterprise report that the trailblazers, the "data masters," see a 70% higher revenue per employee, a 245% higher fixed asset turnover, and 22% more profitability. Even more importantly, they achieve a 20% decrease in customer churn, and a 19% increase in customer satisfaction. They also enjoy a 19% employee productivity enhancement, and 16% more operational efficiency. The list goes on – did we mention cost savings and better sales?

All the more reason for 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, assuring data quality. But ***activating data*** at the heart of the business strategy, having people in the operations to embrace, trust, and use data for all their business purposes, is a different ball game – let alone monetizing data, and building a company-wide data-loving culture.

It puts this data activation at the heart of all trends:

Sharing and collaborating on data in all sorts of different internal and external ecosystems is one way to turn data from an asset into a first-class product. It gets more value out of data, but also drives achieving key sustainability goals.

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

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

Ever evolving algorithms – built and trained on data – show what activation really looks like. Advanced breakthroughs in technology, for example in autonomous devices and battling climate change (see our research report), are due to the latest in algorithms and AI.

Then, as its ***pièce de résistance***, AI systems work together to create and generate text, video, audio, test data, and program code. It makes humans thrive in their most creative tasks and endeavors, including those who didn't have the means or ways to do so before.

PROCESS ON THE FLY

Strategy tends to be eaten for breakfast, by culture – but also by a lack of operational execution. Organizational aspirations simply "blah blah blah" without any 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 skilled human resources and a need to reduce travel and energy consumption. This is where Process on the Fly comes to the fore and shines ever brighter. Having been consistently less in the spotlight than its complementary container, Thriving on Data (ever heard of "Big Process"?), breakthroughs within intelligent automation and a taste of touchless execution have firmly placed this container center stage. Quit talking and start doing.

In many ways, a process is really just another "thing." When equipped with "sensors," it can provide a continuous flow of data points about its status and whereabouts, not unlike the concept of a Digital Twin in the Intelligent Industry domain. With this digital twin process available, it opens up a full spectrum of possibilities 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.

Then, software robots come to the aid as dependable, digital companions, automating the interaction between humans and their technology-enabled processes. This Robotic Process Automation gives us the time and freedom to think, plan and focus – while the more mundane, repeatable activities are done for us, 24 hours per day, 7 days a week, without compromise. It also helps to relieve the pressure on organizations that need to deliver more, with less.

Similar technologies act as a certified 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 what is already there, rather than buying or building solutions from scratch. Add some next generation application services to the mix (see for example Mesh Up Your Applications), and any process is just an API call away.

Finally, the powerful cognitive capabilities of artificial intelligence increasingly enter the arena of process automation and management. They challenge what we used to consider as a given, replacing inflexible, human-dependent processes with powerful reasoning systems. These systems adjust to whatever situation occurs, anticipating next best actions and resources required in real-time. And while learning from what works, they increasingly become hands- and care-free, bringing organizations – and its people – on the road towards a no-touch, frictionless enterprise.

Pretty fly, no?

APPLICATIONS UNLEASHED

At the heart of any Technology Business is its applications portfolio. A 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, to a high quality, and in whatever incarnation necessary. Yet, changes are afoot, dear Watson. Many applications no longer look like the ones we used to know, as they morph into a connected mesh of microservices. And where is that old-fashioned user interface again? With agility and minimum viable products no longer the "new normal," but the "well and truly established," the quality of application services needs to be at enterprise level – with the trust balance of the organization secured by design, and a continuous, flawless deployment throughout all business operations.

The applications portfolio of a Technology Business is lightweight, free of corporate boundaries, easy to connect to, and built on cloud-native and microservice-based capabilities – all the while adapting to ever-changing needs. But achieving such a contemporary portfolio is far from easy, and several aspects need to be considered.

Simplifying, rationalizing, and ultimately decommissioning inflexible, aging applications is a daunting task that no IT expert learns in school. Yet, it is key to levelling 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.

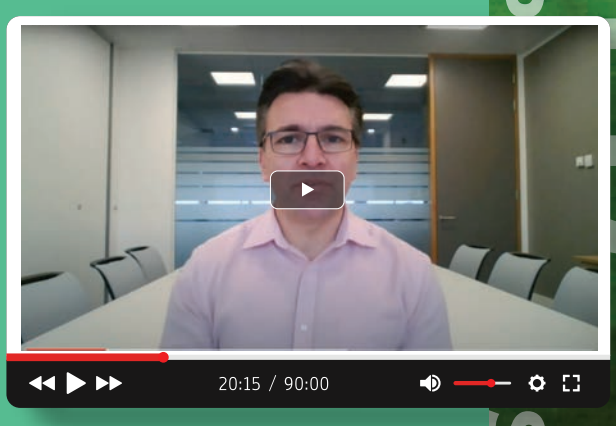
When new application services are built, they must be done in an agile, continuously deliverable way – where business and IT people are in integrated teams, perfectly in sync with the actual operations. Exactly what we'd expect from a Technology Business. And, to add even more decisiveness and transparency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

Having said that, why build at all if you don't have to? Building applications is a challenging, complex undertaking – and the scarcity of skilled experts doesn't help. Low-code tools provide high productivity and enable more people to develop the apps, increasingly on the business side of the wonderwall. Even more so, reusing and buying off-the-shelf apps is preferable to custom-built: it saves time, money, resources, and – yes – even energy.

The resulting assortment of application services should be a finely tuned portfolio; highly accessible and easy to connect to other services, both inside and out of the organization. Then there's the emerging concepts of the applications service mesh as an enabler to similar models in the business, where it's only a matter making secure and easy connections – in countless ways and in rapidly changing constellations.

Still, have more ambitions: look to upcycle and augment applications by adding touches of "smart" through increasingly powerful AI services to significantly prolong the life of application services, eradicating the need to rebuild or replace them. Your very own Philosopher's Stone for your applications portfolio, there to serve you – if you use it for good.

They're eagerly waiting to be uncaged. Unleash your applications!



INVISIBLE INFOSTRUCTURE

O' Infrastructure, Where Art Thou? The odyssey towards a truly invisible IT infrastructure may still be ongoing, but progress is made. For many organizations, the pandemic era accelerated a move towards the public cloud; a signpost of increasing "invisibility." It is now the default choice amid a diverse range of cloud deployment options. To keep up with the pace of a Technology Business – or rather, being its pacemaker – IT infrastructure needs to fluently adjust to changing needs and the whimsical ways of the time. A software- and AI-driven, nearly autonomous supply chain – with reliability engineered within – is key to that. It also deals with the scarcity of skilled experts and excess energy consumption. But IT infrastructure also expands its reach, integrating Operational Technology and "things" at the edges of central IT, showing yet again that "Infostructure" is not a spelling mistake.

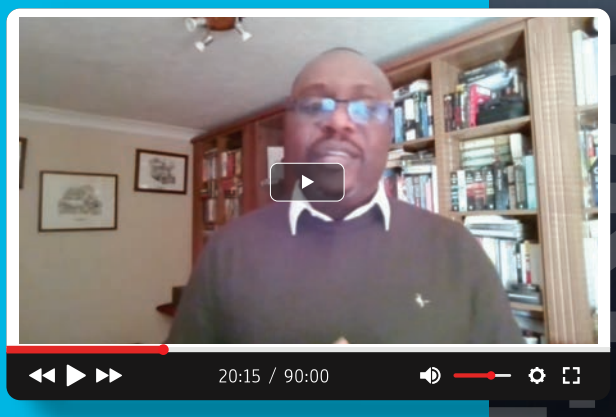
Technology Business operations cannot be successful without up-to-date, reliable, and secure IT infrastructure operations. They are more or less one, inseparable by definition. This is evidenced by the "All Ops" movement (such as DevOps, DevSecOps, DataOps, MLOps, ChatOps), in which IT operations are fully integrated in business change and solutions development. Not as an afterthought, but by design.

The quality levels, availability, and elasticity of such an IT Infrastructure platform can increasingly only be provided by the Cloud. It is not a surprise that our latest Digital Mastery research shows Cloud services are projected to more than double by 2023, growing at a five-year CAGR of 32%. For new solutions, Cloud is the de facto choice, but a diversifying range of deployment options – typically involving multiple providers and locations, including regional sovereign clouds, which – based on Capgemini's recent research – will be adopted to ensure compliance with government regulations and standards, reduce exposure to extra-territorial laws and provide a trusted safe environment for data.

Software-driven configuration and execution, standardization, and simplification technologies such as containers, AI-driven intelligent automation, plus built-in cybersecurity and reliability, all add to the secret of having a scalable – always available – resilient IT infrastructure. One that makes IT infrastructure move and morph in exactly the same cadence as the business operations it enables.

But there's more to achieve. Our recent Sustainable IT research found that only 43% of executives are aware of their organization's (often considerable) IT carbon footprint. So intelligently optimizing the use of available IT assets – and recycling them whenever possible – not only brings cost benefits and agility, but also raises the corporate ESG score.

Finally, as our latest Digital Mastery research report shows, 62% of organizations are already implementing Internet of Things (IoT) technologies in their operations. And, no longer is it just the Intelligent Industry realm in which innovations at the "Edge" drive new business. Operational Technology fuses with Information Technology everywhere, creating an all-encompassing "Infostructure" that securely manages brand new loads of networking, compute, data, events, application services, and devices.



BALANCE BY DESIGN

The essence of designing a Technology Business is to find and preserve several balances in parallel: balance between the interests of stakeholders, between short and long term, centralized and decentralized, friendly and authoritative, purposeful and spontaneous. Besides the WHAT of technology trends, TechnoVision offers a view of HOW to shape these balances within the organization – by purposeful design. The principles within this container aim to provide control questions for executives, a bouquet of perspectives for architects, and a systematic checklist for anybody involved in a Technology Business portfolio, program, project, or initiative.

Presented on a single page, each **principle** is deliberately contrasted with an **anti-principle:** 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 we can apply it on a continuous basis, and finally **the openings** propose the potential first steps for any organization, like the opening moves of a chess game.

We start with **Technology∈Business** (pronounced as "Every Business is a Technology Business"), which makes the case for not "just" aligning business and technology, but fully unifying the two – achieving full transformational impact across the entire organization.

We continue with **Adapt First**, as we still need "water-like" capabilities to seamlessly adapt to whatever changing circumstances may occur inside and outside the organization. Hence, Adapt First is a mantra that cannot be chanted enough.

Being open to any expected or unexpected partnering opportunity out there is now the hallmark of a true Technology Business and being **With Open Arms** means transforming your platform into a true business magnet.

With sustainability now featuring as one of the top of corporate priorities, **Do Well, Do Good** suggests boosting the organization's societal purposes by saying "Yes" to technology that fosters sustainability, and "No" to what is energy-wasting or non-essential.

As trust levels ebb, Technology Businesses must respond with a powerful **Trust Thrust**, which unifies business and technology strengths to carry the torch for trust, protect the corporate foundation and propel business growth.

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

Or are we? Our last design principle of **No Hands On Deck** tantalizes us with the prospect of a fully automated, hands-free business while suggesting a stepwise approach to getting there (if we ever do).

Each of the seven principles is designed to provide guidance on its own. Embrace all seven as a set, make them your Technology Business seven-league boots!

A Few More Things

If Marty McFly travelled back from the future with a TechnoVision report in his back pocket rather than a sporting almanac – what would it say? Unfortunately, no one has a DeLorean time machine, so it seems impossible to envisage the future accurately. Yet, what we can see, is the emergence of key trends we believe will further shape our technological horizon. Maybe not this year, but soon. Very soon.

METAVERSE
The metaverse may just look like a newfangled version of Virtual Reality 2.0 (or even worse, a reload of Second Life) – but many consider it to be the future of the internet. A space where mixed reality augments our own selves, allowing us to socialize, learn, and collaborate in ways far beyond what we envisioned before. Bigger than just a single enterprise or industry, the distributed Metaverse may be created, used, and enjoyed by people all over the world, without exclusion. Yet, still very much in its infancy, no one can accurately predict where the Metaverse will take us, and when. What will our lives look like inside the Metaverse of the future? How can we trust its content and its participants? Will blockchain come back with a vengeance within this context? No one knows, there is no precedent. The one thing for certain: it is definitely one to watch. You hear that Mr. Anderson? That is the sound of inevitability!

THE QUANTUM EQUATION
Quantum computing is maturing, arguably like a fine malt. A technology which is still giving off its angel share, unpredictably unstable, not yet operational for mainstream use. But as a quantum of solace, exploration and experimentation are ongoing (Capgemini deploys its own Quantum Lab). No longer is the question a matter of "if", but "when." Or is it? Quantum computing is already a key consideration when thinking about the future of Cybersecurity and encryption. And hopefully, it will be pivotal to address some of our biggest societal challenges, such as the climate crisis and public health as well.

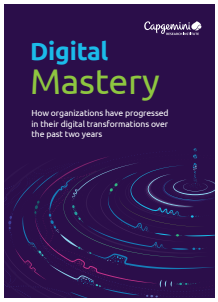
PERMACOMPUTING
Like the frugal qualities of Jugaad? Take a further look at "Permacomputing": aiming to counteract the wastefulness of the computing world. Until now, only a fraction of electronic waste is recycled. Aside from the clear environmental burden, that's tens of billions of gold, silver and other high-value, recoverable materials that could have been collected and reused – a sum greater than the GDP of most countries. Permacomputing extends the lifespan of hardware, reducing the carbon footprint of what is already produced. Reducing the energy consumption of software (both when building and using it) is another aspect, viewing resources as precious, to be used as effectively as possible, only when necessary. The circular economy is coming, make sure it also pertains to IT.

CREATIVE AI
Competitive language transformer models outgrow each other month on month, our fascination by the evolution of generative and creative AI grows even more intense. Yet there is much to consider. Soon, it could be almost impossible to distinguish real from fake – even more so within the Metaverse. Furthermore, training generative AI models consumes a lot of expensive and wasteful computing resources, in direct contrast to our pleas for frugal, upcycled computing (admittedly, applying the models once trained is much better for the carbon balance sheet). Finally, now creative AI has firmly arrived in the once human-only realm, the quest for staying human-centered becomes more relevant than ever.

PURPOSE INTENSITY
For a Technology Business to excel, organizations must now consider the importance of purpose directionality, continuing with their digital strategies while keeping a clear view on the shifting values of society, and what is deemed socially desirable innovation. The more technologically nimble – "born digital" – giant corporations may dominate the marketplace, but they also display a remarkable lack of understanding when it comes to purpose intensity. To outcompete these corporate colossi, incumbents are increasingly adopting a strong purpose directionality. Yet, it is the CIO's responsibility to translate the corporate purpose statement into thought-provoking technology choices. Every technology needs to be tested against the purposeful objective of what role the organization chooses to play in the digital society that is being created. Impact on the environment, the inclusion of the digital have-nots, racial equality, and gender balance – to name only a few – suddenly become factors for consideration in decisions that were once purely technological.

In any case, a more sustainable world where no one is excluded may very well depend on our ability to augment ourselves with advancing technology. Now that sounds like a future you definitely want to go back to.

Further research

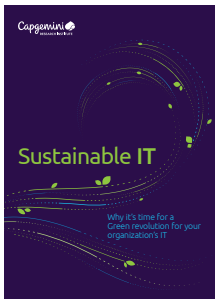


Digital Mastery

Circular Economy for a Sustainable Future

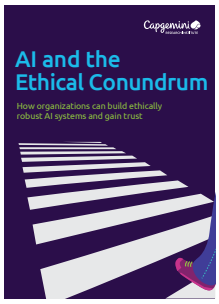
Data Mastery

The Data-powered Enterprise



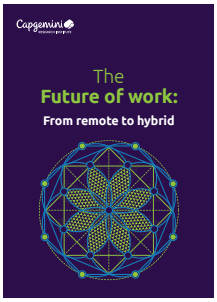
Sustainable IT

Climate AI



AI and the Ethical Conundrum

Sustainable Operations



The Future of Work

Next Destination: Software

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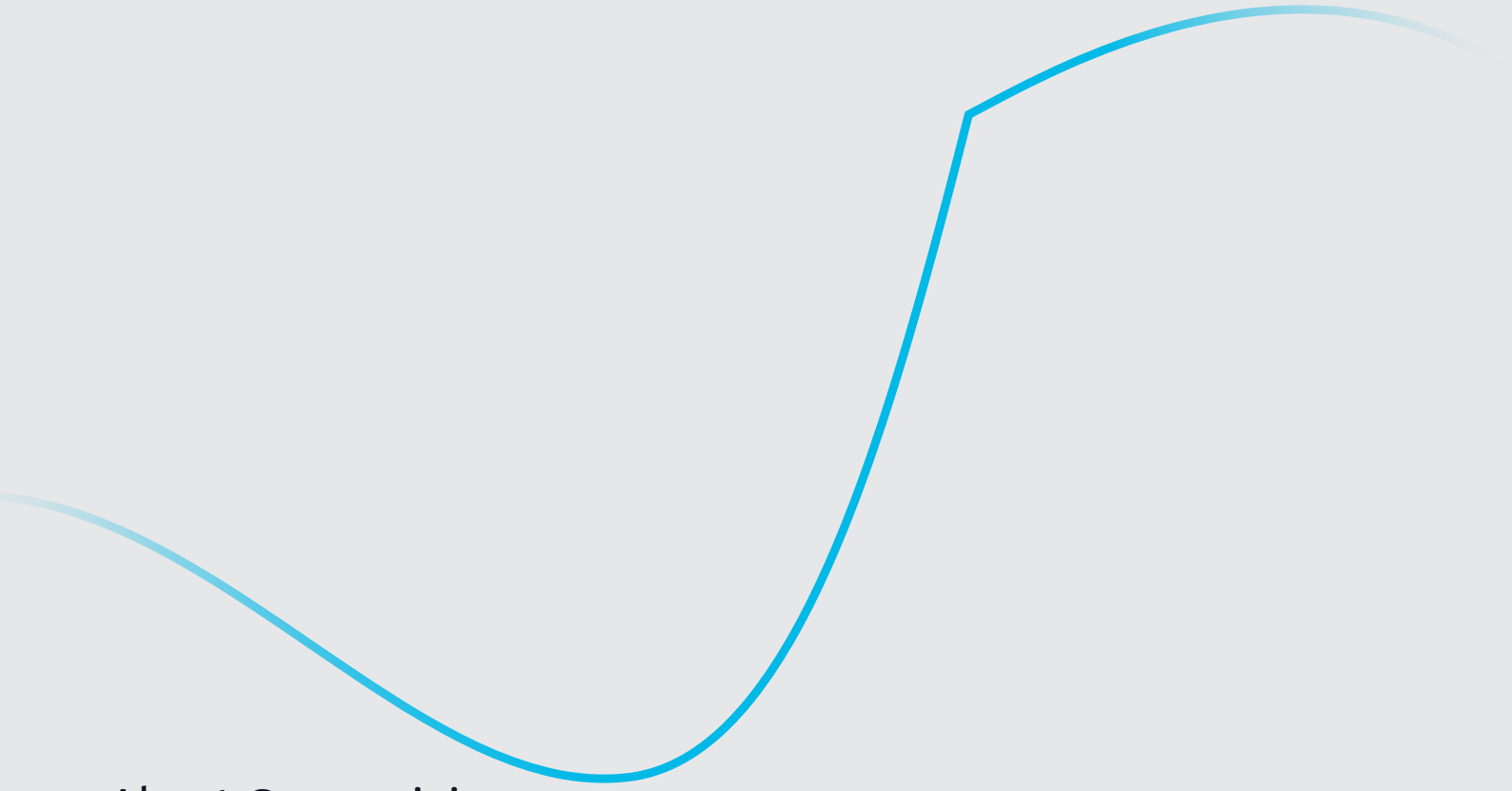

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Capgemini is a global leader in partnering with companies to transform and manage their business by harnessing the power of technology. The Group is guided everyday by its purpose of unleashing human energy through technology for an inclusive and sustainable future. It is a responsible and diverse organization of over 300,000 team members in nearly 50 countries. With its strong 50-year heritage and deep industry expertise, Capgemini is trusted by its clients to address the entire breadth of their business needs, from strategy and design to operations, fueled by the fast evolving and innovative world of cloud, data, AI, connectivity, software, digital engineering and platforms. The Group reported in 2020 global revenues of €16 billion.

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