Research Insights

IBM **Institute for Business Value**

The Virtual Enterprise

The Magic of Extended Intelligent Workflows

IBM

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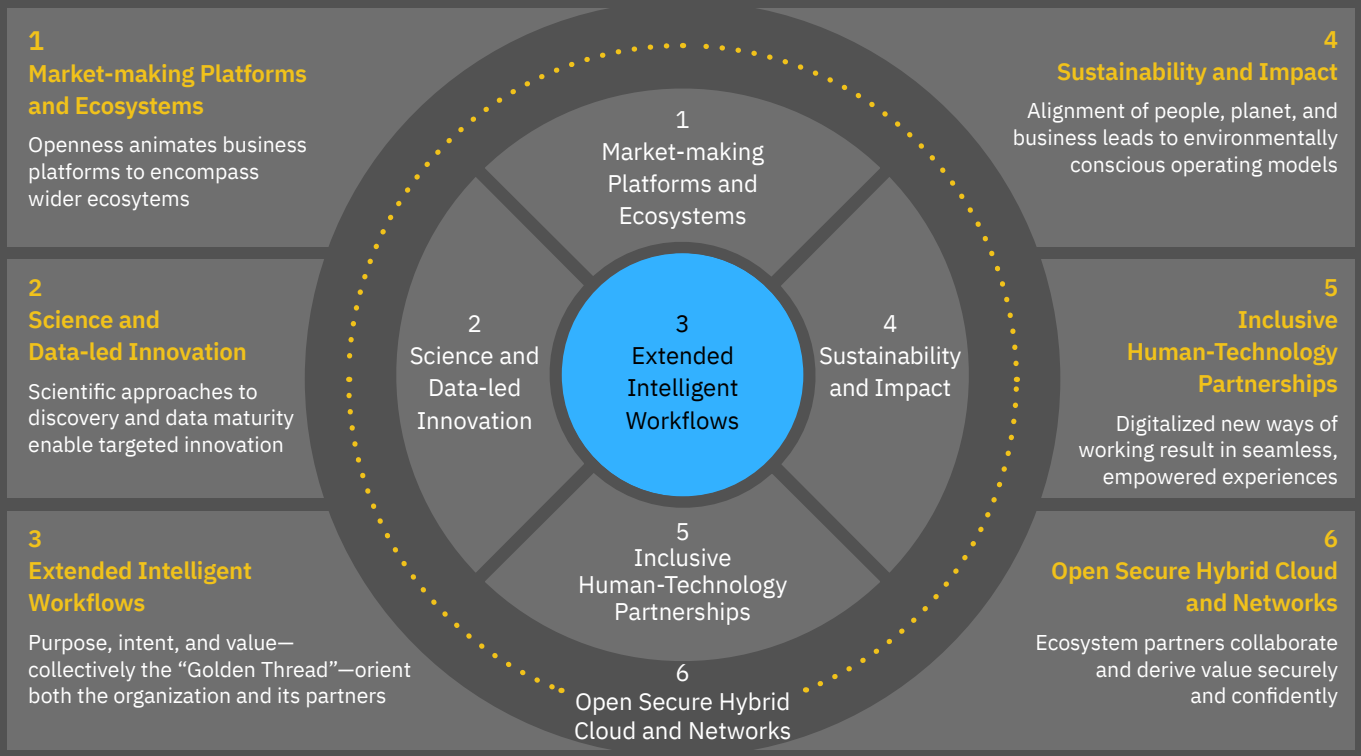
Technology is transforming the business models of enterprises across the globe, creating new opportunities for growth and fresh benchmarks of cost and efficiency. The ability to apply AI, automation, blockchain, the Internet of Things (IoT), 5G, cloud, and quantum computing at scale has made the promise of Cognitive Enterprises real.

As we place this revolution in the context of an increasingly virtual world, we see even more power arising from the ecosystems, digital workflows, and networked organizations that are made possible. The Virtual Enterprise is emerging, supported by a “Golden Thread” of value that animates the enterprise and binds ecosystem participants (see Figure 1).

The Intelligent Workflow is the Golden Thread that creates the backbone of the value chains that connect 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.

Figure 1

Building blocks of
the Virtual Enterprise



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

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.

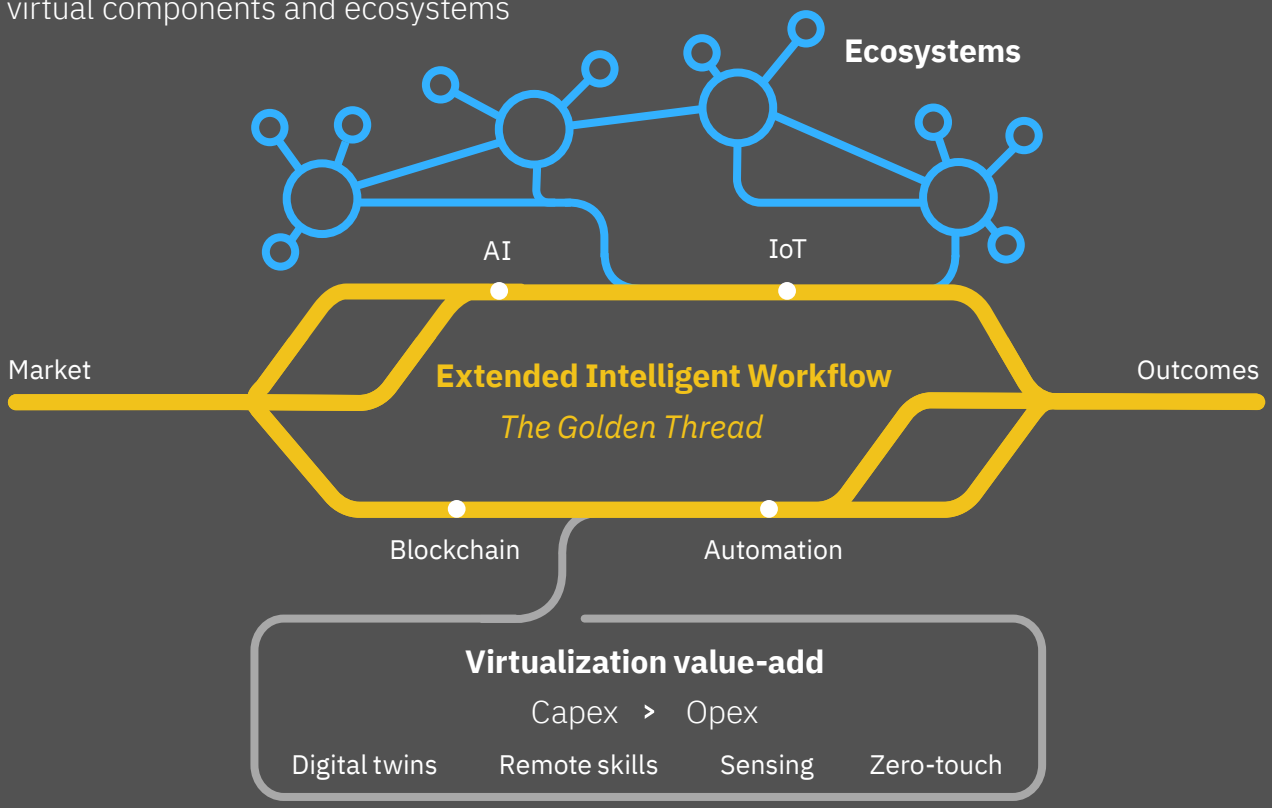
The more we extend the scope of a workflow and the greater the end-to-end connectivity is among the workflow's customers and contributing participants, the greater the business outcomes can be. By extending this scope deeper into customers, suppliers, and other stakeholders, the value potential of the 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 2

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 2).

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 four 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.

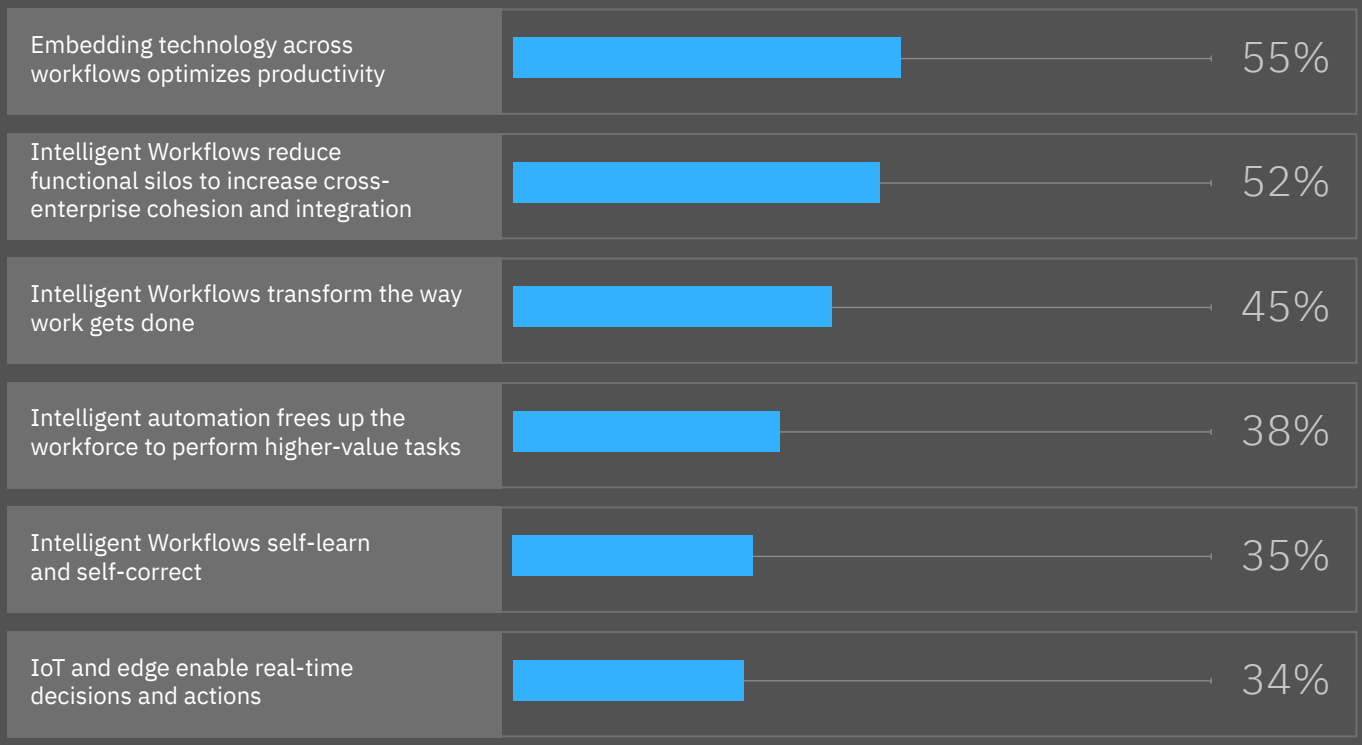
In this way, Intelligent Workflows serve to complement, sharpen, and speed the essential value-add that only people can provide. In fact, more than half of the executives surveyed for a recent IBV study report that Intelligent Workflows reduce functional silos and yield a host of operational benefits including optimized productivity (see Figure 3).[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

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 fulfilment 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 three years. Many of the factors cited map back to—and can be amplified by—Intelligent Workflows (see Figure 4).[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 4

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.

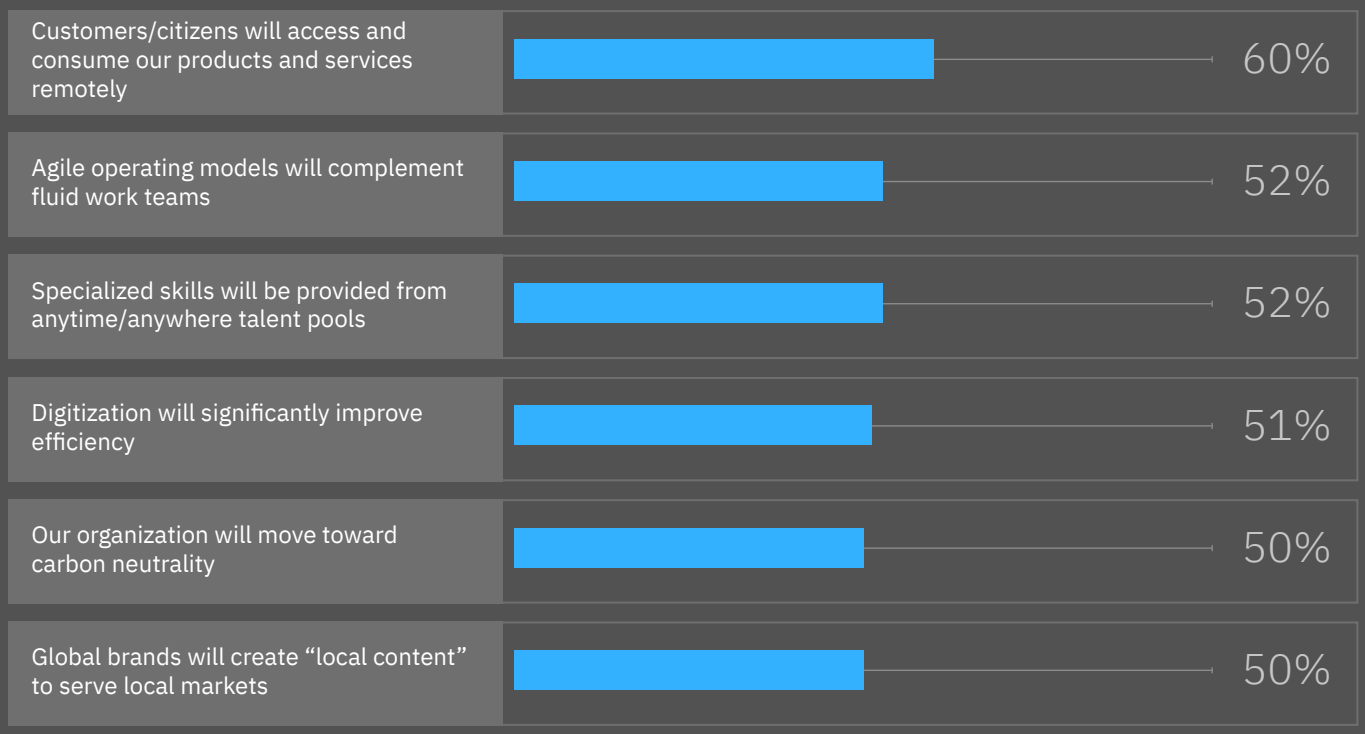
Virtualization applies to workforce practices, customer engagement, and physical assets (see Figure 5). According to recent IBV research, virtualization has already lowered organizational costs by 7%, on average, and is expected to trim a further 9% in costs over the next 3 years.[12]

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 5

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.

Perspectives from across the field

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