McKinsey Digital

Cloud's trillion-dollar prize is up for grabs

Cloud has immense potential, but most companies are only scratching the surface. Recent research clarifies where the value lies—and how to capture it before competitors do.

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Moderna CEO Stéphane Bancel made the decision to build his mRNA research-and-development platform on public cloud to create what he calls "software for life."[i] He used the cloud as a means to accelerate therapeutic discovery and development. When the COVID-19 pandemic hit, this strategy proved prescient. The company was well positioned to quickly design research experiments and to harness its automated laboratory and manufacturing processes and enhanced drug-discovery pipeline.

Moderna runs its Drug Design Studio, a proprietary web application, on cloud and leverages cloud's scalable compute and storage infrastructure to analyze and quickly design mRNA sequences for protein targets. Scientists and engineers also use fully managed cloud data-warehousing services to integrate insights from multiple experiments running in parallel and quickly refine the design and production cycle.[ii] Moreover, the adoption of cloud principles, such as infrastructure as code (IaC) and security as code, helped to automate good-practice (GxP) compliance processes so the organization can move quickly while staying secure and compliant.[iii] Thanks in part to cloud, Moderna was able to deliver the first clinical batch of its vaccine candidate (mRNA-1273) to the US National Institute of Health for phase one trials just 42 days after the initial sequencing of the virus,[iv] "because you don't have to reinvent everything, you just fly," Bancel said.[v]

More companies are starting to see the real benefits of cloud,[vi] which has been long heralded as a catalyst for innovation and digital transformation, thanks to its ability to increase development speed and provide near-limitless scale. While Moderna's success illustrates the business opportunities that cloud makes possible, it only scratches the surface of the potential value at stake. A detailed review of cloud cost-optimization levers and value-oriented business use cases foresees more than $1 trillion in run-rate EBITDA across Fortune 500 companies as up for grabs in 2030 (see sidebar, "About the research"), a number that will grow as cloud facilitates the adoption of emergent technologies such as augmented reality and blockchain. This $1 trillion is less a prediction than an estimate of what should be possible, provided companies aggressively pursue the cloud opportunity—and a call to action, because early adopters will capture a disproportionate share of the total value.

The emergence of this immense value pool comes at a time of increasing competitive pressure on companies. Fast-moving digital players are creating a fluid business landscape and accelerating the pace of change. For CEOs, cloud adoption is not just an engine for revenue growth and efficiency. Its speed, scale, innovation, and productivity benefits are essential to the pursuit of broader digital business opportunities, now and well into the future. Yet an overly narrow view of cloud-value economics and where value exists often keeps companies from achieving the desired outcomes.

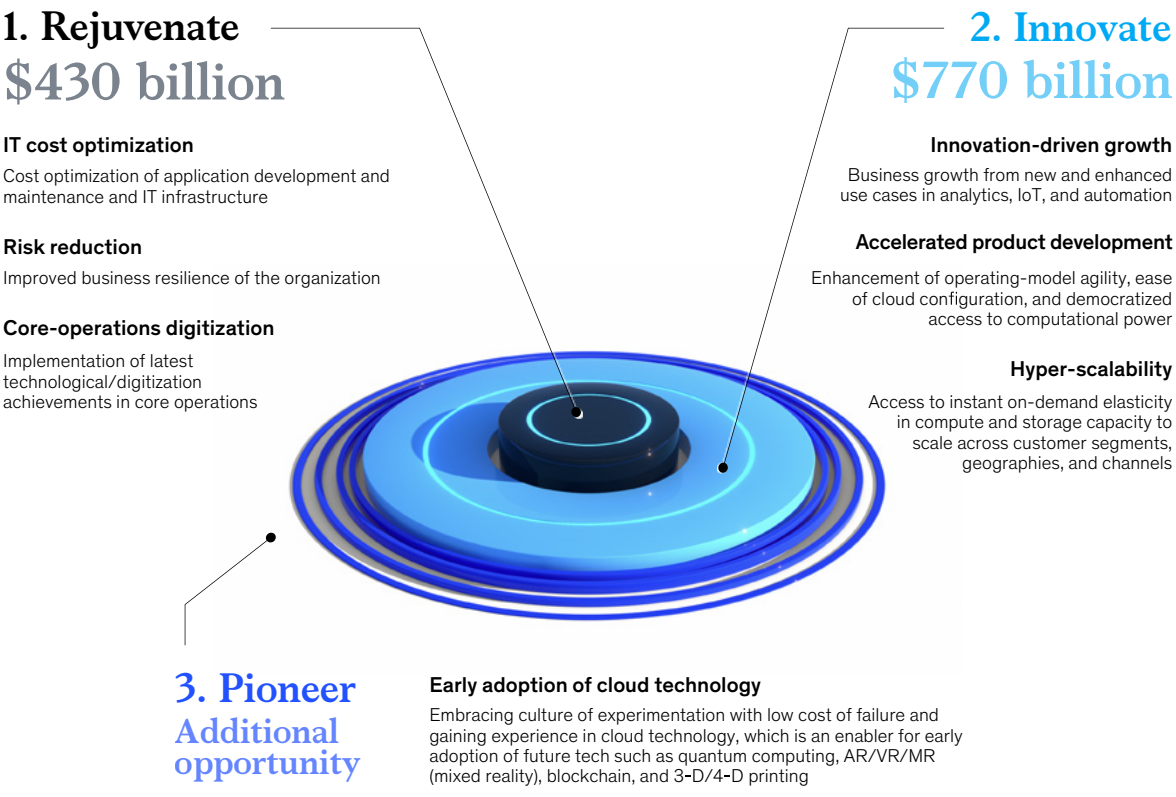
The good news is that many companies across a range of industries have successfully implemented public cloud to achieve impressive results. These companies follow three best practices. First, they execute a well-defined, value-oriented strategy across IT and businesses and install a cloud-ready operating model. Second, they develop firsthand experience with cloud and adopt a much more technology-forward mindset than their peers. And finally, they excel at developing a cloud-literate workforce.

Our research identifies the pools of value for cloud adoption across three dimensions—rejuvenate, innovate, and pioneer—as well as the drivers of that value across the first two dimensions. It also highlights likely avenues for growth in the pioneer dimension. CEOs can begin their journey by working with their tech leadership to focus on four actions: set ambitious targets, pursue a hard-headed economic case, adopt cloud-native ways of working, and invest in standardized, automated cloud platforms.

Dimensions of value

We have sized the value for rejuvenate and innovate only, since many of the use cases in pioneer are still evolving, and their 2030 impact is difficult to quantify with any precision. They do, however, present the next stage of value evolution in cloud, so leaders should start experimenting in earnest now to harness these technologies in the near future.

The value of cloud transcends IT and is estimated at more than $1 trillion.



Source: Independent third-party research data (OmnicomGroup and Known), industry and McKinsey expert interviews, McKinsey D2020 IT cost benchmarking, McKinsey Global Institute research, team analysis

Companies in every industry can capture substantial value from cloud, but it isn't distributed evenly. High tech, oil and gas, retail, healthcare systems and services, insurance, and banking are positioned to generate the most value as measured by EBITDA impact in 2030, although almost all industries across the Fortune 500 show potential for an average rise in EBITDA of more than 20 percent (Exhibit 1).

Exhibit 1

Capture of the economic value is expected to differ by industry.

Impact of cloud use cases and improvements
Estimated 2030 EBITDA run-rate impact

	# of companies	EBITDA impact, $ billion	EBITDA impact as % of 2030 EBITDA
High tech	30	110–160	28–40
Oil & gas	45	80–160	29–60
Retail	64	90–140	31–53
Healthcare systems & services	30	70–140	35–74
Insurance	45	70–110	43–70
Banking	36	60–80	13–17
Automotive & assembly	23	40–60	31–54
Telecom	12	40–60	12–19
Advanced electronics & semiconductors	25	30–50	12–25
Consumer packaged goods	43	20-40	11–20
Transport & logistics	20	20-40	24–41
Pharmaceuticals & medical products	12	20-40	9–19
Media & entertainment	14	20–30	12–18
Travel	11	10–30	28–44
Aerospace & defense	12	10–20	14–22
Basic materials	23	~10	11–20
Chemicals	15	~10	10–18
Electric power & natural gas	14	~0	5–7
Infrastructure	13	~0	12–21
Total	**487**	**700–1,200**	**20–34**

Source: Independent third-party research data (Omnicom Group and Known), industry and McKinsey expert interviews, McKinsey D2020 IT cost benchmarking, McKinsey Global Institute research, team analysis

This value distribution is likely to change as the impact of cloud evolves. Democratized access to computational power and infrastructure could reshape the landscape in industries that have historically not been highly competitive. Like several previous technology disruptions, cloud shifts barriers to entry in many markets from scale to skill, enabling smaller companies with the right skills to scale businesses on the latest infrastructure without worrying about up-front costs—thus creating a threat to slower-moving incumbents.

Use cases also differ by industry. Solutions that unlock the value of cloud include inventory optimization in retail, automated forecasting in oil and gas, chatbot support for high tech, and customer-call-center optimization in banking (Exhibit 2).

Exhibit 2

Cloud can unlock substantial value for technology use cases.

Examples




Retail	Healthcare systems & services	High tech	Oil & gas	Banking
Inventory optimization: Large sets of data are analyzed daily to increase accuracy and maximize availability while minimizing risk of waste	Analytics-driven procurement: Document analysis converts scanned documents into searchable text, and machine-learning (ML) models identify clauses of interest	Chatbots: Provide first-level support and answer most FAQs via phone, email, and chat	Parameter optimization: Data-driven analytics adjust well settings to increase output	Digital advertising: Customized web service based on digital advertising and customer browsing behavior
Design to value: Techniques such as sentiment analysis and social-media listening are used to predict which products are likely to succeed and to develop product economics	Trial-site optimization: Analytics-driven tools optimize site portfolios	Customer-retention management: Customer-loyalty protection through holistic programs driven by advanced analytics and dedicated execution capabilities	Automated forecasting: Automated demand-and-supply modeling reduces need for manual analysts	Next-product-to-buy algorithms: Enhanced recommendation engines with advanced matching techniques
Omnichannel fulfillment optimization: Aggregation of fast-moving data coupled with AI/ML-based insights to optimize inventory across channels, offering a seamless customer experience	Remote health monitoring: Used in virtual trials and for adherence improvement	Media-channel optimization: Maximized ROI on media spend through multivariable modeling for optimal mix across channels	Condition-based maintenance: Active equipment monitoring to prevent unexpected breakdowns	Customer-call optimization: Real-time voice-recognition algorithms redirect distressed customers to experienced handlers for retention offers

Source: Google Cloud and McKinsey Global Institute research

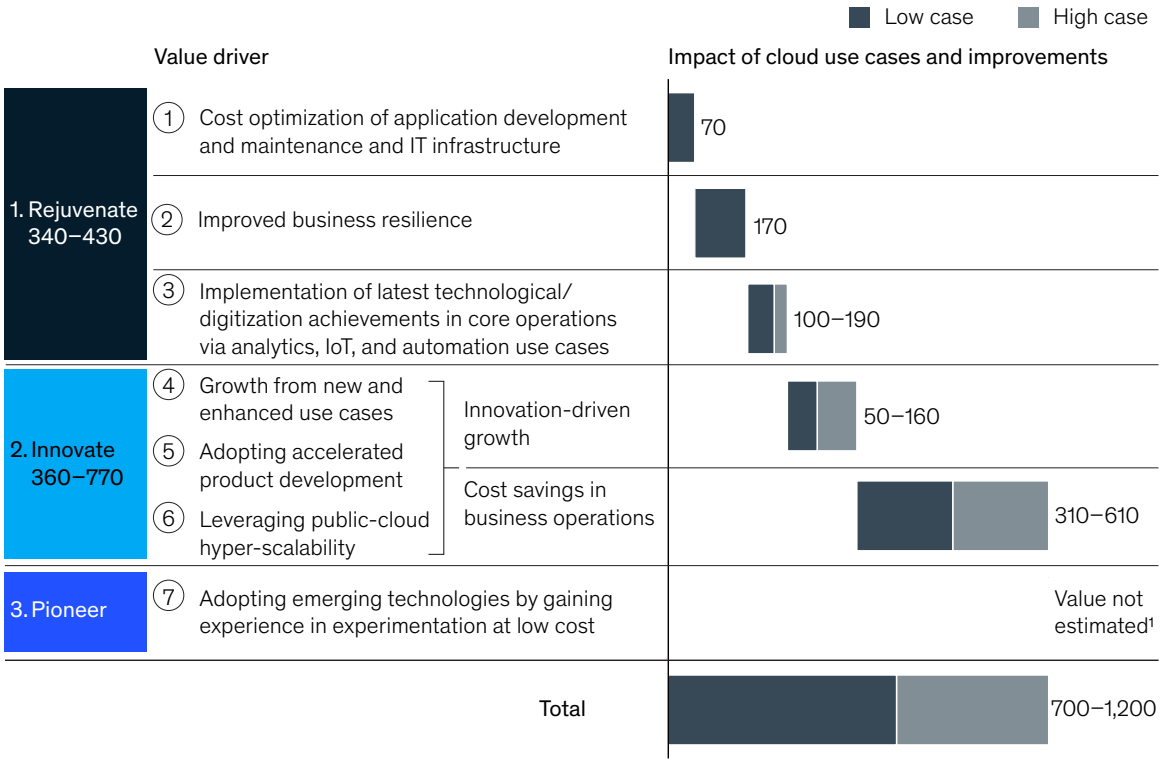
Capturing value: Seven value drivers underpin the three dimensions

As companies assess the opportunities enabled by cloud, a detailed review of the sources of value can pinpoint where they need to focus their attention, people, and resources. Across the three dimensions, seven drivers of value can collectively generate more than $1 trillion in value (Exhibit 3).

Exhibit 3

Seven value drivers could enable cloud to deliver more than $1 trillion in 2030 EBITDA value across the Fortune 500 by 2030.

Estimated 2030 EBITDA run-rate impact, $ billion



Note: Cost of implementation is not included in calculation.
[1] Premature to estimate value in 2030.
Source: Independent third-party research data (OmnicomGroup and Known), industry and McKinsey expert interviews, McKinsey D2020 IT cost benchmarking, McKinsey Global Institute research, team analysis

Rejuvenate

Rejuvenation describes a break from traditional legacy approaches by using cloud to lower costs and risk across IT and core operations.

Value driver 1: IT cost optimization

The traditional on-premise model for managing applications and infrastructure is inherently inefficient. It is highly manual and typically uses expensive technology equipment at less than full capacity.

The economics of cloud computing is both controversial and complicated. On the one hand, cloud provides access to automated capabilities that enterprises could never afford to develop on-premise, and cloud service providers (CSPs) leverage inverse correlation of workload usage patterns to run their assets at much higher utilization. On the other hand, CSPs charge based on consumption, and companies must remediate existing applications for them to run efficiently in the cloud.

Similarly, “lift and shift” migrations of existing on-premise applications to cloud can actually increase cost if they are not optimized or remediated correctly. In contrast, companies that have built new systems in the cloud or remediated existing applications to leverage cloud attributes are seeing dramatic efficiency improvements. Cloud also enables greater development productivity through new ways of working, such as agile and DevSecOps, and efficiency improvements through API-based or self-service-based workflows and automation—for example, automated patching. Early research indicates that developers spend measurably less time on infrastructure and production support and more on business requirements and development when companies move to public cloud.

Research also indicates that effective cloud usage can improve application development and maintenance productivity by 38 percent and infrastructure cost efficiency by 29 percent for migrated applications. As a result, increasing the share of Fortune 500 applications in the cloud from 10 percent to 60 percent would yield benefits of $56 billion in application development and maintenance and $12 billion in infrastructure expenditures.

As it recovered after a cyberattack, Maersk, the largest container-shipping line and vessel operator in the world, used the cloud to build out new capabilities at half the cost of doing it on-premise. The company implemented a new IT operating model to enable user self-service and put the responsibility for resource management in the hands of users. Recognizing the need for centralized governance, Maersk created the tools and processes to allow for real-time chargebacks at a project level, visibility into license management, and better analytics to understand consumption patterns and potential cost savings.

A Fortune 500 consumer-packaged-goods company had been relying on a mainframe with 26 essential applications that processed more than $21 billion in financial transactions each year. When the organization decided to modernize its IT systems, it had to address the challenge of its existing mainframes running on proprietary hardware. The solution was to convert its mainframe applications to software running on modern-day virtualized commodity hardware. The initiative also fully emulated the same levels of integration, interoperability, online interaction, and batch transaction-processing capabilities within the public-cloud environment, reducing operational expenses to 10 percent of the costs to license and support mainframe hardware and software tools, and saving $5 million annually.

Value driver 2: Improved resilience and lower downtime costs

By 2030, companies will lose roughly $650 billion as a result of system downtime and cybersecurity breaches. Through more resilient architecture, cloud could reduce downtime by about 57 percent for migrated applications, resulting in a 26 percent cost reduction for breaches.[vii] Cloud could improve platform integrity through automated, embedded security processes and controls (such as DevSecOps). These features reduce tech risks with a modernized, consistent tech stack across environments.

In India, Easy Pay provides local neighborhood shops with a point-of-sale (POS) system that facilitates their payments to a variety of suppliers. Today, the company has a presence in six cities, with a footprint of 650-plus retail points servicing six million unique customers. It is also involved in government-led smart-city projects in cooperation with major Indian banks. Easy Pay launched in 2016 with its own data centers, but its customers felt that processing was too slow, and the system was plagued with unforeseen downtime. Since migrating to cloud, Easy Pay provides close to 100 percent availability, and transaction times have been reduced from 12 seconds to just five. Easy Pay expects at least a fivefold increase in its existing merchant base, from 300,000 to 1.5 million, in fiscal year 2021 and considers cloud a critical enabler of an exponential increase in traffic.[viii]

Cerner, a large technology and services provider in the healthcare industry, focuses on data security and compliance. Cloud offers a uniform approach to multifactor authentication, identity management, passwords, and endpoint protection. When the pandemic forced organizations to aggressively move to remote work, cloud made it possible for Cerner to manage virtual desktops securely. The ability to integrate a suite of security services creates a global set of controls that can identify, detect, and investigate advanced threats, compromised identities, and malicious actions across its on-premise and cloud environments, improving its cybersecurity posture.

Value driver 3: Core operations

Cloud accelerates and, in some instances, unlocks implementation of the latest technological and digitization solutions in the back office, such as analytics-driven accounting and talent management. Organizations that shift to public cloud unlock additional value by repurposing and reskilling their workforce to focus on higher-value tasks, such as developing products and services that address customer demands. Cloud can allow a reduction in manual effort through API-based models, standardization, and automation (for example, IaC).

California Design, an online fashion-bedding brand, depended upon a myriad of systems to track its complex forecasting and reordering processes. Team members typically planned inventory manually using desktop spreadsheet software, which could lead to excess inventory. Accurately forecasting demand and supply was essential to the company's financial success, but it was also a challenge. The organization migrated its database to a cloud platform and has started leveraging cloud-based vision and machine-learning solutions to reduce inventory carryovers by more than 50 percent, improving the accuracy of demand planning quarter over quarter and gaining granular insights into how individual SKUs are performing.

AON Securities needed a quantum leap in compute power to efficiently process complex financial modeling. By using on-demand graphical processing units (GPUs) in cloud, the organization gets easy access to large numbers of GPUs and the ability to spin them up quickly and inexpensively, an innovative capability that is a challenge to construct on its own. Now its clients can run and rerun Monte Carlo simulations millions of times with different variables, all in parallel, recalculating policies and trades in minutes rather than hours or days. That frees the business to ask a lot more questions without needing to schedule workloads or stand up infrastructure.[ix]

Global retail-pharmacy giant Walgreens Boots Alliance (WBA) is on a digital-transformation journey. Having migrated its SAP environment to the cloud, WBA can rapidly deploy cloud solutions to 600 to 800 stores per month, while paying only for what it is using to optimize spending. Employees have reported that the system is more responsive, which enables them to work more efficiently and provide a better in-store experience for customers. For example, employees are better able to track and manage inventory, which helps customers find products more easily.

Innovate

The next dimension involves harnessing cloud to accelerate or enable innovation using technologies such as advanced analytics, IoT, and automation at scale. These provide companies with ways to pursue innovation-driven growth and optimize costs for business operations. The range of potential value is large and reflects the fact that not all organizations have the cloud maturity to achieve a similar degree of innovation. We analyzed 700 use cases to determine the impact of cloud in unlocking value. The value was allocated across a range from 100 percent in select cases, 30 percent in the bulk of cases, and null in a small number of cases (Exhibit 4).

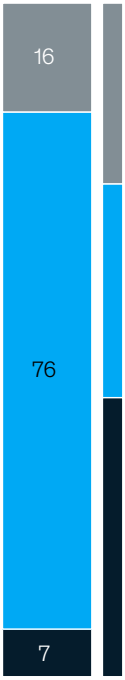
Exhibit 4

Cloud can accelerate or fully unlock the value of implementing innovative technologies for select use cases.

Potential value of innovation dimension[1]

700+ use cases were split into three categories by their level of public-cloud dependency ...

... and then their respective share of value was attributed to the value of public cloud



Use cases per category, %[2]	Category	Definition	Use-case example	Use-case value for the industry,[3] $ billion	Public-cloud allocated value, %	
16	Unlocked	Use cases that **cannot be implemented without public cloud** due to complexity of the algorithm and data volumes	**Design to value in retail:** Using advanced analytics through sentiment analysis, trend modeling, and social listening to predict which products are likely to succeed in private labels	~15	100	Full value allocated, given scale of data volume and compute power would becost prohibitive to stand up on-premise
76	Accelerated	Use cases that can be implemented on-premise but **will benefit from cloud** capabilities—namely, time to market and scalability	**Predictive maintenance in advanced industries:** Predicting defects by managing quality of products and analyzing what drives performance of vehicles	6–11	~30	Partial value allocated, given cloud will expand value via accelerated product development and scalability
7	On-premise	Use cases that **will not likely benefit incrementally** from cloud capabilities and **would most likely be implemented on-premise,** sensitive to regulation, privacy, bandwidth, and latency	**Demand forecasting in healthcare:** Forecasting demand for healthcare services and reducing readmissions through targeted discharge setting, due to strong regulations (eg, HIPAA compliance) and relatively low data volume	~1	0	None of the value of the use case is allocated to public cloud

[1]Also includes core operations in rejuvenation dimension.
[2]Figures may not sum to 100%, because of rounding.
[3]Adjusted to Fortune 500 scale.
Source: Industry and McKinsey expert interviews, McKinsey Global Institute research, team analysis

Value driver 4: Growth from new and enhanced use cases

A "fail fast" mentality is a hallmark of the most innovative companies, and cloud facilitates it by providing access on demand to nearly unlimited infrastructure capacity and computational power. Cloud enables companies to experiment with applications and new business models at lower cost and greater speed. Executives who embrace cloud avoid large up-front capital outlays when they launch or expand businesses. To support this shift, organizations need new operating models focused on, among other things, managing consumption, gaining visibility into future demands, and forming integrated financial operations (FinOps) teams to maintain fiscal control.

New cloud apps tend to draw on ever-evolving large and complex data sets at much lower cost and greater speed. In cold-chain distribution, Carrier harnessed new data and sensor technologies to innovate in food and pharma distribution by designing and building a cloud-based logistics network that ensures uninterrupted, temperature-controlled, multimodal transport and storage. Its network's complexity and vast amounts of data made cloud the only way to bring this vision to life, and the company now hosts up to 70 percent of its computing functions on cloud.

Logistics-and-shipping giant UPS was able to use cloud-based data processing, artificial intelligence (AI), and machine-learning tools to design optimized routing software. When delivering more than 20 million packages a day around the world (more during peak times), UPS drivers make an average of 120 to 125 pickups and drop-offs. The number of possible routes is nearly 200 digits long. Machine-learning models capable of processing one billion data points a day examine package weight, shape, and size, as well as facility capacity across the network, to save UPS up to $400 million a year and reduce fuel consumption by ten million gallons a year.

Melbourne-headquartered Hanes Australasia sells its products through its approximately 550 stores, 14 websites, and extensive wholesale network. The organization is moving away from a manual, labor-intensive way of recommending products and toward using cloud to offer AI-based recommendations. It has integrated a cloud-based recommendation engine into pages for 10,000-plus products for its popular brands, and initial A/B testing has identified double-digit uplift in revenue per user session. Hanes Australasia plans to extend integration to additional sites within its portfolio and to personalize the marketing emails it sends to customers.

Value driver 5: Accelerated product development

Companies have adopted cloud to enhance their operating-model agility, which accelerates the implementation of use cases while lowering R&D investment. Companies can more easily configure solutions on cloud than they can on-premise, enabling them to keep pace with the speed of business change and creating a flywheel for responsiveness. In addition, migrating to the public cloud provides organizations with access to innovative tools and capabilities offered by CSPs, such as containers, microservices, DevOps functions, continuous integration and continuous delivery (CI/CD), and advanced serverless architecture. This enhances product development from the outset and dramatically speeds design, build, and ramp-up, helping companies to dramatically reduce time to market.

To expand into consumer banking, Goldman Sachs launched both its Marcus consumer-lending product and its inaugural credit card with Apple in cloud. The card product required close integration of three different ecosystems to support collaboration and a seamless user experience. Within six months, the offering had already attracted several million customers and had scaled to meet demand. CEO David Solomon stated, "The only reason we were able to deliver these capabilities digitally and at scale is because of cloud technology."[x] This success has sparked leadership's imagination, leading to an ambitious expansion of new offerings as well as enhanced transparency into its operations.

Chevron set up a cloud-readiness acceleration program to expedite its move to cloud. In 18 months, the program expanded from 40 to 450 people across 40 scrum teams. With an automated CI/CD pipeline, Chevron accelerated its cloud migration, the release of new applications, and the delivery of its digital platforms, accommodating around 3,000 active users and 400 live projects. It now delivers code in seven minutes and new infrastructure in as few as 30 minutes, making it faster, easier, and cheaper to deliver new business functionality.

Value driver 6: Rapid scaling

The infrastructure and global presence of cloud providers can be harnessed to scale products almost instantaneously to a broader set of customer segments, geographies, and channels. In addition, organizations are able to gain access to instant on-demand elasticity in compute and storage capacity—critical elements in launching and building new businesses.

Cloud infrastructure allowed Zoom to efficiently add capacity at the rate of 5,000 to 6,000 servers each night to meet demand during the early days of the COVID-19 pandemic. Says CEO Eric Yuan: "When the pandemic crisis started, our own data centers could not scale fast enough to handle the unprecedented traffic."[xi]

Indonesian e-commerce giant Tokopedia needed a solution for issues with network scalability and reliability. The platform was frequently strained during high-profile online events, most notably for its Tokopedia Play product, which could support only 55,000 concurrent users. Cloud enabled the company to rebuild Tokopedia Play as a microservice in five weeks to support 1.5 million concurrent users. At the same time, overall operating cost declined due to more effective scaling.

Pioneer

As its name suggests, pioneer, the third dimension of cloud adoption, is where an enterprise can extend cloud's value once it has reached a certain level of cloud maturity. At this stage, companies can harness cloud to experiment with new technologies, such as blockchain, quantum computing, augmented and virtual reality, and 3-D printing.

Value driver 7: Adoption of emerging technologies

With agile operating models, organizations can set up nimble "swat teams" to develop proofs of concept. This advanced level of cloud maturity has the additional benefit of attracting and retaining top talent to work on emerging technologies. This is critical as companies seek to incorporate transformative technologies that have not yet achieved mass adoption. While the impact of nascent technologies is difficult to calculate, leaders need to account for potential applications and commit to understanding their potential value. Cloud can accelerate this process.

Nestlé is experimenting with blockchain to achieve unparalleled transparency into its supply chain, from origin to store shelves. The company uses a cloud-native blockchain solution to store supply-chain transactions in ways that are transparent, immutable, and verifiable. Similarly, BMW has implemented blockchain to track a vehicle's history from manufacture to registration to maintenance to resale.

Quantum computing is expected to provide significant performance improvement and thus potentially disrupt existing business models. By moving infrastructure to cloud and adapting the operating model, companies will be better positioned to benefit from cloud-based quantum computing when relevant use cases emerge. CSPs already offer these computing services, which allow organizations to run hybrid quantum and classical algorithms.

Other emerging technologies, such as augmented and virtual reality and 3-D printing, also have immense promise. For example, the health-tech company Axial3D provides clinicians with patient-specific 3-D anatomical models, using a cloud-native integrated development environment for machine learning.

What mature cloud adopters get right

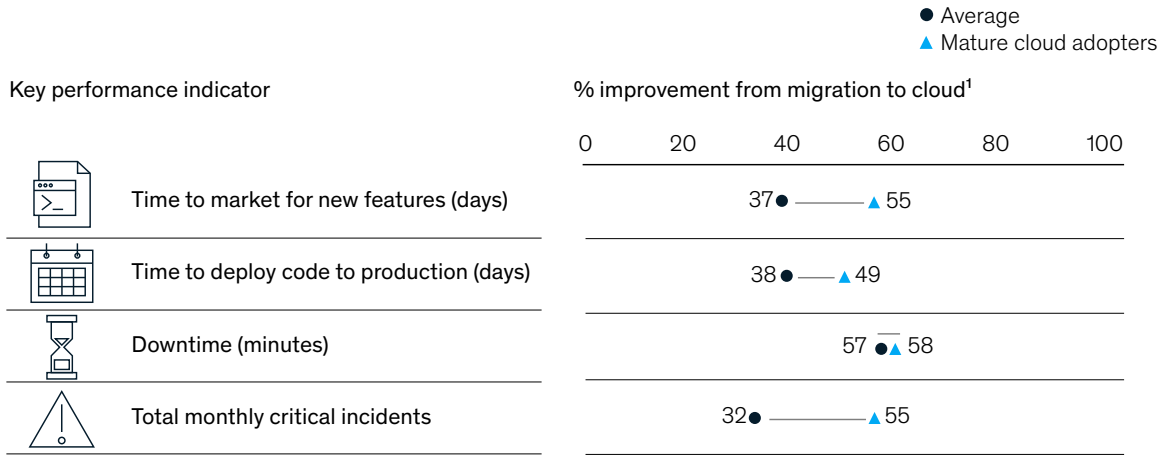
Cloud offers tremendous value, but the benefits don't appear magically. Cloud requires a well-defined, value-oriented strategy and a coordinated execution by IT and businesses to realize full value. For example, organizations that simply "lift and shift" applications to cloud with no change to architecture miss out on key benefits, such as autoscaling and automated performance management. Moreover, success requires a cloud-ready business-technology operating model built around a product life cycle, which improves developer productivity, thereby accelerating product development.

Experience matters, and companies with high cloud maturity exhibit different adoption mindsets compared with their peers. Third-party primary research on 705 users of public cloud indicates that companies with higher cloud maturity share a number of traits: they are early adopters of cutting-edge technology (71 percent), aggressively innovate (72 percent), and view technology as a competitive differentiator and key enabler for launching and building new businesses (79 percent). By being the first ones to move, these organizations gain considerable experience on cloud, outstripping their peers in cloud outcomes (Exhibit 5).

Building capabilities yields tangible results. Highly mature cloud companies pursue excellence in knowledge and skill sets, which translates into a cloud-literate workforce. To build capabilities within the workforce, these companies create tracks for role and career progression specifically for cloud experts, and they build tailored learning programs to develop cloud-specific skills and competencies. They also ensure that all workers across the enterprise receive on-the-job training about relevant cloud capabilities.

Exhibit 5

Mature cloud adopters read larger benefits than average cloud-embracing companies.



Note: Percentage improvement from migrating to AWS from on-premise.
[1]Percentage improvement may vary by level of modernization of on-premise infrastructure and remediation/refactoring of apps before migration to cloud.
Source: Data from cloud-migration experience of AWS and independent third-party research data (OmnicomGroup and Known)

Four key actions to get started

One of the most common mistakes that companies make when integrating cloud is to develop a portfolio of use cases. Individually, these use cases can generate some benefits, but collectively they lack the scale to generate the full potential value. In our experience, the best companies take four steps to create a clear path to cloud-driven performance improvements.[xii]

Set an ambitious and urgent business aspiration

Many leaders know that cloud frees companies from the limitations of traditional technologies, but they remain stuck in outdated models of what they can achieve and set the bar too low. Business and IT leaders should clearly and urgently articulate a high-value ambition—a moon shot achievable when they work closely together on cloud.

Pursue a hard-headed economic case

A business case for cloud should be grounded in a clear understanding of cloud economics across cost savings (rejuvenate) and business acceleration (innovate). It should be adjusted to transformation risks and prioritized by business domain, and it should include the required resource allocations and sequencing of tasks. One effective approach in developing business-innovation cases is to analyze and articulate the value that can be unlocked or accelerated by cloud. For example, the business-innovation case for an insurer that can refresh its analytical underwriting models twice as fast on public cloud as on a traditional, on-premise infrastructure should calculate both the improvements in return on investment and the value of freeing up capacity for additional innovation. Although the details will vary by organization, we find a holistic, hard-headed business case can help companies gain consensus across functions and build organizational momentum to hit targets within two years.

Adopt agile, cloud-native ways of working

The scope of the change needed to harness cloud requires companies to have real expertise: leaders, staff, and partners with deep experience in cloud and cloud transformations; expert practitioners; and a broad ecosystem. Further, successful cloud efforts are possible only when organizations transform their operations. That includes, for example, a DevSecFinOps approach with small cross-functional teams working within a well-defined architecture to deliver business cases (rather than applications) in rapid iterative cycles, policies that embed security into development, and end-to-end process automation.

Build a standardized, automated cloud platform

Invest in creating a standardized, automated cloud platform that improves productivity and delivers a great self-service experience for developers, who are among the primary consumers of cloud. Developers could use automated, API-based services to provision workloads securely and resiliently on cloud platforms. A higher level of automation also reduces the time needed to prototype new business ideas, which helps businesses innovate and scale rapidly.

The acceleration in digital engendered by COVID-19 is likely to continue far beyond the COVID crisis, and companies must be prepared to respond and adapt rapidly. Cloud can not only help organizations move faster and reduce IT costs but can also support innovation and the integration of powerful, disruptive, emerging technologies. However, companies can capture their share of the trillion-dollar prize only when they develop a clear view of the value at stake and the business cases they need to prioritize.

About the research

To quantify the total potential value that companies could generate by adopting cloud, we conducted detailed analysis based on three reports from the McKinsey Global Institute (MGI); McKinsey D2020 benchmarking for IT spending structure based on more than 1,000 IT diagnostics worldwide; and independent third-party surveys of more than 1,000 organizations that have adopted cloud to pursue potential operational efficiency gains. In applying the MGI research, we assessed more than 700 use cases across 19 industries. We used industry-level, historical, real-revenue growth rates (4 percent weighted average across industries) to forecast revenues to 2030. To forecast 2030 EBITDA and costs, we applied the 2019 EBITDA margin (17 percent) to the projected 2030 revenues. We estimated the revenues and EBITDA of Fortune 500 companies to 2030 to establish a baseline for the assessment. The analysis identified three dimensions for cloud adoption (Exhibits 1 and 2).

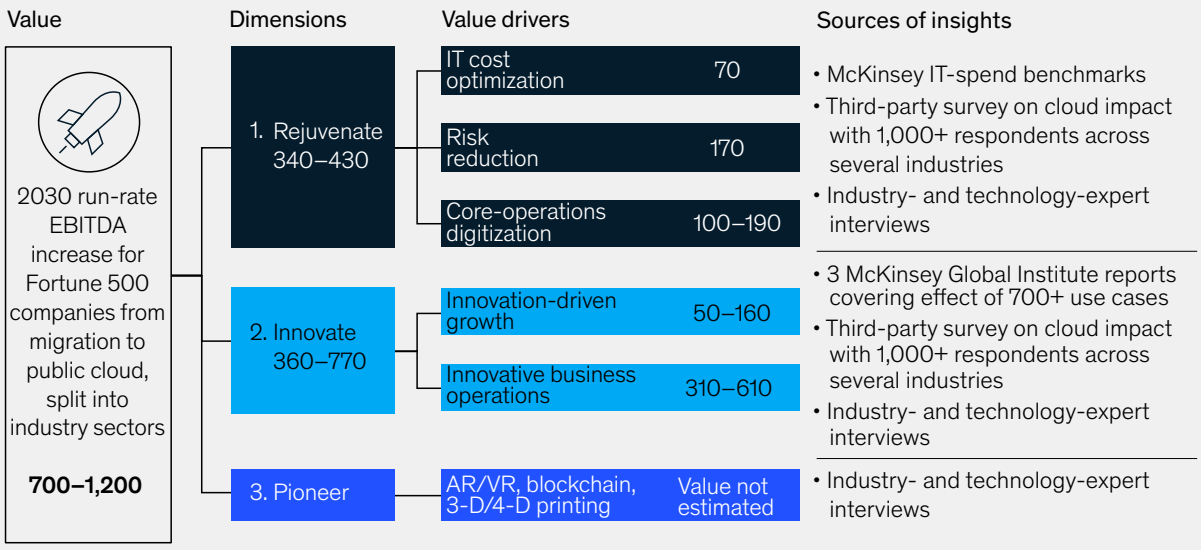
For the first dimension, rejuvenate, we calculated the potential value from IT cost efficiency across application development and maintenance and infrastructure spending, drawing on double-blind surveys of more than 1,000 cloud-adopting companies conducted by Omnicom Group, an independent third-party market-research firm. The cost baseline has been assessed by drawing on McKinsey's proprietary D2020 knowledge base, which encompasses holistic IT-performance diagnostics conducted at more than 1,000 clients spanning more than 20 industries and all geographies, and IHS Markit and Oxford Economics market projections. In addition, we have analyzed reports by Ponemon Institute, IBM Security, and CyberEdge Group to estimate the value in reduced risk of breaches and lower spending on cybersecurity and breach management. Last, we assessed the potential improvement in back-office performance from cloud's ability to accelerate and unlock technology use cases.

For the second dimension, innovate, we assessed revenue uplift (the margin impact of revenue increases) and cost savings from business operations. We

Exhibit 1

Value was estimated from the bottom up, based on use cases, benchmarks, surveys, and expert input.

Estimated additional run-rate EBITDA of Fortune 500 companies in 2030, $ billion



Note: Cost of implementation is not included in calculation.
Source: Independent third-party research data (OmnicomGroup and Known), industry and McKinsey expert interviews, McKinsey D2020 IT cost benchmarking, McKinsey Global Institute research, team analysis

Exhibit 2

Significant value exists in increasing public-cloud adoption from 10 to 60 percent, particularly in innovative business operations.

Dimensions Estimated additional run-rate EBITDA of Fortune 500 companies in 2030, $ billion	Value drivers	Baseline Run-rate financials of Fortune 500 companies in 2030, $ billion	Impact of moving from current 10% to 60% of estate migrated to public cloud Impact potential Estimated additional run-rate EBITDA of Fortune 500 companies in 2030, $ billion	Impact vs baseline Estimated relative run-rate improvement against baseline of Fortune 500 companies in 2030
1. Rejuvenate 340–430	IT cost optimization	765 IT costs (software ADM[1] and infrastructure, including incident management)	70 Cost-reduction potential	9% Cost-reduction potential
	Risk reduction	659 Cost of downtime and cybersecurity	170 Cost-reduction potential	26% Cost-reduction potential
	Core-operations digitization	6,543[2] Core-operations costs	100–190 Cost-reduction potential	2–3% Cost-reduction potential
2. Innovate 360–770	Innovation-driven growth	20,166 Revenue	50–160 EBITDA improvement potential	0.2–0.8 pp[3] EBITDA margin improvement potential
	Innovative business operations	8,736[2] Business-operations costs	310–610 Cost-reduction potential	4–7% Cost-reduction potential
3. Pioneer	AR/VR, blockchain,3-D/4-D printing	Value not estimated		
EBITDA		3,476 EBITDA	700–1,200 EBITDA improvement potential	20–34% EBITDA improvement potential

Note: Cost of implementation is not included in calculation.
[1]Application development and maintenance.
[2]Calculated as: revenue – EBITDA – IT costs – risk-related costs, split into core-operations digitization and innovative business operations by their relative share of estimated labor costs.
[3]Measured in percentage points, since value from innovation-driven growth is measured as margin expansion.
Source: Independent third-party research data (OmnicomGroup and Known), industry and McKinsey expert interviews, McKinsey D2020 IT cost benchmarking, McKinsey Global Institute research, team analysis

quantified the potential value of more than 700 use cases involving advanced analytics, IoT, and automation. Here, we categorized use cases as not requiring public cloud and as accelerated or unlocked by public-cloud technology, attributing respective share of value to public cloud. The output was a detailed estimate of value by dimension, benefit driver, and industry.

The third dimension, pioneer, involves exploring business models by experimenting with new and emerging technologies such as blockchain, quantum computing, augmented and virtual reality, and 3-D printing. Given the nascent stage of these technologies, it is far too early to quantify their potential impact over the next decade with any reasonable precision. We anticipate being able to calculate the impact of this dimension within the next three to five years as case evidence matures.

For further reading, on McKinsey.com:

"Three actions CEOs can take to get value from cloud computing"
"Debunking seven common myths about cloud"
"Unlocking value: Four lessons in cloud sourcing and consumption"
"How CIOs and CTOs can accelerate digital transformations through cloud platforms"
"Capturing value in the cloud" (collection)

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