The Virtual Enterprise Blueprint

Six building blocks for openness, innovation, and sustained growth

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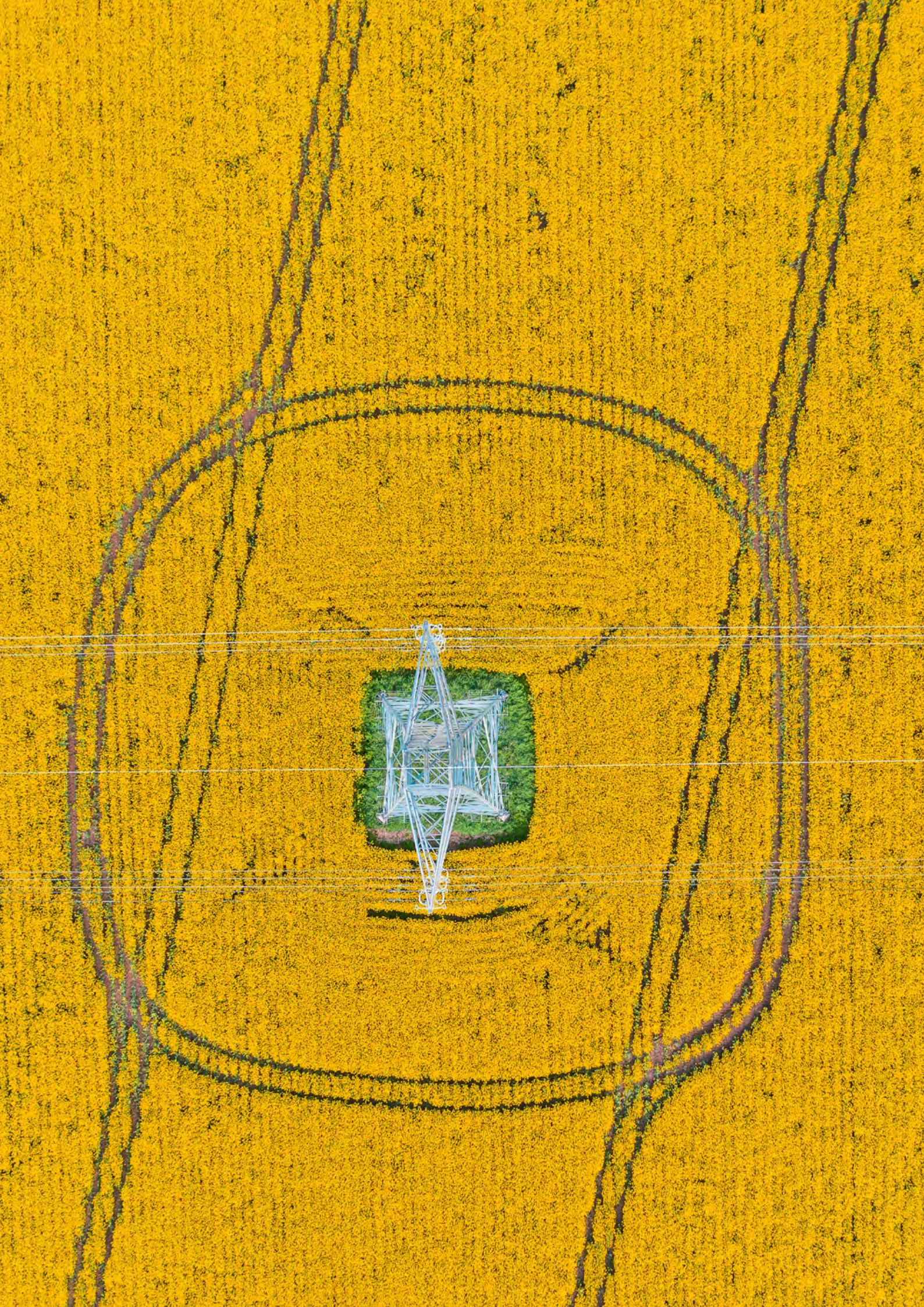
The Virtual Enterprise Blueprint

Six building blocks for openness, innovation, and sustained growth

Exponential technologies like AI, automation, blockchain, the Internet of Things (IoT), hybrid cloud, and quantum computing have matured to a level where they can make a profound impact on business outcomes—provided an enterprise has the capabilities and infrastructure to leverage them. Seeking to capitalize on this, organizations are digitally transforming themselves to become technology, platform, and experience companies.

When the pandemic delivered its collective sucker punch, the move toward digital only accelerated, as organizations transitioned operations to meet ever-changing stakeholder demands. The resulting growth in virtualization technology also crystallized the emergence of the advanced organizational and operating model we identified in our 2021 report “The Virtual Enterprise: The Cognitive Enterprise in a Virtual World.” Here, we dive deeper into the Virtual Enterprise and explore the individual building blocks that form the essence of this next-generation organization. Together, they provide the foundation required to power a world-class enterprise, positioning it to drive growth today and sustainability for tomorrow.



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Introduction

The Virtual Enterprise Blueprint

Over the past few years, we have moved toward a tipping point where enterprises across the world have looked to leverage technology holistically to transform their business models. We have seen digital transformation move from the front or edge of the organization to deep into the core. At the same time, technologies such as AI, automation, IoT, blockchain, and 5G have reached a level of maturity that can be leveraged at scale to drive real impact on business outcomes.

Organizations across all industries are seeking to become technology, platform, and experience companies. We have called this evolution the emergence of Cognitive Enterprises, which are brought to life by the imagining of market-making platforms, the shaping of Intelligent Workflows, and a deeper focus on experience and humanity.

The COVID crisis has had its impact on these Cognitive Enterprises. It has accelerated digital transformation journeys; reinforced the importance of applying exponential technologies to produce more efficient, effective, and flexible processes; and clarified the case for the leverage of hybrid cloud infrastructures to deliver adaptive consumption models and services. We have seen that the 3 main building blocks of the Cognitive Enterprise have been stretched by the new reality.

Market-making business platforms have had to digitize even more quickly and extend their remit wider into new ecosystems and partners; Intelligent Workflows have had to prioritize the use of extreme automation and AI to meet mass customer and employee connectivity and service needs; and new definitions of experience and humanity have emerged from the need to keep customers, employees, and citizens safe and healthy.

The truth is that the virtualization forced by the pandemic is actually a key transformational theme that has been becoming more and more important anyway. We see this recent experience as accelerating the emergence of the Virtual Enterprise as the next generation of organizational and operating model (see page 3). The Virtual Enterprise is powered by a Golden Thread of Intelligent Workflows that connect ecosystem participants for shared value. It builds upon the drivers that we have seen for a while and takes the potential to the next level. The Virtual Enterprise re-evaluates the need for physical assets, infrastructure, and talent and opens the potential for extreme digitalization as well as extended value chains and new partnership approaches.

The single most important characteristic of the Virtual Enterprise is “openness.” This openness brings value at 3 levels (see page 2 figure):

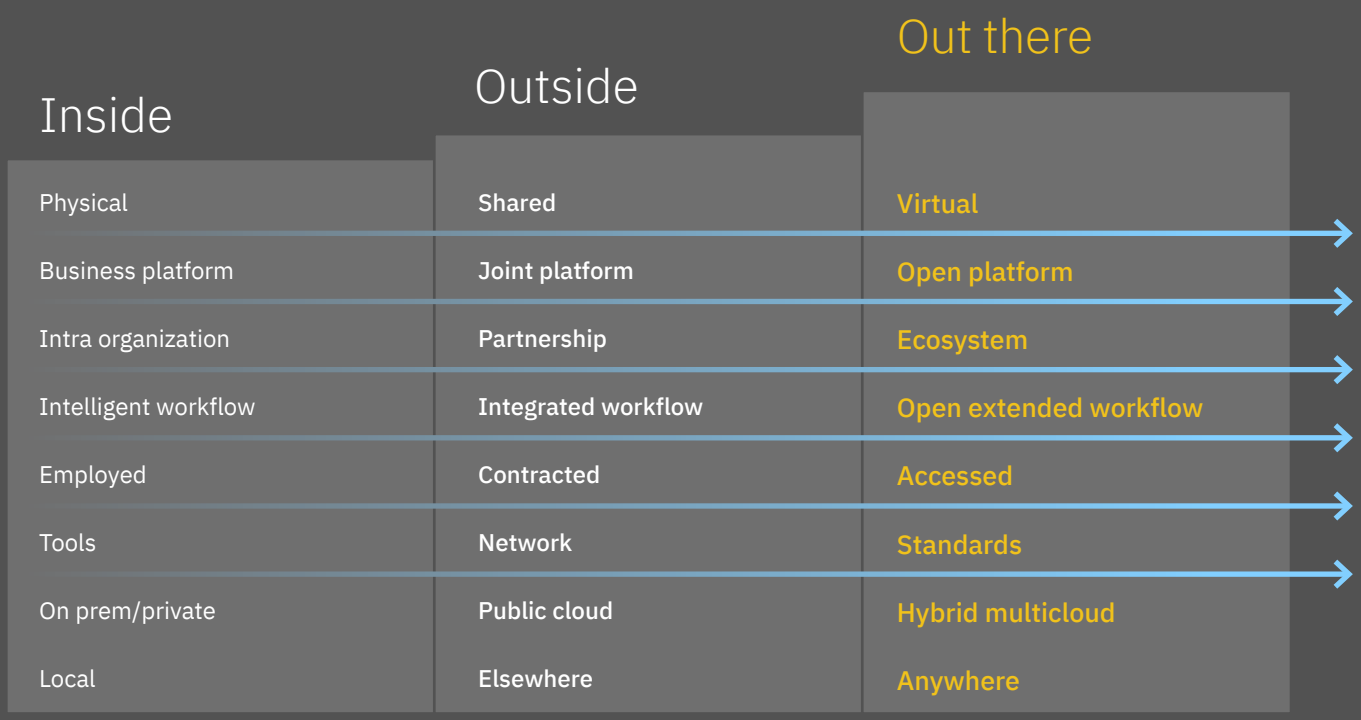
Inside: Inside the enterprise—connecting divisions and functions in more collaborative and agile workflows

Outside: With partners outside the enterprise who become ever more critical to delivering the core purpose of the business

Out there: With the wider ecosystem that allows true platform economics to play out and the enterprise to take advantage of all those who wish or need to connect with its intent.

Figure 1

The Virtual Enterprise is based on 3 levels of openness



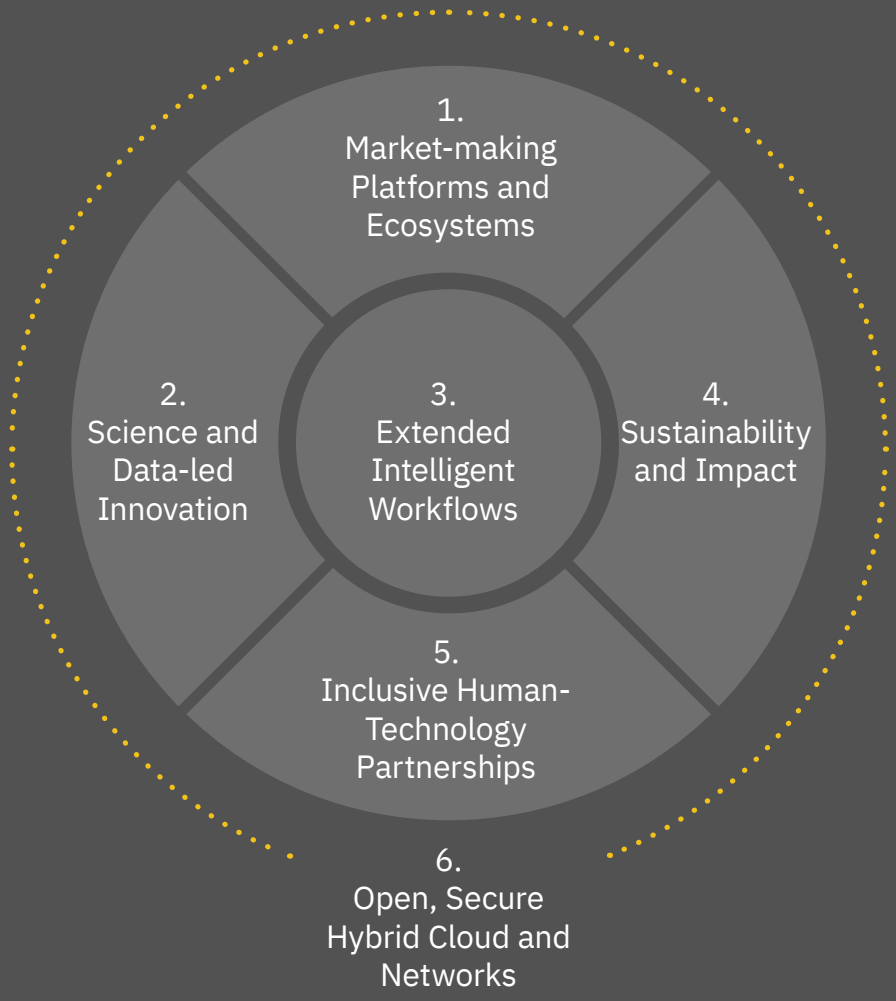
The extremes of virtual access to customers and work colleagues over the past year have also accelerated a reset of the human-technology interface. New tools and ways of working have become commonplace overnight.

The digital channel has become a primary source of engagement, unleashing new potential for markets and access, as well as creating new challenges for recreating empathy, sense of belonging, and human connection. Working relationships and collaboration have also been tested and enabled by ever-advancing software and technology solutions.

The pandemic experience has also reinforced the degree to which everything is connected around the world and the impact humanity has on itself and the planet. The Virtual Enterprise therefore operates in an environment where purpose, intent, and wider societal impact have come to the fore.

The potential to align ecosystems as solutions to the big issues of climate, health, and equality is real. As sustainability and stakeholder capitalism become C-suite imperatives, the new technology-enabled business models that are emerging have a critical role to play.

The Virtual Enterprise arrives



The Virtual Enterprise makes ecosystems the heart of its strategy to enhance innovation, make markets, and massively enhance capabilities.

Openness

1. Market-making Platforms and Ecosystems

Openness is the defining characteristic of the Virtual Enterprise. Most importantly, openness animates the stretching of the business platforms that are being envisioned to encompass wider ecosystems. We see organizations recognizing the power of combining platforms to seize new markets, as well as recognizing that the scale of the impact that is required demands this alignment with other substantive players. By optimizing platform economics, open connectivity, and frictionless engagement, the Virtual Enterprise enables all participants across market-making platforms and ecosystems.

Acceleration

2. Science and Data-led Innovation

The openness of the Virtual Enterprise accelerates access to new sources of product and service innovation. It takes a scientific discovery approach, constantly experimenting, relying on predictive and prospective analysis fueled by the massive amounts of data it can access from itself and its ecosystem partners. More and more industries are seeing the value that used to be the preserve of R&D-led industries (for example, pharmaceuticals) as they look forward rather than backward and mine the information in their value chains to spark creativity.

Agility

3. Extended Intelligent Workflows

The Intelligent Workflow is the Golden Thread that animates the Virtual Enterprise. It creates the backbone of the value chains that bind the ecosystem participants. As the reach of the workflows is extended, the power of applied technologies such as extreme automation, AI, IoT, and others is multiplied to unlock efficiency and differentiation and render the platforms ever more attractive. Virtualization adds new opportunities for networks, connectivity, and skills engagement to bring the workflows to life and drive agility.

Purpose

4. Sustainability and Impact

The Virtual Enterprise reinforces the extent of connectedness around the world and the impact of humans on each other and on the planet. It aligns purpose and intent with wider societal impacts. With sustainability and stakeholder capitalism taking hold in the C-suite, new ecosystem business models are helping provide solutions to the biggest challenges of our time around climate, health, security, and equality. This plays an increasing part, too, in the way that customers, partners, and employees feel about engaging with the organization.

Culture

5. Inclusive Human-Technology Partnerships

The Virtual Enterprise embraces the new tools and ways of working that have become the norm during the pandemic. It takes advantage of the accelerated reset of human-technology interfaces, including digital channels to customers and seamless virtual working across processes. It also, though, recognizes the need to build new forms of leadership, inspiration, engagement, and connection to deal with exacerbated challenges of human empathy, creativity, and sense of belonging.

Resilience

6. Open, Secure Hybrid Cloud and Networks

The Virtual Enterprise takes full advantage of the flexibility and nimbleness promised by hybrid cloud architectures. It enables the openness of the enterprise to connect with business partners as well as access the full potential of leading open technologies to drive innovation. The Virtual Enterprise is therefore underpinned by robust networks and secure technology infrastructure, with the right workloads within the right overarching architecture and plug-compatible with the world around. The dual demands of adaptability and resilience are therefore prerequisites of the journey to become a Virtual Enterprise—a journey on which many organizations have now embarked.

The Power of Market-making Platforms and Ecosystems

Openness can help broaden business platforms to encompass expanded ecosystems. Organizations are recognizing the power of combining platforms to seize new markets; they're also recognizing that the scale required demands this alignment with other substantive players. By optimizing platform economics, open connectivity, and frictionless engagement, the Virtual Enterprise enables participants across market-making platforms and ecosystems.

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How open platforms and ecosystems can boost value

The biggest strategic idea of the Virtual Enterprise is the combination of platform thinking with the concept of ecosystems. The Virtual Enterprise makes ecosystems the heart of its strategy to enhance innovation, make markets, and massively enhance capabilities. It requires leadership to have a clear vision of the growth potential that comes from creating strategic relationships with other organizations, as well as the competitive advantage that comes from orchestrating the extended business platform in which others wish and need to participate.

The openness of the ecosystem increases its reach and value creation potential while enabling those entities that are "in the club" to share in maximum business outcomes, within industry contexts as well as with new cross-industry combinations.

The potential for ecosystems to connect with customers and participants is given a new release through the power of digital connectivity and the sharing of information and new combinations of data. And thanks to technology architectures built on open, secure standards and software-defined networks, such engagement is increasingly straightforward.

Externalized business processes and extended workflows, differentiated through the combined power of applied technologies, create new market opportunities for all participants. We can see industry and cross-industry platforms and ecosystems providing solutions and standards that individual organizations cannot.

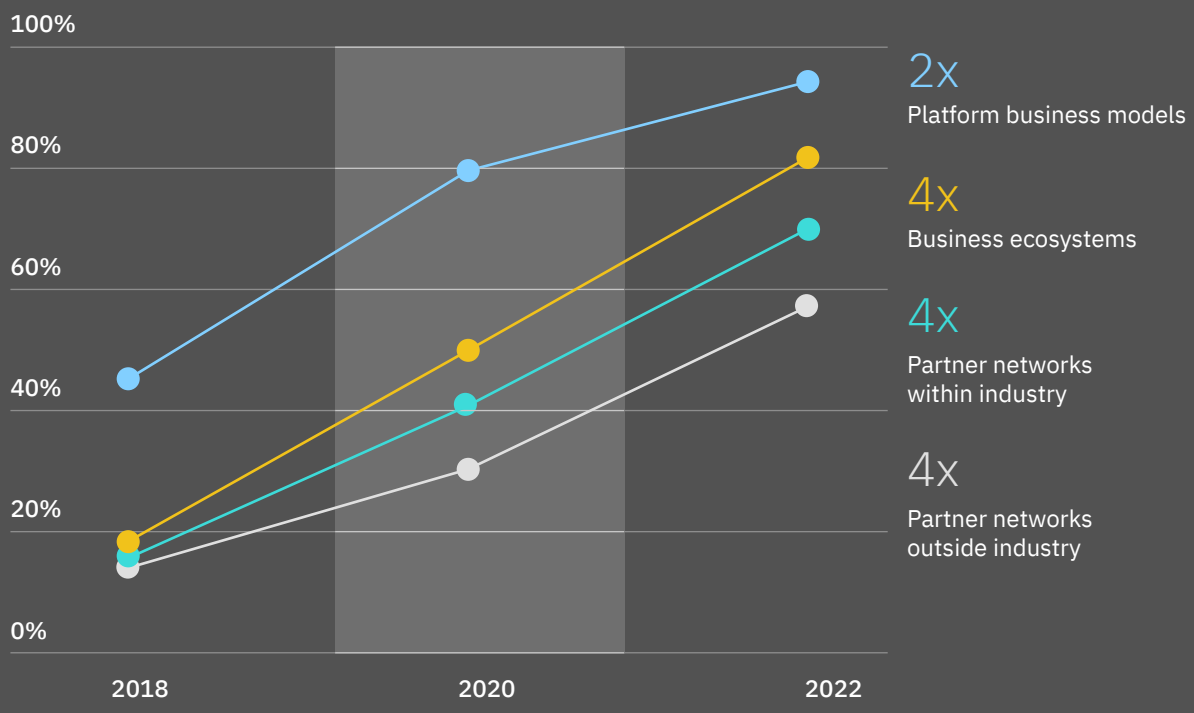
What are platforms and ecosystems?

Platforms enable organizations to gain a competitive advantage by allowing them to tap into resources otherwise unavailable to them—whether due to scale, maturity, or capital—and develop stronger offerings themselves. Platforms can exist across functions within a single organization, across organizations within an industry, across industries, across the consumer market, or across a range of technologies. On a platform, all players provide value to others, and they extract greater value for themselves through the benefits of the network.

Ecosystems are the basis for continuous collaboration, co-creation, and open innovation. They move working relationships beyond the transactional or tactical. Within an ecosystem, the collective intelligence, capabilities, and technology of the networked participants are harnessed for enhanced value propositions and greater value creation. Ecosystems can foster cooperation and trust among partners, suppliers, customers, and stakeholders. Within an organization, they can break down silos and encourage cross-departmental collaboration.

Figure 1.1

Businesses are increasingly opening up



Source: "COVID-19 and the future of business: Executive epiphanies reveal post-pandemic opportunities." IBM Institute for Business Value. ibm.co/covid-19-future-business
Q: To what extent is your organization participating in the following networks and business models (2 years ago, today, or in 2 years)? Percentages represent respondents that answered high or very high; n=3,450, fielded April-June 2020.

Many of the bigger challenges facing the world need this kind of collaboration. Whether it is for extended public-private partnerships (such as those that provide vaccine solutions for the pandemic) or the alignments of players that drive sustainable impact on climate change or food security, the power of open, extended, and secure platforms is very evident.

Blockchain consortia have been one class of industry and cross-industry ecosystem play that has arisen over the past few years. They help participants trust the data as they remove cost, drive efficiency, and securely "know" all the participants throughout the workflows.

The applications that have emerged first have been in areas such as supply chain, provenance, and identity. We can imagine that the combination of secure and reliable identification of participants and status of transactions—combined with the immediacy of real-time synchronization—will only enhance the viability and creativity in the shaping of platforms and ecosystems (see Figure 1.1).

As a first step toward a platform business model, many organizations that market physical products or services are creating new digital experiences that enhance the originals. For example, digital services that support physical blood monitoring could send alerts to trigger pharmacological testing.

The power of digital solutions to drastically reduce barriers to entry and create new cost benchmarks is real, too—as the opportunity expands to replace expensive capital expenditure with shared operating expense. Automation and zero-touch approaches reinforce this potential.

Leveraging the transformative value of openness

With openness at the heart of the Virtual Enterprise, ecosystems have become the engine that drives performance and impact across economies. For enterprises battling dislocation and disruption, extended partner platforms can promote agility and resilience, and open new revenue opportunities. For businesses exploring such opportunities, ecosystems have been the essential vehicle for growth and expansion.

New IBM Institute for Business Value (IBV) research reveals that the companies most focused on ecosystem engagement across 16 industries generated higher growth and more business value. During the pandemic, revenue growth captured by these ecosystem leaders outpaced that of others by 5 to 1.[1]

But value does not automatically emerge from ecosystem engagement. If an enterprise continues to operate in old-style analog ways, then potential is squandered. While most organizations now participate in and/or own a variety of platforms and have ecosystem strategies in place, those efforts can still deliver disappointing results. What's required is an intentional effort to digitally transform the business.

Enterprises must take the correct, considered steps to create and capture value from existing and new ecosystems. Only by appropriately cultivating a value-focused strategy—managing a portfolio of value opportunities and their risks—can an organization fully capitalize on market-making platforms and ecosystems' transformative potential.

What does ecosystem leadership look like? There is no singular model, no one way to derive value from a platform and ecosystem. But leaders distinguish themselves by identifying the unique strategies and operational approaches that fit both their enterprises and the environments they operate in.

The IBV identified leading enterprises by assessing their success across 2 principal dimensions: their value capture expectations in an ecosystem and their maturity level within that ecosystem. Leaders demonstrate high ecosystem maturity and operate in a high-potential value capture environment.

These organizations are not passive. With so much on the line, and so much already invested, a successful enterprise continually focuses on protecting and growing its status across both of those vectors.

These ecosystem leaders describe the source of their value as: "We own the customer relationship." More than half of our surveyed leaders cite "strengthening existing strategic relationships" as a top success factor. They also increase investment in innovation that includes new products or services, and look to gain access to new industries, markets, and customers.[2]

We found that successful leadership depends on 4 priorities:[3]

Openness: 60% of leading participants report a significant shift from proprietary to open technologies.

Customer relationship: 74% point to deeper customer relationships as a key value driver.

Innovation: 49% say that innovation will be required to maximize value creation.

Agility: 42% identify a lack of organizational agility as one of the biggest impediments to success.

The Virtual Enterprise brings these priorities to life, leveraging platforms and ecosystems. And 3 key insights drive that activation:

— Connectivity

— Partnerships

— Technology

Key insight #1

Connectivity leads to growth and value

Open platforms and ecosystems offer new avenues for growth, efficiency, and innovation.

The Virtual Enterprise utilizes market-making platforms and ecosystems for practical, tangible reasons: Connectivity drives growth and value.

Outsized performance is increasingly driven by ecosystem engagement. According to a recent IBV study, technology adopters that invest in ecosystems gained a revenue growth premium of 40%.[4]

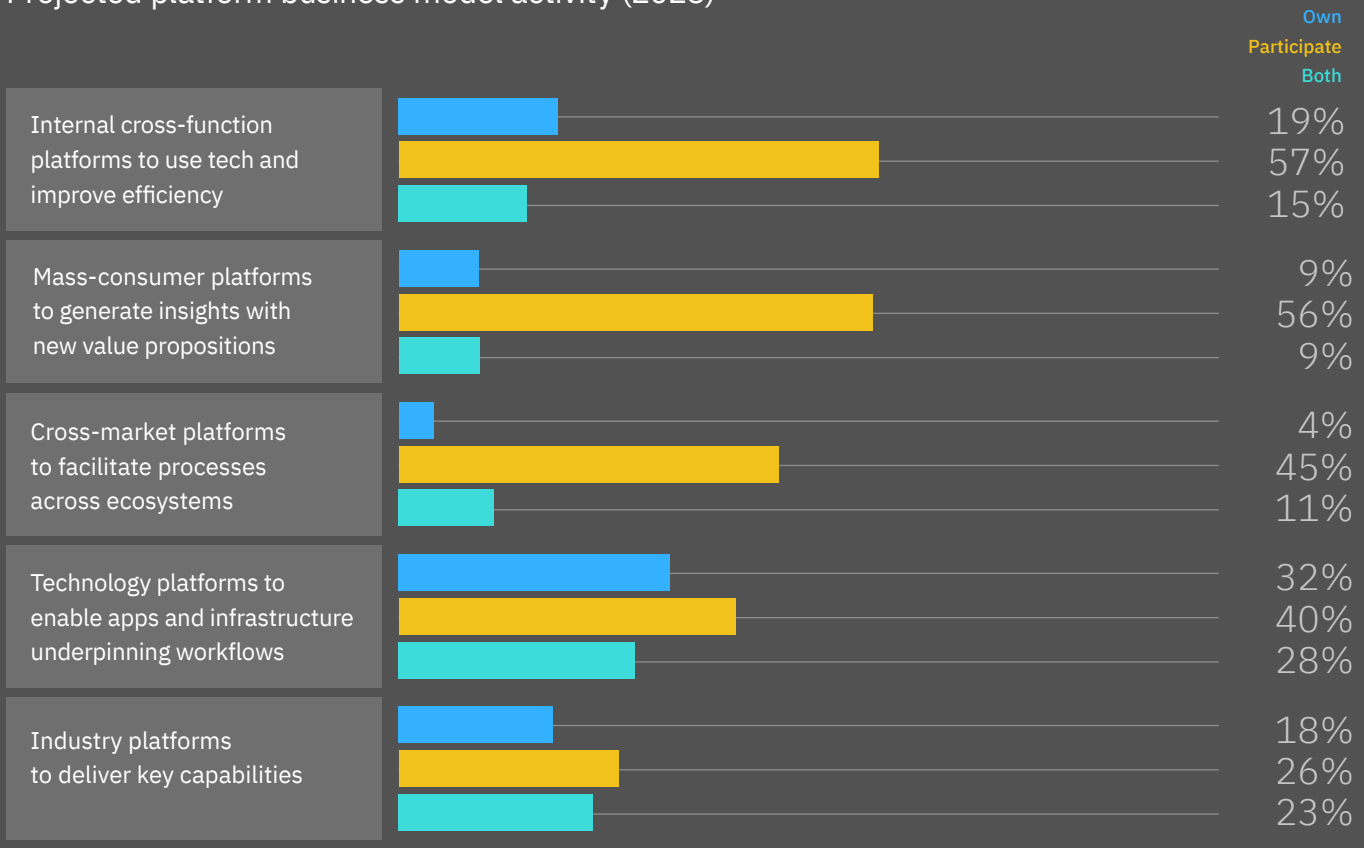
Achieving that success requires a modern, digitally savvy operating model and mindset. By aligning an enterprise with business priorities and optimizing ecosystem engagement, performance impact can be considerable. The Virtual Enterprise puts ecosystems at the heart of strategic efforts to spur innovation, make markets, and massively enhance capabilities.

Connectivity begins with a commitment to platforms, which IBV's proprietary research shows is increasing broadly. In fact, most of the organizations surveyed say they will either own or participate in a business platform over the next 3 years to support their market growth, efficiency, and innovation strategies (see Figure 1.2). What's more, at least 60% of organizations will own or participate in internal cross-function, mass-consumer, cross-market, and cross-industry platforms. And 72% of organizations will own or participate in technology platforms.

Platforms distribute the supply chain, moving it from inside the enterprise to outside, shifting traditional operations and expenses to a larger network, and enabling accelerated fulfillment and value.

Figure 1.2

Projected platform business model activity (2023)



Source: "The Virtual Enterprise: The Cognitive Enterprise in a virtual world." IBM Institute for Business Value. https://ibm.co/virtual-enterprise

Are you prepared to drive growth through connectivity?

Q1 How can your organization's business platforms embrace wider ecosystems?

Q2 Which value-focused strategies and initiatives will your organization adopt to intentionally manage platform and ecosystem value opportunities and associated risks?

Q3 How can your organization's goals and tactics enhance platform participation and ecosystem maturity to create and capture value?

SBI YONO

Spurring growth with a platform and ecosystem

The State Bank of India has been around for more than 200 years. Yet as India's economic ascent gained steam in recent years, the bank found itself losing market share. To attract a younger, more digital-savvy customer base, the bank created a digital bank, online marketplace for third-party offerings, and digital financial superstore under a new brand, SBI YONO ("You Only Need One"). Partnering with more than 100 e-commerce sellers, SBI YONO quickly grew into a mobile platform with more than 10 million daily logins and 64 million downloads.

Since the launch of the ecosystem, SBI has implemented over 100 digital customer journeys, hosted over 650,000 mutual fund transactions, and sold over 400,000 life insurance policies through YONO. SBI's 2020 annual report mentions YONO no fewer than 96 times, almost on every page. Today, in line with its success in creating and capturing value from the extended ecosystem, SBI's strategy has shifted to expand network presence, as it adds an average of 15 new use cases per month to the platform.

Key insight #2

Deeper partnerships serve as strategic drivers

Partnership has become an imperative for most organizations to find value, focusing on fewer, deeper ecosystem combinations to build out their growth agendas.

The Virtual Enterprise does not operate in a vacuum. It relies on partnerships to leverage platforms and ecosystems—and, in the best cases, to connect ecosystems of ecosystems.

Ecosystem leaders are not narrowly focused on short-term transactional gains for their own businesses. They take a broader view of ecosystem value opportunities for all participants. In fact, according to IBV research, 72% of ecosystem leaders stress that competitors within their industries also gain value from ecosystems, and 67% note value to competitors outside their industries.[5]

Rather than provoke competitive anxiety, this leader group embraces ecosystem engagement as a win-win game: When ecosystem value is enhanced for others, it helps their own businesses realize even more opportunity.

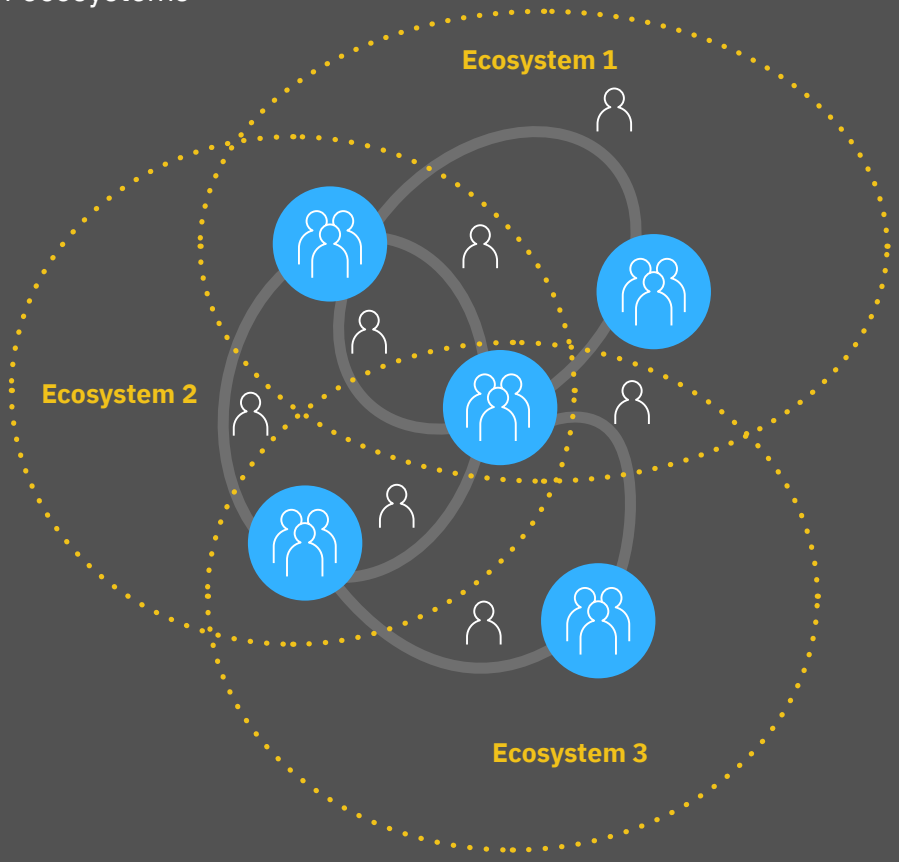
These findings illustrate the importance of generating positive ecosystem dynamics for participants rather than focusing purely on immediate competitive gains. Such positive dynamics could enable the ecosystems to grow within and across industries and even connect to other ecosystems, creating an inclusive ecosystem of ecosystems for value creation and capture (see Figure 1.3).

Partnership is the key strategic tool to build out an ecosystem of ecosystems. As another IBV survey reveals, 54% of executives say drawing ecosystems together is one of the most important drivers for their organizations' digital transformations.[6]

One critical obstacle to keep in mind: As enterprises engage in multiple platforms and ecosystems, they may be pursuing multiple strategies in multiple places at the same time. This can limit value capture if an enterprise's ecosystem priorities—which may be many and wide-ranging—are not appropriately aligned to business-performance priorities and a singular overall strategic vision for the business. In fact, even in single-ecosystem situations, such alignment is critical in optimizing value capture.

Figure 1.3

It's all about dynamics:
Ecosystem of ecosystems



Is your organization ready to form deeper, more strategic partnerships?

Q1 How will you engage all parts of your organization to fulfill the growth potential that comes from creating and fostering strategic ecosystem partnerships?

Q2 How will your organization enhance the viability and creativity of platforms and ecosystems, including the support of secure and reliable identification of participants and the clarity of transactions' status?

Q3 What plans have you put in place to build new partnerships and ecosystems of ecosystems, whether to explore new market opportunities, externalize business processes, extend Intelligent Workflows, access exponential technologies—or all of the above?

Digital Health Pass

Tackling pandemic-era challenges through partnerships

The Digital Health Pass helps organizations as they strive to reopen in the wake of COVID-19 and provide individuals with a privacy-preserving way to voluntarily share their COVID-19 test results or vaccination status. It is the outcome of a collaboration across industries and existing ecosystems.

Organizations can make data-driven decisions for configuring a health pass as they look to mitigate risk, take action where needed, and communicate effectively. IBM is invested in collaborating with COVID-19 testing and vaccination providers, technology companies, and other consortia and alliances around digital health passes.

The solution—based on IBM blockchain technology—provides organizations an efficient way to verify COVID-19 health credentials in order to bring employees back to offices, travelers back to travel, students back to campuses, concert goers back to music venues, and sports fans back to stadiums. It does this while also allowing individuals to maintain control of their personal health information and share it in a way that is secured, verifiable, and trusted.

Key insight #3

Technology and openness underpin value acceleration

New and emerging technologies grounded in principles of openness and standards, like blockchain and hybrid cloud, underpin the acceleration of this opportunity.

Technology platforms are the backbone of the Virtual Enterprise. The modern business ecosystem is built on technology and the open, trusted, innovative engagement that a digital platform can provide.

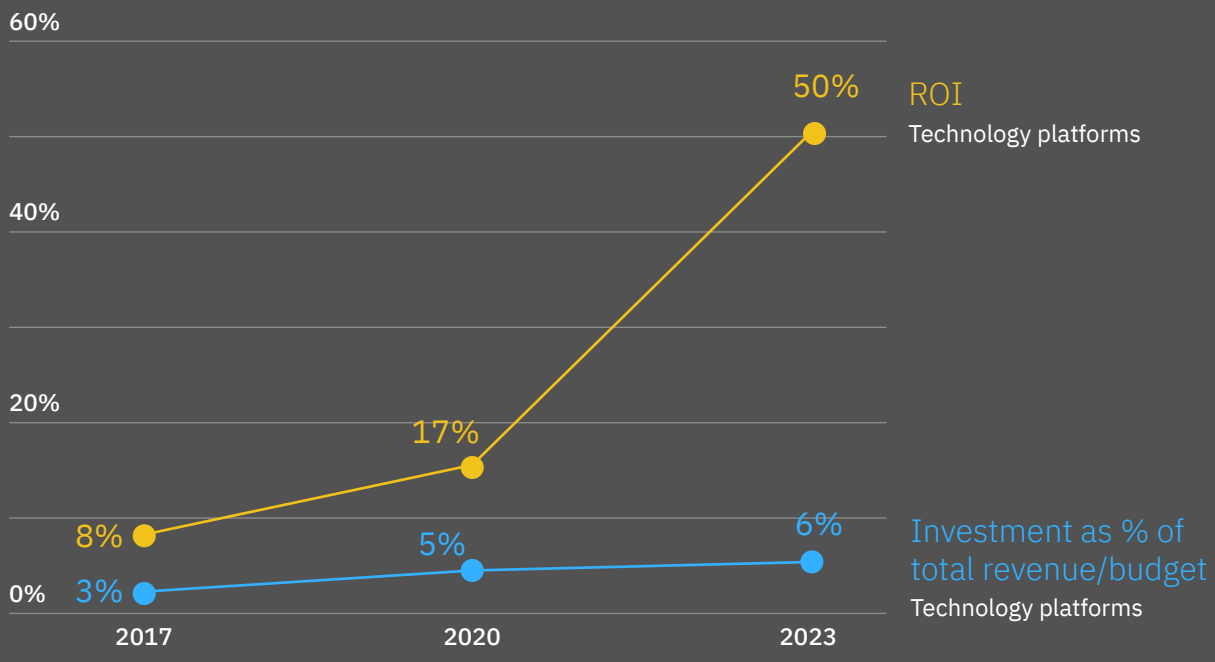
Organizations have begun placing increasing emphasis on tech platforms, allocating 84% more investment there since 2017, according to IBV research. The level of investment continues to accelerate—as does their anticipated return on investment from those efforts (see Figure 1.4). By 2023, executives expect to invest nearly 6% of revenue in technology platforms and to glean almost a 12% return on that investment.[7]

Despite that positive trajectory, and the clear lessons of 2020, tech maturity for many organizations remains lagging. In fact, tech-related impediments to strategy implementation were cited repeatedly by respondents to a recent IBV survey: 44% complained about the existing state of their enterprises' tech infrastructure and the risk of technical difficulties when connecting operations, 43% pointed to inadequate organizational agility, and 39% highlighted inadequate tech investments.[8]

The solution to leapfrogging over these impediments is technology itself. The convergence of exponential technologies such as AI, blockchain, edge computing, and hybrid cloud increasingly enables open, expanded, trusted ecosystems to be integrated and intelligent—providing solutions while limiting, rather than exacerbating, risks. In another recent IBV survey, for instance, 3 out of 4 respondents say that establishing a hybrid cloud can help draw ecosystems closer together, and 39% say they expect hybrid cloud to accelerate innovation by expanding partner solutions.[9]

Figure 1.4

Digital platform growth in investment and returns



Source: "The Virtual Enterprise: The Cognitive Enterprise in a virtual world." IBM Institute for Business Value. https://ibm.co/virtual-enterprise

What is your capability for embracing open technology platforms?

Q1 How is your organization actively leveraging technology and openness to create or participate in industry-based and cross-industry ecosystems?

Q2 In what ways are you investing in platform differentiation, trust, and security to transform your business models, create new opportunities for growth, and identify fresh benchmarks of cost and efficiency?

Q3 What are your plans for accelerating your organization's objectives and openness through the infusion of exponential technologies such as AI, automation, blockchain, IoT, hybrid cloud, and quantum computing?

Schlumberger

Improving performance with leading-edge technology and openness

Schlumberger provides leading digital solutions and deploys innovative technologies to enable performance and sustainability for the global energy industry. The organization is accelerating customers' move to the cloud with its DELFI cognitive exploration and production (E&P) environment, where customers' teams can collaborate freely across boundaries—breaking down traditional data silos.

By providing access to the company's cutting-edge E&P solutions and applications, the DELFI environment enables energy companies to create new data-driven workflows and adopt game-changing technologies such as AI, analytics, and automation.

Its "write once, deploy anywhere" approach helps ensure faster development of applications and workflows, and overall platform performance for customer-specific requests, leading to improvement in volume and velocity. The reduction in customers' total cost of ownership (product, service, and operational costs) is expected to be 10 to 20%.

Customers and partners worldwide can integrate their deployment of the DELFI environment with the OSDU™ Data Platform, the industry standard for energy data. Schlumberger intends to expand the global addressable market from under 50% today to potentially almost the entire world.

Action guide

Converting platforms and ecosystems into value

The Virtual Enterprise will be the anchor of the future economy. As our IBV research confirms, platforms and ecosystems are more prominent than ever and vital to driving business performance. Tailoring your strategy to your specific situation unlocks business value. And aligning activities and goals captures that value.

The scale of the strategic leap that can come from open, ecosystem, and platform thinking is very considerable and can go to the core of the way an organization looks at itself. Platforms and ecosystems must be at the core of the enterprise, not on the periphery as an additional facet to the business. Virtualization and new connectivity models allow smaller participants, such as SMBs and even individuals, to participate in such extended ecosystem plays as they become more attractive and add higher value.

The cultural implications of being an effective virtual participant in ecosystems are also huge. Ecosystems need to become the primary social system and focal points of interaction and energy of the participating organizations. The persona of an organization and its core competence need to be aligned to this intent. Leadership teams need to develop mutual trust as they make joint commitments and create an open culture, which means letting go of many aspects of proprietary ownership and control.

Here is a 6-step outline for converting the potential of platforms and ecosystems into value:

Tune your strategy

- Identify value creation and value capture opportunities.
- Prioritize levers aligned with these opportunities to capture value at speed and scale.
- Test and confirm that value capture and value realization meet specific milestones.

Transform your model

- Assess the implications of any new strategy for your operating model.
- Prepare to adjust the model so all components of the business work together.
- Develop foundational capabilities geared to realize value from the ecosystem.

Reinforce your culture

- Foster a mindset shift to emphasize collaboration and co-creation.
- Create incentive structures and targets that de-emphasize short-term transactional opportunism in favor of collaboration and co-creation.
- Invest in programs that drive internal and external sharing, partnering, and openness.

Orchestrate your participation

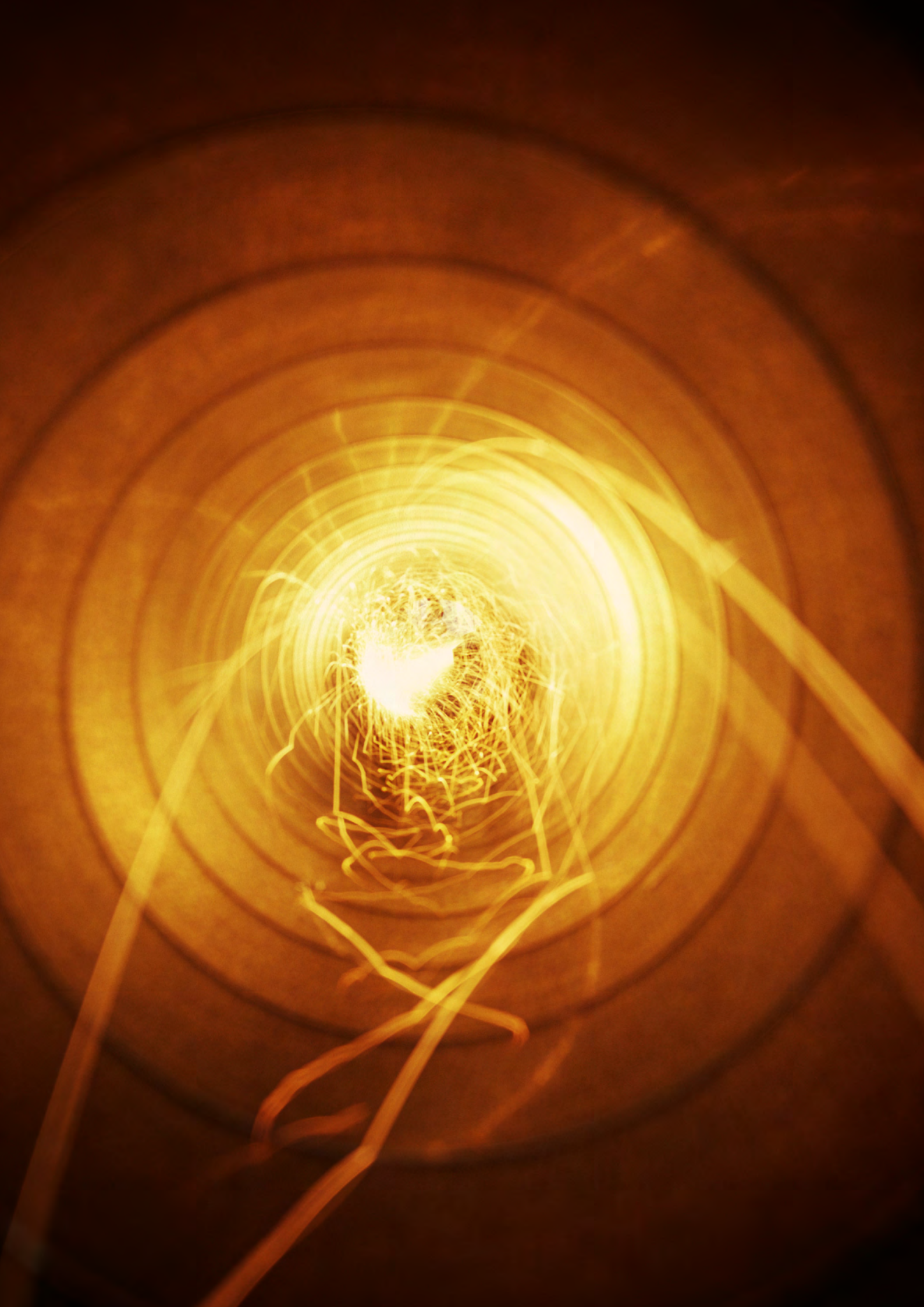
- Define various partner roles, key rules, and essential collaboration tools.
- Confirm which ecosystem role you have (and which you want), and where new or hidden value might reside; not all participants find value in the same ways or at the same levels.
- Support holistic network development, which aids value creation and capture for all.

Execute with agility

- Adopt an agile execution structure.
- Leverage co-creation, co-execution, and co-operation to accelerate idea development and value capture (using an end-to-end Garage model).[10]
- Act on experiments and positive opportunities in parallel to fuel real-time progress.

Enable future progress

- Invest in open and secure technology architecture to feed rapid integration, engagement, and expansion.
- Utilize pre-existing architectures for rapid scale-up.
- Embrace open, extensible hybrid-cloud technology that supports fluid integration of new participants and at scale.



The Spark of Science and Data-led Innovation

The Virtual Enterprise takes a scientific discovery approach, constantly experimenting, relying on predictive and prospective analysis fueled by massive amounts of data from itself and its ecosystem partners. More and more industries see the value that used to be the preserve of R&D-led industries as they mine information in their value chains to spark creativity.

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How science and data-led innovation can unlock new solutions

The Virtual Enterprise is fundamentally one that looks forward and outward. It does not seek to innovate or drive decisions based on history and internal information, but through the combination of predictive and prospective analysis based on massive access to data and new kinds of crowd and swarm intelligence.

The Virtual Enterprise is also more rigorous, pursuing a deeper scientific discovery approach to innovation. And with COVID vaccines developed and tested in months instead of years, scientific discovery is the concept du jour. What if we could apply a similar accelerant to business innovation?

Experimentation, simulation, and testing of hypotheses have long formed the core of scientific discovery. For the Virtual Enterprise, access to exponential technologies such as AI, IoT, and quantum computing enables analogous processes for business—faster than ever before—and across many different industries (see Figure 2.1).

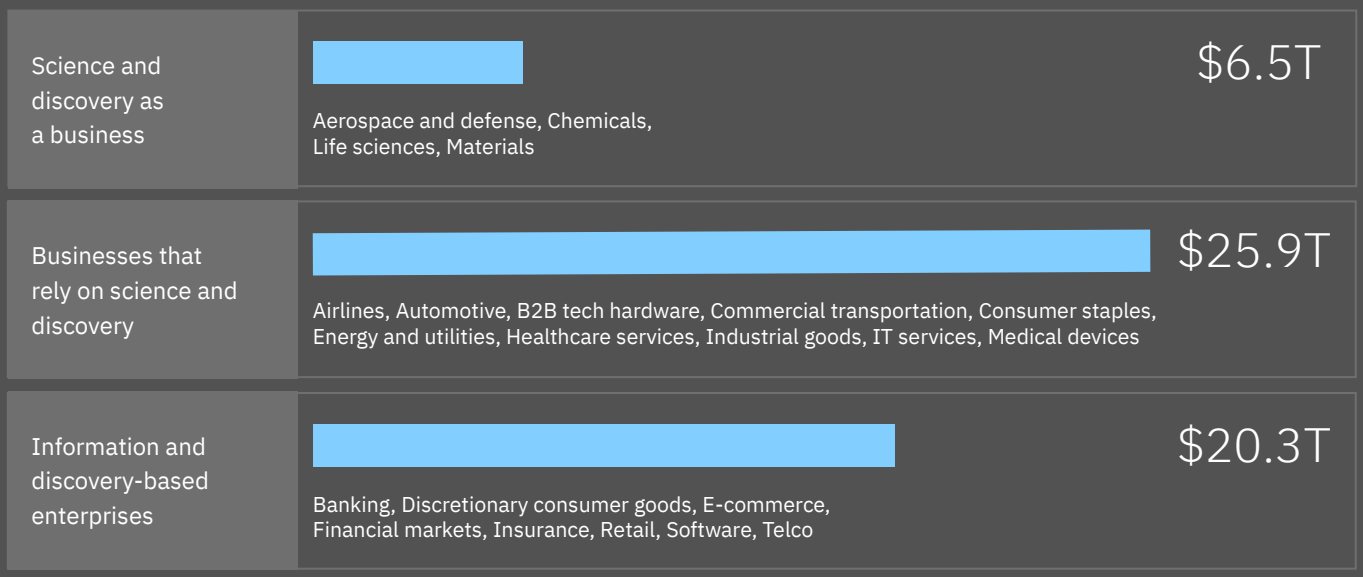
All this can now be executed in real time through ecosystems and Intelligent Workflows, allowing the Virtual Enterprise to identify and mine new value pools faster and better. Data scientists leverage open architectures in the Virtual Enterprise and its ecosystems that multiply the benefits of data sharing, including micro-insights only possible with extreme digitization. Neural networks and other techniques allow decomposition of the most critical and complex problems, facilitating identification of exciting and novel new solutions.

What is science and data-led innovation?

Science and data-led innovation fosters competitive advantage by dynamically and perpetually uncovering new opportunities and solutions. Following the scientific method of experimentation—hypothesize, test, learn—science and data-led innovation taps into both new technologies and the rapidly exploding new data being unleashed by sensors, information sharing, and other connectivity efforts. With an open and rigorous approach, this intersection of data and technology can produce ongoing—and invaluable—process improvements, as well as solutions to previously unanswered questions. Open collaboration is a core facilitator and requirement of science and data-led innovation. Agile development and the IBM Garage approach are great examples of how the power of experimentation is evolving from co-creation to co-execution and co-operation to achieve impact at scale.

Figure 2.1

Science and discovery drive innovation across industries—and constitute $52 trillion of the $88 trillion world economy



Sources: Data and research from Strategic Business Insights, IBM Research; Ward-Foxton, Sally. "Accelerated Discovery: AI and the Scientific Method." EE Times. January 19, 2021. https://www.eetimes.com/accelerated-discovery-ai-and-the-scientific-method/

As AI and machine learning enable ever better pattern recognition, workflow optimization solutions become clearer and more powerful. Cross-industry partnerships and consortia can also be amplified by smart application of scientific methods to drive ecosystem-wide innovations.

Data-led innovation operates at multiple levels in the Virtual Enterprise. It can be at the base level of insights driven from a particular analysis of customer data that prompts the reshaping of a service proposition. It can be within the context of a workflow, where continual monitoring and mining of the activities and performance within a process can highlight areas for improvement and prompt automated or human intervention.

It can also take place at the platform level, where deeper combined opportunities can be imagined from pulling on data sources from across the enterprise and business partners to identify marketplace gaps and product or service innovations. It is in broad ecosystems, however, that the biggest potential for ideation and breakthrough can be seen, where the sheer scale of data, inputs, and participants drives acceleration of not just the idea origination process, but more importantly, the execution and scaling of the inventions. It is for this reason that virtual models and ecosystems will increasingly be the solution to the biggest challenges that we face.

Accelerating discovery via virtualization and openness, integrated communities, and exponential tools

The COVID-19 crisis has changed businesses in profound ways, accelerating the pace of transformation across supply chains, manufacturing, distribution, workforce norms, consumer behavior, and more. This perpetual acceleration requires enterprises to be more agile and responsive than ever. The tools and approaches for managing this new condition are born from science—and will themselves amplify the acceleration.

Many businesses had already begun using analytics and AI to improve business processes prior to the pandemic. Those technologies and a growing focus on examining core enterprise data assets—such as user or transaction data or enterprise workflow patterns—have paved the way to remove, digitize, and automate tasks from production to billing.

Leading organizations are relying on intelligent automation to help reduce costs and improve workflow efficiency. They are building automated AI-powered Intelligent Workflows to balance continuity of operations in response to customer demand. These workflows are embedded with predictive intelligence, such as dynamic customer response, preventive maintenance, and real-time inventory status. This automation enables digitally supported decisions for rapid identification, prioritization, and recommendations for next-best actions. And data from machine sensors and IoT technologies can further enhance workflow automation for real-time insights and predictions.

The Virtual Enterprise takes these practices a step further, tapping into a wealth of external information—whether related to global health or climate or other ecosystem conditions—to guide decisions and adapt its operations and strategy.

Businesses need discovery tools to assimilate information from beyond the core—information on politics, the environment, social moments, and other industries—to protect and extend continuity and resilience. Science and data-led innovation is the instantiation of this process: The rapid collection of data informs decisions, with scientific rigor helping both identify knowledge and manage risk. Executives increasingly recognize the differentiation such innovation can provide, with more than three quarters saying their competitive edge is based on utilizing discovery insights.[1]

The emerging Virtual Enterprise is discovery driven, unlocking value-chain advantage. Science has long been core to sectors such as life sciences, chemicals, and materials. And other businesses rely on the results and outputs of science, such as those in the energy and utilities, healthcare, and technology hardware industries that are propelled by scientific advances in geology, medicine, physics, or other areas.

Today, all enterprises need to become information driven. By applying the scientific method and experimentation at scale—and building on data and AI—they can gain new information about markets and management practices that can drive critical improvements in business strategy, product development, and operations.

What differentiates leaders

What does science and data-led innovation leadership look like? As enterprises become more discovery driven, transformations are required in the areas of culture, skills, business processes, tools, and platforms. For experimentation to be effective, it needs to be performed at scale and in a frictionless manner throughout the organization. A discovery culture is evidence based, which requires adaptivity and openness.

These transformations power enterprise discovery efforts; drive advances in domains such as climate, work, and health; and enable activities in accelerated discovery broadly. Beyond traditional AI tools, enterprises need hybrid cloud platforms to support experimentation at scale. And the injection of quantum computing will open even more new possibilities.

By examining how people work, AI can already help determine the most efficient or effective workflows. Tasks can then be routed to traditional or quantum systems—one or more quantum computers working with a classical computing system—depending on which is the best option. Once information technologists establish a workflow, a user need not know where or how the computation is being done, nor would any specialized knowledge of quantum computing be required.

To make the transformations necessary to cultivate a discovery culture that embraces science and data-led innovation, we suggest a focus on 4 leadership priorities:

Teamwork: 50% of executives in a recent IBV study cite the ability to collaborate in a team environment as a central workforce capability in a post-pandemic world.[2]

Ecosystem focus: 78% of recently surveyed CTOs say they use discovery-driven mechanisms to identify innovations across their broader ecosystems.[3]

Digitization: Executives predict the percentage of virtual workforce and customer engagement capabilities in their organizations in 2023 will be almost triple the percentage in 2017.[4]

Data advantage: 67% of executives understand the strategic value of data, while 58% access data in real time to create actionable insights.[5]

The Virtual Enterprise embraces these priorities, supporting science and data-led innovation and fueling accelerated discovery. Three key insights form the foundation of this support. They are focused on:

— Virtualization and openness

— Integrated communities

— Exponential tools

Key insight #1

Virtualization and openness enhance discovery across ecosystems

The Virtual Enterprise fundamentally looks outward and forward, leveraging new kinds of data and intelligence.

The Virtual Enterprise unlocks scientific innovation by virtualizing traditional tools for faster and better experimentation, hypotheses, and testing. It relies on open science practices.

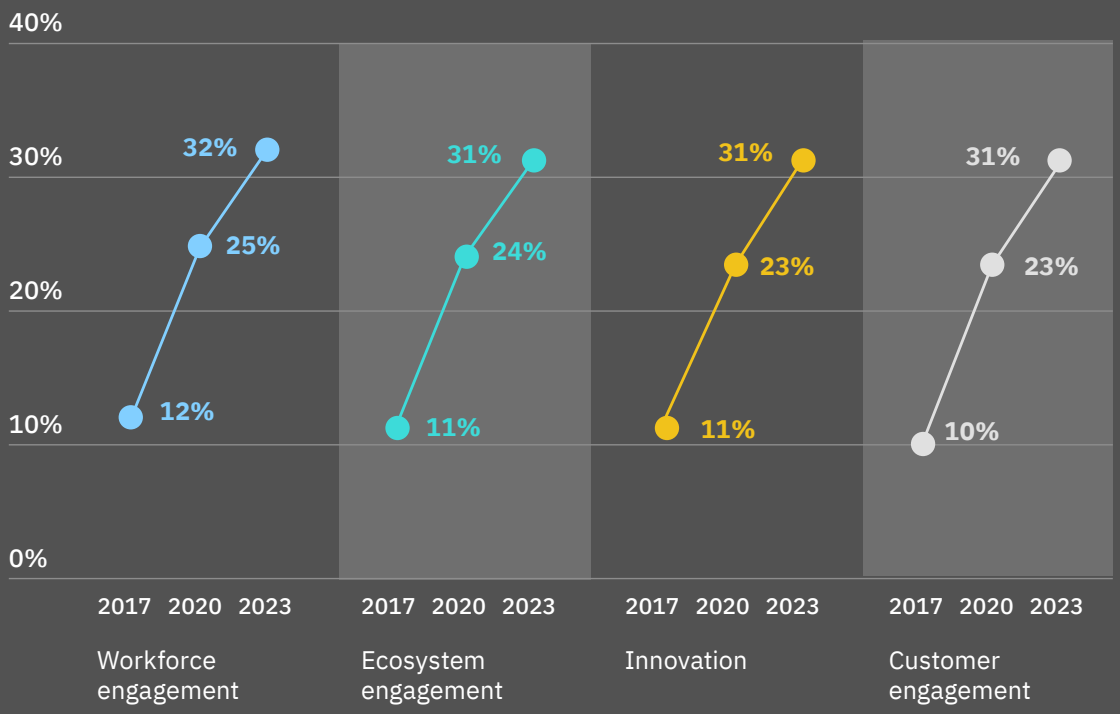
In its earliest days, science was empirical and theoretical. People observed and measured phenomena, such as the motion of objects; made hypotheses and predictions about why they happened; and tested them repeatedly. Computers—and eventually AI and supercomputers—changed that, ushering in the age of analytics. We can now ingest massive amounts of data and develop models for how systems will behave. The Virtual Enterprise redefines traditional infrastructure so that people talent can optimize this capability across the workforce, partnerships, and ecosystems. As 82% of CTOs agree, accelerating the discovery process is central to future growth.[6]

Systems and processes need to be purpose-designed so open collaboration and scientific discovery can emerge. Extended Intelligent Workflows should be digitally fluid—so that one computer, for instance, can be treated by simultaneous users as several independent computers to optimize both agility and security. These advances will make it simpler to define discovery workflows, flexibly manage and deploy them, and enable accelerated scientific discovery at scale. Recognizing these advantages, executives tell us they are increasing their virtualization efforts across functions (see Figure 2.2).

A hybrid cloud environment can further enhance the discovery process, fostering productivity, collaboration, integration, and scientific reproducibility, while also providing a way to obtain feedback to improve the platform and further grow adoption. There are innovation opportunities across the full hybrid cloud stack, from reimagining middleware—software that sits between the operating system and user applications—to enhancing the way processing gets distributed across computers.

Figure 2.2

Organizations continue to virtualize a growing number of activities



Source: Previously unpublished data from the 2021 IBM Institute for Business Value Virtual Enterprise Survey.
Q: What percentage of the following activities is/will be virtualized in your organization?

Is your organization looking outward and forward to facilitate accelerated discovery?

Q1 How are you enabling open science practices so your workforce, partnerships, and ecosystems can engage in constant discovery?

Q2 How are you envisioning the evolution of your infrastructure and virtualization efforts so that science and data-led discovery is supported?

Q3 How are you making rapid and ongoing experimentation a core part of your culture?

ExxonMobil

Optimizing global maritime shipping

How do you orchestrate tens of thousands of merchant ships traversing the oceans to deliver massive amounts of consumer goods? Roughly 90% of world trade is dependent upon maritime shipping. More than 50,000 ships, carrying as much as 200,000 containers each, move around every day, transporting goods worth $14 trillion.

On an international scale, optimizing this magnitude of shipping routes is intractable for classical computers. Research teams from ExxonMobil and IBM are using this scenario to investigate how to effectively map optimization problems to quantum computers.

ExxonMobil, in partnership with IBM, is exploring quantum computing algorithms to further tackle the complexities of global shipping. Researchers are applying different strategies to model maritime routing with the ultimate goal of optimizing fleet management. The intent is to calculate journeys that minimize the distance and time traveled by merchant ships across the globe.

The findings benefit not only global shipping, but also extend across ecosystems. Obviously, routing problems are not limited to the shipping industry, and the researchers indicate their findings could easily be transferred to other vehicle optimization problems with time constraints, such as those related to goods delivery, ride-sharing services, or urban waste management.

Key insight #2

Communities of discovery elevate value for all

The Virtual Enterprise applies scientific discovery principles to innovate its enterprise, platforms, and ecosystems, along with its products, services, and business models.

The Virtual Enterprise does not achieve scientific discovery in isolation. More than two-fifths (42%) of organizations expect most of their innovation will flow from open engagement with customers and ecosystem partners over the next 3 years.[7]

Central to that effort are "communities of discovery," which are becoming the new paradigm for the practice and advancement of scientific discovery (see Figure 2.3). They rely on open science practices and are characterized by dynamic knowledge circulation and well-coordinated collaboration—extended across ecosystems of ecosystems. Such discovery communities are purpose driven, with the impetus for their formation including infrastructure sharing, innovation competitiveness, and a collective mission focus. They operate with portability, elastic capacity, AI-based tools, and security features across multiple clouds.

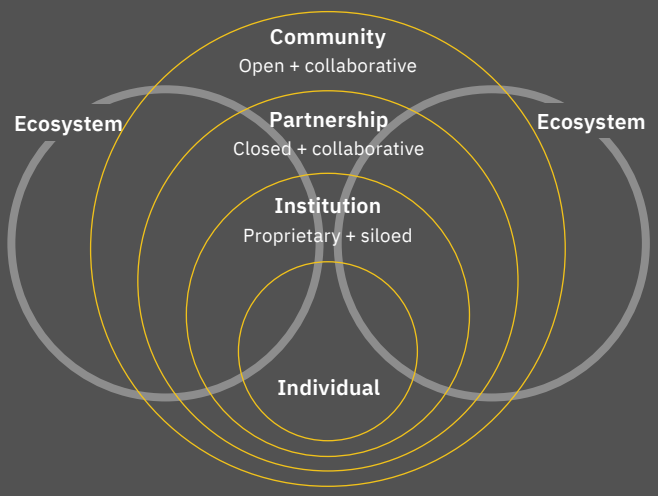
The modern scientific discovery process demands reproducibility of results, collaboration, and effective communication for further expansion. Enterprises cannot remain competitive without leveraging the abundant knowledge, creativity, and resources in these communities. The scientific discovery models practiced there are precursors to the next generation of high-value workflows and workloads.

Leveraging communities of discovery to find solutions to large-scale problems is essential for scaling impact and creating a cycle of accelerated discovery and innovation to positively impact society.

Figure 2.3

Scaling the scientific method requires communities of discovery

As the size and scope of discovery problems increase, new models of collaboration are imperative to drive innovation and impact of scale



Top 5 workflows conducted or enabled by quantum computing in the next 3 years

Sources: "IBM Science & Technology Outlook 2021." IBM Research; Previously unpublished data from the 2021 IBM Institute for Business Value Virtual Enterprise Survey.

How do communities of discovery fit into your business strategy?

Q1 How are you participating in and encouraging the development of communities of discovery?

Q2 What are you doing to leverage scientific discovery outside your organization, and how openly are you sharing scientific advances and data caches uncovered from within?

Q3 How effectively do your tech systems and cloud processes support collaborative discovery from within and externally?

The Hartree National Centre for Digital Innovation

Accelerating discovery through community

The United Kingdom Research and Innovation's Science and Technology Facilities Council (STFC) is building a community dedicated to discovery. The Hartree National Centre for Digital Innovation (HNCDI) in Daresbury, UK, has a mission to support UK businesses and the public sector by reducing the risk of experimentation and exploration in the adoption of innovative new digital technologies.

The program, a partnership with the Hartree Centre and IBM, will apply AI, high-performance computing and data analytics, quantum computing, and cloud technologies to accelerate discovery and develop innovative solutions to industry challenges, such as materials development, life sciences, manufacturing, and environmental sustainability. In the process, HNCDI will help businesses enhance productivity, create new skilled jobs, and boost regional and national economic growth.

HNCDI will help organizations navigate 4 key stages of digital adoption by providing accessible training and application-focused skills, equipping staff to take full advantage of digital technologies, exploring and discovering the technologies businesses need to succeed, turning ideas into practical digital solutions for industry, and identifying and preparing for emerging technologies needed to futureproof the UK economy. In addition to IBM quantum and hybrid cloud resources, scientists in the program will have access to a vast portfolio of IBM commercial and emerging AI technologies focused on materials design, scaling and automation, asset management, supply chain, and trusted AI.

Key insight #3

Exponential tools and systems accelerate discovery

New kinds of data and emerging technologies—such as process mining, neural networks, swarm intelligence, and quantum computing—open up entirely new opportunities to accelerate targeted and insight-led experimentation and innovation.

You may recall learning about the basics of the scientific method as a child: a sequence that runs from observation, to question, hypothesis, experiment, results, and finally, conclusion. With classical computing, we've been able to speed up that process.

But as powerful as classical computing is, it has fundamental limitations in the face of exponential problems. Emerging technologies like AI and quantum computing demonstrate enormous potential to accelerate scientific discovery. The Virtual Enterprise embraces these emerging technologies as powerful and essential tools.

Consider the amazing impact of research involving mRNA, a single-stranded RNA molecule that is complementary to one of the DNA strands of a gene.[8] This research expedited COVID-19 vaccine development, from decoding the virus to vaccine creation in only a few weeks and broad vaccine release in a year. This was possible because we had a decade's worth of mRNA research to leverage.[9]

The triad of classical computing, AI, and quantum computing can supercharge experimentation and the scientific method, generating discovery at a radically faster pace (see Figure 2.4). The unprecedented ability to model complex systems can accelerate the ability to extract, integrate, and validate so that we can draw conclusions. We are already using AI to generate hypotheses automatically and using robotic labs to automate physical experimentation.

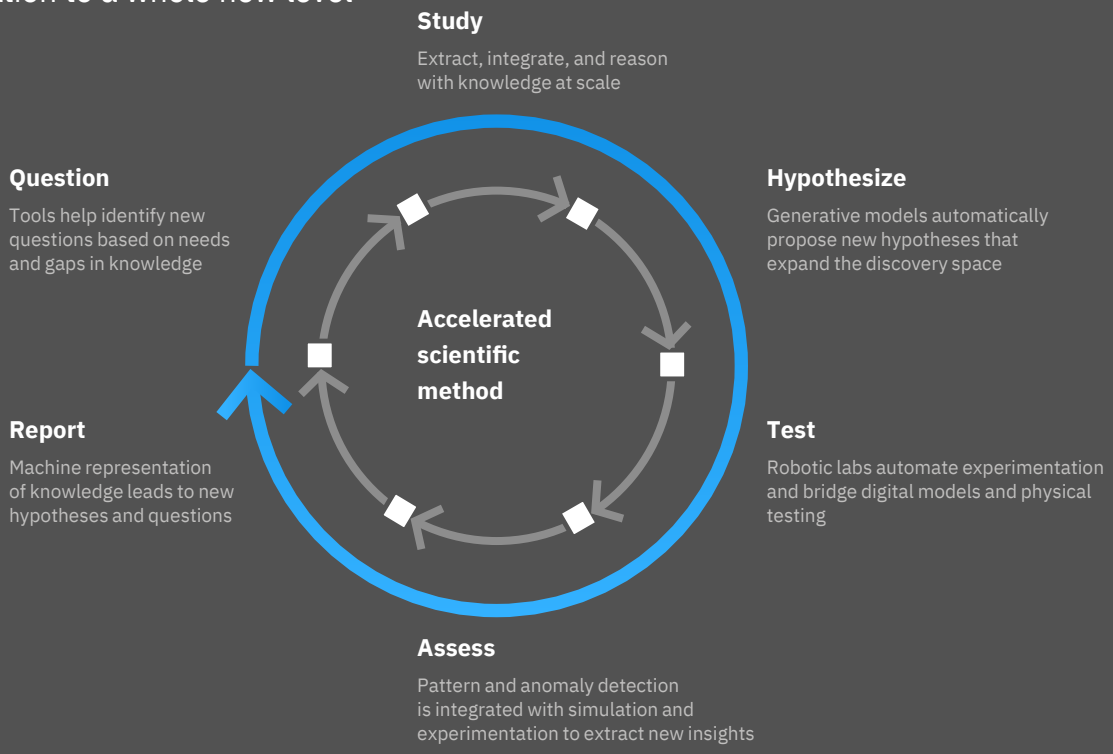
With existing computing, we can model chemical systems, move individual atoms, and simulate how some materials will perform or react over millions of uses. But there are challenges beyond our reach, such as addressing problems where data is unavailable or unclear or imprecise. Quantum computing's step-change capabilities hold the promise of eventually creating solutions to such vexing challenges.

Quantum computers—which are capable of analyzing in minutes problems that would take traditional computers centuries to complete—open the potential to revolutionize areas such as logistics and materials or drug discovery. Quantum-powered workflows and accelerated discovery processes can help the Virtual Enterprise rethink and recast existing workflows entirely, yielding new methodologies, efficiencies, and ways to engage customers, partners, and employees. Extended Intelligent Workflows will be established to offload specific tasks to quantum computers and the innovation that will stem from it.

By *accelerating discovery* and more rapidly translating knowledge into practice, all kinds of new leaps will be possible, from healthcare to finding new materials, to improving the efficiency of solar panels, wind turbines, and battery life.

Figure 2.4

The combination of classical computing, AI, and quantum computing takes experimentation to a whole new level



Source: "The Quantum Decade: A playbook for achieving awareness, readiness, and advantage." IBM Institute for Business Value. July 2021.

Is your organization equipped to embrace exponential tools?

Q1 How advanced are the scientific tools and data available to your organization, as it looks to accelerate innovation?

Q2 Are you exploring partnerships with exponential technology experts to mesh your organization's insights and information with larger pools and faster tools?

Q3 How well do you understand what quantum computing might bring to your enterprise, industry, partner platforms, and ecosystems?

Cleveland Clinic

Unleashing the potential of cloud, AI, and quantum computing

Nonprofit multispecialty academic medical center Cleveland Clinic, ranked #1 in heart care, is partnering with IBM to establish the Discovery Accelerator, a center that will deploy hybrid cloud, AI, and quantum computing technologies to fundamentally increase the pace of discovery in healthcare and life sciences.

Cleveland Clinic researchers will use advanced computational technology to generate and analyze massive amounts of data to enhance research in genomics, single cell transcriptomics, clinical applications, chemical and drug discovery, and population health—including new approaches to public health threats like the COVID-19 pandemic.

The center will rely on next-generation IBM technologies and innovations like deep search, AI and quantum-enriched simulation, generative models, and AI-driven autonomous labs. As part of the 10-year collaborative program, IBM will provide cloud network access to more than 20 IBM quantum systems, with 1,000+ qubits deployed by 2023.

Action guide

Deploying science and data-led innovation for optimum impact

The Virtual Enterprise can accelerate discovery at an unprecedented pace. The challenges of today's marketplace and today's world are intense. But the tools we have at our disposal are more powerful than ever.

Exponential challenges require exponential capabilities. Embracing those capabilities and integrating purpose-fit processes—relying on experimentation, deploying open science, and leveraging advanced human and technological assets—will help catalyze new solutions. Only through science and data-led innovation will the Virtual Enterprise begin to exhibit its potential.

Here is a six-step outline for deploying science and data-led innovation for maximum impact:

Experiment at scale

- Encourage collaboration and the sharing of new ideas within the organization, with partner networks, and through ecosystems.
- Rely on testing of hypotheses, simulation, and other tools of the scientific method that are core to discovery.
- Develop new and improved data sources through open science methods and practices.

Harness massive data

- Build and replenish clean, clear, reliable information sets, drawn both deeply and broadly.
- Combine predictive and prescriptive analysis for better decision making.
- Look for micro-insights that become possible with extreme digitization.

Architect modern infrastructure

- Leverage open architectures that multiply the benefits of data sharing.
- Deploy AI and machine learning to allow better pattern recognition, workflow optimization, and solution gathering.
- Engage with quantum computing tools and methods to experience expanded capabilities.

Reinforce ecosystem connectivity

- Rely on open, secure hybrid cloud to smooth and speed Extended Intelligent Workflows.
- Join communities of discovery to tap into new ideas and discoveries.
- Prepare guidelines and roadmaps for engagement, information verification, and trust.

Champion science innovation

- Support well-researched solutions, even when surprising or challenging to the organization.
- Invest in ongoing open-ended, but value-based, discovery initiatives.
- Execute on new ideas to scale inventions and innovation.

Embrace the future

- Redefine workforce roles for the discovery-led practices of tomorrow.
- Reorient systemic processes for speed and perpetual change.
- Reimagine where, how, and what your organization can achieve in light of new science and data-led exponential possibilities.

The Magic of Extended Intelligent Workflows

The Intelligent Workflow is the Golden Thread that creates the backbone of the value chains that connect ecosystem participants. As workflow reach is extended, the power of technologies such as extreme automation, AI, and IoT is multiplied. Virtualization adds new opportunities for networks, connectivity, and skills engagement, bringing the workflows to life and driving agility.

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Business Transformation Services, Japan

How Extended Intelligent Workflows amplify opportunity

Intelligent Workflows serve as glue for the Virtual Enterprise, bringing together purpose, intent, and value. Participants who operate along the workflow, whether they are inside the organization, in partnerships, or beyond across its ecosystems, need to be aligned to that intent, and they must provide an integrated, consistent experience.

These workflows are ultimately in service of end customers, who experience their collective value. COVID certainly drove home the importance of Extended Intelligent Workflows in delivering transformational experiences at pace and scale.

The effectiveness of the Extended Intelligent Workflow is also dependent on the clock speed, accuracy, and security of all the participants who engage. The openness and plug compatibility of the workflow set the boundaries for the extension of value creation and leverage. We have seen the power of looking at workflows within the enterprise and using them to straddle the historic process siloes.

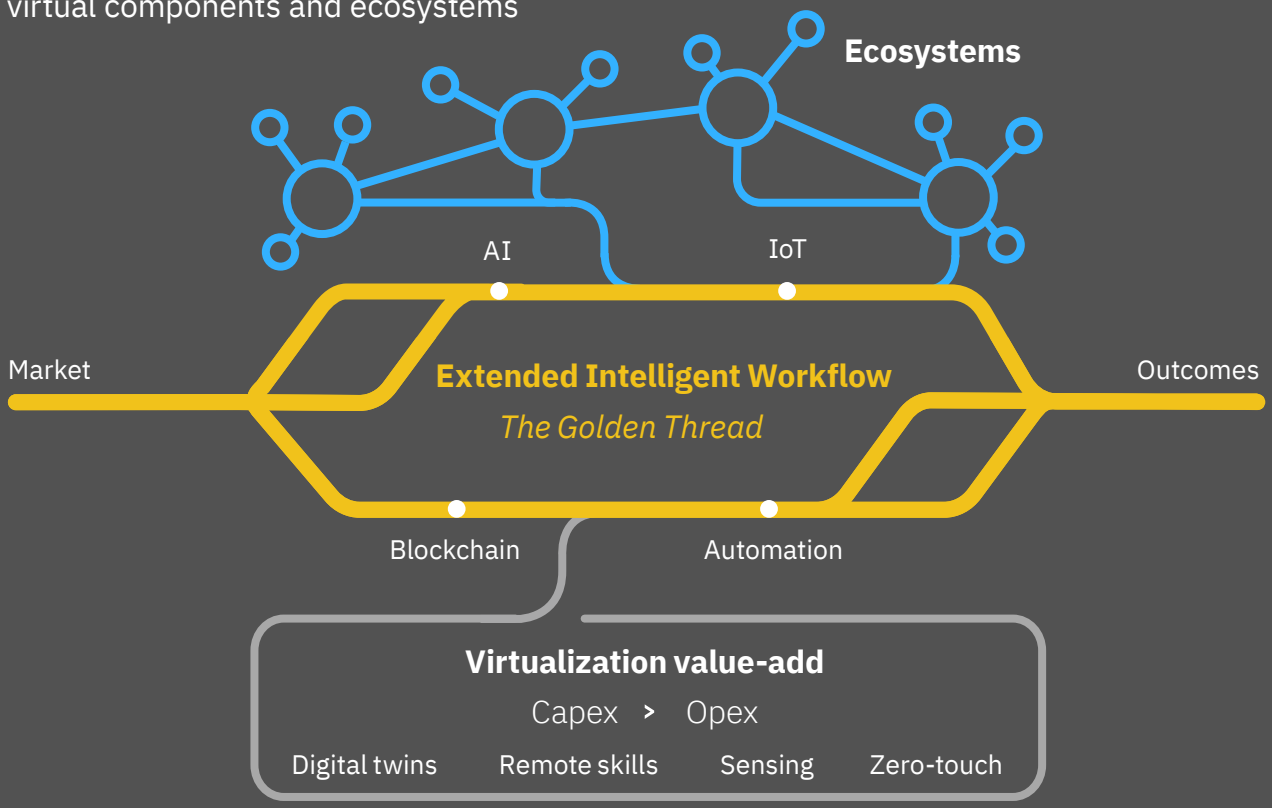
The more we extend the scope of a workflow and the greater the end-to-end connectivity is among the workflow's customers and contributing participants, the greater the business outcomes can be. By extending this scope deeper into customers, suppliers, and other stakeholders, the value potential of the Virtual Enterprise can be exponentially amplified.

What are Extended Intelligent Workflows?

Extended Intelligent Workflows power business transformation by optimizing operational efficiency, speed, and agility. These workflows connect resources within a single organization, as well as resources across organizations and industries, through open digital standards and protocols. They rely on data and trusted hybrid cloud access to fuel experimentation, real-time decision making, and ongoing partnership. In the process, Extended Intelligent Workflows foster collaboration and massively enhance value potential and value creation.

Figure 3.1

Extended Intelligent Workflows integrate virtual components and ecosystems



As Extended Intelligent Workflows become true platforms with attributes that attract mass participants, they become the instantiation of the Virtual Enterprise and its related platforms and ecosystems. The opportunity to identify improvement potential by applying combinations of exponential technologies, implemented to operate along the extended workflows, drives business model transformation and next-level performance. As such, workflows define competitive advantage and differentiation of the modern extended enterprise.

Virtualization becomes another class of exponential technology that can drive new performance opportunities. The potential to transform physical assets to digital entities; capital expenditure (Capex) to operational expenditure (Opex); and people, teams, and offices to new models of participation exposes new value pools.

In addition to being aligned to a shared purpose, Intelligent Workflows need to straddle silos and provide consistent experiences as a whole—within the organization and beyond. The effectiveness of the workflow and, by implication, the Virtual Enterprise depends on the speed, accuracy, and security of every organization and individual who engages (see Figure 3.1).

Agility: Transforming work, ecosystem thinking, and virtualization

With agility at the heart of the Virtual Enterprise, Extended Intelligent Workflows have become the mechanism for transmitting experiences, information, and relationships across ecosystems to drive better, faster experimentation and decision making and to unlock exponential value.

Leading organizations are shaped by a goal of speed and efficiency. They are building digital Intelligent Workflows that are streamlined and optimized, leveraging protected data for seamless any-to-any and end-to-end frictionless connectivity. AI-powered and automated, these workflows balance the continuity of operations—operational effectiveness—in response to surges in customer demand. They are embedded with predictive intelligence, such as dynamic customer response, preventative maintenance, and real-time inventory status. This automation enables digitally supported decisions for rapid identification, prioritization, and recommendations for next-best actions.

The benefits of intelligent automation are transformational. Executives from a recent IBM Institute for Business Value survey say intelligent automation affords their organizations numerous advantages, with improved customer experience at the top of the list, followed closely by efficiency gains (reduced operational costs) and improved decision making.[1] Additional benefits include improved reliability and reduced risks—often undervalued in pre-pandemic days but now more broadly apparent as companies address workforce dislocation, supply chain challenges, and customer service disruptions.[2]

What's more, reinvention of Extended Intelligent Workflows can move beyond that of the virtual knowledge worker into the world of engineering and manufacturing. IoT and sensing bring information from the edge of the enterprise—or within the heart of the machines that make things—into the workflow for further automation, insight, and prediction.

When physical meets digital, automation and Intelligent Workflows can drive velocity with low- or no-touch operations in customer service, manufacturing, distribution, transportation, and field services. Computer modeling yields new discoveries, supported by unprecedented advances in sensor technology, AI, edge access, and even quantum processing.

These benefits rely on secure yet flexible connectivity and interoperability: machines that connect readily to other machines and to a full range of exponential technologies. AI and machine learning algorithms have become more efficient, making it easier to program these devices, devise innovative use cases, and reduce energy requirements.

What differentiates workflow leaders

What does workflow leadership look like? Organizations that have embraced Extended Intelligent Workflows distinguish themselves through new insights, flexible operations, and constant learning that yields significant value. Analysis of customer data might prompt the reshaping of a service proposition. Continual monitoring of activities and performance within an operational process can expose areas for ongoing improvement and prompt automated or human intervention. As AI and machine learning are applied to huge new universes of data, the potential for pattern recognition and workflow optimization is enormous.

We have seen productivity improvements arise from remote-working models and massive delayering of organizations and process complexity from digital zero-touch approaches. Those, combined with extreme automation and pervasive leverage of bots, have opened up new workflow improvement opportunities, as has the development of more comprehensive "digital twin" models. A digital twin is the virtual representation of a physical object or system across its life cycle, using real-time data and other sources to enable learning and reasoning, while dynamically recalibrating for improved decision making.

The potential to take location out of the equation is huge and opens up new labor-cost pools, virtual Centers of Excellence, and the redefinition of spaces within which Intelligent Workflows operate. Whole new extreme digital business models can be imagined, such as marketplaces, aggregators, and technology-powered consortia, straddling geographic boundaries.

Intense connectivity fuels this value expansion. In a recent IBV study, executives cite a hybrid cloud environment as key to Intelligent Workflows. Hybrid cloud architecture allows for workload portability, orchestration, and management across multiple environments, as well as a consistent standards-based approach to development, security, and operations.[3]

Overall, successful workflow leadership depends on 4 priorities, according to IBV research:

Openness: Just 36% of executives say they outperform competitors or similar organizations in openness and transparency; yet over 50% report that transparency and visibility will be a critical area of advantage over the next 3 years.[4]

Innovation: 42% of executives agree that over the next 3 years, most of their organization's innovation will be based on an open approach that involves partnering with customers and ecosystem participants.[5]

Agility: Almost half of executives cite improved operational agility as an important business priority and say that over the next 3 years, agile operating models will compliment fluid work teams.[6]

Automation: 78% of executives whose organizations are scaling automation say that intelligent machine decisions will advance from routine to complex or mission-critical decisions in the next 3 years.[7]

The Virtual Enterprise brings these priorities to life, activated through the Golden Thread of Extended Intelligent Workflows. The key insights that drive that activation revolve around:

— New ways of working

— Ecosystem thinking

— Virtualization

Key insight #1

New ways of working transform organizations

Extended Intelligent Workflows are the Golden Thread of the Virtual Enterprise that integrate the end-user experience provided by the enterprise, its platforms, and its ecosytems.

The Virtual Enterprise relies on Extended Intelligent Workflows to facilitate hyper-interconnectivity: New ways of working unlock opportunity and transform organizations.

The sophisticated combination of digital tools and human ingenuity can take operational performance to new levels. According to a recent IBV study, implementation of Intelligent Workflows is estimated to drive an additional 8% of annual revenue growth (on average).[8]

AI-powered and automated extended workflows transform the way that work is done, as they create new ways of working—human with machine. This extends beyond functional execution, as automated decision making is affected. Advanced algorithms enable devices to self-learn, self-correct and self-direct; such connected devices and assets understand their current state, learn, and take action accordingly.

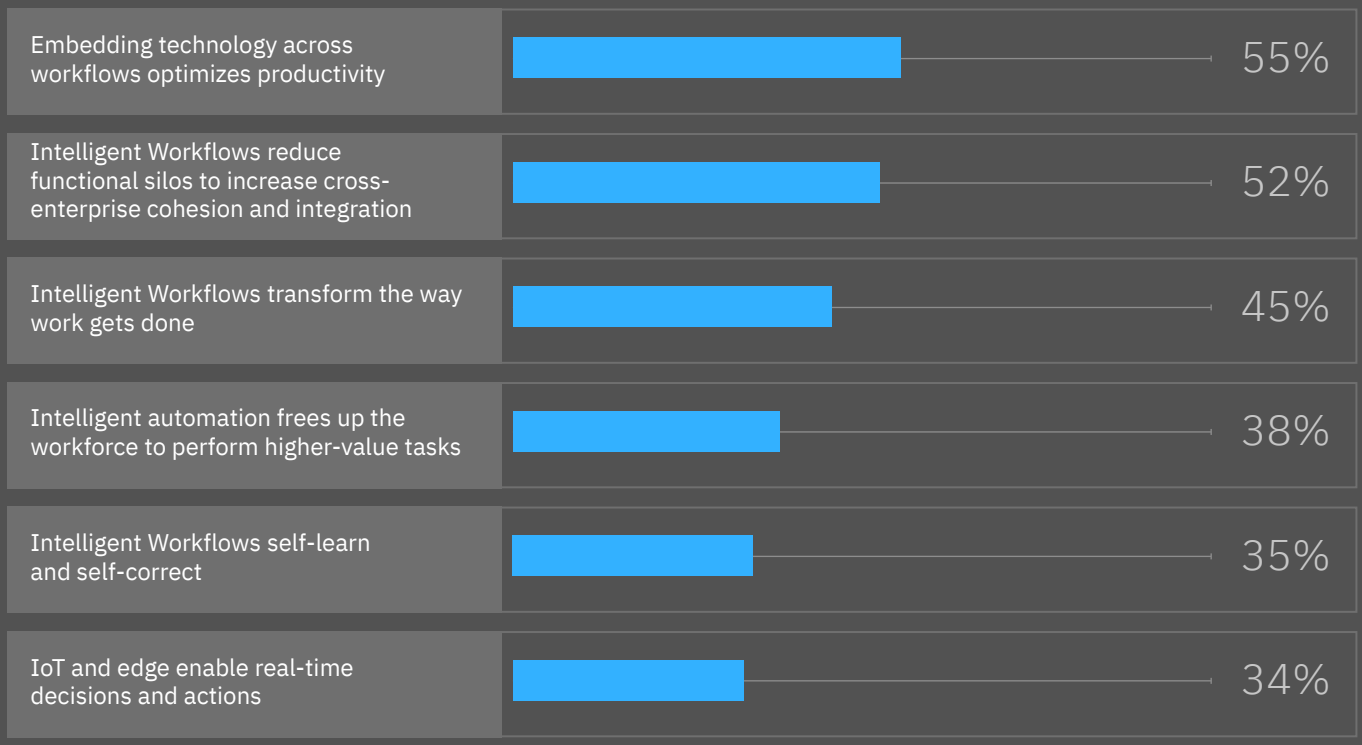
In this way, Intelligent Workflows serve to complement, sharpen, and speed the essential value-add that only people can provide. In fact, more than half of the executives surveyed for a recent IBV study report that Intelligent Workflows reduce functional silos and yield a host of operational benefits including optimized productivity (see Figure 3.2).[9]

Data and information are the raw materials of these new Intelligent Workflows. Data fuels the Intelligent Workflow, where new adjacencies and combinations of data will be uncovered. Data standards and leverage of open protocols can extend the potential for experimentation and innovation with partners. This creates one of the drivers for open hybrid cloud architectures as the speed of data access becomes mission-critical for new real-time processes.

Data from machine sensors and IoT technologies can further enhance workflow automation, enabling real-time insights and predictions. One of the biggest areas of value reinvention during the pandemic has been the supply chains of the world, where flexibility and adaptability have vied with resiliency and risk management to drive the importance of real-time demand and supply signals.

Figure 3.2

Intelligent Workflows transform organizations: human and machine



Source: Previously unpublished data from the 2021 IBM Institute for Business Value Virtual Enterprise Survey.
Q: To what extent do you agree with the following statements about your organization's Intelligent Workflows today? (Figure depicts "somewhat agree" and "strongly agree" responses.)

Is your organization prepared for new ways of working?

Q1 How will your organization apply automated and AI-powered extended workflows to transform the way work is done, amplifying the impact and effectiveness of both humans and machines?

Q2 How can you expand data ownership and access to enhance Intelligent Workflows?

Q3 Are you exploring embedded intelligence to predict, self-learn, self-correct, and self-direct your organization's operations, as well as customer and workforce experiences?

Pandora

Innovating customer experience with Intelligent Workflows

Pandora found international success in designing, manufacturing, and marketing hand-finished jewelry made from high-quality materials at affordable prices. It is sold in more than 100 countries through more than 6,700 points of sale, including around 2,700 concept stores. In the wake of the pandemic, Pandora was forced to close down most of its stores. This has led to a shift to online retail and acceleration of its digital transformation.

The company quickly leveraged a comprehensive order management platform as the backbone to omnichannel fulfillment with a commerce-on-cloud solution powering its ecommerce workflows.

Greater automation across its channels streamlined workflows for more efficient delivery while also boosting the jeweler's sustainability credentials.

At the same time, an Intelligent Workflow provided in-store staff and virtual customer service representatives superior end-to-end visibility to better meet consumer needs. The digital transformation has brought digital and store technology closer together and closer to the customer. Virtual queuing for stores and virtual product trials emulate the in-store experience via augmented reality technology. Pandora is meeting its digital mission of creating personal experiences that are individualized, localized, and connected across channels and markets.

Key insight #2

Ecosystem thinking amplifies value creation

Value can be exponentially amplified if Intelligent Workflows extend their scope deeper into customers, suppliers, ecosystem partners, and other stakeholders.

The Virtual Enterprise prioritizes advanced end-to-end connectivity to generate deeper relationships across the ecosystem. Ecosystem thinking fuels Intelligent Workflows, further extending value.

Through the application of technology at scale, Extended Intelligent Workflows link together various areas of organizational engagement and massively enhance economic results, for instance, by generating closer, more aligned customer relationships. This ecosystem thinking begins with internal-to-the-organization Intelligent Workflows that span silos and include embedded technologies such as automation, blockchain, AI, 5G, cloud, and edge computing to support exceptional outcomes. (IBV research shows that implementing these technologies in workflows can triple the benefits.)[10]

But the biggest outcomes come with broader reach. Workflows that run deep into ecosystems—and into ecosystems of ecosystems—have the potential to improve impact exponentially by fueling innovation and collaboration among participants. Massive digital acceleration that connects customers, suppliers, and partners across ecosystems enables reinvention at scale. A recent IBV survey asked executives what areas will be most important for competitive advantage in 3 years. Many of the factors cited map back to—and can be amplified by—Intelligent Workflows (see Figure 3.3).[11]

The emergence and expansion of new agile operating models can empower networks of teams through a culture of accountability, alignment to strategic objectives, and constantly evolving expertise. By providing transparency and visibility, these models propel ongoing collaboration and self-calibration and offer near-instant insights in support of an organization's intent.

The purpose of ecosystem thinking is to bring consistent experiences and, with the openness of secured data exchanges, accelerated value creation. The explosion of data sources and micro-insights born out of extreme digitization provide the opportunity to decompose complex problems and find solutions. As we approach a revolution that's driving computing toward highly heterogeneous environments, exponential technologies, including quantum computing, will be integrated into Intelligent Workflows managed on a hybrid cloud.

Figure 3.3

Most important areas of competitive advantage in the next 3 years

Source: Previously unpublished data from the 2021 IBM Institute for Business Value Virtual Enterprise Survey.
Q: What are your organization's most important areas of competitive advantage?

Are you ready to extend value with ecosystem thinking?

Q1 What value and growth potential might be unlocked by exponentially extending your organization's workflows to varied ecosystems and ecosystems of ecosystems?

Q2 How will you scale the integration and application of automation, AI, blockchain, hybrid cloud, and other technologies to amplify value to customers, suppliers, and partners?

Q3 What are your plans and strategies for bringing ecosystem thinking into the operating models for your workforce to enhance transparency, collaboration, and insights internally and externally?

we.trade

Simplifying trade with Intelligent Workflows

Founded by a consortium of major banks in Europe, we.trade uses blockchain technology to connect buyers, sellers, banks, insurers, and logistics organizations with greater data intelligence and traceability. This first-of-a-kind ecosystem simplifies cross-border trading, fosters greater trust and transparency, and opens new markets for participants by reducing barriers to engage.

The we.trade platform streamlines the trade finance lending workflow, reducing friction and supporting companies as they expand into new markets.

In addition to providing traders with trusted access to insurance, credit rating, and logistics services, the platform helps reduce counterparty risk, automate transactions, and integrate the end-to-end trade ecosystem.

In the past two years, we.trade has grown to include 17 banks across 15 countries and now provides track and trace visibility for over 400 couriers. In addition, the efficiencies and interconnectivity provided by the platform have led to an 80% reduction in transaction processing costs.

Key insight #3

Virtualization becomes an exponential technology

Virtualization adds opportunity to enhance the efficiency and effectiveness of Intelligent Workflows and the platforms that they support.

While Intelligent Workflows are the Golden Thread that connects the Virtual Enterprise, virtualization is the thread that connects Intelligent Workflows. Virtualization enhances efficiency and effectiveness.

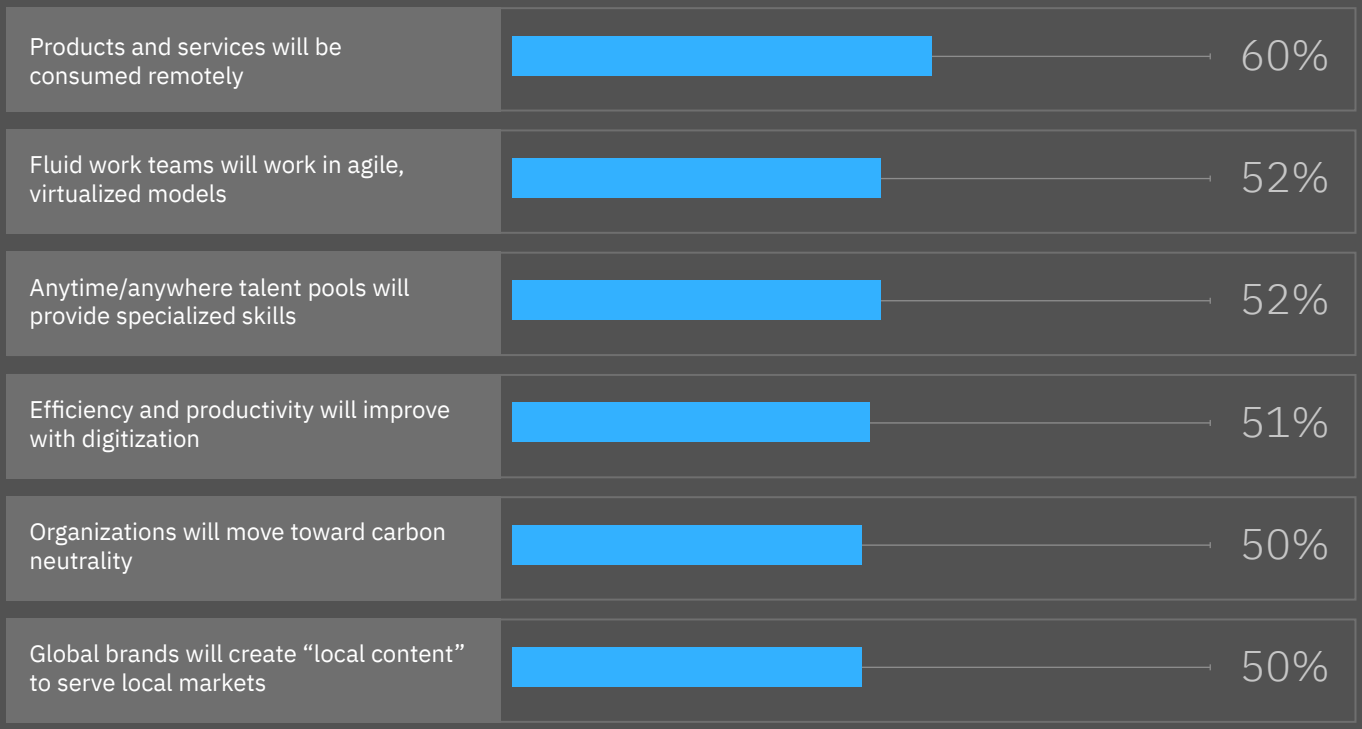
Virtualization applies to workforce practices, customer engagement, and physical assets (see Figure 3.4). According to recent IBV research, virtualization has already lowered organizational costs by 7%, on average, and is expected to trim a further 9% in costs over the next 3 years.[12]

Virtualization binds remote and hybrid working models, transcending location-based obstacles and enhancing productivity. As location becomes less important, the opportunity to access skills and capabilities from anywhere becomes real. This extended access to people across the organization, from partner organizations and wider labor pools throughout ecosystems, unlocks huge potential.

Virtualization also transforms physical assets into digital entities via computer simulations, digital twins, and advanced modeling in augmented reality (AR)/virtual reality (VR) interpretations. These advances can provide new real-time insights and help lower risk profiles. What's more, virtualization can alter the historical equation for an organization's expenditures on real estate, operating assets, heavy equipment assets, and more. By shifting capital expenditures to outsourcing and other new models of asset-sharing—opportunities that only ecosystem platforms with Intelligent Workflows can advise, connect, and provide—virtualization enables the managing of physical assets on an "as needed" basis as Opex, versus the traditional approach of ongoing maintenance and Capex.

Figure 3.4

Digital transformation and virtualization over the next 3 years



Source: Previously unpublished data from the 2021 IBM Institute for Business Value Virtual Enterprise Survey.
Q: Think about your organization's digital transformation over the next 3 years. To what extent do you agree with the following statements? (Figure depicts "somewhat agree" and "strongly agree" responses.)

How can virtualization benefit your organization's workflows?

Q1 How will the virtualization of Intelligent Workflows connect your organization's remote and hybrid working models, taking location out of the equation and enhancing productivity?

Q2 What are you doing to leverage virtualization to reconfigure physical assets and infrastructure, including potential resource-outsourcing and resource-sharing models?

Q3 How might virtualization contribute to more secure, reliable, predictive, and near-instant insights, decisions, and actions?

ASTRI

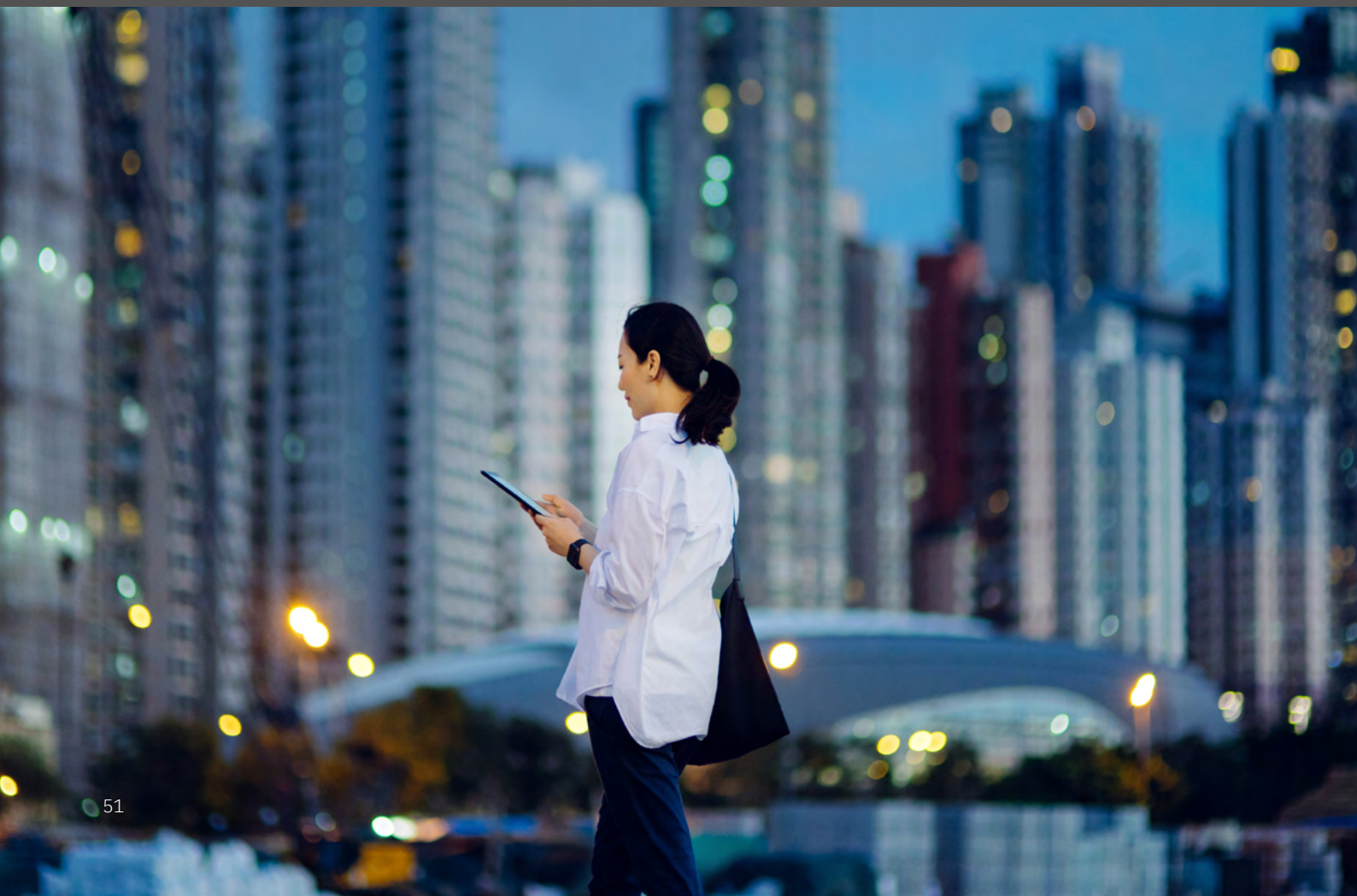
Intelligent Workflows for smarter manufacturing

Hong Kong Applied Science and Technology Research Institute Company Limited (ASTRI) was founded to promote Hong Kong's competitiveness in technology-based industries through applied research. As part of its mission, ASTRI is tasked with helping manufacturers shorten time to market, reduce development costs, and enhance quality.

ASTRI has implemented a science-based, agile approach to designing smarter manufacturing equipment, leveraging Intelligent Workflows across assets throughout the extended production process.

Using requirements-driven analysis and a model-based design, the organization creates a digital "twin" of a piece of equipment. This allows engineers to perform a wide-range of simulations and tests, at nominal incremental cost, and identify potential design defects much sooner in the cycle. This model-based method also enables earlier validation of customer requirements.

ASTRI estimates that the twin approach has reduced integration time by 40% and cut the total cost of development by 30%. In addition, the use of robotic automation, IoT sensor integration, and digital twin modeling for predictive maintenance supports 24x7 factory uptime.



Action guide

Extending Intelligent Workflows for optimal impact

As the Golden Thread of the Virtual Enterprise, the extended workflow becomes the transmission mechanism for the experience and values of the ecosystem that it is threaded through. Workflows become the backbone of trusted information and relationships and the repository of the automated rules and algorithms that drive crucial, in-the-moment decision making.

Extended Intelligent Workflows fueled by data-driven decisions can adapt to rapidly shifting conditions. Intelligent Workflows are the essential tools for connecting ecosystems of ecosystems; generating value by reimagining the way work is done; adding AI and automation to everyday tasks; and enabling better real-time insights, decisions, and actions.

Here is a five-step outline for optimizing the impact of Extended Intelligent Workflows:

Customize your customer experiences

- Deliver differentiation through a radically personalized customer experience that is integrated across operational touchpoints.
- Reimagine a cross-domain approach to customer engagement.
- Drive new insights across the organization and the platform to speed the delivery of transformational experiences at scale.

Build self-correcting operations

- Strive for operational improvement through self-learning, self-correcting, and self-directing capabilities.
- Connect devices and assets with intelligence to understand the current state, learn, and take action accordingly.
- Anticipate emerging technology that leverages automation.

Execute with agility

- Create an operating culture of accountability, alignment to strategic objectives, and constantly evolving expertise with relentless transparency and ongoing collaboration.
- Provide near-instant data for insights in support of your workforce, ecosystems, and fluid work unit teams for rapid response and efficiency.
- Evolve hybrid work models and automation to reduce reliance on physical assets and infrastructure, shifting the Capex-Opex equation.

Foster transparent, ethical networks

- Draw on ecosystem networks and new global talent pools.
- Enable cross-industry, multi-enterprise networks to provide shared visibility into trusted data, backed by blockchain technology.
- Extend connectivity and transparency to promote higher human expression and engagement.

Evolve dynamic, open, more secure computing configurations

- Integrate hybrid cloud into technology strategies to support Intelligent Workflows.
- Configure workflows by assembling data in varied computing environments, supporting AI and extreme automation.
- Embrace open, extensible technology systems that support fluid integration of new participants at scale.

The Urgency of Sustainability and Impact

The Virtual Enterprise aligns purpose with wider societal impacts. With sustainability and stakeholder capitalism taking hold in the C-suite, new ecosystem business models are helping provide solutions to some of today's biggest challenges around climate, health, security, and equality. Increasingly, sustainability also impacts how customers, partners, and employees feel about an organization.

Sanjay Tugnait

Chief Market Maker and Global Managing Partner
Sustainability Practice

Sheri Hinish

Global Executive Partner, Enterprise Sustainability
Sustainable Supply Chain

Manish Chawla

General Manager, Global Industrial Sector
Chemical, Petroleum, and Industrial Products Industries

How sustainability and impact drive positive enterprise transformation

Even before the pandemic, a new focus on sustainability and environmental, social, and governance (ESG) goals for business was emerging. Against that backdrop came lessons from the COVID crisis about the interconnectedness of the globe and the role of nature and its relationship to humanity. We have seen that the shifts to more virtual work, less travel, and lower levels of urban activity and global physical trade have made a meaningful impact on carbon in the atmosphere.

The evolution toward the Virtual Enterprise reinforces this trend and can be part of a systemic shift to a sustainable planet. The connection of business intent to a wider intent has arisen as corporations seek to embrace and scale stakeholder capitalism and as customers and employees seek to make purchases and work choices based upon the values of the organization with which they are interacting (see Figure 4.1).

The extended ecosystems of the Virtual Enterprise that operate with their automated Intelligent Workflows, remodeled asset mixes, and smart leverage of data have the potential to live up to this new level of impact. The partnerships that will characterize them will be made up of participants with shared values.

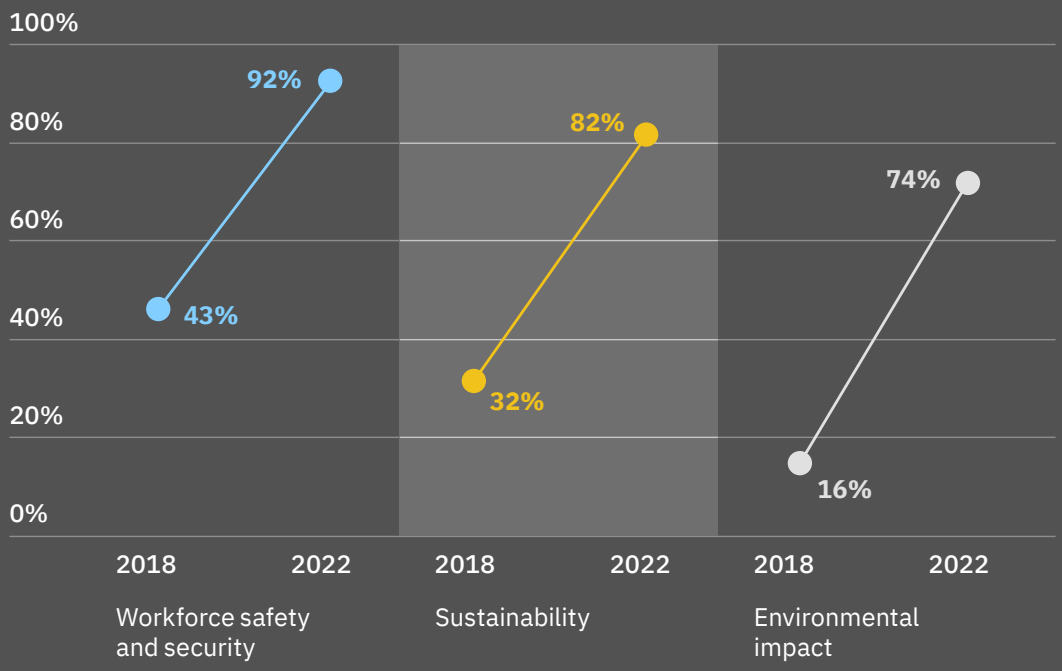
This is all happening against a rising focus on stakeholder capitalism where the purpose of the enterprise has been extended to its societal impact. All the big issues that the world faces—from health, climate, and food security to inequality—are now being targeted by growing partnerships and ecosystems.

What is sustainability?

Sustainability can be a complex, somewhat nebulous concept, with different meanings for different groups. For some, it signals environmental objectives only. Others apply the term to a broad agenda of social, economic, and even political factors. Regardless of specific focus, sustainability requires a commitment to ongoing transformation. Transformational sustainability is both a necessity and a tool for organizations to future-proof themselves against looming risks, deliver on community needs, and enable new opportunities and business models.

Figure 4.1

Business leaders express more concern about people and the planet than ever before



Source: "COVID-19 and the future of business: Executive epiphanies reveal post-pandemic opportunities." IBM Institute for Business Value. September 2020. ibm.co/covid-19-future-business.
Q: To what extent is your organization prioritizing the following business competencies? Figure depicts "high" and "very high" responses.

With companies vying to take the lead in shaping new transformative platforms and models, the Virtual Enterprise is the perfect vehicle to facilitate these moves. Its open approach enables the integration of sustainability into a company's fiber—its DNA. Organizations can weave sustainability into value propositions, business partnerships, and customer engagement strategies to influence how humans treat each other and the planet, encouraging behaviors that contribute to a positive ecological footprint. Relying on new exponential technologies, they can create innovative products and services linked specifically with sustainability efforts.

Ways of working have changed forever, and the explicit recognition of health and wellness of employees and stakeholders will remain a high priority. As the Virtual Enterprise develops new networks of activity and team models, technology will play a huge role in taking the relationship between employee, employer, and organizational IT to a richer level.

The enterprise will be brought into the homes of employees, resulting in new relationships between work, employees, their families, and the community as a whole. Recognizing the ethics and governance issues that arise as technology is increasingly woven into our lives, the Virtual Enterprise espouses the spirit of responsible computing. It works to channel technology toward positive outcomes and identify ethical principles and practices that protect data privacy and integrity.

Sustainability and impact: Connecting with stakeholders, improving outcomes, and solving the unsolvable

Organizations that lead on sustainability and impact do not approach them as secondary objectives. They integrate the related objectives into their core motivation, radically altering the corporate equation for success. Sustainability and impact provide a guiding prism through which priorities and activities are viewed.

The Virtual Enterprise appreciates that pursuing "social-good" agendas can go hand in hand with delivering business results. Recalibrating the relationship between business and society can trigger new processes and drive discovery at unprecedented speed, scope, and scale.

Increasingly, investors, consumers, employees, and partners consider sustainability and societal impact when making purchasing, employment, investment, and engagement decisions. Together these imperatives are shaping a new corporate agenda. According to IBV research, 9 out of 10 companies today are working on sustainability initiatives, up from about half prior to the pandemic.[1] In fact, almost 60% of executives say the upheaval associated with the pandemic will impact the broader social contract and fundamentally change the relationship between business and society.[2]

Some of the corporate motivation behind social responsibility is about future-proofing: Government-imposed sustainability regulations are increasing; consumer demands related to sustainability are becoming more strident; and investors are increasingly emphasizing ESG criteria and other sustainability metrics. Organizational leadership cannot ignore these rising pressures and requirements.

The COVID-19 pandemic also underscored society's interconnectedness—how actions taken in one part of the world can have global implications. In such circumstances, supporting the collective interest can also serve an organization's self-interest. For the Virtual Enterprise, serving a social agenda can also contribute to growth and market gain.

Whether it's digitizing resource-intensive processes, uncovering new efficiencies using high-performance digital-enabled systems, or solving problems through science and data-led innovation, sustainable practices help open the door to new markets and growth. Ethical innovation that progresses the ESG agenda can shift the business-as-usual paradigm and transform into profit-with-purpose, a higher form of capitalism. Organizations that follow such a path can serve as paradigms of the future, reaping outsized gains and identifying future avenues for growth.

Sustainability and purpose are now corporate imperatives in the fullest sense of the word. Environmental and wider societal challenges are influencing organizational strategies and operating models across sectors and functions. This increased focus on sustainability and social responsibility is creating new market opportunities, driving operational efficiencies, impacting risk management strategies, influencing customer and employee expectations, and operationalizing new supply chain strategies.

What differentiates leaders

The cycle of change mandated by sustainability requires enhanced virtualization: market-making platforms and ecosystems; science and data-led innovation; Extended Intelligent Workflows; inclusive human-technology partnerships; and the open, secure sharing and collaboration enabled by hybrid-cloud engagement.

A focus on sustainability can strengthen both corporate purpose and customer and employee engagement. In addition, digital technologies can help companies combine improved sustainability performance with better business outcomes.

We found that successful sustainability leadership depends on 4 priorities:

Commitment: According to surveyed executives, the #1 leadership hurdle in developing a post-pandemic workforce is fostering a culture rooted in empathy, adaptability, and innovation.[3] Leaders are embracing sustainability and purpose as a corporate imperative, embedded within their organizations' business strategies and value propositions.

Deployment: One in 3 executives report that increasing sustainable operations is one of their most important business priorities.[4] Tapping digital technologies and data insights can help align operational improvements with better sustainability outcomes.

Collaboration: Platform-enabled ecosystems can facilitate open innovation focused on building a more sustainable future. Recognizing the need to support such synergy, 65% of executives say their organization will leverage digital command centers to enable ecosystem collaboration within the next 3 years.[5]

Transformation: According to 60% of executives, customers and citizens will access and consume their products and services remotely over the next 3 years.[6] To meet societal and business needs, transformation itself must be an ongoing, sustainable practice—not simply a step, action, or plan.

The Virtual Enterprise brings these priorities to life. We identified 3 key insights that serve as a foundation for responding to and advancing the urgency of sustainability and impact. They are focused on:

— Stakeholder motivation

— Business and societal outcomes

— Open innovation

Key insight #1

Sustainability appeals to and motivates stakeholders

Sustainability and corporate purpose are an increasingly important ingredient of success with customers, employees, ecosystem partners, and the community as a whole.

The Virtual Enterprise recognizes that because stakeholders (such as customers, employees, companies, and countries/governments) are motivated and animated by sustainability, its influence spans the enterprise experience—from consumer decisions, to workforce issues, to relationships with investors and partners.

Customers have become more environmentally conscious and aware of the societal impact of their consumer choices. According to a 2021 IBV consumer survey, 93% of global consumers say COVID-19 affected their views on environmental sustainability, and more than 2 in 3 say environmental issues are significantly important to them personally. More than half are even willing to pay a premium for brands that are environmentally responsible.[7] Many consumers are embracing the philosophy of sustainable living, which involves making choices that aim to reduce their individual and society's collective environmental impact.[8]

Consumers are also focused on social responsibility issues, viewing environmental and social responsibility as two sides of the same coin. Roughly 3 in 4 say access to education and ensuring good health and well-being are significantly important to them, while 72% cite ending poverty and hunger.[9]

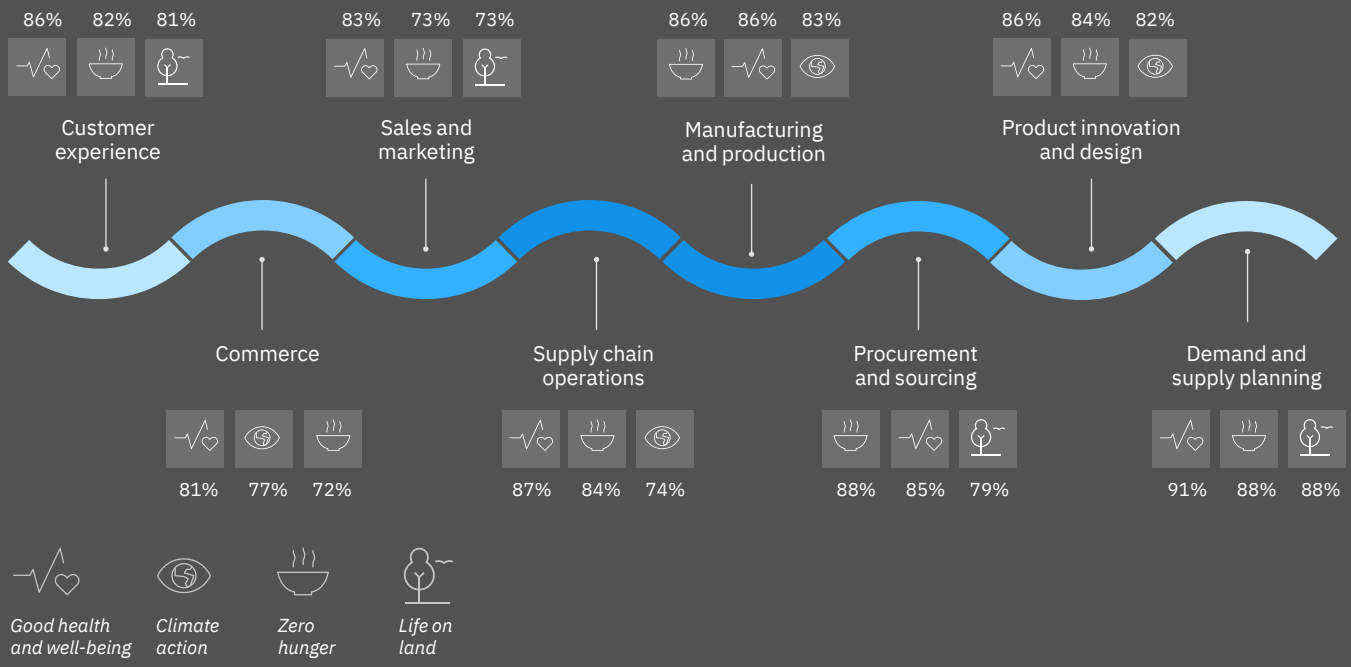
This perspective is echoed when the subject is potential employment: 69% of respondents say they're more likely to accept a job with an organization they consider environmentally sustainable—and roughly half would accept a lower salary to work for such a company. Sustainability can also impact employee retention, with 7 in 10 workers more likely to stay with an employer that has a good reputation on environmental sustainability. In addition, nearly 3 in 4 expect their employers to take action on social responsibility issues.[10]

More and more, investors and financial managers are also incorporating sustainability criteria in their decisions: Blackrock, the world's largest asset manager, announced in early 2020 "that sustainability should be our new standard for investing."[11] Ecosystems, too, are increasingly animated by these goals. Some organizations now include sustainability criteria in their purchasing and business partner decisions, in some cases requiring key suppliers to set carbon reduction targets.

Many companies are moving in the direction of the Virtual Enterprise and incorporating sustainability goals into functions across the value chain (see Figure 4.2). By embracing responsible sourcing—or considering the social and environmental ramifications of supply chain decisions—organizations can make great strides in creating more sustainable products and services.

Figure 4.2

Consumer companies increasingly consider sustainability across the value chain



Source: Cheung, Jane, Sachin Gupta, Chris Wong, and Sashank Yaragudipati. "The last call for sustainability: An urgent growth agenda for consumer products and retail." IBM Institute for Business Value. August 2021.
Q: To what extent are you applying your top 3 sustainability goals as part of initiatives in the following areas? Figure depicts "to some extent" and "to a great extent" responses.

Does your organization share a common commitment to sustainability with its stakeholders?

Q1 How have you embedded sustainability as a core element of your value proposition, internally and externally?

Q2 How are you engaging your customers, employees, and ecosystem partners in shaping and executing your sustainability and social impact objectives?

Q3 Can you do more to effectively track sustainability data and outcomes and share learnings broadly through your organization and across your ecosystems?

Yara

Feeding a growing population

As part of its efforts to create a sustainable world without hunger, Norway-based Yara has built a digital farming platform, Atfarm/FarmX, supporting sustainable farming globally and covering over 10 million hectares of arable farm land. One of the world's largest mineral fertilizer producers and a global leader in digital farming solutions, Yara created the platform to connect and empower independent farmers across the globe.

By providing holistic digital services and instant agronomic advice, Yara ultimately helps avoid deforestation and increase food production on existing farmland. For example, the platform provides timely and accurate crop yield forecasts and nitrogen and water management recommendations, supported by hyperlocal minute weather data.

The cloud-agnostic platform follows a pay-as-you-go commercial model and delivers cutting-edge data services. It uses IoT sensors and AI to provide farmers with hyperlocal weather forecasting, crop damage predictions, and real-time fertilization suggestions.

Already accessed by more than 3 million farmers, the platform has enabled Yara to expand its business model and create a competitive differentiator—all while supporting sustainable operations. It has also paved the way for other advanced technologies that can empower farmers, such as blockchain for transparency and trust in trade transactions.

Key insight #2

Deploying technology for societal good can be good for business

Virtualization expands the ability of organizations to open up to new economic opportunities, while becoming more sustainable at the same time.

The Virtual Enterprise is dedicated to improving society—and that effort can improve business outcomes, too.

Pursuing an environmental and social agenda and improving business outcomes are not mutually exclusive goals. On the contrary, 7 in 10 executives say achieving sustainability goals can improve operational effectiveness and agility.[12]

The technological forces reshaping the modern economy are not just commercial tools–but tools to address some of the most complex environmental and societal challenges. At the same time, pursing ESG goals pushes organizations to embrace technology, data, and insights that can enhance business efficiency and opportunity (see Figure 4.3).

By applying hybrid cloud and exponential technologies to create new business platforms and implementing Intelligent Workflows to drastically improve operations and customer experiences, the Virtual Enterprise aligns business with positive environmental outcomes and societal impact.

Forty-two percent of recently surveyed Chief Information Officers point to sustainability as the business area where digital technologies will have the greatest impact over the next 3 years.[13] For example, virtualization can support decarbonization through digital access for remote working, reducing office space and commuting. It can also underpin the circular economy.

Analytics applied to extended supply chain provenance and predictability can help reduce waste and align consumption to sourcing. New engines for carbon reduction and renewable energy will arise as climate progress is embedded deeper in the measures and metrics of success for all entities. In fact, 50% of executives say their organization will move toward carbon neutrality in the next 3 years.[14]

We already see digital twins being applied to simulate sustainable practices in big infrastructure. At Hong Kong Airport and the Port of Rotterdam, the combination of operational technology innovation, renewable outputs, and human-machine interactions are driving better outcomes.[15]

In the context of the supply chain, becoming net-zero requires increased visibility across ecosystem workflows, as well as collaboration with partners to develop more sustainable solutions. By integrating data and insight across open ecosystems, the Virtual Enterprise can achieve positive environmental and social outcomes, as well as enhanced organizational value. Moreover, data can be infused into business processes and decision making to drive improved environmental and social outcomes.

From a business perspective, these types of efforts enable organizations to differentiate themselves by turning environmental and societal challenges into marketplace opportunities, benefitting both society and the individual enterprise. In fact, the Business and Sustainable Development Commission has identified a $12 trillion market opportunity associated with environmental sustainability.[16]

Figure 4.3

Integrated technologies help support ESG objectives

The virtual community: Customers, employees, ecosystem partners

Environment: Open innovation can help solve some of the planet's most daunting challenges

Social: The extended virtual community supports agility, diversity, and inclusion

Governance: Many environmental and social challenges cut across industry sectors requiring new forms of governance

New business platforms and ecosystems

Environment: Platform visibility and transparency enhance ecosystem collaboration

Social: New insights to working conditions and sourcing behaviors support cooperation on resolutions

Governance: Platforms provide opportunities to promote ethical standards

Human-technology partnerships

Environment: Circularity requires partnerships and technology-enabled platforms

Social: New team models and technology create purpose-driven relationships from the home to the community

Governance: Ethics and governance issues arise as technology weaves into our lives

Virtualization and new ways of working

Environment: Remote working can support decarbonization by reducing office space and commuting

Social: AI-powered workflows leverage continuous learning and new skill enhancements

Governance: Agile and virtual operating models can uncover new opportunities for stakeholder engagement

Hybrid cloud and exponential technologies

Environment: Analytics for operational predictability can reduce waste and reinforce the circular economy agenda

Social: Digital twins model the physical to simulate sustainable practices in infrastructure and impact decisions

Governance: Stakeholder entrepreneurship can provide a holistic lens of people, planet, purpose, and profit impact

Intelligent Workflows and transparency

Environment: Intelligent Workflows can monitor and provide insights into energy, water, and waste management

Social: Customers and employees make purchase and work choices based on trust in the organization's values

Governance: Increased visibility and transparency can transform the way economies operate and govern

Source: IBM Institute for Business Value analysis.

What business opportunities will your organization's sustainability efforts uncover?

Q1 How have you applied technology and data to examine and improve your organization's and ecosystem's sustainability and social impact?

Q2 Are you deploying exponential technologies to break down silos and enable AI-powered processes to identify efficiency improvements that align environmental objectives with business goals?

Q3 Could you advance and refine the sustainability outcomes and metrics you are using in process improvement and automation efforts?

Farmer Connect

Fostering supply chain transparency—and sustainability

Coffee drinkers consume more than half a trillion cups per year, and two-thirds aged 19-24 say they prefer to buy coffee that is sustainably grown and responsibly sourced.[17] But despite progress by international certifying bodies, there is still a lack of knowledge around the need for coffee farmers to earn a sufficient living. The industry's large global supply chain makes tracing coffee difficult, with participants tracking only their small segments of the journey and using their own systems to log data.

Consumers hoping to close the gap between their neighborhood barista and the farmer who grew their coffee now have a solution. farmer connect® has created "Thank My Farmer," a consumer-facing application that connects consumers to farmers and everyone in between for a more transparent and sustainable food supply chain. Information is presented on an interactive map, allowing each product to tell a story in a simple and scalable way. The "Thank My Farmer" app also presents sustainability projects in coffee communities and an opportunity for consumers to support them.

The solution is underpinned by blockchain technology that brings all the parties in the coffee and cocoa supply chain together. Farmers, cooperatives, traders, and retailers can interact more efficiently, and consumers can gain new insights about the origins of the products they consume.

Key insight #3

Open collaboration and partnerships are instrumental in tackling vexing societal challenges

Ecosystems and their technology-enabled platforms will be at the heart of solving complex challenges and providing purpose to customers and employees.

Developing sustainable solutions requires open innovation and collaboration among diverse stakeholders, which the Virtual Enterprise is ideally suited to enable.

Sometimes new ideas for advancing sustainability come from unexpected sources. Open innovation channels input from a wide range of partners, stakeholders, and other sources across ecosystems.

Going beyond traditional collaboration, open innovation involves breaking down silos to harness the innovation potential and collective intelligence of entire ecosystems. Perhaps with this in mind, 58% of organizations stress that executing their environmental sustainability strategy requires effective engagement with ecosystem partners.[18]

Data, co-created and shared, is one important aspect of this open innovation. Shared data can highlight areas of common interest and help break down barriers. Digital technologies like AI and blockchain can further accelerate discovery, helping cultivate a more sustainable future. For example, digital command centers can facilitate open innovation within an organization, with customers, and across entire ecosystems (see Figure 4.4). Business platforms enabled by these tools support co-creation and new ways of working in a manner hitherto impossible, fostering the creation of business strategies that align with climate objectives and other social purposes.

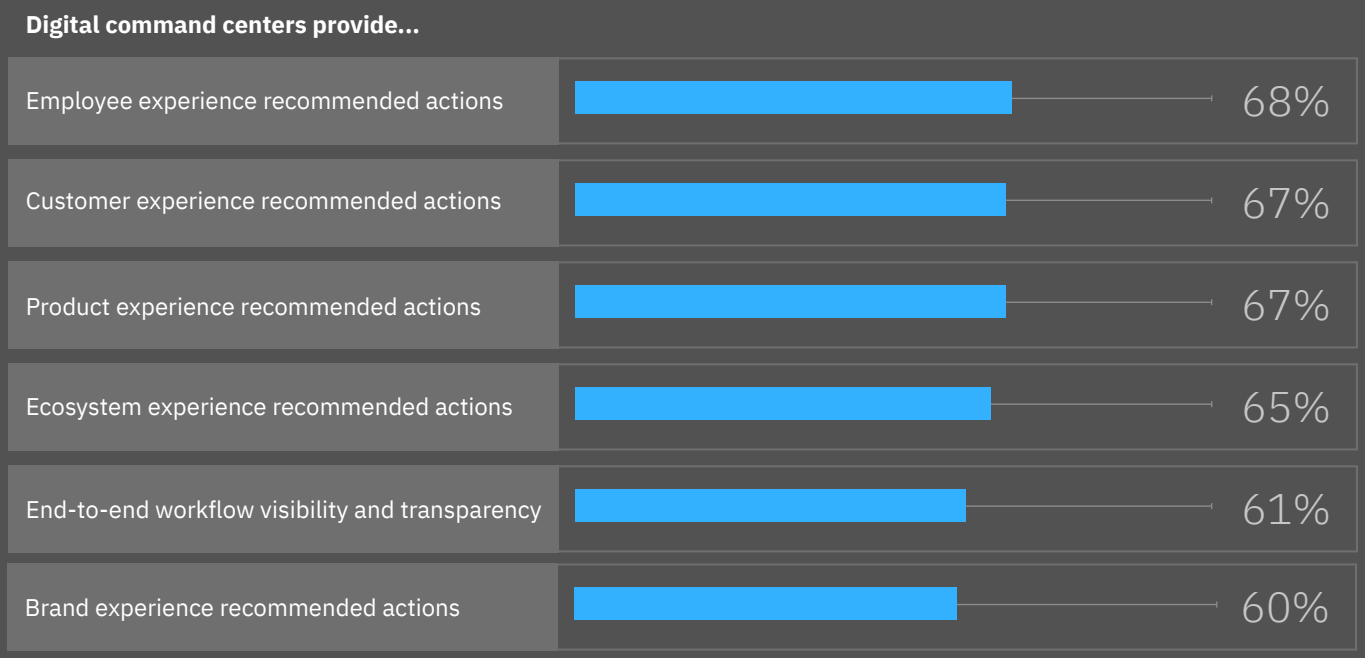
But to fully tap the potential of platform-enabled open innovation, traditional approaches and operating models must be transformed from linear processes to more complex dynamics. Ecosystem collaboration must be inclusive of every element in the workflow, as openness helps identify differentiated capabilities.

Greater transparency and insight allow consumers, companies, investors, and governments to change the way they buy, produce, sell, transport, consume, and govern, which in turn has the potential to transform the way economies operate. Many environmental and social challenges cut across industry sectors, demanding cross-sector collaboration. Take plastic waste, for example, and the promise of a more circular economy. A chemical company produces ethylene to create plastic, which a manufacturer then uses to make a plastic bottle; a consumer products company fills the bottle with a beverage that's sold to a consumer.

If all goes well, the consumer places the emptied plastic bottle in a recycling bin, from which a transporter collects it and moves it to a waste management company. There it's sorted and sent to a recycling company, which transforms it into recycled polyester. A clothing company then spins the polyester into a fleece jacket for sale at a sporting goods store. Making this sort of circular cycle more routine, efficient, and expected demands cross-industry collaboration—the kind that can be achieved through ecosystem partnerships and technology-enabled platforms.

Figure 4.4

AI-powered digital command centers foster collaboration inside and outside the enterprise



Source: Previously unpublished data from the 2021 IBM Institute for Business Value Virtual Enterprise Survey.
Q: To what extent do you agree with these statements regarding your organization's use of digital command centers in the next 3 years? Figure depicts "agree" and "strongly agree" responses.

How does your organization facilitate open innovation?

Q1 How open is your technology architecture to enable data sharing and collaboration with ecosystem partners?

Q2 What are you doing to expand participation in open innovation platforms and develop improved collective-intelligence architectures?

Q3 Do you have ecosystem orchestration capabilities that encourage open innovation to thrive, and how are you measuring and monitoring them for maximum impact?

Plastic Bank

Revolutionizing recycling by creating an ecosystem for plastic

The name says it all. Theoretically, Plastic Bank is where plastic is deposited and currency is withdrawn. Practically, Plastic Bank builds ethical recycling ecosystems in the world's most vulnerable coastal communities where collectors come to exchange plastic waste for bonuses. The collected waste is reborn as Social Plastic® for reintegration into products and packaging while the bonuses help collectors improve household income and affordability for basic family necessities such as groceries, cooking fuel, school tuition, and health insurance.

At one end, Plastic Bank strives to eliminate the need for single-use plastic by creating a closed-loop supply chain for global manufacturing. On the other, it enables collectors in vulnerable communities to become recycling entrepreneurs, potentially lifting millions out of poverty. Plastic Bank has deployed a blockchain infrastructure under the name of Alchemy™ that secures every transaction and provides real-time data visualization—allowing for transparency, traceability, and rapid scalability.

A social enterprise in its true sense, Plastic Bank reveals the value in plastic waste by gathering corporations and consumers together to stop ocean plastic while improving the lives of collector communities in some of the most vulnerable coastlines of our planet.

Action guide

Prioritizing sustainability and impact to drive positive transformation

The Virtual Enterprise does not compartmentalize social responsibility into a separate building block or function but, instead, ingrains it into every function across the enterprise. Understanding the importance stakeholders place on social responsibility, the Virtual Enterprise integrates transformation and sustainability efforts both strategically and operationally, leveraging digital technologies to drive progress in both areas.

The Virtual Enterprise relies on technology to drive sustainability efforts, while also expanding economic opportunities. It prioritizes sustainability through collaboration, ecosystem partnerships, and platform participation. Through its open approach, the Virtual Enterprise can unlock new solutions that align with its goals for a responsible, equitable, and sustainable world.

Below are actions to help your organization align its purpose and intent with wider societal impacts:

Evolve your strategy

- Integrate environmental sustainability and social impact into your enterprise strategy using the United Nations Sustainable Development Goals as a North Star.[19]
- Identify materiality, marketplace, and ecosystem opportunities from sustainability as well as integrated ESG risks including regulatory, financial, economic, and political.
- Recalibrate value using stakeholder capitalism and a holistic lens of people, planet, purpose, and profit impact.

Expand your tools

- Assess how data, digital technologies, and automation can improve your operations and enterprise workflows while achieving more sustainable outcomes.
- Optimize production processes and supply chains through automation and AI to reduce your environmental footprint.
- Experiment with open innovation and science-led discovery to explore new solutions and possibilities.

Leverage your platforms and ecosystems

- Engage with ecosystem partners from within and outside your industry to accelerate improvements to workflows and the development of more sustainable products and services.
- Expand your ecosystem network to embrace private, public, and not-for-profit sectors.
- Share what you find broadly and learn from others on an ongoing basis.

Transform your operating model

- Commit to open innovation in pursuit of more sustainable outcomes and practices.
- Break down internal and external barriers to cooperation.
- Accelerate adoption of new technologies and reliance on transparent data.

Measure your progress

- Emphasize sustainability in operational metrics, leadership assessment, and investment criteria.
- Establish sustainability benchmarks, measurement tools, and reporting processes.
- Deploy big data and analytics to assess efficiency and uncover opportunity.
- Review, rethink, and reinforce priorities on an ongoing basis as new information and insights become available.

The Creativity of Inclusive Human-Technology Partnerships

The Virtual Enterprise takes advantage of the accelerated reset of human technology interfaces. It also recognizes the need to build new forms of leadership, inspiration, engagement, and connection to deal with the exacerbated challenges of human empathy, creativity, and sense of belonging that have come with increased digital engagement.

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How inclusive human-technology partnerships can create a competitive edge

The Virtual Enterprise relies on new interfaces among people, ecosystems, and the exponential technologies they access. As location becomes less important, the opportunity to access skills and capabilities from anywhere becomes real. This extended access has huge potential for unlocking new value and discovering new solutions. The effectiveness of this dynamic collaboration requires robust and defined workflows and easy-to-use tools and systems.

For people, the Virtual Enterprise is both an opportunity and a threat. There is a chance to bring your skills to bear in new areas through the power of global connectivity, but likewise the access to skills that can out perform your own is easier too. Thus, it steps up the imperative for continuous and extended learning, as well as the alignment of agile approaches. The concept of the employee is open to reconsideration in a manner that extends beyond the gig economy to a deliberate structural approach to organization and capability building. The Virtual Enterprise will thus need a clear, reinvented, and open workforce strategy.

Virtual Enterprises need to be entities where leaders, employees, and stakeholders have a renewed trust in data and technology as key drivers of decision making and the core rules of the operating model. Digital workers and AI bots will make more decisions that have greater impact. Being able to build these in a way that is predictable, contextual, and progressive will be a challenge.

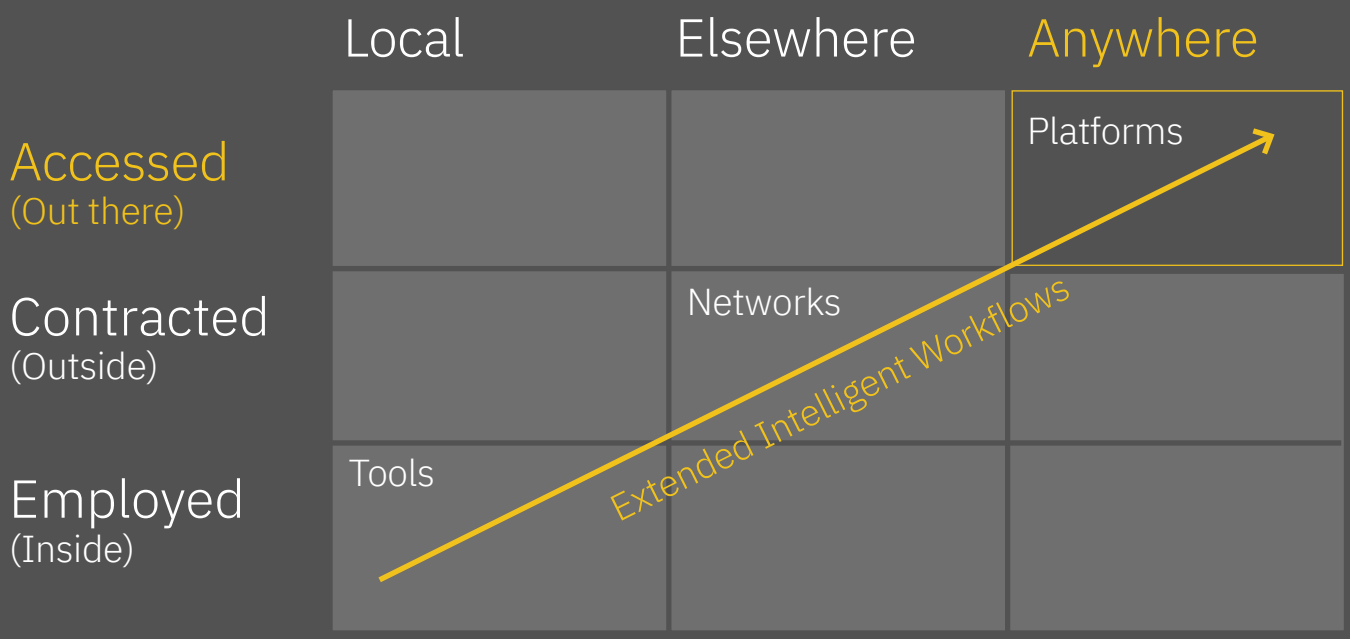
What are inclusive human-technology partnerships?

Digitization introduces challenges for traditional workflows, as tasks once performed by people are taken up by machines. Resistance and fear could ensue. But, if implemented appropriately, technology can improve both productivity and the workforce experience.

Inclusive human-technology partnerships will define the virtual organization of tomorrow. They prioritize the positive potential of an organization's people and its ecosystems. By implementing new systems and tools with empathy and intentionality, leaders can enable the best of machines and the best of humans—optimizing outcomes, talent effectiveness, workforce diversity, and work-life balance.

Figure 5.1

Evolution of human-technology partnerships



Very importantly, the Virtual Enterprise has the potential to be a massive accelerator of inclusion and diversity as different divisions, organizations, geographies, and backgrounds get to engage in the extended workflows and new organization constructs that are created. There is an opportunity to create new "on ramps" to the global economy for people and businesses that are currently excluded through trusted open platforms and extended workflows.

But the openness potential in this area is not simply driven by the technology or platform attractiveness. There needs to be a deep underlying openness in the culture and values of the organization and its ecosystem. Poorly considered or narrow definitions of the Virtual Enterprise team can actually damage the diversity of the group if group think thrives in remote, disconnected bubbles.

As extreme automation, digitization, and algorithms become the norm and people are fragmented into more remote work environments, there is, of course, a risk that the humanity of the Virtual Enterprise will come under pressure. We can see that some of the new work models have already stretched the ability of teams and individuals to cope with the blurred worlds of home and work.

The Virtual Enterprise and its leadership will need to proactively put the "human" back in the machine. As a more hybrid work environment becomes standard, office location, design, and scaling will become more complex, as will the balance between open spaces and privacy (see Figure 5.1).

Building a strong corporate culture will require a new playbook as the enterprise becomes increasingly virtual. Leaders will be challenged to instill a positive corporate identity among a workforce that spans the globe and includes employees who perhaps only meet virtually. Clear communication, leading by example, and continuous feedback to foster employee growth will be crucial to establishing a winning culture and a clear path to competitive advantage.

Building a collaborative modern culture

The way we work and interface with one another is changing rapidly, accelerated by the virtualization of customer and employee interactions. New possibilities for work and collaboration, including the ability to work anywhere and anytime, compel organizations to re-examine existing processes and create new ones across the ecosystem with partners.

For the Virtual Enterprise, this is an exciting and unmistakable opportunity—a chance to build a more modern, effective, and collaborative culture that amplifies human talents through the skilled, intentional implementation of technology.

In a recent IBV study, more than half of C-suite executives report they intend to tap anywhere-anytime talent pools for specialized skills over the next 3 years.[1] Yet the virtualization of work has created both opportunities and challenges for organizations and employees. C-suite executives estimate that, by 2023, 14% of their workforce will require retraining or reskilling annually. As a result, organizations are creating cultures of continuous and extended learning opportunities to attract, develop, and retain top talent.

For those who have been excluded from the workforce, tech-enabled ecosystems extend an invitation to the global economy by removing the need to migrate to access economic opportunity. 25% of organizations already leverage talent and skills through ecosystem partners, and another 41% plan to do so within the next 3 years.[2]

The extended talent pool made available through virtual models helps organizations close critical skills gaps. It also can provide a pipeline of diverse candidates poised to inspire positive change, innovation, and creativity in the workplace.

The Virtual Enterprise dramatically reconceives the human-machine relationship, based on heightened automation tools and Intelligent Workflows. Individuals now expect to interact with workplace systems with ease and immediacy. They demand greater flexibility and autonomy in when, where, and how they work—a networked system with the tools to collaborate, innovate, and succeed.

Forward-looking enterprises use automation and AI as core to this effort, augmenting the key strengths of human talent and empowering people to focus on what's important. Intelligent automation enables an entire organization to be "always on," optimizing the delivery of goods and services for seamless continuity in dynamic markets. Workflows become the backbone of trusted information and relationships and the repository of the automated rules and algorithms that drive crucial, in-the-moment decision making.

What differentiates leaders

Leading enterprises are always on the hunt for ways to work smarter and faster, and to build more adaptable, resilient operations. That includes digitally augmenting the workforce to handle spikes in demand or declines in capacity, as well as shifting workers within and between industries in a dynamic market.

Digitization unleashes new workforce potential while also introducing new challenges related to empathy, sense of belonging, and human connection. In this way, working relationships and collaboration have been both enabled and tested by ever-advancing software and technology. Leaders should maintain balance within the human-technology partnership—taking a human-centric approach that considers physical, mental, and emotional health alongside bottom-line performance metrics.

Leading enterprises integrate AI, cloud, and automation technologies to enable this new reality, empowering Intelligent Workflows fueled with data. This allows for the creation of new, agile business models and serves as the Golden Thread of value within the Virtual Enterprise, shaping the future of how work is performed.

We found that successful leadership depends on 4 priorities:

Culture awareness: 89% of leading organizations realize they must transform their culture and processes, as well as reskill and retrain employees, to receive the full value of intelligent automation.[3] This includes the responsible use of new tech tools and avoiding demographic inequities and biases.

Workflow automation: Enterprises plan to entrust automation with complex, cross-enterprise work at 7 times the current rate by 2023, according to a recent IBV study.[4]

Authentic communication: Just 34% of executives say communication from their organizations' leadership comes across as authentic and empathetic.[5] Leaders must provide personalized engagement and deliberately foster an inclusive, positive workplace culture in a talent marketplace where employees have more freedom of choice than ever.

Intelligent technology: As much as 12% of routine tasks and 11% of simple business decisions are expected to be performed by intelligent machines by 2023, compared to 7% and 6% in 2017, respectively.[6] Entrusting more tasks to intelligent machines could free up people to focus on higher-value work.

By striking the right balance between human and digital labor, the Virtual Enterprise can enable accelerated productivity, collaboration, and creativity—building a more flexible, inclusive, and impactful workforce. We identified 3 key insights that guide the Virtual Enterprise in achieving this balance. They are centered on:

— Workflows

— Decision making

— Leadership

Key insight #1

Digitized workflows can improve revenue

The pandemic has accelerated the virtualization of customer and employee interactions and shaped durable new ways of working.

The Virtual Enterprise deploys technology to improve the effectiveness of its human workforce, enhancing efficiency and creativity. By investing in a future-focused culture, the organization can become better positioned to deliver long-term positive outcomes and attract inclusive worldwide talent.

These efforts can produce enhanced business results, as recent IBV research shows: Leading technology adopters who succeed at reskilling employees for technology-driven changes achieve a revenue growth rate premium of 15%.[7]

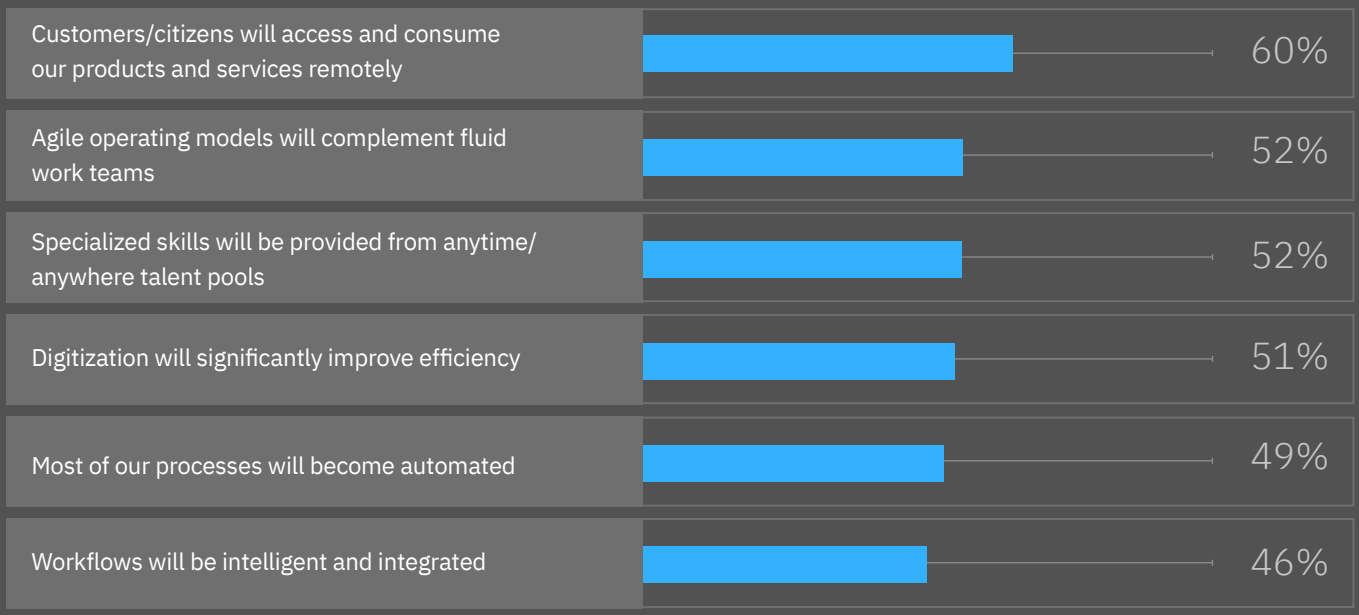
The pandemic has introduced wide-ranging business disruption. Individuals and employers have struggled to identify sustainable ways to work, play, and live while staying safe and healthy. For executives, it can seem almost impossible to balance each employee's needs with rebuilding and growing the business. The increasing virtualization of the workforce requires new hybrid ways of working, reskilling, and retraining, as well as differentiated talent management.

Automated workflows can help overcome these challenges. Half of organizations cite "technology-infused workflows" as one of their most important competitive advantages in the next 3 years.[8] Extending the scope of a workflow and creating end-to-end connectivity between the workflow's customers and ecosystem could bolster business outcomes.

Digitization of workflows supports virtually all areas of talent management—including attracting, training, and reskilling. It allows organizations to tap skills and capabilities from anywhere and take advantage of new opportunities to foster diversity and inclusion. As exponential technologies, new business models, and global disruptions converge to transform the enterprise, it has become more important than ever before to elevate the work that humans do and the skills that they need (see Figure 5.2).

Figure 5.2

Hybrid work and hybrid consumer consumption require agility and digitization



Source: Previously unpublished data from the 2021 IBM Institute for Business Value Virtual Enterprise Survey.
Q: To what extent do you agree with the above statements?

How effectively are you digitizing your workflows?

Q1 How are you planning for and modeling the impacts of hybrid work environments within the enterprise and across networks and ecosystems?

Q2 How is your organization prioritizing workflow automation? And to what degree does your workflow automation require new talent acquisition or workforce reskilling?

Q3 How are you integrating your investment in new technologies with investments in workforce development, training, and engagement?

Siemens AG

Supporting workers with a virtual agent

As part of its digital transformation initiative, Siemens AG has integrated automation and AI into many of its processes to deliver exceptional service to customers and employees. The company's People & Organization (P&O) leaders continuously embrace change and digital technologies to support their 293,000 people worldwide. Leaders brought their teams into the design process to provide employees with interactive experiences and quicker, more accurate answers to questions—regardless of location, device, or time of day.

As a result, Siemens created CARL, an AI-based HR virtual agent. Just 3 months after being developed, CARL made its debut in 2017 to an audience of 120,000 people in Siemens locations in Germany and Austria. And it has been significantly enhanced and rolled out to additional countries since then.

In keeping with design thinking practices, the development team prioritized the user experience in creating and enhancing CARL. The team initially programmed the chatbot to address 5 key topics that Siemens employees in Europe most often inquired about. But from the very beginning, CARL's architecture was designed to easily scale and adapt to accommodate increasing numbers of users, languages, and topics as it expanded to other Siemens sites. Today, CARL is available to over 290,000 people globally and in 17 languages, covering countless topics.

Siemens also decided to implement a global human capital management (HCM) cloud platform. By doing so, Siemens simplified and harmonized global P&O policies and processes to create a standardized digital platform for HCM.

Today, Siemens people across 38 countries can access self-service HR capabilities securely and conveniently through their device of choice.

Key insight #2

Decision making must be shared—and trusted

The virtualization of work has opened up new opportunities and challenges for organizations and employees alike, where global capabilities can be accessed with greater ease.

No aspect of the Virtual Enterprise is more fraught—or full of more potential—than AI-driven decision making: What decisions must be made by humans, and what can be deferred to machines? This evolving area is a core element of human-technology partnerships.

The expansion of machine-led decisions is inevitable. Dynamic networks and services increasingly rely on automated processes and tools. There has been a massive explosion of data sources, born out of extreme digitization and providing the opportunity to resolve complex problems and seek new solutions.

As AI and machine learning are applied to this huge universe of input, the potential for pattern recognition and workflow optimization becomes clearer. Data-led analysis of customer behavior can reshape a service proposition; monitoring performance can highlight areas for improvement.

Almost 4 in 5 surveyed executives (78%) expect that intelligent machines will make complex or mission-critical decisions by 2023.[9]

Yet the human factor remains equally central. And it could come under increasing pressure, as extreme automation, digitization, and algorithms become the norm and people become more fragmented within remote work environments. Leadership will need to embrace and proactively tackle these challenges.

Focusing on the human side of the human-machine partnership is essential to both quality outcomes and trust in those outcomes.

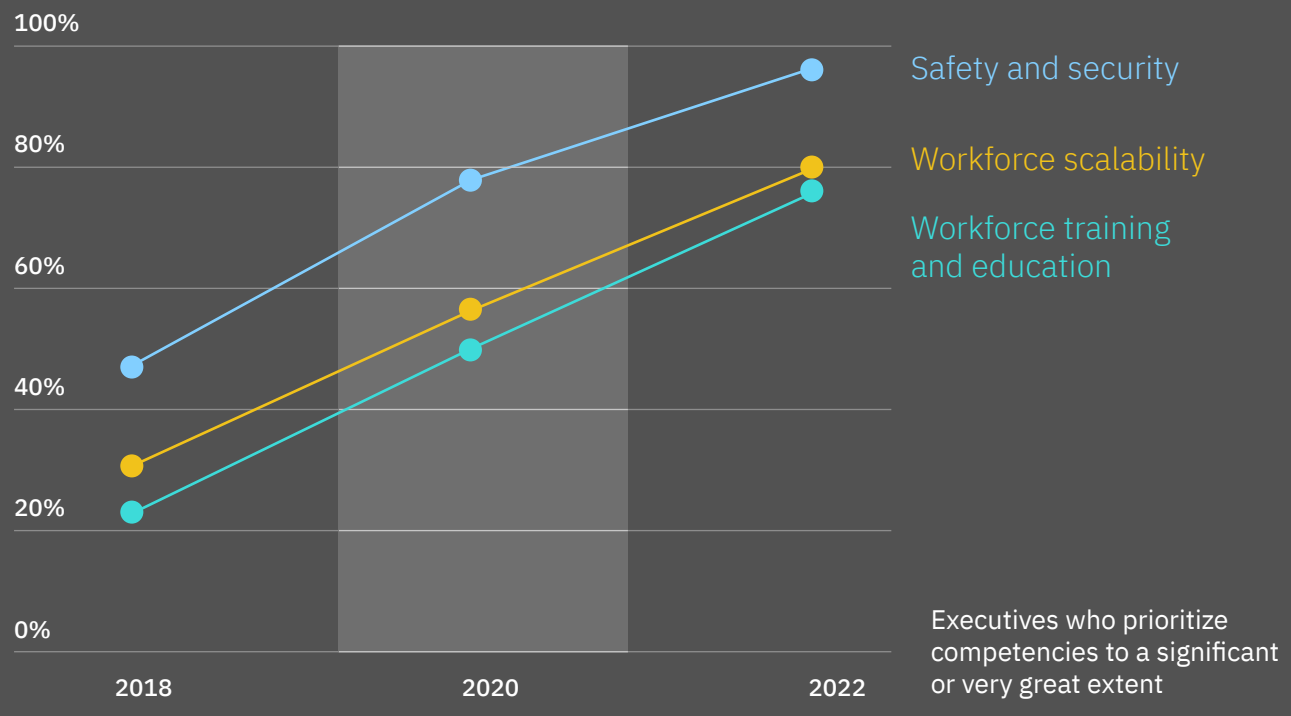
Most executives understand that their people play a significant role in helping them manage economic turmoil, and they're prioritizing workforce capabilities accordingly. In fact, workforce safety and security is the top executive priority, with 92% of surveyed executives planning to prioritize this capability by 2022.[10] And nearly four fifths are putting a premium on workforce training and education (see Figure 5.3).

With data and information as the raw materials of the new automated decision making, the value of that data is hugely dependent upon the transparency, trust, and security of the sources (enterprises, partner ecosystems, or customer insights). Business leaders must have trust in data and technology to help drive decision-making rules for business operating models.

It is in linking the tech inputs and the human inputs that the Virtual Enterprise distinguishes itself. Intelligent Workflows provide the workforce—both digital and human—with visibility and data transparency to uncover real-time insights and dynamically adjust with both self-learning and self-calibration. Indeed, the modeling of human-machine interactions, via operational automation, allows the Virtual Enterprise to simulate and analyze improved efficiencies and outcomes.

Figure 5.3

Executives shift their focus toward workforce-related competencies



Source: "Closing the chasm: Executives and employees don't see eye-to-eye on employer responses to COVID-19." IBM Institute for Business Value. ibm.co/closing-chasm

How are you enabling both AI-led and human-led decision making?

Q1 How does your organization delineate the decision-making authority of software and AI versus human talent? How are you advancing machine-led decision making while protecting against potential bias in data and software?

Q2 How are you enabling scientific practices and reliable, secure data sources so your workforce, partnerships, and ecosystems can engage in constant discovery and innovation?

Q3 How are you preparing your workforce and your executives for the speed of automation-led decision making? And what fail-safes are being contemplated and implemented?

Medtronic

Delivering innovative HR solutions

With more than 90,000 employees in 150 countries, Medtronic develops and manufactures devices and therapies for the treatment of more than 70 of the world's most complex and challenging health conditions. To support Medtronic's enterprise-wide business transformation, its HR organization has implemented the IBM Garage model for delivering solutions that matter at scale.

HR aimed to promote new, collaborative ways of working through the rapid evolution of innovative solutions. It maintained a repeatable cadence that continuously identified new use cases for improving the experience of HR customers and delivering positive business outcomes.

By applying IBM Garage principles such as design thinking, agile methods, and co-creation with HR stakeholders, Medtronic HR was able to establish a shared vision for improved HR service and support that put employees and managers at the heart of value-driven enhancements to processes and tools.

This innovation-driven delivery method is now the engine for the digital enablement of HR and a model for value-based, agile solution development in the enterprise. It has led to simplified processes, improved customer experience, and significant time and efficiency savings. And Medtronic HR now has an innovation pipeline to explore ideas and help realize value.

Key insight #3

Leadership requires empathetic engagement

New hybrid ways of working are emerging and will require new tools and rules of engagement for people, teams, and organizations.

The Virtual Enterprise is not an unfeeling place. On the contrary, it instantiates empathy as a key animator for the openness, discovery, and creativity that enable value creation and societal impact.

Virtualization brings the enterprise into the homes and workplaces of customers, employees, and partners. The multifaceted roles of offices, teams, and locations have all been redefined recently. That evolution will only accelerate as technology advances and new models of interaction emerge for reimagined collaboration and work.

For some individuals, the lines between home and work have become less clear as they adopt and adjust to new ways of working. While virtual work has enhanced some collaborations, such as co-working on projects or transactions, the organizational glue of empathy and networking may be at risk of eroding.

That all puts new pressure on leadership to rethink organizational culture. As a recent IBV study reports, 41% of executives say they are focused on developing a culture rooted in empathy, adaptability, and innovation.[11]

Empathetic leadership puts employee safety and wellness first—and uses technology to do so. Despite anxiety that technology could displace some workers, autonomous and drone vehicles, along with augmented technologies, are supplementing human activities in industrial products, mining, and energy. These technologies not only reduce carbon output but improve workforce safety and wellness.

The Virtual Enterprise also has opened up opportunities to tap skills and capabilities from anywhere via digital workflows. This extended access stretches across the organization, partner organizations, and the wider community—providing access to diverse talent and disrupting old paradigms in talent management. New work opportunities are created, drawing on global talent pools and offering greater diversity and inclusion.

Extended automation, connectivity, and transparency can also promote human expression and engagement across the workforce. With an explicit recognition of health and wellness and work-model flexibility as high priorities, organizations can build a new, “open” workforce strategy. Organizations that nurture their employees’ various skillsets—digital, cognitive, social, emotional, adaptability, and resilience—will position themselves for competitive advantage (see Figure 5.4).

Figure 5.4

The growing importance of soft skills

Source: Previously unpublished data from the 2021 IBM Institute for Business Value Virtual Enterprise Survey.
Q: What are the most important workforce skills in a post-pandemic world?

How are you developing empathetic leadership?

Q1 As virtualization blurs the work-home distinction, how are you amplifying the positive benefits while addressing any negative repercussions?

Q2 How are you nurturing managers' and leaders' soft skills? How open is your organization to the struggles of the workforce?

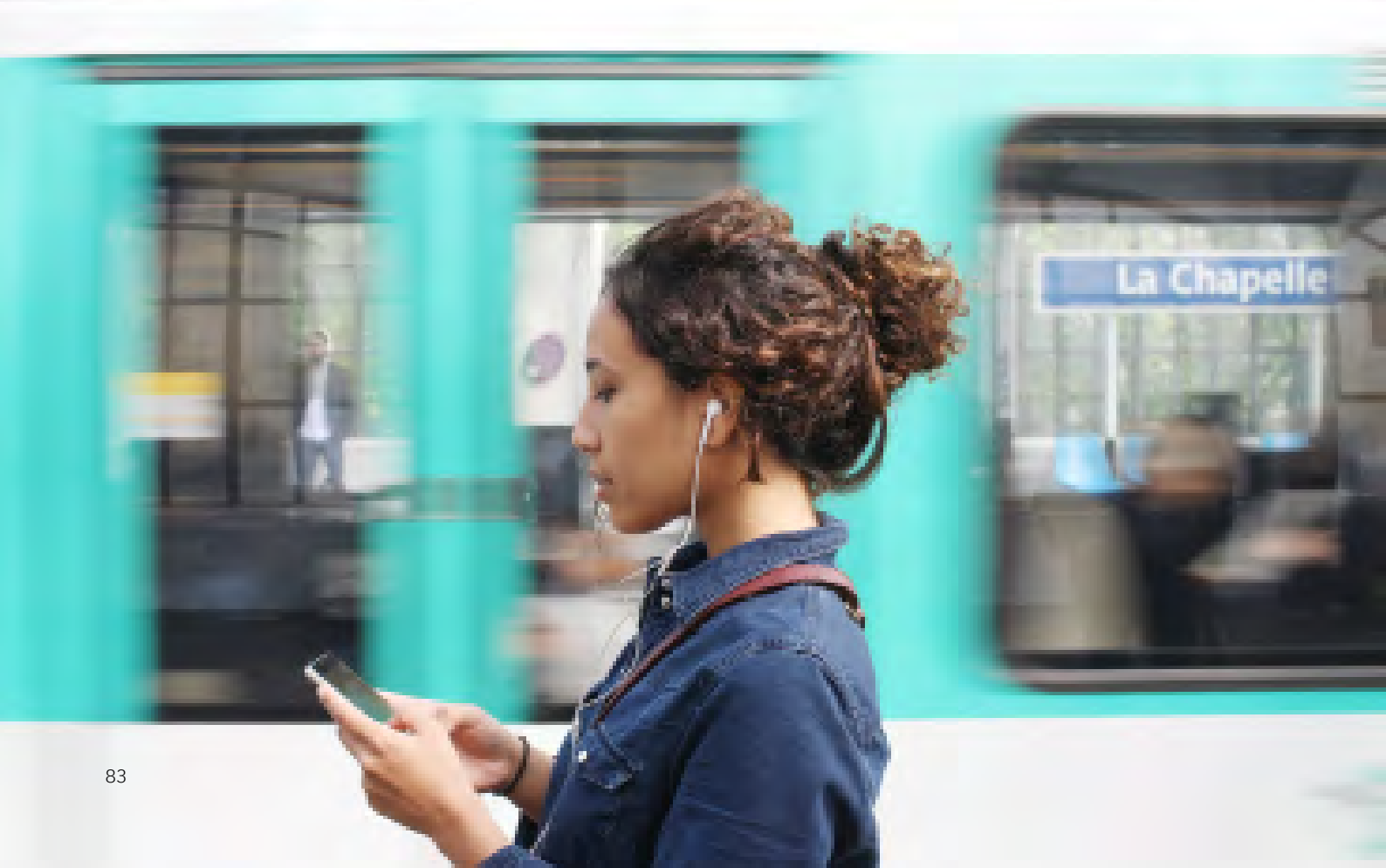
Q3 How are you addressing anxiety about new technologies? And how are you using new technologies to improve the workplace experience?

Orange France

Helping people to partner with tech

A leading national telecom company, Orange France developed a comprehensive Orange Campus program to enhance employees' digital competencies. Using co-creation studios, Orange France formed a vision of how human talent and technology can work together seamlessly. In the process, 150 existing roles were narrowed down to 30 top roles, and 80 digital competencies for tomorrow's workforce were identified.

The results have been impressive. Orange France reorganized training paths and boosted career mobility by helping employees acquire new—and critical—digital skills. 50% of the workforce involved in the digital transformation have achieved new digital skills through Orange Campus. An assortment of new digital offerings helped yield a 150% increase in customer sales, with a 10-point gain in the net promoter score. And Orange France achieved a 30% increase in its digital channel self-service use with full digital assistance.



Action guide

Deepening inclusive human-technology partnerships to gain a competitive advantage

The Virtual Enterprise embraces technology and humanity, leveraging each to amplify the impact of both. Rather than placing people and machines at odds, it puts intentional, consistent effort and investment into melding them into a cohesive, collaborative, and competitive whole.

The pandemic introduced new work models in a matter of weeks, with stresses emerging just as quickly. As work-home distinctions continue to blur, so do both positive and negative repercussions. New hybrid ways of working require new tools and rules of engagement for organizations and their people and teams. Organizations not willing to adapt could fall behind.

Human-technology partnerships enable the Golden Thread of Intelligent Workflows. Openness within the organization and across ecosystems accelerates the inclusiveness of the workforce and broadens talent access and opportunity.

Technology can be a source of strain but also of solutions, opportunities, and discoveries. Only by optimally balancing the human-machine interplay can organizations of tomorrow reach their full potential—for their employees, stakeholders, and broader society.

Here is a 5-step outline for gaining a competitive advantage by deepening human-technology partnerships:

Reinvent workforce dynamics

- Explore new ways of working to enable flexibility.
- Support and engage talent as it faces strains from work-home disruption.
- Provide continuous learning and skills building, especially related to tech use.

Apply intelligence tools

- Develop Intelligent Workflows with AI and automation to free up employees for higher-value work.
- Deploy hybrid cloud and other connectivity systems to enable open sharing and transparency internally and across ecosystems.
- Tap data for ongoing insights about processes and the man-machine relationship.

Augment your workforce

- Improve business continuity and outcomes with flexible labor pools and approaches.
- Foster a mindset shift to emphasize enterprise- and ecosystem-wide collaboration and co-creation.
- Leverage experiments and real-time insights.

Orchestrate digital decision making

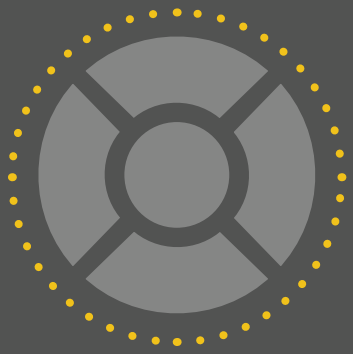
- Invest in roles and skillsets that align with emerging exponential technologies.
- Clarify where algorithms act independently and where humans make the call.
- Test new capabilities for integrating man-machine expertise.

Foster employee engagement and a culture of inclusion

- Adopt visible supports for diversity, equity, and inclusive business practices.
- Capture and prioritize the breadth of voices across the enterprise.
- Lead with empathy, compassion, and transparency.

The Imperative of Open, Secure Hybrid Cloud and Networks

The Virtual Enterprise takes full advantage of the flexibility and nimbleness promised by hybrid cloud, connecting with business partners and accessing leading open technologies. The Virtual Enterprise is underpinned by robust networks and secure technology infrastructure, with the right workloads within the right overarching architecture and plug-compatible with the world around.



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How open, secure hybrid cloud and networks drive virtual excellence

In the Virtual Enterprise, the power of the network to bind together the players in a seamless, secure, and real-time manner is critical. The Virtual Enterprise relies on new market-making platforms embedded in new ecosystem relationships, as well as powerful Intelligent Workflows that are being reinvented through science and data-led innovation and bringing wide-ranging sustainable impact. None of this, however, will be possible without a fit-for-purpose application and infrastructure architecture to support it.

The Virtual Enterprise is massively enabled by the modern, open, and secure architecture delivered by hybrid cloud. The recent pandemic triggered a natural acceleration in the use of cloud-based architectures to deliver the flexibility and adaptiveness digital acceleration demands. But more than just "clouds" will underpin the enterprises of the future. Only the right clouds for the right workloads in the right overarching architecture can enable openness and security.

Open-source solutions have a multiplier effect on the collaboration and building of shared capabilities that can release new cross-functional and cross-industry value. Within the enterprise, application islands create silos that limit the reach of Intelligent Workflows, and the emergence of multiple cloud-based solutions has only created new levels of potential disjointedness. Breaking down those silos unleashes new solutions that can draw upon the development and innovation of the crowd. In an open, secure hybrid cloud environment, different contributions arrive with inherent compatibility. This is fundamental to the adaptiveness of the Virtual Enterprise.

What is open, secure hybrid cloud?

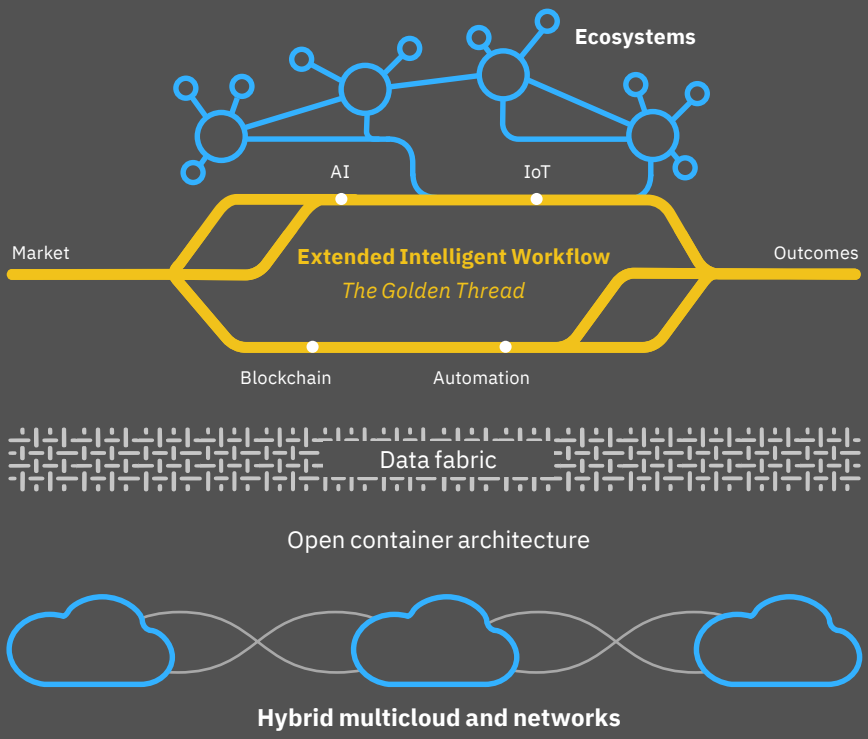
Open, secure hybrid cloud is a technical architecture that straddles on-premise, mainframe, private, and public environments. The "open" element encourages sharing and interoperability. The "secure" element protects both the integrity and the availability of data and information, integrating and translating seamlessly.

Hybrid cloud creates flexibility, fulfilling the need to keep some workloads on premise or in a private cloud while also taking advantage of the speed and available-anywhere capability of the public cloud. Hybrid cloud architecture provides a consistent standards-based approach to development, security, and operations from the core to the edge. And it allows for workload portability, orchestration, and management across multiple environments.

As the Virtual Enterprise extends through the organization and outward to partners and ecosystems, seamless integration and translation become imperative. Hybrid cloud supports that process. Software-defined networks are the adaptive solutions that, together with hybrid cloud technologies, provide the next generation of connectivity and resilience. This is redefining the role of the telco provider and opening up the field to new players and ecosystem partners seeking to provide components in these new network value chains. The openness of the underlying technology architectures is becoming more and more critical.

Figure 6.1

Open secure hybrid cloud and networks are foundational to the Virtual Enterprise



Open-source architecture and the control planes that accompany it enable more value when they reinforce partner and ecosystem connectivity outside the enterprise. Many of the evolving, new multiplatform ecosystems are benefiting from the plug compatibility that has arisen from open APIs and microservices that can be shared and from data mobility across partners. Open source also has a huge impact on accessing the skills required to build and maintain these new systems.

The CIO and CTO become more important members of the C-suite because the strategic calls made about the technology architecture become the indicators of competitive advantage. The need to make the right decisions with regard to next-generation enterprise systems is key, as are the choices of on-premise, private, and public cloud infrastructures that will support data and security needs. And all of this has to sit within an economic cost envelope that can be flexed in line with business context.

Application modernization in service of the Virtual Enterprise is a complex task, and there is a very real risk of legacy complexity being replaced by digital and cloud complexity. Agile approaches, DevSecOps, and automation can help, but they need guardrails and tracks on which to be organized. Data availability, quality, security, and scalability will be critical for the Virtual Enterprise to flourish, with big implications for the underlying technology architecture (see Figure 6.1).

Security is already one of the most important factors underpinning the evolution of more technology-enabled business and business models. As the enterprise ecosystem is extended into other partners or platforms, the need to align security along the whole Intelligent Workflow only increases.

Data and information are the raw material of these new workflows, but the value of that data is hugely dependent upon the transparency, trust, and security of these sources. It is an irony of the virtual world that data gravity can matter more than ever. New technologies such as blockchain have the potential to play a fundamentally different and enhanced role in the acceleration of these new models, as they provide certainty of identity, provenance, and activity along the workflow.

All of these opportunities can be advanced by the adoption of open, secure hybrid cloud and networks.

Leveraging cloud technology to accelerate progress

Organizations that choose to evolve toward becoming Virtual Enterprises will need to develop deep cloud capabilities. From ecosystems to Intelligent Workflows, the fundamental building blocks of the Virtual Enterprise rely on open, secure hybrid cloud technology.

Cloud is not simple infrastructure. Unlike roads, railways, and airports, cloud should not be approached as a one-time, single-purpose capital expense. It's insufficient to approach "cloud adoption" as an event that swaps parts of an old system (the data center and conventional IT management) with a plug-and-play new system.

The bigger game today is about getting radically better at designing, developing, and operating software. Leaders across industries are fast becoming software ecosystem companies on the inside, while remaining banks or healthcare or industrial companies on the outside. Leaders understand cloud, applications, data, and networks as core elements of a software-driven enterprise.

There's no way to build an Intelligent Workflow that crosses organizational boundaries with just a private cloud or a public cloud; only hybrid cloud provides the integration and orchestration required. Once viewed as increasing risk, the adoption of cloud brings new opportunities to create a more secure and open digital environment at scale. Cybersecurity and cloud-based digital capabilities complement each other in support of sustainable performance, end-user trust, and reduced exposure to disruption.

Hybrid cloud supports levels of openness and collaboration far beyond what was possible in the past. Coupled with digital and business transformation, that can generate unprecedented strategic and financial benefits for an organization.

What differentiates cloud leaders

What does cloud leadership look like? Leading organizations have a broad and shared vision of the role cloud plays in the Virtual Enterprise. They recognize that hybrid cloud architecture is critical to an Intelligent Workflow. And they understand that applications and data may be running on and through any number of private or public clouds and even via a conventional on-premise data center.

The IBV analyzed the traits of technology leaders through a wide series of studies and across industries and functions. Increasingly, these organizations prioritize the need to pivot seamlessly between virtual and analog worlds. They operate beyond traditional organizational boundaries, looking to take advantage of the possibilities offered by new technology through an increased engagement with business platforms and ecosystem partnerships. They prioritize open strategies.

We found that successful leadership depends on 4 priorities:[1]

Adoption: Technology adopters had on average a 6 percentage-point revenue growth premium over their peers across 12 industries during the pandemic.

Integration: Integrating multiple cloud environments fuels performance, with hybrid cloud investments generating 2.5 times greater business value than a single cloud platform approach.

Transformation: The revenue impact of cloud investments can be amplified up to 13 times when orchestrated as an end-to-end reinvention of the enterprise. And the more that hybrid and multicloud are tightly coupled with enterprise transformation, the greater the revenue impact of all technology investments to the business.

Commitment: 92% of the revenue potential from cloud is expected to be generated through its interaction with other transformation capabilities.

In the emerging Virtual Enterprise, the democratization of data and the dramatically increased intelligence and insight brought about by open hybrid technology and architecture promise to redefine the economics of business. The Virtual Enterprise embodies the traits necessary for cloud leadership, building a foundation around 3 key concepts:

— Openness

— Continuous modernization

— Culture and productivity

Key insight #1

Openness unlocks opportunity

The openness of the Virtual Enterprise needs to be enabled by open, secure hybrid multicloud technology architectures.

The Virtual Enterprise is founded on openness. And openness requires open, secure, and hybrid cloud technology architectures. It also involves collaboration—sharing applications and data with reduced friction, transaction costs, and risks. That's true whether the applications and data are mainframe based or in a public or private cloud.

The Virtual Enterprise operates on 3 levels: *inside the enterprise*, linking divisions and functions in more collaborative and agile workflows; *outside*, with partners that become ever more critical to deliver the core purpose of the business; and *out there*, with the wider ecosystem that allows true platform economics to play out and the enterprise to take advantage of those that wish or need to connect with its intent.

Connectivity is at the core of this operational matrix. In fact, 53% of organizations cite "transparency and visibility" across workflows as one of their most important competitive advantages in the next 3 years, according to IBV research.[2] Agile, open operating models empower networks of teams through a culture of accountability, alignment with strategic objectives, and constantly evolving expertise.

Yet participants in an Intelligent Workflow—such as those in an ecosystem—may be using many systems, applications, and data. 2 out of 3 executives say that over the next 3 years, their organizations' innovative operations will include unique configurations of data and computing environments, including on-premise data center, mainframe, private cloud, public cloud, and edge computing.[3]

The solution to this multiplicity dilemma: a secure and open hybrid cloud, which allows these services to behave as if in a unified environment, while enhancing overarching security protection. In a recent IBV study, 82% of respondents report they want to adopt more open approaches in their systems and operations. During the pandemic, hybrid cloud emerged as the dominant type of cloud delivery, in part because advanced cloud capabilities are critical to the success of digital transformation (see Figure 6.2).[4]

Intelligent Workflows are a composition of services. Cloud infrastructure must allow those services to interact and to share data. Vertical integration operating models are migrating to vertical connectivity operating models. The hybrid cloud strategy must embrace the virtual computing environment, aligning workloads and interfaces with the appropriate platform: traditional, private cloud, or public cloud.

Figure 6.2

As they digitally transform, organizations seek connectivity to integrate data

Source: "Application modernization on the mainframe: Expanding the value of cloud transformation." IBM Institute for Business Value. https://ibm.co/application-modernization-mainframe.
Q: To what extent do you agree with the following statements? (Percentages represent "completely agree" and "partially agree" responses combined.)

How ready are you to adopt openness?

Q1 How are you expanding the openness of your systems to enable improved connectivity and value creation?

Q2 How might your current tech infrastructure be limiting opportunity and exposing risk inside the enterprise, with partners, and in wider ecosystems?

Q3 How might an investment in hybrid cloud technology impact organizational costs, adaptability, and transformational potential?

Airtel

Hybrid cloud, AI, and new telco services

Faced with rapidly growing data consumption in India at a compound annual growth rate (CAGR) of over 70% by 2022, Airtel—one of the country's largest integrated telcos—is turning to a modern hybrid cloud architecture. With this platform, Airtel plans to deliver more responsive networks that tap into automation and AI to address growing customer needs and deploy new services at the right location and network tier.

Airtel's open hybrid cloud platform is expected to help enable new revenue streams with the onboarding of third-party services, including gaming, remote media production, and enterprise services. Airtel aims to improve the time-to-market of services and reduce operating and capital expenses. The network cloud also could position ecosystem partners, including B2B and B2C application developers, to create value-added services, including new edge offerings.

Additionally, the network cloud is embedded with AI, designed to facilitate automation in onboarding and improve monitoring and predictive capabilities for different services from network equipment providers.

Key insight #2

Perpetual modernization must be embraced

The new ecosystems and extended Intelligent Workflows require massive application modernization and technology renewal to leverage data access, flexibility, and total cost of ownership.

The Virtual Enterprise is always improving and modernizing; it's always leveraging insights across its Intelligent Workflows. The Virtual Enterprise is never static.

Hybrid cloud is the lubricant in this process, enabling comprehensive, ongoing transformation. 4 of 5 executives say organizations need to rapidly transform to keep up with competition, including modernizing applications and adopting a more open approach, according to recent IBV research.[5] And almost 70% of executives plan to leverage hybrid cloud to improve the integration and effectiveness of current legacy systems.

Digital transformation strategies motivate the modernization of underlying systems and, more important, the applications that reside therein. A hybrid cloud environment facilitates the alignment of workloads and interfaces with their most appropriate environment from technical, strategic, and regulatory perspectives. All of this helps enable continuous modernization and workflow evolution in response to integrated feedback loops (see Figure 6.3).

Such modernization can take multiple forms. Many enterprises have been taking advantage of cloud platforms to develop "cloud-native" applications, for instance. A cloud-native application is built very differently than a monolithic application—an application that is originally designed to satisfy the functional requirements for a business activity but over time becomes outdated. With a cloud-native application, each chunk of functionality is constructed as a stand-alone microservice using containers, which have become the standard for microservice architecture.

The emergence of control tower approaches to orchestrate the moving parts of the enterprise architecture is another important cloud-based modernization, and we can imagine the extension of this thinking to straddle the end-to-end environments of the ecosystem, powered by open standards. Many executives tell us Intelligent Workflows require a hybrid environment—in fact, only 13% from a recent IBV survey disagree with this assertion.[6]

Cloud-based enterprise resource planning (ERP) solutions can also play an important role in the overall architecture—and are a mainstay for Intelligent Workflows. Through precise integration of cloud-based ERP solutions, differentiated data, and open application platforms, Extended Intelligent Workflows operate together across multiple environments, providing a robust core for the Virtual Enterprise.

Finally, hybrid cloud models enable the Virtual Enterprise to remain on the cutting edge of security protection. An open, secure hybrid cloud network allows organizations to tap into better, more modern solutions, instantly available and continually updating.

Figure 6.3

Top workflows improved by cloud computing

Source: Previously unpublished data from the 2021 IBM Institute for Business Value Virtual Enterprise Survey.

Do you have the capability to continually modernize?

Q1 Have you created a continuous, perpetual process for modernizing your applications and systems?

Q2 How do you determine which applications to modernize, how do you implement the improvements, and how do you identify the appropriate destination for the new functionality?

Q3 How are you future-proofing the security of your workflows, even as you integrate more partners, networks, and ecosystems?

Lumen Technologies

Bringing hybrid cloud to the network edge

Lumen, a US-based multinational technology provider, was looking to offer customers speedier, real-time solutions. Enterprise clients that used Lumen's services for compute-intensive applications, such as financial trading and visual inspection—often deploying AI-fueled analytical models—needed instant results. If Lumen sent information to a data center or external cloud for processing and calculations, a delay would be unacceptable.

Lumen's answer was to implement edge computing networks. But to more effectively enable the technology, Lumen needed to put in place robust hybrid cloud capabilities. Via a security-rich tunnel, Lumen now provides clients with access to a centralized cloud console, through which they can develop, distribute, and manage edge applications across the global enterprise—with the versatility they require.

With the IBM Cloud Satellite integrated into Lumen's network, Lumen's clients can drive innovation more rapidly at the edge—propelling them forward to capitalize on emerging capabilities and exponential opportunities.

Key insight #3

Culture and productivity are linked

Architectural choices and open, secure solutions with fungible skillsets are fundamental to the success of the Virtual Enterprise.

Culture is the organizational glue that holds internal and external actors together, motivating innovation, collaboration, and value creation. It is a critical ingredient in the Virtual Enterprise that connects people, technology, and organizational capabilities in pursuit of transformational outcomes and better business performance.

With hybrid cloud as an open technology foundation to integrate operations, more securely share data, and improve trust among ecosystem participants, organizations can collaborate, co-create, and innovate for increased value delivery (see Figure 6.4).

Organizations are struggling with the skills reinvention challenge they face with legacy IT workforce as they embark upon their transformation journeys. The more open the underlying solutions and architectures leveraged—and the more they straddle the worlds of mainframe, private cloud, and public cloud—the more fungible and reusable the teams that undertake the work of development and maintenance can be.

According to recent IBV research, 81% of organizations say culture makes a positive contribution to digital transformation. In addition, 3 out of 4 respondents tell us that drawing ecosystems closer together is a key driver for establishing a hybrid cloud.[7]

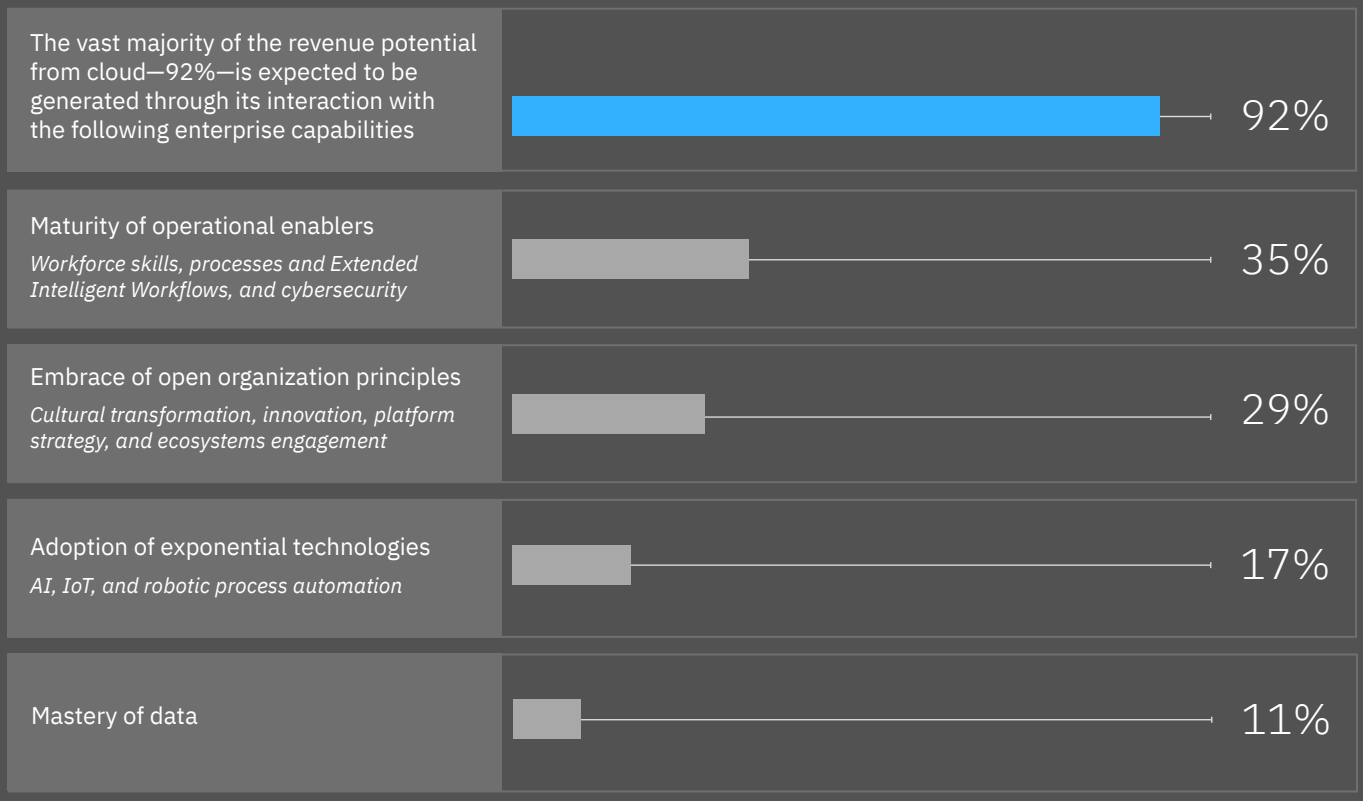
As technology redefines tasks and augments work, employees inevitably need to be reskilled, retrained, and supported as they adapt to new ways of working. An open cloud-enabled organization can harness the skills potential of both its own people and the wider partner ecosystem. Advanced cloud adopters that excel in their ability to develop talent and skills as a learning enterprise realize a 9% higher rate of revenue growth than other advanced cloud adopters, IBV research shows.[8]

Enterprises across industries want to pivot seamlessly between virtual and analog worlds. To unlock new sources of value, they are looking to extend and operate beyond traditional organizational boundaries, through increased engagement with platforms and ecosystem partnerships. As they adopt these strategies, their ability to shift data and workloads between operating environments becomes ever more crucial.

Establishing and maintaining a culture of interoperability and openness through hybrid cloud can bolster both workforce and organizational productivity.

Figure 6.4

Revenue potential from cloud



Source: Payraudeau, Jean-Stéphane, Anthony Marshall, and Jacob Dencik. "Unlock the business value of hybrid cloud: How the Virtual Enterprise drives revenue growth and innovation." IBM Institute for Business Value. ibm.co/hybrid-cloud-business-value

How will your culture promote productivity?

Q1 How might the complexity of your technology estate complicate the development of a collaborative yet standards-based operating environment across your enterprise, with partners, and within ecosystems?

Q2 How can you best address potential talent gaps as you prepare for future-state operations in more virtualized environments?

Q3 What obstacles exist in upskilling or reskilling your workforce amid ongoing digital transformation?

Delta Air Lines

Modernizing the technology platform

With demand down due to the pandemic, Delta Air Lines recognized a unique opportunity to modernize its digital operations. Delta understands the need to constantly enhance its customer and employee experience, and to improve efficiency across its business. As part of this digital transformation, the company is migrating most of its data and applications to the cloud.

More than 2,000 Delta IT experts are dedicated to application development, security, and cloud deployment. Moving to an open hybrid cloud architecture enables a consistent standards-based approach to operations and improvements. Delta's new cloud architecture will help weave its networks together, increasing agility and unlocking data for use across applications.

Delta expects to have modernized 90% of its applications and databases over the next 3 years via a hybrid cloud environment. The business-value advantage: The airline anticipates a more than 30% improvement in development productivity.

Action guide

Tapping into hybrid cloud to advance the Virtual Enterprise

The Virtual Enterprise affords new opportunities for co-creation, collaboration, and innovation across platforms and ecosystems, relying on Extended Intelligent Workflows, exponential technologies, and new data capabilities. Openness is its defining characteristic, underpinned by cloud.

As multicloud solutions proliferate along the Intelligent Workflows and platforms, the need grows to understand and manage the location of—and the speed to access—the data that fuels them. Cutting-edge security protocols become imperative. Integration unlocks value that transforms business and society. We can envision a wholesale shift in how people will interact with technology along these workflows, driving empathy, productivity, and experience.

By providing near-instant insights in support of an organization's workforce, ecosystems, and fluid work unit teams, open hybrid cloud-based models foster collaboration and enhance opportunity.

Here is a 5-step outline for effectively tapping into hybrid cloud and networks:

Open your organization

- Participate in platforms that can enable your organization to connect with partners, customers, and other stakeholders in new and improved ways.
- Identify the value of cross-system, cross-network collaboration. Modernize your portfolio to connect with other ecosystems and continue to track value.
- Build trust within the organization, with partners, and across ecosystems.

Invest in the right technology mix

- Embrace hybrid cloud as the foundation of integration and connections.
- Modernize to enable the right data to be available to the right location and the right application at the right time by allowing data to flow through a broad "on tap" network.
- Prioritize technologies with the highest compounding value to drive business results.

Develop operational enablers

- Build out and optimize Intelligent Workflows, infused with data and enabled by exponential technologies, to capitalize on the business potential of digital acceleration.
- Enhance cybersecurity capabilities as you engage ecosystem partners to both protect and encourage collaboration, co-creation, and data-sharing.
- Embed learning and continuous reskilling within the enterprise.

Modernize continuously

- Avoid the impulse to look at transformation as an event. Instead, accept ongoing improvement as a never-ending goal and process.
- Explore digital dashboard approaches; cloud orchestrator/management platforms; and cloud-based ERP, software-as-a-service (SaaS), and independent software vendor (ISV) solutions.
- Implement feedback loops that promote learning, best practices, and improved processes.

Drive cultural change

- Foster an open culture that encourages constant experimentation, builds new skills and ways of working, and understands that new ideas can come from anywhere.
- Clarify strategy and establish clear criteria for prioritizing the most valuable ideas.
- Develop and institute performance metrics that value and reward innovation, collaboration, and value creation.

Conclusion

Over the last 20 years, we've seen technological advances continually ignite changes in business and operating models, products and services, and entire industries. From the proliferation of smart phones to the rise of AI and quantum computing, technology has had enormous impacts across the board—from home life, to education and governments, to the corporate world. The momentum has carried us to a state in which technology is inextricably woven into our lives. The pandemic served as a tipping point of sorts, further propelling individuals and organizations alike toward the digital realm.

A coalescence of these technological, societal, and economic influences has set the stage for the debut of the Virtual Enterprise. The Virtual Enterprise Blueprint embraces the collaboration and open innovation made possible by extended ecosystems and platforms and relies on the Golden Thread of Intelligent Workflows to connect stakeholders within and beyond the organization. It takes a scientific discovery approach, mining information across its value chains for "in-the-moment" data-driven insights.

The Virtual Enterprise is committed to societal good—and realizes this commitment can also be good for business—and to fostering inclusive human-technology partnerships that help augment human talents and capabilities. And it builds all of this on a foundation supported by open, secure hybrid cloud and networks. By looking outward and forward, the Virtual Enterprise promotes continued collaboration and enhanced capabilities that allow for innovative business platforms, breakthrough solutions, and enduring growth. With its focus on openness, agility, and resilience, the Virtual Enterprise is built for longevity, armed with capabilities that enable success today and continued evolution for tomorrow.

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