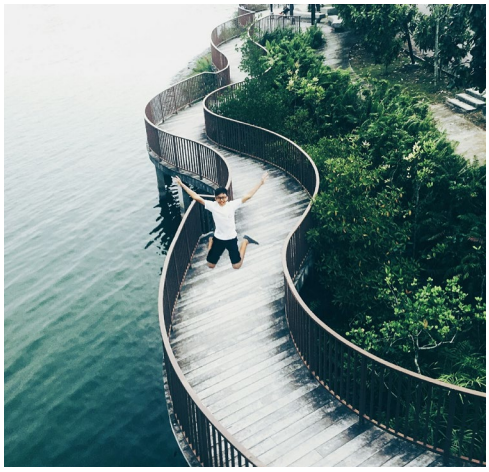
Cloud's next leap

How to create transformational business value for energy and resources

How IBM can help

The new generation of hybrid cloud provides a common platform across your cloud, on-premises, and edge environments. That means you can skill once, build once, and manage from a single pane of glass. IBM provides you with a comprehensive and consistent approach to development, security, and operations across hybrid environments. For more information, please visit: ibm.com/cloud/hybrid



Key takeaways

Energy and resources enterprises ... have emerged from the pandemic newly emboldened to accelerate digital transformation as a means of modernizing stale product portfolios and outdated operating procedures. Hybrid cloud is a key enabler.

Cloud platforms can accelerate digital transformation in energy and resources

By acting as the bond connecting technologies, hybrid cloud can allow energy and resources enterprises to accelerate growth and improve performance. Transformation includes optimization of exploration and R&D processes, creation of digital supply networks, management of greenhouse gases, production of more sustainable energy, intelligent automation on the shop floor, and new service business models.

The key to hybrid cloud excellence is reinvention

Energy and resources organizations can amplify the revenue impact of cloud investments by up to 14 times when they orchestrate those investments as an end-to-end reinvention of the enterprise.[1] The more that hybrid cloud is tightly coupled with enterprise transformation, the greater the revenue impact of all technology investments to the business.

Hybrid cloud can yield an enduring competitive advantage

To establish and maintain a competitive advantage, energy and resources companies should create a cloud platform strategy, then pursue business transformation through one or more cloud-enabled journeys that align with their strategic objectives.

In energy and resources, the answer to turbulence is transformation.

The last decade has been a crescendo of challenges for companies in the energy and resources sector. Although the appetite for their products and services continues to increase—global electricity consumption grew 36.4% between 2009 and 2019, during which time world oil demand grew 14.2%[2]—delivering them consistently, efficiently, affordably, and safely has become exponentially more difficult thanks to a litany of internal and external threats.

Internal to the industry, energy and resources companies face workforce shortages, the need to add digital and data skills, and rising material/component costs. Externally, pressure is mounting from regulators who seek compliance with new laws and standards in areas such as sustainability and data privacy. Meanwhile, the menace of cyberattacks looms large as threat actors seek new opportunities to make money, pilfer trade secrets, and cause political and economic damage by way of disrupting critical infrastructure.

Clearly, risks in the energy and resources industry are great. But so is resilience—particularly among businesses that boast mature processes in sales, supply chain, data, and IT. Confronted with volatile oil prices and equally volatile demand during the COVID-19 pandemic and the subsequent war in Ukraine, enterprises have shifted their attention toward activities that can further bolster that resilience. For example, US and Canadian utilities are rapidly converting to renewable generation sources, including distributed energy resources.[3]

The trend toward new sustainable business models supported by mature IT is escalating across sectors. It represents a significant opportunity for energy and resources enterprises, which have emerged from the pandemic newly emboldened to accelerate digital transformation as a means of modernizing stale product portfolios and outdated operating procedures.

Hybrid cloud is a key enabler. By helping them respond rapidly and effectively to changing business environments, it can give energy and resources companies the ability to:

- Quickly and easily connect ecosystem partners and suppliers that have different cloud and hosting standards
- Drive faster agile development cycles
- Scale workloads such as remote access
- Stay in control of, redirect, and adapt supply chains
- Manage the control and security of the enterprise architecture.

To determine the current state of cloud-powered digital transformation in the energy and resources industry, the IBM Institute for Business Value (IBV) partnered with Oxford Economics to survey 7,164 C-suite executives across 29 industries and 44 countries, then analyzed responses from 1,074 executives representing energy and resources, including: 215 executives from the chemicals sector, 286 from the energy and utilities sector, 215 from the industrial products sector, 143 from the mining sector, and 215 from the petroleum sector. (See “Study approach and methodology” on p. 23.)

What we found was a compelling case for the use of hybrid cloud by energy and resources enterprises for the purposes of increasing innovation, improving performance, and maintaining competitive advantage in the midst of increased chaos and complexity.

Perspective

Four evolving versions of cloud

Across industries—including energy and resources—organizations are moving en masse to the cloud. Not every organization will end up in the same place, however. That's because "the cloud" is not a monolithic destination. In our cross-industry "Cloud's next leap" study, we mined our work with clients around the world and across industries to discern different iterations and interpretations of cloud.[4] What ultimately emerged were four distinct versions of cloud, each of which presents distinct value propositions for distinct types of stakeholders:

Cloud v1:

Cloud v1 introduced the disruptive idea that what happens in an enterprise data center could be purchased as a service, with the cost based on actual consumption of the service. Adopters have embraced this version of cloud as a solution to the high cost and cumbersome processes associated with conventional on-premises data centers.

Cloud v2:

Cloud v2 helps the non-IT customers of the data center bypass the IT organization almost entirely by getting out a credit card and opening a cloud services account with a hyperscale cloud service provider. It makes business-unit experimentation with software development faster, easier, and less expensive.

Cloud v3:

Cloud v3 presents an enterprise-scale shift to cloud as the default model for application, compute, and networking infrastructure. It emphasizes migrating existing workloads to the cloud, modernizing applications, and assembling cloud "estates" composed of cloud service providers and styles of cloud computing (infrastructure-, platform-, or software-as-a-service, for example). Here, cloud is the "platform" on which new and modernized applications are developed and deployed.

Cloud v4 (Deep cloud):

Cloud v4—which we call "deep cloud"—is an emerging version of cloud wherein cloud becomes the active operational infrastructure for business transformation. It recasts the entire enterprise as the object of cloud-enabled software development. It's concerned not only with reducing the cost of data center operations and reaping the benefits of better, faster software delivery, but with changing the top and bottom lines of the enterprise by innovating at the core of how the business works.

Hybrid cloud triumphs

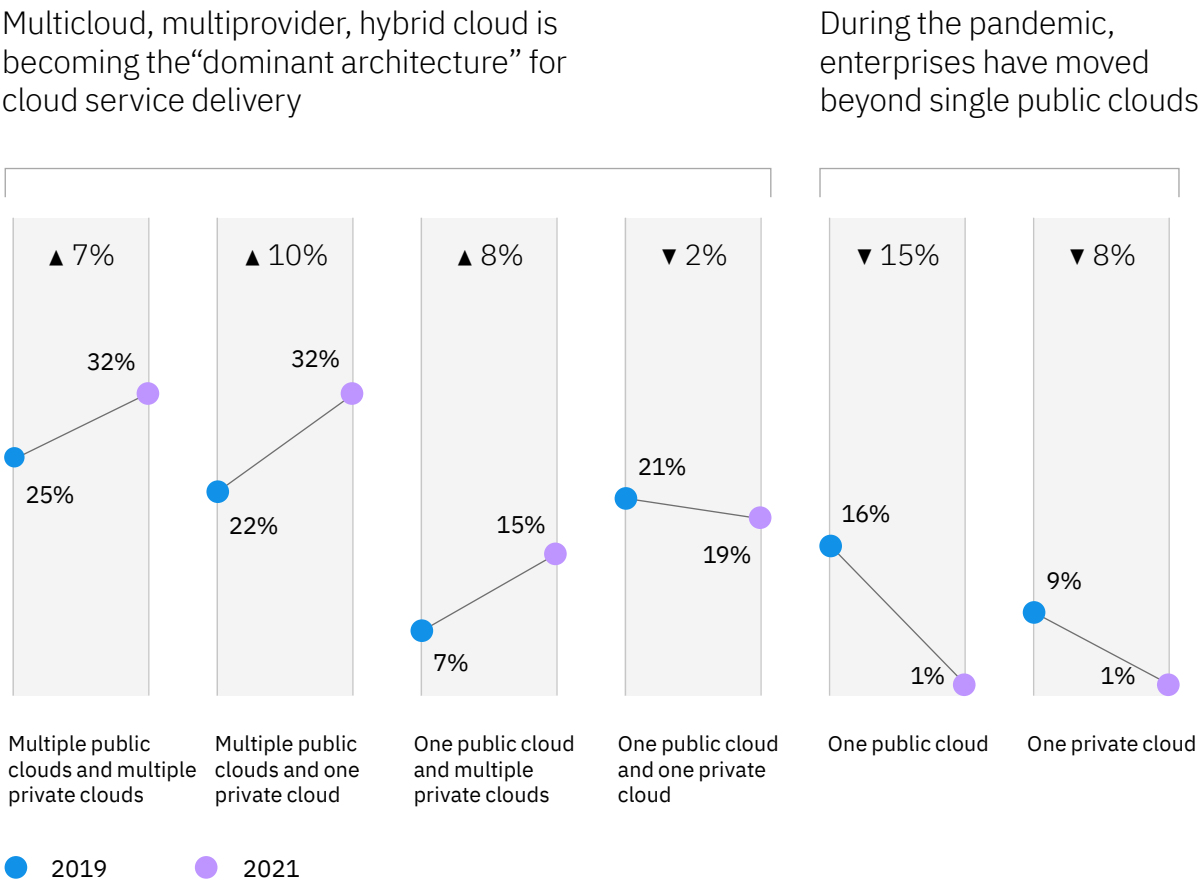
Entering the COVID-19 pandemic, organizations had to decide between two competing architectures for cloud: a single-cloud architecture and a hybrid cloud architecture encompassing a mix of on-premises infrastructure, private cloud services, and public cloud offerings.

Energy and resources enterprises have since made their choice: hybrid cloud, wherein organizations comprehensively orchestrate workloads across multiple clouds to help more securely employ software and data at scale and with speed across the enterprise IT landscape (see Figure 1).

FIGURE 1

Destination: hybrid

Most energy and resources companies moved to a hybrid cloud architecture during the COVID-19 pandemic.



Source: Boville, Howard, Hillery Hunter, and Richard Warrick. “Cloud’s next leap: How to create transformational business value.” IBM Institute for Business Value. October 2021. https://ibm.co/cloud-transformation

Q: What was your organization’s archetype for cloud service delivery in 2019 (pre-COVID)?
Q: What will your organization’s primary archetype for cloud service delivery be in 2021?

A single public cloud is rarely adequate because of data gravity, security and regulatory requirements, and the complexity of mission-critical applications. Over the course of the pandemic, the percentage of energy and resources respondents claiming a single public cloud as their primary archetype for cloud service delivery therefore dropped from 16% to 1%, which is similar to the drop observed in our cross-industry sample—from 16% to 2%. The percentage of respondents claiming a mix of multiple public clouds with either multiple private clouds or one private cloud, on the other hand, rose from 47% to 64% among energy and resources respondents and from 44% to 59% in our cross-industry sample.[5]

That energy and resources enterprises are adopting hybrid cloud at a higher rate is not surprising given the amount of data they need to manage: a single production line at a modern manufacturing plant may have 2,000 different pieces of equipment, each with 100 to 200 sensors that collect data every second. That single production line can easily generate 2,200 terabytes of data every month.[6]

Organizations that make hybrid cloud their dominant cloud architecture can seamlessly develop applications and operate workloads virtually anywhere and on any cloud. After all, hybrid cloud acts as infrastructural glue holding the IT organization together; as the bond connecting technologies, it can allow enterprises to harness a full range of available capabilities to accelerate growth and improve performance. By promoting open instead of closed IT systems, hybrid cloud can activate increased innovation and, as a result, enhanced business value. Plus, it lets organizations use best-of-breed cloud security technologies while implementing security across multiple environments more consistently, which helps provide increased protection alongside increased performance.

Case study

OREN: Delivering an innovation software and services marketplace for mining

Shell and IBM have joined forces to create OREN, the first B2B marketplace for the mining and industrial sectors. OREN offers solutions, software, and services designed to accelerate digital and sustainability transformation. It provides mining companies with a one-stop shop to find digital solutions from IBM, Shell, and third-party vendors in areas such as operations, sustainability, safety, and production.[7]

The portfolio includes digital solutions from across the mining value chain.[8] For example, MachineMax is a cloud-based digital service for off-highway vehicles and industrial fleet optimization. It operates using wireless smart sensors that fit near the engine of the vehicle or other accessible machine locations. With AI, the solution tracks vehicles, measures idling, and generates utilization analytics.[9]

Hybrid cloud helps energy and resources companies, in particular, with industry-critical activities such as optimization of exploration and R&D processes, creation of digital supply networks, management of greenhouse gases, production of more sustainable energy, intelligent automation on the shop floor, and new service business models. Examples abound:

- Utilities can use AI and machine learning on a cloud-based platform for solar radiation tracking. By connecting multiple information sources and processing it, these companies can produce accurate forecasts and optimize balance distribution on the energy that this renewable source creates.[10]
- By enhancing data management through cloud computing, oil and gas companies can oversee their gas flaring processes to address carbon emissions.[11]
- In a chemical company, cloud ERP can be used to optimize workforce utilization on the shop floor and to access near-real-time data on a uniform platform, boosting throughput.[12]
- For industrial manufacturing—where mission-critical, real-time applications require low latency and high security—it's common to have multiple, smaller on-premises clouds and a hub-and-spoke model. In this scenario, hybrid cloud provides benefits such as on-demand computing failover and auto-scaling while helping to ensure that operations are continually running, even in the event of connectivity failure.

  Hybrid cloud also allows industrial manufacturers to make control decisions in near real time.[13] A cloud-based platform that uses AI, IoT, and analytics for asset management, monitoring, and predictive maintenance can reduce downtime and generate equipment cost avoidances.

Case study

Horizon Power: Embracing a smart approach to smart energy[14]

Horizon Power is a government trading enterprise that generates, distributes, and retails electricity in Australia's westernmost state, Western Australia. Contending with manual business processes and slow information exchange between applications, it reviewed its entire enterprise architecture and identified two areas that had technological gaps: integration and data management.

Horizon Power chose an AI-powered software to automate application and data flows. The solution's application integration component includes pre-existing patterns that the company can use to do more configuration and less customization across virtually any cloud or on-premises environment.

By using the solution to integrate, reuse, and transform its business applications, Horizon Power has reduced its IT development time by more than 50% and its development costs by approximately 40%.

Destination: reinvention

The most successful enterprise operating models stand on the shoulders of hybrid cloud, suggests IBM-sponsored research, which indicates that a full hybrid cloud platform technology and operating model drives 2.5 times more value compared to a single-platform, single-cloud-vendor approach.[15]

It's not hard to understand why: Enterprises need an application development platform that can run anywhere, workloads that can execute seamlessly across environments, and a comprehensive orchestration capability that touches every corner of their IT ecosystem. Moving workloads freely among hybrid deployment models enables increased resiliency, provides better flexibility, and helps energy and resources companies avoid vendor lock-in by allowing them to work with myriad partners regardless of their chosen cloud.

Cloud's contribution to business is even greater in the context of business transformation. To reinvent themselves, energy and resources enterprises must adopt state-of-the-art technology while embracing an organizational culture that's open, innovation-friendly, and employee-centric. With high levels of cloud adoption among most energy and resources enterprises (approximately five clouds across public, private, hybrid, and distributed clouds), new cloud investments alone are likely to yield relatively few direct benefits. In fact, our research suggests that of the total potential revenue from new cloud investments, only 7% can be attributable to cloud adoption alone.[16]

The remainder—93%—is expected to come from the interaction of new cloud investments with the following enterprise capabilities (see Figure 2):

- Enhanced data capabilities
- Other exponential technologies
- Operational enablers, such as workforce skills, processes and extended intelligent workflows, and cybersecurity
- Open organization principles, such as cultural transformation, innovation, platform strategy, and ecosystems engagement.[17]

If an energy and resources organization successfully implements each of these transformation elements, the revenue impact of $1 invested in cloud is 14 times greater than it would be without them.[18]

Case study

Raj Petro: Achieving joint-venture success[19]

Raj Petro, a Brenntag Group company, manufactures and markets petroleum and lubricants. As it was accelerating its business growth, it wanted to more closely align its workflows, reporting, and compliance processes with Brenntag.

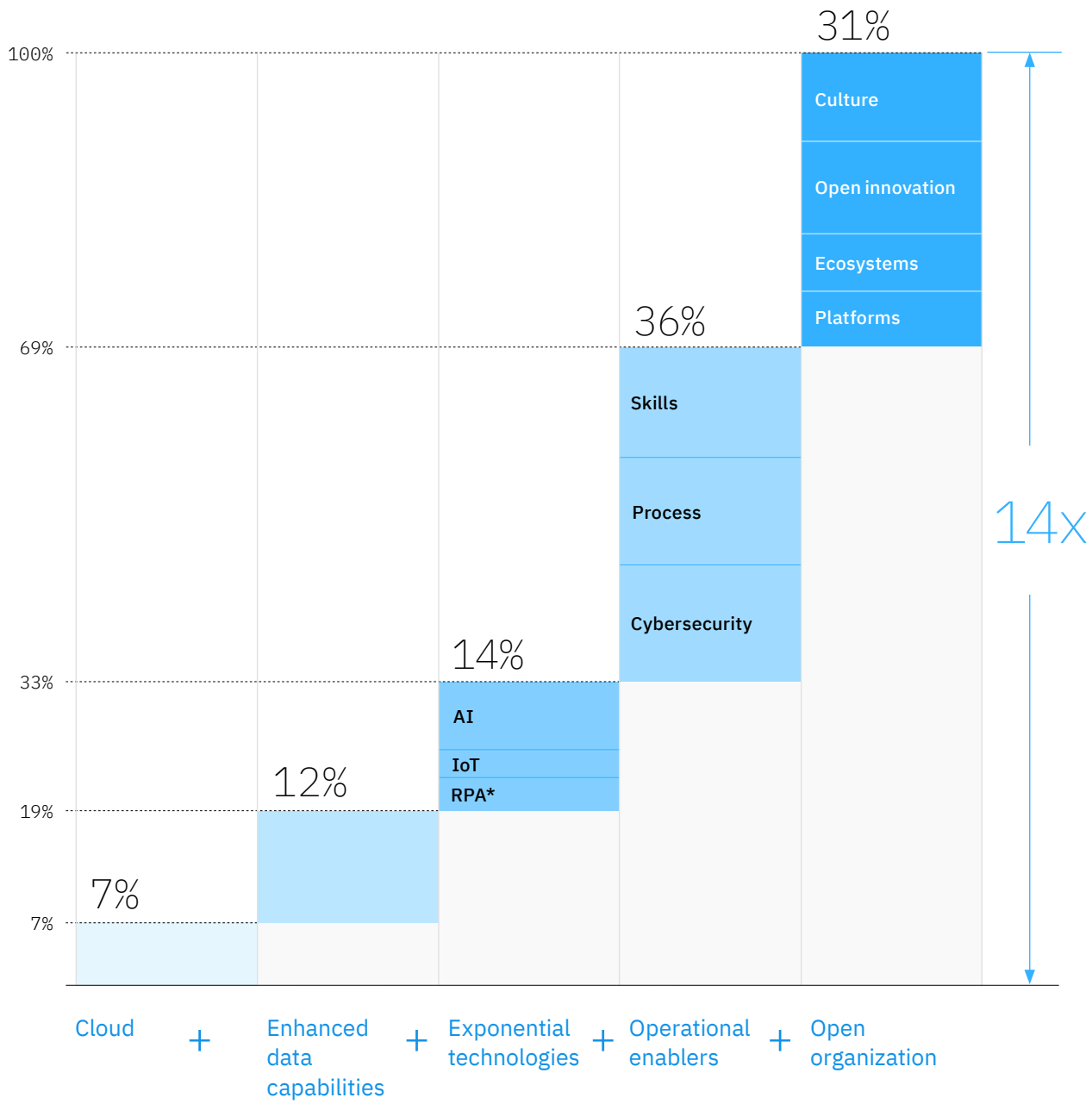
As a first step, the company moved its mission-critical ERP systems to managed services in the cloud. Doing so allowed the company to more cost-effectively manage its partner's requirements related to compliance and financial reporting. At the same time, moving to cloud gave it the opportunity to optimize its workflows—contributing to record-breaking revenues despite the COVID-19 pandemic.

Since moving ERP business systems from an on-premises data center to highly available managed services in the cloud, Raj Petro has slashed its recovery point objective to under 15 minutes and cut its recovery time objective to less than 4 hours. The company's IT organization is now leaner and more effective, and its personnel are empowered to focus less on technical troubleshooting and more on fine-tuning systems for operational excellence.

FIGURE 2

Amplified impact

Cloud by itself accounts for only 7% of cloud computing's potential revenue impact in energy and resources organizations; combining cloud with other capabilities can amplify its revenue impact by up to 14 times.



*RPA = robotic process automation

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. July 2021. Unpublished data.

Energy and resources enterprises can achieve this value by directing cloud investments at their highest-priority digital plays—that is, by employing software to improve business performance (see Figure 3). The top plays across energy and resources are: digitizing existing products and services, recovering from COVID-19, improving the customer experience, and supporting employee productivity.

Both the chemicals and industrial products sectors cite improving cybersecurity as a higher priority, which is not surprising given that manufacturing overtook finance and insurance as cybercriminals' top target in 2021, according to the IBM Security X-Force Threat Index 2022.[20]

In addition, the industrial products sector sees a need for launching new digital products and services. Unlike physical equipment and assets, demand for which is cyclical, these services deliver a continuous revenue stream and can be a vehicle through which to improve the customer experience, since they span the entire product lifecycle. They therefore represent an important growth engine for industrial machinery manufacturers.

Case study

ExxonMobil: Transforming customer experience at the gas pump[21]

ExxonMobil is one of the world's largest publicly traded energy providers and chemical manufacturers. To improve the customer experience at the gas pump, it created a smartphone app to enable a streamlined and security-focused fueling payment process.

Called Exxon Mobil Rewards+, the mobile app is among the first offered by a major fuel retailer for digital payment at the pump. Its cloud-based platform helps reduce costs and is designed to scale effortlessly as the app's user base continues to grow, all while providing increased flexibility, resiliency, and security.

With downloads in the millions, the app is considered a resounding success: Not only does it make countless transactions safer, but it also serves as a competitive advantage, drawing new and legacy customers to Exxon and Mobile stations for the increased speed and convenience that it provides.

FIGURE 3

Highest-priority digital plays

Energy and resources enterprises are directing resources toward efforts that improve business performance.

Plays	Energy and resources (aggregate)	Chemicals	Energy and utilities	Industrial products	Mining	Petroleum
Digitizing existing products/services	1	1	1	1	2	1
Recovering from/responding to COVID-19	2	2	4	2	3	2
Improving the customer experience	3	4	2	5	4	3
Supporting employee productivity/collaboration	4	7	3	6	1	4
Improving cybersecurity, reducing security risks	5	3	5	4	5	5
Launching new digital products/services	6	5	7	3	10	8
Modernizing core business systems	7	6	6	8	6	7
Improving/expanding data/analytics capabilities	8	10	8	7	8	9
Reinventing core business workflows	9	11	10	9	11	6
Improving business resilience/business agility	10	12	9	11	9	11
Adopting new ways of working	11	9	11	12	7	12
Building industry ecosystem platforms	12	8	12	10	13	10
Launching new business models	13	13	13	13	12	13

Top 4 Middle 4 Bottom 5

Q: What types of digital business performance improvement initiatives are your highest priorities today?

Successfully executing these plays demands either more comprehensive cloud capabilities or the most advanced available cloud capabilities, executives say (see Figure 4). In other words, they require capabilities above and beyond those that are available through traditional infrastructure-as-a-service (IaaS) and software-as-a-service (SaaS) offerings. Across the 13 surveyed highest-priority digital plays, only about 25% of energy and resources respondents claim they could execute those plays successfully with basic cloud infrastructure hosting alone.

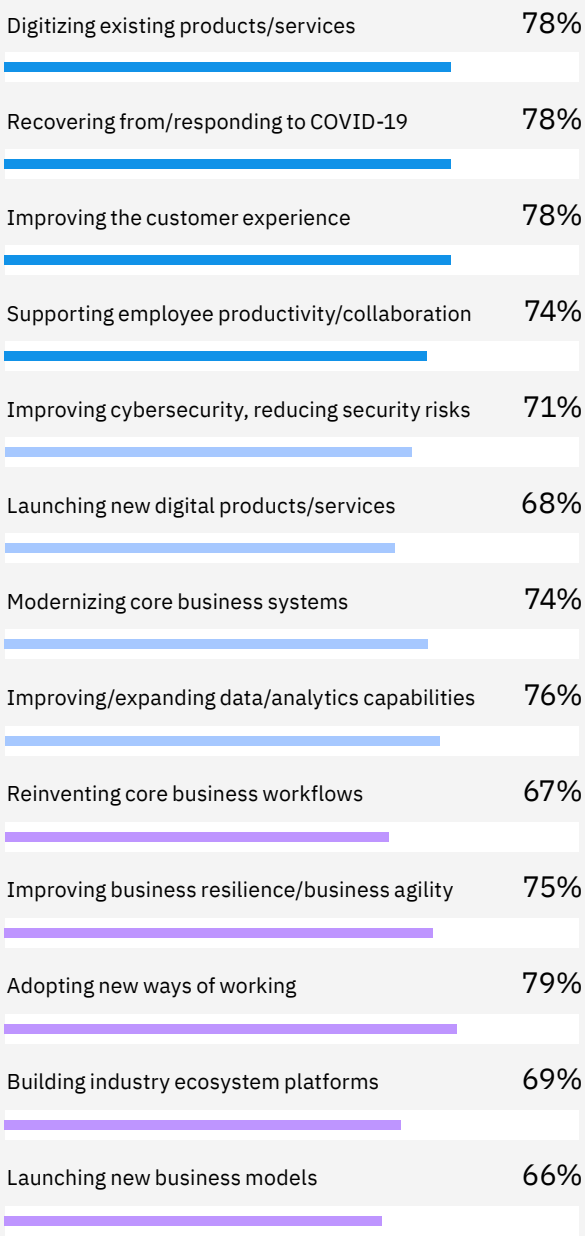
Combining digital plays with cloud as the development and delivery infrastructure is paying off. These plays are returning a mix of "positive improvements at enterprise scale" and "transformational improvements at enterprise scale" (see Figure 5). As evidence of these returns, our prior research shows that digital investments have generated value for industrial products organizations, with averages of 15% return on investment, 5% expense reduction, 4% increase in revenues, and a 62-day reduction in time to market for new products/services. For an average $5 billion company with a 10% margin, this translates to an additional $425 million in profit. [22]

Clearly, energy and resources organizations that invest in a hybrid cloud strategy can capitalize on the capabilities of a cloud-enabled, software-driven virtual enterprise. And when they do, they can improve the customer experience, increase employee collaboration, and expand business intelligence through data and analytics.

FIGURE 4

Help wanted

Energy and resources companies say their highest-priority digital plays require either "more comprehensive cloud capabilities" or "the most advanced cloud capabilities."

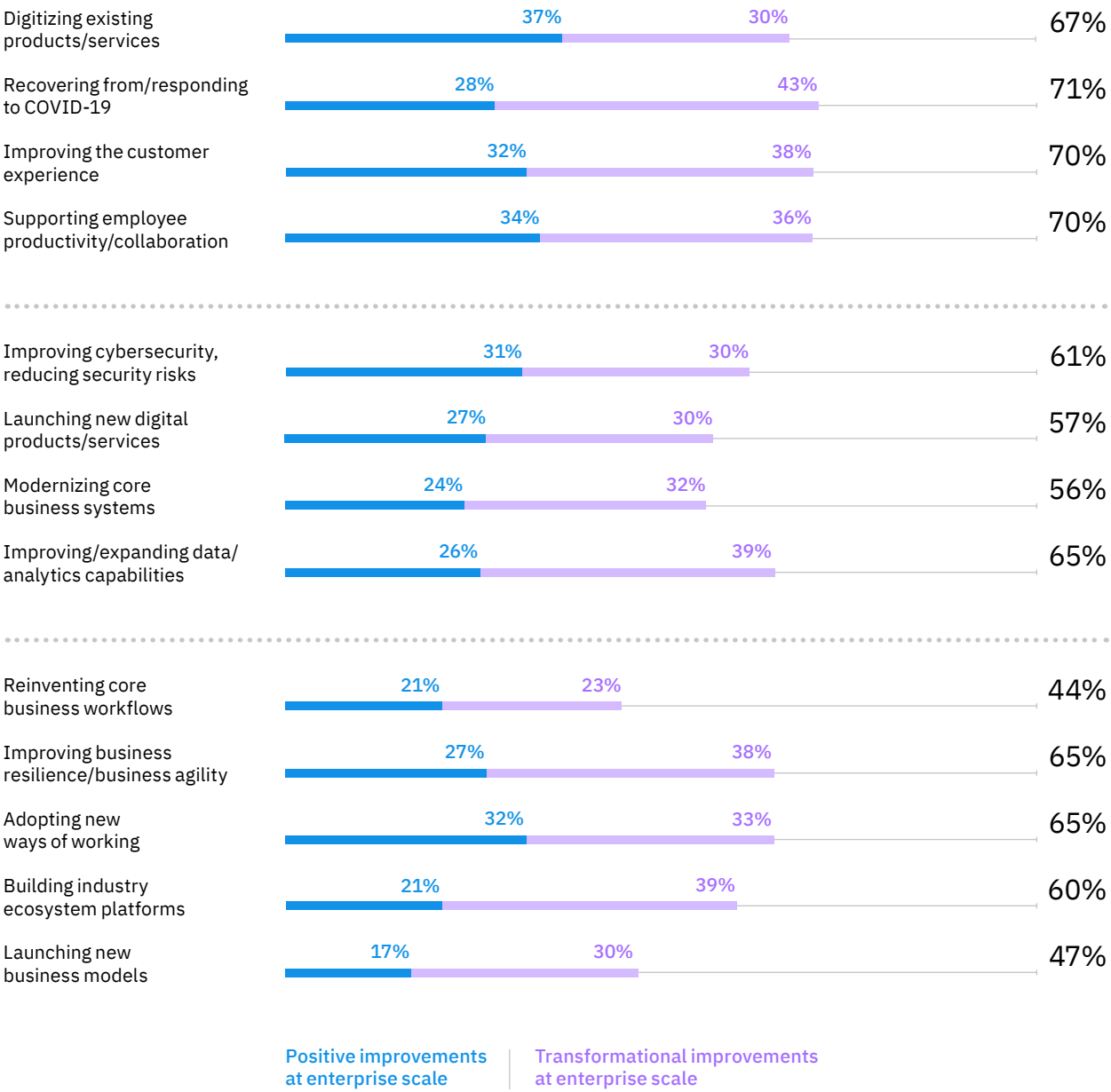


Percentage of respondents saying digital plays require more comprehensive or the most advanced cloud capabilities

FIGURE 5

Return on cloud investment

When they're combined with cloud, energy and resources companies' highest-priority digital plays are returning a mix of "positive improvements at enterprise scale" and "transformational improvements at enterprise scale."



Q: What level of impact in business performance are those digital initiatives delivering today?

Case study

ENN Group: Boosting productivity with hyperautomation[23]

ENN Group Co. Ltd. is a vertically integrated energy supplier and one of China's largest private companies. As a complex, multifaceted company, ENN faces myriad challenges, including: climbing operating costs, growing customer expectations for high-quality products and services, constantly changing business requirements, and increased competition for talent. To manage these and other obstacles, the company decided to take the next step in its ongoing automation journey: hyperautomation.

Hyperautomation is the use of AI to automate a large number of business and IT processes at scale. To achieve it, ENN built upon its existing robotic process automation (RPA) foundation. It started with an open, modular, integrated platform with embedded AI. It then combined the platform with a cloud-based service to build and deploy virtual assistants and an AI-powered search technology that retrieves information buried within enterprise data.

ENN's virtual assistants—the use of which now spans employee and customer self-service functions—can query users on intent, then share that information with the company's automation software to perform appropriate actions.

Having a single cloud-based platform through which to execute hyperautomation gives ENN a foundation for future solutions, as well as the ability to consolidate, operationalize, and govern data from across its operations. As a result, it can reduce its costs while eliminating data silos. The platform also offers the convenience of pre-integrated automation technologies and low-code tools so ENN can design, build, and run automated applications and services more quickly and at scale.

Perspective:

Open Subsurface Data Universe[24]

To stay competitive in the data-driven era of today, energy companies need to put embracing revolutionary transformation technologies at the heart of their business strategy. To do so, they require a common data platform architectural design that benchmarks the ways in which their industry works with data.

The Open Subsurface Data Universe (OSDU) is an application interoperability platform through which the energy industry seeks to overcome legacy data challenges. Developed by the vendor-neutral Open Group OSDU Forum, it is open-source, standards-based, and technology-agnostic. Organizations that use it say it reduces costs, breaks down data silos, enables innovation, and centralizes data in a single location.

The OSDU Forum's scope of work includes:

- Creating a scalable data platform and related services
- Enabling the OSDU platform in virtually any technical setting (cloud, on-premises, edge)
- Establishing a single set of APIs that provide stable platform services to the applications developed on top of the platform
- Providing a broad set of OSDU services to enable utilization by a larger group of energy companies
- Delivering services using the latest developments to improve and monitor data quality.

Case study

Schlumberger: Expanding access to the DELFI cognitive E&P environment[25]

Schlumberger Ltd. is among the world's leading providers of oil field services, including reservoir characterization, drilling, production, and processing. In 2020, it announced a major collaboration with IBM and Red Hat to accelerate digital transformation across the oil and gas industry.

Specifically, the joint initiative provides global access to Schlumberger's cloud-based DELFI environment—a data ecosystem supporting exploration and production (E&P) activities by oil and gas companies—as well as cognitive applications. The IBM hybrid cloud technology, built on the Red Hat® OpenShift® container platform, is a key enabler.

Collaborative development initially focuses on two key areas:

- Private, hybrid, or multicloud deployment of the DELFI cognitive E&P environment enabled by Red Hat OpenShift to significantly expand access for customers
- Delivering the first hybrid cloud implementation of the industry's open data platform, the Open Subsurface Data Universe (OSDU).

Using the container platform enables the deployment of applications in the DELFI environment across virtually any infrastructure, from traditional data centers to multiple clouds, including private and public. This new way of hosting offers the possibility to use multiple cloud providers and addresses critical issues for customers, facilitating in-country deployments to support compliance with local regulations and data residency requirements.

The DELFI environment incorporates cutting-edge data analytics and AI, drawing upon multiple data sources, automating workflows, and facilitating virtually seamless collaboration for domain teams. Many more oil and gas operators, suppliers, and partners from around the world can work from one of the industry's leading digital environments—built on a standard, open platform where they can create new applications by "writing once and running everywhere."

The creation of a differentiated data management and operations solution for the OSDU data platform enables oil and gas operators to build, deploy, and transition digital solutions with hybrid cloud data infrastructures. This can foster wider collaboration and greater efficiency among professionals in the E&P value chain.

Action guide

We have established a clear process to help energy and resources organizations get more value from their hybrid cloud commitment and engagement (see Figure 6).

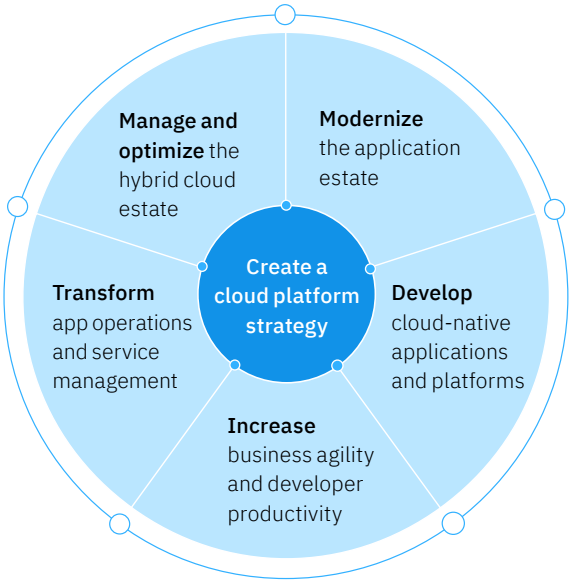
The first step in achieving a hybrid cloud platform advantage is to create a cloud platform strategy, after which you can undertake any of five journeys that can help you leverage hybrid cloud for business transformation. Choose one or more journeys based on alignment with your strategic goals:

- Modernize the application estate
- Develop cloud-native applications and platforms
- Increase business agility and developer productivity
- Transform app operations and service management
- Manage and optimize the hybrid cloud estate.

FIGURE 6

Journey to value

Energy and resources organizations can get more value from hybrid cloud by creating a cloud platform strategy, then taking any of five available journeys toward cloud-powered business transformation.



Actions to create a cloud platform strategy

The goal of creating a cloud platform strategy is to harness the cloud as a means to achieve strategic goals, such as aligning end-to-end business transformation with new operating models. Because they're interrelated, the cloud platform strategy should work in concert with a data governance strategy, an application modernization strategy, and a mobile strategy. In this way, organizations can execute business and IT transformation in tandem.

- Recognize cloud capabilities as strategically important to business success and align cloud capabilities with business and operating priorities.
- Take your business objectives as a point of departure for the development of hybrid cloud management capabilities.
- Recognize the need for business process redesign and application modernization to go hand-in-hand with enhanced cloud capabilities.

Actions to modernize the application estate

As previously mentioned, organizations that embrace a full hybrid cloud platform technology and operating model can achieve 2.5 times more value compared to those that use a single-platform, single-cloud-vendor approach. Modernizing the application estate is about realizing that potential with modern core-business operations, the outcomes of which can include improved time-to-market and reduced total cost of ownership.

- Pursue continuous modernization of the entire estate for virtually any hyperscaler, cloud, or edge.
- Enable talent and operating model transformation to support modernization. This could include a new IT target operating model, addition of roles to coordinate operations, and growth of technical skills.

Actions to develop cloud-native applications and platforms

Developing cloud-native applications and platforms requires a build-once, deploy-anywhere approach. The ability to write applications just one time and deploy them anywhere in the enterprise or ecosystem—across public or private clouds—is tightly linked to the use of common tools and application environments such as containers. Kubernetes is an open-source platform that supports management of workloads and services in containers. It's highly portable and enables consistent, automated deployment of applications. With a microservices architecture on an open, highly-scalable hybrid cloud platform, organizations can assemble reusable components to accelerate the delivery of new applications. Outcomes routinely include improved time to market and reduced development costs.

- Use containers technology in a microservices architecture to design, build, and optimize innovative, security-rich, and more resilient cloud applications, regardless of hyperscaler.
- Deliver re-imagined business capabilities by data mining with advanced AI and machine learning.

Actions to increase business agility and developer productivity

By increasing business agility and developer productivity, you can drive innovation, stimulate growth, and increase IT resiliency. Developers can consume services through a self-service portal within a hybrid environment, which can improve their work experience and productivity and ultimately result in increased output and shorter cycle times.

- Foster scalable transformation by encouraging adoption of KPI-driven DevSecOps and shift-left operating models.
- Leverage best-in-class toolchains, enhanced by an asset-based delivery approach.

Actions to transform app operations and service management

Transforming app operations and service management can streamline operations and enable a future-fit IT operating model. Outcomes typically include self-healing through AIOps and reduced total cost of ownership.

- Streamline workflows with an automation-first approach to drive a consistent operating model across the estate.
- Harmonize your entire vendor ecosystem with integrated service management.

Actions to manage and optimize the hybrid cloud estate

Managing and optimizing the hybrid cloud estate can give you increased visibility into—and increased control over—the costs of operating applications. While the hybrid cloud orchestration platform constitutes a foundation, you can further enhance it with containers, Kubernetes, and microservices. These tools act as building blocks for an organization's overall ability to effectively manage its hybrid cloud environment. A governance dashboard helps with management across the entire cloud estate and is extendable to future anticipated technologies that will be governed in the cloud environment. Outcomes can include reduced total cost of ownership and decreased incidents.

- Build and implement a single control pane to enable more seamless, end-to-end cloud management services across the estate.
- Conduct ongoing assessments of the cloud estate to optimize costs and increase resiliency.

About
the authors

Zahid Habib

Global Energy and Natural Resources Leader
IBM Consulting
zhabib@us.ibm.com
linkedin.com/in/zhabib1

Zahid is global industry leader for energy and resources, global industrial SAP leader, and vice president at IBM Consulting. He is responsible for all industry solutions at scale and go-to-market strategies. He has more than 35 years of experience in management consulting, program management of capital projects, ERP transformation, AI and IoT solutions, trading systems implementations, business process transformation, and enterprise application integration.

Spencer Lin

Global Research Leader, Chemicals, Petroleum, and Industrial Products
IBM Institute for Business Value
spencer.lin@us.ibm.com
linkedin.com/in/spencer-lin-35896317

Spencer is the global research leader for chemicals, petroleum, and industrial products, and CFO/finance at the IBM Institute for Business Value. In this capacity, he is responsible for market insights, thought leadership development, competitive intelligence, and primary research on industry and role agendas and trends. He has more than 25 years of experience in financial management and strategy consulting.

About
the authors

Santosh Mulayath

Principal, Global Energy Industries
IBM Technology
santosh.mulayath@us.ibm.com
linkedin.com/in/santosh-mulayath

Santosh is the IBM Technology global industries principal use case lead for the energy industry. Leveraging more than 35 years of experience in the chemicals and petroleum industry, he provides guidance on transformative business applications of IBM technologies for hybrid cloud, artificial intelligence, machine learning, automation, security, and modernization. He has worked extensively with upstream oil and gas, refiners, national oil companies, electric and gas utilities, and engineering procurement construction companies.

Richard Warrick

Global Research Leader, Cloud
IBM Institute for Business Value
rwarric@us.ibm.com
linkedin.com/in/richardwarrick

Richard leads the IBM Institute for Business Value cloud research agenda, which explores cloud as part of a new way of working as enterprises evolve to become more fully digital businesses. Richard's consulting career spans more than 20 years of helping Global 1000 clients navigate the intersection of business and technology. His work has focused on business and IT strategy, operating model design and implementation, and large-scale transformation programs.

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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. July 2021. ibm.co/hybrid-cloud-business-value

The hybrid cloud platform advantage

Comfort, Jim, Blaine Dolph, Steve Robinson, Lynn Kesterson-Townes, and Anthony Marshall. "The hybrid cloud platform advantage: A guiding star to enterprise transformation." IBM Institute for Business Value. June 2020. ibm.co/hybrid-cloud-platform

Study approach and methodology

In partnership with Oxford Economics, we surveyed 7,164 executives in enterprise cloud adoption. The scope of the survey was global, including 44 countries across the Americas, Europe, India, China, Asia/Pacific, the Middle East, and Africa. The surveyed enterprises represented 29 industries, from agriculture to travel. This report focuses on the 1,074 respondents from energy and resources: 215 chemicals executives, 286 energy and utilities executives, 215 industrial products executives, 143 mining executives, and 215 petroleum executives.

The survey targeted enterprises with revenue greater than $500 million. The survey respondents included a wide variety of job roles related to cloud enterprise adoption: CEOs, CIOs, CTOs, COOs, CFOs, and IT professionals in infrastructure, software development, operations, digital transformation, and design/UX, among others. The survey respondents included a variety of organizational levels, from team members to C-suite executives. All respondents were screened based on their ability to answer questions about enterprise IT investments and cloud adoption.

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New Orchard Road
Armonk, NY 10504

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