

IDC FutureScape

IDC FutureScape: Worldwide Cloud 2019 Predictions

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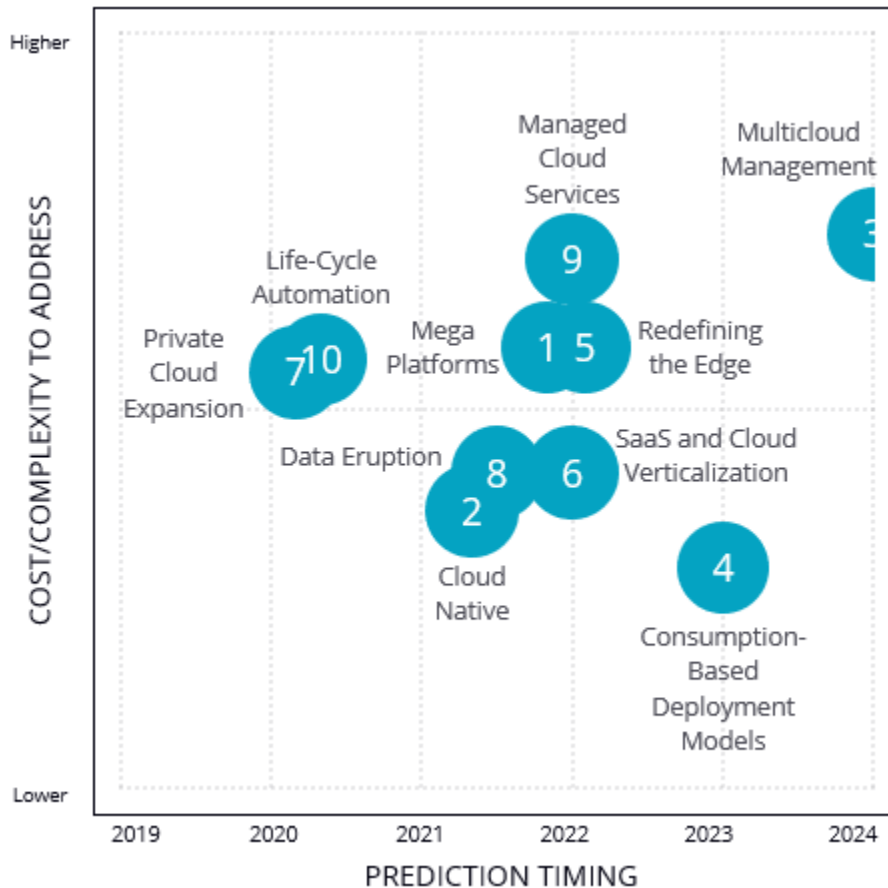
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IDC FUTUREScape FIGURE

FIGURE 1

IDC FutureScape: Worldwide Cloud 2019 Top 10 Predictions



Note: Marker number refers only to the order the prediction appears in the document and does not indicate rank or importance, unless otherwise noted in the Executive Summary.

Source: IDC, 2018

EXECUTIVE SUMMARY

Organizations increasingly demand solutions to enable new, agile business models that enhance the customer experience, create new sources of revenue, and drive efficiency and profitable growth. We are nearing a technological milestone where if you can imagine it, you can likely manifest it with technology.

Cloud is foundational to virtually all these solutions. According to IDC's 2018 *Global CloudView Survey* of more than 5,700 firms, 81% of companies currently use or plan to use public cloud, and 86% of companies currently use or plan to use private cloud. This represents an increase of more than 30% from the previous year's results.

Hybrid cloud and multicloud deployments have become commonplace, driving demand for cloud management platforms to help orchestrate and manage workloads across the IT estate. By 2020, more than 90% of global organizations will have a multicloud strategy in place. Most organizations using public cloud will also deploy on private cloud platforms and leverage a hybrid cloud strategy to integrate and orchestrate workloads across cloud deployment models based on the characteristics and business impact of the workload.

The future of enterprise applications is moving toward cloud-native architecture to improve IT speed and business agility. Innovation accelerators including artificial intelligence (AI), machine learning (ML), and Internet of Things (IoT) result in exponential increases in data, driving the need for advanced analytics and real-time information delivery. Distributed computing in the form of edge provides decision support via local data storage and analytics.

Spending on managed cloud services is projected to significantly increase as organizations need solutions to optimize return on IT investments and address the considerable gap in cloud skills within the organization. The market for applications delivered as a service (SaaS) shifts from horizontal applications toward applications that are specifically created to address the needs of vertical markets.

This 2019 IDC FutureScape for cloud highlights key trends in the growth and adoption of cloud-enabled technologies and presents the top 10 predictions and key drivers for the next five years, including:

- **Prediction 1:** By 2022, the top 4 clouds ("megaplatforms") will be the destination of choice for 80% of workloads, while lock-in will be avoided through multicloud and cloud-native approaches to achieve portability.
- **Prediction 2:** By 2021, 70% of new enterprise applications will be developed cloud native, based on a hyperagile architecture, but only 10% of those environments will have machine learning capabilities built in.
- **Prediction 3:** By 2024, 90% of Global 1000 organizations will have a multicloud management strategy that includes integrated tools across public and private clouds.
- **Prediction 4:** By 2023, more than 50% of enterprise IT operations spend will be consumption based, opting for public cloud platform as a lower-risk option to manage complexity and aligning cost to revenue.

- **Prediction 5:** By 2022, more than 40% of organizations' cloud deployments will include edge computing to address bandwidth bottlenecks, reduce latency, and process data for decision support in real time.
- **Prediction 6:** By 2022, organizations will spend more on vertical SaaS applications, excluding desktop and internal employee productivity apps, than horizontally designed applications.
- **Prediction 7:** By 2020, 75% of enterprises using public cloud will also use an enterprise private cloud platform; majority of these platforms will support delivery of higher-layer PaaS and SaaS functionalities.
- **Prediction 8:** By 2022, 60% of G2000 enterprises will be AI-enabled, with over 50% of enterprise application workflows aided by AI to better utilize legacy data, real-time operational data, and third-party data feeds.
- **Prediction 9:** Enterprises' need to optimize ROI, reduce budgets, and cope with scarcity of cloud experts drives spending on managed cloud services to nearly \$75 billion by 2022 and almost 25% of technology outsourcing.
- **Prediction 10:** By 2020, 40% of organizations will have invested in automation, orchestration, and development life-cycle management of cloud-native applications to realize the cost benefits and operational efficiencies.

This IDC study provides IDC's top 10 predictions for cloud for 2019 and beyond.

"We're experiencing unprecedented disruption in how businesses operate, driven largely by changes in customer expectations and behavior. For organizations with the cultural fortitude to capitalize on the trends presented in this IDC FutureScape, the next four to five years offer the opportunity to dramatically improve performance, while the less able and willing struggle to retain customers and margin," according to Frank Della Rosa, IDC research director for SaaS and Cloud Software. "All of these topics are discussed in greater detail within this IDC FutureScape, along with our assessment of their IT impact and our recommendations for how organizations should approach these initiatives."

IDC FUTUREScape PREDICTIONS

Summary of External Drivers

Many external factors have an impact on technology operations, related investments, and ultimately IDC's predictions on the future of cloud. Business, social, economic, and technology trends all play a part in shaping the future. While dozens of external factors influence the future, IDC has identified six primary forces that are important to consider when projecting the future of cloud:

- **Next chapter of DX** – Technology-driven transformation altering business and society
- **Platforms, platforms, platforms** – Industry competes for innovation at scale
- **Sense, compute, actuate** – Turning data into value
- **Emerging autonomy** – Learning to live with AI
- **Rising consumer expectations** – More convenience, customization, and control
- **Legacy inertia** – Retrofit the old into the DX world

Collectively, these drivers helped lead to the top 10 predictions discussed in this document. A more detailed description and explanation of each driver are provided in the External Drivers: Detail section at the end of this document.

Predictions: Impact on Technology Buyers

Prediction 1: By 2022, the Top 4 Clouds ("Megaplatforms") Will Be the Destination of Choice for 80% of Workloads, While Lock-In Will Be Avoided Through Multicloud and Cloud-Native Approaches to Achieve Portability

Software only vendors are increasingly choosing to adopt a multicloud strategy as the hurdle to build their own infrastructure is increasingly becoming insurmountable. The range of choices to deliver on a multicloud option for customers is narrowing to a few vendors with hyperscale capabilities, a wide range of services, and broad geographic presence. Similarly, large organizations with worldwide presence will also choose from among the megaplatforms, while start-ups can build solutions leveraging the megaplatform service choices and handle unpredictable demand growth.

Applications built on cloud-native architectures deliver value on portability as well as efficiencies obtained from workloads running on containers. With increased demand for low latency on the edge, optimal placement of applications and data is achieved with cloud-native architectures. Lightweight containers make the ability to move workloads between destinations easier and edge computing more manageable.

Associated Drivers

- **Platforms, platforms, platforms** – Industry competes for innovation at scale
- **Next chapter of DX** – Technology-driven transformation altering business and society
- **Rising customer expectations** – More convenience, customization, and control

IT Impact

- Designing a multicloud application that consumes services on-premises and aboard multiple public cloud platforms requires application architects to think about the impact of distributed systems and role that application design and packaging plays.
- Developers will need to work with infrastructure architects to ensure application designs will be compatible with elastic capacity that enables applications to take advantage of new architectural patterns.

Guidance

- Look for technology that supports open protocols that enable the deployment and delivery of capabilities in a distributed multicloud environment.
- Look for products that offer automation to improve productivity and a more supportable full life cycle that includes the ability to control infrastructure with code.
- Find suppliers that understand the modern security of distributed applications, as security should be built in to applications rather than glued on after the fact, reducing the potential for application breaches in a multicloud environment.

Prediction 2: By 2021, 70% of New Enterprise Applications Will Be Developed Cloud Native, Based on a Hyperagile Architecture, But Only 10% of Those Environments Will Have Machine Learning Capabilities Built In

Digital transformation (DX) requires organizations to deliver value to their customers, users, and partners through a rich user experience and smarter data-driven interactions. Consequently, cloud-native applications are being developed to facilitate the data-driven user experience.

Cloud-native applications will be developed to take advantage of cloud's elasticity and scalability, but predominantly to take advantage of fast-paced innovation delivered through cloud services. Increasingly, cloud-native development will be leveraged to further boost organizational performance, increase business velocity, and adapt to changing markets.

Accordingly, the portion of enterprise applications running in production that are cloud native is set to increase by at least 20% in the next two to three years. By 2021, 70% of newly developed enterprise applications will be developed as cloud-native applications, based on a hyperagile architecture, which utilizes containers, microservices, and serverless functions. These cloud-native environments, while automated and capable of self-management, won't be as sophisticated as they will be in future years. Indeed, only 10% of the newly developed enterprise applications will be deployed into cloud-native environments that include built-in machine-learning capabilities designed to self-optimize the usage and consumption of containers, microservices, and functions.

To solve the challenges that are associated with cloud-native applications, like infrastructure-as-a-service (IaaS) reliability, stability, security, proliferation of containers, microservices and functions, and unpredictable costs, which will be holding back a faster transition to cloud-native applications, organizations will need to invest in machine learning capabilities in the supporting infrastructure. Building machine learning capabilities into private and public cloud infrastructure, so that it can self-optimize, manage the life cycle of virtual machines, containers, microservices, and functions, will be critical to keep the cost of running cloud-native applications in check.

Associated Drivers

- **Next chapter of DX** – Technology-driven transformation altering business and society
- **Rising customer expectations** – More convenience, customization, and control
- **Legacy inertia** – Retrofit the old into the DX world

IT Impact

- An explosion in the use of containers and microservices creates a more dynamic, complex environment, increasing the need for machine learning-enabled orchestration of these environments.
- Traditional IT and digital development teams will be gradually unified, while in the past, the two have been kept as two separated strategic IT clusters, as part of a two-speed IT policy.

Guidance

- Optimize software development processes, IT processes, and business processes to take advantage of cloud-native applications. In parallel, it is critical to increase the sophistication and intelligence of the infrastructure expected to support these modern applications.
- Require IT organizations to invest in automation and orchestration systems that can deal with container, microservices, and functions-based applications. Understand and embrace automation and orchestration systems that use machine learning as soon as practical.

Prediction 3: By 2024, 90% of Global 1000 Organizations Will Have a Multicloud Management Strategy That Includes Integrated Tools Across Public and Private Clouds

Enterprise IT departments now operate in a multicloud world, as they have accepted the use of multiple cloud architectures, across private cloud and public cloud environments. They have also accepted the fact that in this scenario, the business risks and technology and business process

complexity skyrockets. The reality is that each cloud is its own "silo." The need to manage and orchestrate each cloud becomes paramount to optimizing business outcomes, automated processes, and reducing cloud total cost of ownership (TCO).

In addition, IT executives often choose cloud architectures as part of an agile development strategy to modernize application development, deployment, and management. This strategy provides executives with a path to innovate using management tools that span development and operations teams and requires tool decisions that transcend a single cloud architecture. Management tools must meet modern application management requirements using agile development processes, container and microservices-based architectures, and software-defined infrastructure. The difference between traditional three-tiered applications and modern models is significant and requires IT executives to reexamine their management strategies.

Besides tools, IT executives must understand the agility, automation, and process opportunities that modern application and cloud environments create across organizational structures and teams. Opportunities exist for IT executives to create centers of enablement (CoE), DevOps teams, infrastructure platform organizations, cloud architects, and automation managers to drive process optimization through collaboration and tool integrations. Besides cloud-first policies, automate-everything policies are becoming common across large enterprise IT organizations.

Associated Drivers

- **Platforms, platforms, platforms** – Industry competes for innovation at scale
- **Sense, compute, actuate** – Turning data into value
- **Emerging autonomy** – Learning to live with AI

IT Impact

- A lack of a cloud management strategy can result in higher costs and underutilized cloud resources.
- A lack of an integration strategy can result in poor team communications and longer problem resolution and identification cycle times.

Guidance

- Create a cloud management strategy that takes advantage of the unique properties of public cloud infrastructures and realize the deep differences between various clouds and use management tools and processes to reduce risks.
- Take an inventory of existing management tool investments and consider the need to consolidate and purchase new tools that enable multicloud transparency and a DevOps methodology.
- Understand the process integration requirements between clouds and how these requirements drive business and IT metrics for speed, quality, and reliability through management tools.

Prediction 4: By 2023, More than 50% of Enterprise IT Operations Spend Will Be Consumption Based, Opting for a Public Cloud Platform as a Lower-Risk Option to Manage Complexity and Aligning Cost to Consumption

The buildout of hybrid cloud architecture and multicloud deployment are critical to all enterprise's digital transformation journey. However, this results in increased infrastructure complexities and costs as enterprises struggle to get the desired benefits from their cloud investment, which include simplifying IT, gaining business agility, and ensuring security to meet regulatory and compliance requirements.

Consumption-based public cloud platforms present a more consistent and standardized availability of automated cloud resources to enable developers and lines of business (LOB) to execute at speed and at predictable costs. With the increasing investment from public cloud vendors in platform-as-a-service (PaaS)-based development tools and open standards-based platforms, public cloud can help to address the challenges in systems integration and scalability. Enterprises can rapidly create, host, and scale applications across hybrid and multicloud environments while aligning costs to revenue.

Enterprise consumption-based IT operations spend will go beyond the traditional public cloud services and include the consumption model for on-premises cloud infrastructure that is delivered as a service through an on-demand, pay-per-use billing method. IDC believes that a utility-based IT operating model will bridge the gap between the traditional private and public cloud deployment to help accelerate cloud adoption and service delivery end to end.

Associated Drivers

- **Next chapter of DX** – Technology-driven transformation altering business and society
- **Platforms, platforms, platforms** – Industry competes for innovation at scale
- **Rising customer expectation** – More convenience, customization, and control

IT Impact

- A utility-based IT operating model allows for flexible capacity building and consumption to help align IT operating costs to business revenue.
- The system update management is better because of reduced time spent in coordinating, deploying, and verifying patches and upgrades.
- Efficient use of IT resources keeps costs under control while maintaining scalability.
- The IT transformation from cost center to revenue stream is focused on creating, building, and maintaining business value.

Guidance

- Consider a consumption-based IT operating model as a lower risk option. For enterprises in the early stage of cloud maturity, the burden of managing the complexity of converged infrastructure outweighs the cost. Thus a consumption-based IT operating model is a viable low-risk option for a cloud journey.
- Look to managed end-to-end IT services to ensure accountability for the service delivery against the outcomes.
- Develop a cost allocation model for IT to improve transparency and align costs to revenue.
- Adopt open standards-based platforms to avoid vendor lock-in, and streamline development and interoperability in hybrid and multicloud environment.

Prediction 5: By 2022, More than 40% of Organizations' Cloud Deployments Will Include Edge Computing to Address Bandwidth Bottlenecks, Reduce Latency, and Process Data for Decision Support in Real Time

Over the past two decades there has been a massive shift away from on-premises software to cloud computing. To capitalize on all that Internet of Things has to offer, technology must become local again. Edge computing refers to the computing infrastructure that resides close to the sources of data that information is extracted from and is optimally positioned for the Internet of Things.

Speed is a critical driver for edge computing. The technology enables connected devices to process data created at the edge, which is within or much closer to the actual devices. Mobile and last-mile

bandwidth comes at a premium and next-generation applications need low-latency connections. With edge, datacenters can execute time-sensitive tasks and then batch stream data to the cloud for analysis when bandwidth requirements are not as high. Edge computing relies on the connection between sensors and a local datacenter, which significantly reduces the potential for outages. The benefits of edge are experienced across industries. For example, in manufacturing, centralized compute systems handle tasks that do not need direct input, while day-to-day operations run directly in the manufacturer's datacenter. In energy, edge offers the ability to detect equipment malfunctions in real time. Sensors monitor energy produced by everything from electric vehicles to wind farms, providing information to make decisions on reducing cost and improving energy efficiency. Edge is used in retail to help improve the customer's in-store experience.

Associated Drivers

- **Next chapter of DX** – Technology-driven transformation altering business and society
- **Sense, compute, actuate** – Turning data into value
- **Rising customer expectations** – More convenience, customization, and control

IT Impact

- Network connectivity becomes even more important with edge. Incorporating an edge network means altering the way to manage and run datacenters. Systems are no longer centralized in a building with a local team providing oversight.
- Businesses want immediate access to data. Data at the edge needs to be available in real time at the point of collection and available for processing at the organization's central datacenter. Edge-located compute must have a small footprint and work reliably and affordably without much human interaction.

Guidance

- Invest in edge applications that are autonomous capable and have some form of automated recovery such as self-healing or being able to fail over to alternative operational nodes, to ensure users maintain access. When IT is managing many small remote datacenters across a variety of locations, remote monitoring and automation are imperative and can reduce operating costs.
- Consider edge computing part of the company's cybersecurity strategy. By allowing sensitive data to be stored and analyzed near the source prior to sending, edge allows industries with strict security policies to take advantage of the cloud.

Prediction 6: By 2022, Organizations Will Spend More on Vertical SaaS Applications, Excluding Desktop and Internal Employee Productivity Apps, Than Horizontally Designed Applications

Organizations are now choosing vertical SaaS applications nearly twice as often as horizontal applications, largely because they are built to specifically address the requirements of their specific industry. As businesses engage in digital transformation, vertical SaaS applications offer greater cost efficiency, usability, and increased flexibility for customers, and since vertical SaaS providers invest in industry-specific know-how, and data and tools are not available from horizontal SaaS companies.

Vertical SaaS providers are not just offering customizable features and add-ons to standard packages, they have built-in data models that deliver targeted intelligence, industry context, and actionable analytics and guidance to everyday users.

Vertically focused SaaS providers are increasingly more attractive targets for acquisition by large enterprise software suppliers. Oracle's acquisition of Opower in the utility industry and Textura in construction are recent examples.

Associated Drivers

- **Next chapter of DX** – Technology-driven transformation altering business and society
- **Platforms, platforms, platforms** – Industry competes for innovation at scale
- **Rising customer expectations** – More convenience, customization, and control

IT Impact

- Now more than ever, organizations have an unprecedented selection of vertical solutions that are closely aligned with how their business and workflows operate. Industry-specific applications usually require fewer customizations, reducing the time to value for lines of business.
- As more vertical best-of-breed products emerge, integration with other applications and platforms within organizations' technology portfolios will become a priority.

Guidance

- Seek out vertical SaaS applications to give your business a competitive edge. Streamlined workflows, user interfaces, and usability will help you increase return on investment (ROI) on your application while also allowing you to serve customers more efficiently. Vertical SaaS applications also do a better job of keeping companies compliant with industry standards and regulations.
- Use vertical applications from vendors with deep domain expertise. Their applications are more likely to eliminate extraneous features and have better industry-optimized data models.

Prediction 7: By 2020, 75% of Enterprises Using Public Cloud Will Also Use an Enterprise Private Cloud Platform; Majority of These Platforms Will Support Delivery of Higher-Layer PaaS and SaaS Functionalities

Enterprise private cloud offerings will grow rapidly in maturity, functionality, and adoption over the next two years. As enterprises proceed with their IT infrastructure transformation, a majority will find themselves using a mix of public cloud and private cloud platforms. With the evolution of private cloud capabilities, these private clouds will increasingly deliver higher-layer PaaS and SaaS alongside IaaS – providing fast access to new technologies on both shared and dedicated infrastructure.

Enterprise private cloud platforms will support delivery of popular higher-layer PaaS and SaaS functionalities as a service – such as database services, analytics services, and in the future, machine learning services – in response to growing customer demand. These will change the nature of services and capabilities available for dedicated infrastructure platforms. These capabilities will facilitate acceleration of next-generation applications, particularly for use cases with deployment location constraints that cannot easily move to public cloud.

Associated Drivers

- **Next chapter of DX** – Technology-driven transformation altering business and society
- **Rising customer expectations** – More convenience, customization, and control
- **Legacy inertia** – Retrofit the old into the DX world

IT Impact

- Growth in usage of public cloud and private cloud infrastructure will increase the need to build shared workflows and shared tooling that works across both platforms.
- The tools and services available to the developer community within enterprises are already rich and will continue to provide developers with higher-layer services for their needs.

Guidance

- Address workflow and tooling needs with offerings delivering a consistent experience across both platforms or through third-party services that provide a unified control overlay across platforms.
- Invest in processes and tooling to support management of public and private cloud platforms alongside each other, as a growing portion of services and resources consumed are new, higher-layer services. Coordinate investment in these platforms to ensure spend management, and budgeting and audit functions are executed effectively in such an environment.
- Incorporate new cloud-native and agile approaches to application development and delivery to derive value from access to these newer capabilities. Leveraging the new PaaS and SaaS will require a change in skill sets and attitudes within the development staff, to enable successful experimentation and adoption of new services.

Prediction 8: By 2022, 60% of G2000 Enterprises Will Be AI-Enabled, with Over 50% of Enterprise Application Workflows Aided by AI to Better Utilize Legacy Data, Real-Time Operational Data, and Third-Party Data Feeds

Data is the new oil in the DX economy. However, organizations are stuck trying to extract it, encumbered by legacy systems with little integration and context. Add to it the fact that data is everywhere, and business processes can't consume it fast enough or in the right context. In the DX economy, organizations need both data and intelligence to create value, changing the way an organization consumes and leverages data to deliver meaningful, value-added predictions and actions.

Organizations are seeking innovation in machine learning, natural language processing, and artificial intelligence for business processes. These processes must be able to consume legacy data, real-time operational data, and third-party data. All data elements must not only be consumable but put in context to the business processes across the enterprise, not just one or two functions. AI will enable the workflows and allow the data to be contextualized as needed within the business processes. In addition, the data consummation in the AI-enabled workflows will allow the business to have better operational visibility, making it possible to model possible future states and enabling better short- and longer-term business outcomes.

Associated Drivers

- **Sense, compute, actuate** – Turning data into value
- **Next chapter of DX** – Technology-driven transformation altering business and society
- **Legacy inertia** – Retrofit the old into the DX world

IT Impact

- Data requirements and their impact on workflows must be understood enterprisewide, otherwise the benefits will be curtailed.
- Current technology functionality, near-term road maps and strategic R&D investments, and ecosystem partners will help IT to quickly capitalize on the right technology vendors and data sets.

Guidance

- Embrace the IDC DX use case taxonomy by function and by industry to help identify new AI-enabled business processes and data requirements.
- Understand your technology vendor's current functionality and road map, identifying updates and their impact to AI-enabled business processes.
- Plan for skill changes across the enterprise from transactions, data aggregators, and report creators to impact assessors, modelers, and results-oriented employees.

Prediction 9: Enterprises' Need to Optimize ROI, Reduce Budgets, and Cope with Scarcity of Cloud Experts Drives Spending on Managed Cloud Services to Nearly \$75 Billion by 2022 and Almost 25% of Technology Outsourcing

According to enterprises worldwide, 39% of organizations indicate that the top business driver for using managed cloud services is business demanding more agility and/or speed from IT, 31% of organizations indicate the need to increase revenue by enabling firms to build new revenue streams, and 29% of organizations indicate the top technology driver is to simplify and standardize IT infrastructure and applications platforms. However, 28% of organizations highlight that the top inhibitor in using managed cloud services is lack of effective security along with concerns that cloud cannot support the operational/performance requirements of critical applications.

When it comes to financial metrics in measuring the success of managed cloud services, enterprises worldwide most commonly use ROI, followed by productivity gains (e.g., revenue per employee), profitability, and cost savings. However, organizations should also use measurements for determining the value of managed cloud services like improved employee productivity, improved supply chain optimization, achievement of cost reduction goals, and driving product innovation and market thought leadership.

There is a scarcity of cloud expertise, which is why 42% of organizations indicate the top talent required of managed SPs to support client migration to managed cloud services is for public cloud expertise (AWS, Azure, Google, IBM, Alibaba, etc.). Similarly, 31% of organizations indicate they have a need for managed SPs to have legacy application technology expertise (e.g., custom-coded applications such as COBOL and packaged applications such as SAP, Oracle, and Microsoft).

Associated Drivers

- **Platforms, platforms, platforms** – Industry competes for innovation at scale
- **Emerging autonomy** – Learning to live with AI
- **Legacy inertia** – Retrofit the old into the DX world

IT Impact

- Issues of underperformance of managed cloud services to support critical applications could result in not achieving a wide range of business objectives from targeted financial results (ROI) and worker productivity to meeting customer needs.
- There is the potential for security breaches of critical business process data and information, a particularly important concern for heavily regulated processes and industries, that could impede business performance and create potential exposure to regulatory infractions.
- Potential for not having the level of agility in using managed cloud services could result in suboptimal business performance and inability to meet key business measurements such as employee productivity and product innovation.

- Managed SPs can free up scarce internal IT resources, which can be redeployed for more strategic IT initiatives.

Guidance

- Require that managed SPs provide stringent service-level agreements (SLAs) in areas such as performance, availability, provisioning time for applications, and recovery services (e.g., data).
- Ensure that benchmarking of managed cloud services is incorporated into engagements that clearly define financial targets such as ROI and productivity gains.
- Emphasize the need for managed SPs to offer a set of more standardized set of capabilities, access to multiple public cloud providers, and key new technologies and capabilities (e.g., cognitive, containers, PaaS) that can meet agility expectations.
- Require managed SPs to incorporate solutions based on open source technologies (i.e., Hadoop, Elasticsearch) to ensure buyers have access to a broad set of technology options to minimize any technology lock-in.

Prediction 10: By 2020, 40% of Organizations Will Have Invested in Automation, Orchestration, and Development Life-Cycle Management of Cloud-Native Applications to Realize the Cost Benefits and Operational Efficiencies

The move to cloud-native application development requires the integration of formerly distinct stages of development, test, quality, application release, application updates, and ongoing monitoring to realize the cost benefits and operational efficiencies enabled through cloud-native applications. Automation, orchestration, and life-cycle management of cloud-native applications is critical to control development and maintenance costs of containerized applications, microservices, and functions-based applications and to enable automatic scaling.

As CIOs embrace an architecture underpinned by microservices and containers when building net-new applications, they need to invest in automation, orchestration, and life-cycle management software as well, to avoid container and microservices sprawl and to realize the efficiency gains promised by cloud.

Life-cycle management software will reduce the friction across development and operations workflows by automating and streamlining many formerly manual processes such as artifact management, creation of new builds, quality and load testing, application deployment and updating, configuration compliance analysis and automated infrastructure provisioning, and configuration across development, testing, staging, and production environments. It will also help control cost of cloud-native applications.

Life-cycle software will commonly be made available through public cloud service providers as a free or low-cost SaaS feature, which can be used to support applications deployed to IaaS and PaaS environments. These application life-cycle software solutions, often based on commonly used, open source software DevOps tools, will be critically important for most customers.

Without automating the life cycle of cloud-native applications, costs will spiral out of control and operational efficiencies, and scalability will not be achieved.

Associated Drivers

- **Next chapter of DX** – Technology-driven transformation altering business and society
- **Rising customer expectations** – More convenience, customization, and control
- **Legacy inertia** – Retrofit the old into the DX world

IT Impact

- IT organizations that do not use software application life-cycle management tools today will need to adopt them in the near future.
- IT operations and software development teams will need to combine forces and establish DevOps teams to optimize the life-cycle of cloud-native applications.
- Containers, microservices, and functions create a service mesh of components to manage in an integrated fashion.

Guidance

- Embrace a new operational paradigm that places developers in the driver's seat, increasing the agility and speed to market with which they can respond to opportunity and change. Life-cycle automation software plays a key role in achieving this objective.
- Reduce the cost for developing and running modern applications by enabling access to infrastructure, containers, orchestration, application performance monitoring, infrastructure configuration automation, application testing, code management, and analytics.
- Invest in agile process change and systemic adoption to implement a continuous DevOps pipeline. Cloud-based life-cycle software capabilities are also broadly available and reasonably affordable, and they have seen strong growth across both hyperscale cloud providers and industry clouds.

ADVICE FOR TECHNOLOGY BUYERS

Organizations across the world have broadly accepted cloud as the foundation technology for transformational initiatives within the enterprise. It is no longer a question of "if or when" but how cloud will be deployed and managed. IDC research shows that 64-70% of users deploy public and private cloud across several workloads, not just for one or two small applications.

As cloud adoption matures, the time has come for organizations to look beyond experimentation and low-hanging fruits in terms of leveraging cloud and set their sights on the next level that IDC expects to be focused on building the essential foundation to address the second chapter of the 3rd Platform – the era of "multiplied innovation."

IDC expects that in the near term, there will be a dramatically accelerated period of cloud-native digital innovation. Organizations will take advantage of cloud and cloud-based AI, blockchain, and hyperagile application technologies such as containers, functions, microservices app architectures, and API-based integration to drive the innovation at an increasingly fast pace. Tech buyers should consider the following when building their strategy moving forward:

- Consider how cloud technologies will be incorporated across enterprise initiatives and digital transformation strategies. This will enable organizations to reap the value and the promise of the benefits the technology can potentially deliver. A narrow view of cloud that leads to limited deployments can result in the potential business value of the technology to be restricted to small island of innovation within the organization.
- Human change management is vital. Cloud is disruptive, and end users are often resistant to change. Focus on ensuring improved user experience and showcase the value of the cloud platforms through training and awareness sessions. In addition to addressing cloud adoption, IT decision makers need to ensure they have the relevant skill sets to manage diverse and complex cloud environments.

- It will be a multicloud world, as organizations seek to get the most out of different types of cloud deployment. Automation, management, and a well-thought out policy-based approach to workloads, on top of ensuring integrations capabilities across the various cloud platforms, are a must. Develop (and partner) for strong multicloud integration and management capabilities to ensure one can address complex, multicloud service delivery environments.
- Successful cloud deployments require organizations to engage in data classification and data governance. The criticality of the data will help organization determine if they need to adopt a public, private, or hybrid cloud strategy. Increased regulatory pressure across sectors focused on data privacy requires organizations to ensure that they partner with cloud vendors that adhere to stringent data security and data management standards.
- Ensure that new technologies such as AI/ML, serverless, microservices, and containers are considered in your road map and how they best serve in delivering on business agility and value.

The previously mentioned list is not an exhaustive list of things to consider. Cloud is a work in progress, areas such as executive sponsorship, automation, industry-specific requirements, talent management, adjusting business strategy, and goals linked to cloud and how they might change and evolve over time among others for instance naturally need to be addressed.

For more information on the external drivers discussed in IDC's predictions, the section that follows provides additional background and context for each driver.

EXTERNAL DRIVERS: DETAIL

Next Chapter of DX – Technology-Driven Transformation Altering Business and Society

Description: Digital transformation (DX), the continuous process by which enterprises adapt to or drive disruptive changes in their operations, customers, and markets, has entered the next chapter – multiplied innovation. Now, competition is driven by platforms and ecosystems, and innovation feeds off of itself. Ubiquitous changes affect business in markets, customer expectations, and operational efficiencies, while society sees improvements in daily life. But many businesses are implementing DX without success, and some will fail entirely. Societal impacts include disturbed trust, jobs, alliances, and new inequities. Companies that achieve multiplied innovation can thrive in the next chapter of DX.

Context: In the past few years, we have witnessed the evolving of DX and the disruptions and opportunities it poses for business and society. Organizations of every size and industry must adapt to new technologies, new players, new ecosystems, and new ways of doing business. IDC predicts that by 2021, at least 50% of global GDP will be digitized, with growth in every industry driven by digitally-enhanced offerings, operations and relationship. While most organizations are attempting DX, only a small percentage are getting it right. Early attempts are met by subsequent challenges of change management, budget, talent, platform, scale and sustainability.

Platforms, Platforms, Platforms – Industry Competes for Innovation at Scale

Description: Understanding and building a "DX platform" that can sustain, advance, and scale business and operations may be the most important decisions leaders make for the next 10 years. The platform is the new battleground for innovation, developers, and marketplaces as the industry rushes to enable its customers with a range of platforms. Leaders must discover what their own platform should look like, how they compete in the platform business economy, and what platform vendors they

choose. Megaplatfroms compete to own infrastructure and development environments. Application-centric platfroms look for the network effect to expand their reach. Industry-specific platfroms harness multiplied innovation to build niche ecosystems. Every business must incorporate these new options into its own DX-platfrom.

Context: Today, we are in a platfrom economy – one in which tools, capabilities, and frameworks based upon the power of information, cognitive computing, and ubiquitous access will frame and channel our economic, business, and social lives. Companies and industries must shift to compete in their own sectors – but also in the new, larger platfrom business economy. The DX platfrom concept expands from microservices, technology stacks, and software bundles to PaaS and entirely new digital business- and industry-specific platfroms, ecosystems, and operating models. It lies at the heart of digital transformation strategy, providing the architecture that drives and accelerates every digital initiative.

Sense, Compute, Actuate – Turning Data into Value

Description: Today, data and intelligence represent a unique opportunity for creating unimaginable value. IoT, mobile devices, big data – combined with historical data, systems of record, and global information – continually sense an environment and put it into new contexts. Combined with AI and machine learning, organizations are spreading intelligence from the edge to the core to turn data into value. However, it is harder than it appears. Winners are differentiated by the ways they leverage data to deliver meaningful, value-added predictions and actions for personalized life efficiency and convenience, improving industrial processes, healthcare, experiential engagement, data monetization, or any enterprise decision making.

Context: By 2020, in over half of G2000 firms, revenue growth from information-based products and services will be twice the growth rate of the balance of the product/service portfolio. Data as a service (DaaS) presents an expanding market for both providers and consumers. The volume, velocity, and variety of data, and large and diverse data sets create new challenges but, when combined with AI technologies and exponential computing power, create ever-greater opportunities. Any application, process, service, or organization that isn't part, or all, of the new "sense, compute, actuate" paradigm is missing the boat with digital transformation.

Emerging Autonomy – Learning to Live with AI

Description: AI is actively impacting experiential engagement, business and manufacturing processes, strategies, and more – autonomously creating a significant portion of new innovations. Many future applications will be developed by AIs without human supervision. Beyond that, augmented humanity – the fusion of digital technologies and humans – for improved mobility, sensing and cognition will start to become routine. Unfortunately, the "ethics of AI" have yet to catch up with the technology, leaving potential for bad AI as well as good. Bias in AI models is just beginning to get attention. Regulations are even farther behind. There will be a long period of augmentation before autonomy takes over. Unfortunately, society is unprepared; however, there is still time to adapt. As AI is changing the way people live, work, and play, learning to live with AI is essential.

Context: Intelligent applications based on artificial intelligence and continual deep learning are the next wave of technology transforming how consumers and enterprises work, learn, and play. By 2027, 10%+ of applications will be developed by AIs without human supervision. Automated customer service agents increased public safety, preventative maintenance, reduction of fraud, and improved healthcare diagnosis are just the tip of the iceberg driving spend today. IDC forecasts AI solutions will

continue to see significant corporate investment over the next several years, achieving a compound annual growth rate (CAGR) of 46.2% through 2021, when revenue will be more than \$52 billion.

Rising Customer Expectations— More Convenience, Customization, and Control

Description: As disruptive organizations leverage breakthroughs in cloud, mobile, social, and AI to deliver personalized, rewarding, and immediate experiences, customers have more choices than ever. New devices and interfaces, wearables, AR/VR, home automation, information and connectivity are combining to instill a belief that people can have what they want – when, where, and how they want it – and, at the same time, be in control of the data and their experience. Yet AI-based consumer reputational scoring may be at odds. Emerging economies are bringing hundreds of millions of new customers that businesses are competing to win. Enterprises live and die by Net Promoter Scores, apps, network integration, and more.

Context: With new customer expectations being set by thriving companies that disrupted markets, the previously accepted levels of customer service are no longer good enough. New platforms and business, operational, and organizational models are required to meet consumer expectations. Customers now expect real-time support with answers to complex questions ready at the click of a button. More people are willing to share personal data in exchange for better service, but they also want more control around their personal data.

Legacy Inertia – Retrofit the Old into the DX World

Description: Technology has been enabling business for decades, and refreshing deployed systems has always been problematic. While new technologies are transforming some aspects of the business, legacy systems are holding others back, limiting innovation, opportunity, and engagement. Every company in every sector is faced with balancing traditional and next-generation systems and technologies: transformation at scale demands the replacement of outdated systems. Mergers and acquisitions challenge industry leaders as they struggle to incorporate acquired technologies. Many organizations are retrofitting the traditional systems and technologies to meet the new requirements, while trying to create the flexible and adaptable DX platform of the future.

Context: DX is becoming a competitive requirement and the source of a massive wave of new investments in digitizing business operations, communications, and services. Many organizations are facing the challenges of simplifying the current technology environment. The legacy systems and processes and change management issues often derail DX initiatives. Organizations should evaluate systems against business, financial, technology, and operations measures and create a road map for modernization.

LEARN MORE

Related Research

- *Critical External Drivers Shaping Global IT and Business Planning, 2019* (IDC #US44330818, October 2018)

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