

IDC FutureScape: Worldwide Cloud 2023 Predictions

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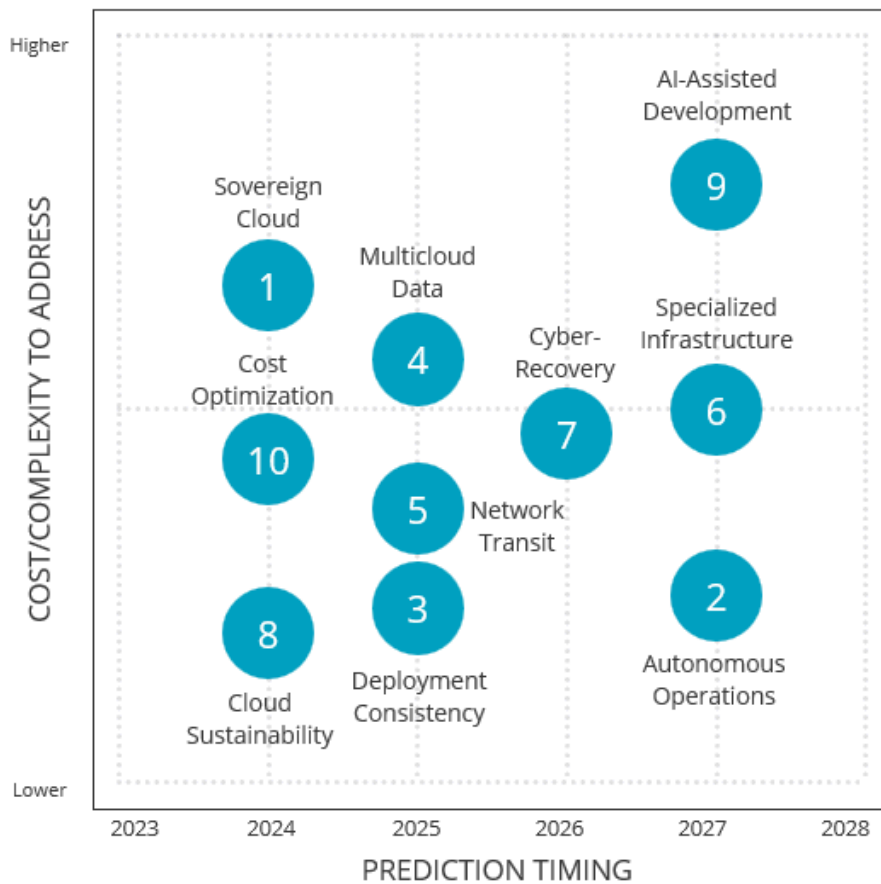
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IDC FUTURESCAPE FIGURE

FIGURE 1

IDC FutureScape: Worldwide Cloud 2023 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, 2022

EXECUTIVE SUMMARY

Cloud in all its permutations will continue to play ever greater, and even dominant, roles across the IT industry as enterprises pivot to a digital-first economy. Digital enablement is now a permanent, yet dynamic fixture in our world. Individual consumers and employees in schools, companies, and governments are always asking whether there is some digital-based capability/enhancement that could improve lives and desired outcomes. Entire industries want to intelligently leverage data to their advantage and can do so because they have faster access to digital technologies built on a cloud foundation.

The following are the top 10 predictions that frame IDC's perspective on how IT organizations can best take advantage of cloud technologies, capitalize on the extension clouds into new locations, and focus on more intelligent governance of cloud resources in the coming five years:

- **Prediction 1:** By 2024, 40% of the G2000 will move 10% of their workloads to a sovereign cloud provider to address data, technical, and operational requirements.
- **Prediction 2:** By 2027, 65% of companies will save over \$1 million a year using event-driven automation to improve resiliency and reduce repetitive IT ops tasks and moving to a fully autonomous digital infrastructure.
- **Predication 3:** By 2025, 75% of organizations will favor technology partners that can provide a consistent application deployment experience across cloud, edge, and dedicated environments.
- **Prediction 4:** By 2025, 55% of the G2000 will adopt multicloud data logistic platforms to enable active data migration between hyperscalers to optimize costs, reduce vendor dependencies, and improve governance.
- **Prediction 5:** By 2025, 70% of enterprises will adopt cloud WANs and transit networks to improve the availability, latency, performance, reliability, and scale of their cloud and edge applications and workloads.
- **Prediction 6:** By 2027, 80% of organizations will invest in specialized cloud-based performance-intensive computing environments to gain agility, scale, and faster business insights.
- **Prediction 7:** By 2026, 45% of the G2000 will adopt cyber-recovery as a service as ransomware attacks increase and require sophisticated recovery strategies not readily available through DIY efforts.
- **Prediction 8:** By 2024, 80% of IT buyers will make their decision to work with a cloud services provider on their ability to demonstrate how they can help reduce their client's indirect carbon emissions.
- **Prediction 9:** By 2027, AI will dramatically increase developer velocity by automatically generating code to meet functional business requirements for 80% of new digital solutions in development and early deployment.
- **Prediction 10:** Complexities of digital business and IT budget pressures will drive 70% of G1000 companies by 2024 to increase FinOps maturity with granular chargebacks, benchmarking, and multiple cloud optimization.

This IDC study provides IDC's top 10 predictions for cloud for 2023 and beyond.

"Cloud is no longer considered a location but rather an operating model for future innovation," said Dave McCarthy, research vice president, Cloud and Edge Infrastructure Services at IDC. "The agility

provided by cloud methodologies enables organizations to quickly deliver at scale on rapidly changing requirements from internal and external stakeholders."

IDC FUTUREScape PREDICTIONS

Summary of External Drivers

- **Storms of disruption** – Accelerating, interconnected uncertainty
- **Geopolitical reality** – Sovereignty in a digital world
- **Cybersecurity and risk** – Scaling and evolving threat environment
- **Digital business** – Stepping stone to the future enterprise
- **Ecosystem-based innovation** – Driving enterprise value
- **Everything as a service** – Thriving through the change

Predictions: Impact on Technology Buyers

Prediction 1: By 2024, 40% of the G2000 Will Move 10% of Their Workloads to a Sovereign Cloud Provider to Address Data, Technical, and Operational Requirements

Digital sovereignty has quickly become a significant area of interest for both cloud service providers and their customers. Expanding beyond simple data residency, principles of digital sovereignty will affect technical/operational controls, data assurance policies, and technology supply chains. IDC views the concept in three main categories: self-determination, self-sufficiency, and survivability.

Because of recent economic and geopolitical events, at least 75% now consider digital sovereignty to be of greater importance as a business and technology concern than in previous years. Improving and implementing privacy measures is now the top priority for multinationals. Complicating matters, the Russia-Ukraine War is impacting data processing locations and supplier country of origin for organizations worldwide – more than half of those surveyed are now either developing new guidelines or accelerating their implementation.

Multinational organizations should use the jurisdiction that has the toughest regulations and laws as the benchmark when evaluating the use of sovereign solutions across all their international operations. This will ensure higher levels of assurance and uniformity across the organization's business locations and help mitigate any regulatory challenges. They must also be aware of new and upcoming legislation that will impact their current operations as well as any new markets they expand to in the future.

Cloud is at the core of digital sovereignty with many of those surveyed in specific regions planning to move more IaaS/PaaS workloads to local cloud providers. Global cloud providers will respond by developing sovereign offerings that address the same needs.

Associated Drivers

- **Storms of disruption** – Accelerating, interconnected uncertainty
- **Geopolitical reality** – Sovereignty in a digital world
- **Cybersecurity and risk** – Scaling and evolving threat environment

IT Impact

- Cloud sovereignty is a relatively new concept. While the need for sovereign solutions will largely be driven by data privacy laws, regulatory needs, and continued uncertainties regarding future legislation, all organizations should ultimately be guided by business outcomes when considering cloud.
- Implementing sovereignty principles is a long-term process and involves adapting to new IT requirements in terms of infrastructure, strategy, governance framework, and skills. All these therefore become key criteria for sovereign cloud selection.

Guidance

- Adding sovereign cloud options in multicloud or hybrid IT scenarios means further complexities and potential extra costs for organizations. Investments needed here include areas such as local infrastructure and platforms, new tools for data governance and management, and redesigning internal processes and mechanisms to ensure compliance.
- IT decision makers need to understand that by over-optimizing for local needs, they not only risk lock-in with local providers but also jeopardize future opportunities in international markets where they will need to leverage more globalized IT resources and assets.

Prediction 2: By 2027, 65% Of Companies Will Save Over \$1 Million a Year Using Event-Driven Automation to Improve Resiliency and Reduce Repetitive IT Ops Tasks and Moving to a Fully Autonomous Digital Infrastructure

Enterprises facing multiple headwinds in today's geopolitical environment are looking for solutions. With global inflation and interest rates on the rise, IT budgets may soon come under increased pressure. Line-of-business owners impacted by higher raw material and salary costs may look to IT to flatten or reduce spending soon. In addition, IT has unfilled open headcounts for skilled workers for months or longer. Finally, digital businesses require a focus on the customer experience, where resiliency is critical. Slow performance or downtime can mean missed sales and losing customers to a competitor.

IT automation solutions may be a unique way to address these dual challenges of cost control and improving customer experience. In the past, automation projects' goal was to reduce ongoing labor expense costs using a lower one-time capital investment. Today, enterprises tell IDC that IT automation projects had an impressive post-implementation return on investments (ROI), with 58.8% of large organizations reporting a less than 12-month payback period. In addition, IT automation with proper employee buy-in can increase morale by freeing staff from repetitive incidents to focus on more strategic projects.

Modern IT automation platforms offer many advantages over previous generations. These benefits include quick time-to-value software-as-a-service (SaaS) models and artificial intelligence (AI)/machine learning (ML)-enabled capabilities to initiate proactive actions with limited human intervention. In addition, event-driven automation is the latest capability of lean-forward automation platforms. By monitoring an event, the automation solution can use a decision engine to compare this to a set of rules with preapproved actions the software can implement. In addition, the automation software can initiate a workflow process to gain approval for new actions of unknown incidents. IDC believes this will dramatically reduce level 1 response time and lower the quantity of level 2 escalations.

Furthermore, IT automation can reduce the toil and the repetitive tasks required of operations. IT automation improves consistency and cybersecurity compliance and delivers faster provisioning in

new environments. Quicker and more proactive responses to customer-facing applications translate to better resiliency. In addition, fewer after-hours support calls will improve morale.

Associated Drivers

- **Storms of disruption** – Accelerating, interconnected uncertainty
- **Geopolitical reality** – Sovereignty in a digital world
- **Everything as a service** – Thriving through the change

IT Impact

- **Staffing:** IT automation can relieve stress on understaffed operation teams and deliver business value. Thanks to the latest SaaS models, fewer dedicated staff are needed to support an automation platform than in past years.
- **Investment:** IT automation projects can be expensive, but research shows impressive ROI. SaaS offers a pay-as-you-go model instead of a significant one-time capital investment that may be difficult in today's economy. SaaS also allows an enterprise to start small and grow its utilization and maturity levels over time.

Guidance

- **Identify IT automation maturity level:** IDC identifies five maturity levels for automation with improved business outcomes at each level. The levels from low to high are beginner, managed, predictive, innovator, and optimized. Do a self-assessment to determine the organizational level and how to increase maturity.
- **Focus on tool rationalization:** Many enterprises have multiple monitoring and automation tools. As budgets come under pressure, leadership should review and reduce the number of tools. Consolidating automation solutions increases the chances it will be adopted widely and improves return on investment
- **Communicate IT automation goals:** Executives should ensure goals and expectations of IT automation projects are communicated to all levels of staff. In addition, it is essential to cover the "what it means to me" benefits of the project and invest in existing staff training.

Predication 3: By 2025, 75% Of Organizations Will Favor Technology Partners That Can Provide a Consistent Application Deployment Experience Across Cloud, Edge, and Dedicated Environments

As we approach 20 years into the cloud computing era, the term's meaning has changed in a significant way. It is no longer a reference to a specific delivery model – compute, storage, and software tools and applications delivered remotely from vendor-managed infrastructure – but rather a cohesive operating model for IT.

Cloud computing's tenets of flexible scalability, consumption-based pricing, and opex versus capex investment can today be realized not just in hyperscale datacenters but in dedicated environments controlled by customers, as well as in edge environments (which continue to grow in variation).

There is room for the cloud operating model to improve, however, and IT vendors must work collaboratively to enable this across their platforms, even in competitive situations. IDC data shows emphatically that customers want to run hybrid and multicloud environments, but today, the industry has made only modest steps toward the type of integration and deployment standards needed to minimize customer effort and enable success with this approach.

To be sure, efforts have been made to ameliorate cloud computing's fragmentation problem, such as by cloud service brokers. Yet these labor-intensive offerings are not enough. Customers want their services partners to spend their time working on new innovations, not yoking together disparate systems. They will increasingly want to run SaaS applications in the location of their choosing due to regulatory and other concerns. They see the promise of open source deployment methods such as Kubernetes and do not want it sunk in a mire of "value-add" distributions that create lock-in and technical debt.

Associated Drivers

- **Geopolitical reality** – Sovereignty in a digital world
- **Ecosystem-based innovation** – Driving enterprise value
- **Everything as a service** – Thriving through the change

IT Impact

- A consistent application deployment experience is not only about streamlining IT processes but also about providing the best experience for your company's customers. Choose providers that help deliver on this promise, and not just features, speeds, and feeds.
- Shifting economic and geopolitical sands may force companies to seek a consistent application deployment experience. Start to prepare and execute now.

Guidance

- **For customers:** Realizing cloud computing's full potential as an operating model with a consistent application deployment experience needs both cooperative vendors and a smart IT sourcing strategy that considers the big picture with every purchase.
- **For providers:** Realize that adhering to practices that support a consistent application deployment experience across the cloud computing spectrum is good for customers and thus good for business. Rethink the battle lines of competition, for they are changing.

Prediction 4: By 2025, 55% of the G2000 Will Adopt Multicloud Data Logistic Platforms to Enable Active Data Migration Between Hyperscalers to Optimize Costs, Reduce Vendor Dependencies, and Improve Governance

Data logistics describes the way data moves through a system, from creation to value, just as a package moves from a manufacturer to a consumer. It describes how data is captured, stored, moved, protected, and governed along with the policies that drive these actions. Data logistics is an element of data management but a much more precise definition.

Currently, smooth cloud data logistics is challenged by two key factors: data is often isolated in silos because of its type, location, platform and other factors and data in the cloud is not easily moved from one hyperscaler to another due to data formats and egress fees.

Although no one likes the concept of vendor lock-in, to date there have been few use cases compelling enough to cause organizations to go through the considerable effort to migrate from one hyperscaler to another. However, those use cases are emerging, such as the concern of being deplatformed due to terms of service technicalities. Vendors are now responding with data logistics platforms that present a unified cloud experience to the user, regardless of private or public cloud deployment. These platforms abstract many of the data-related issues that have previously stymied multicloud interoperability and shield users from egress fees that disincentivize data movement. As they become more robust, users will turn to them for greater flexibility, reduced risk, and better cost management.

Associated Drivers

- **Storms of disruption** – Accelerating, interconnected uncertainty
- **Geopolitical reality** – Sovereignty in a digital world

IT Impact

- IT organizations will have greater leverage when negotiating terms and fees with hyperscalers. The ability to move data from one cloud platform to another will enable organizations to take advantage of services available on one platform and not the other.
- Deplatforming from a hyperscaler can be sudden, difficult to appeal, and potentially catastrophic to the business. Having platform options help reduce this risk.

Guidance

- Have a solid business case. Multicloud data logistic platforms are not intended for one-off application deployments. They can be extensive to deploy and require an organizational initiative so a compelling need must exist.
- Align with existing key data management suppliers. The most likely suppliers to engage are those that already have a significant footprint in the organization.

Prediction 5: By 2025, 70% of Enterprises Will Adopt Cloud WANs and Transit Networks to Improve the Availability, Latency, Performance, Reliability, and Scale of Their Cloud and Edge Applications and Workloads

Applications are the lifeblood of digital business, and a growing wave of modern and existing applications is migrating to cloud environments. As applications gravitate to the cloud, they're redefining how networks should be architected and operated to serve the needs of digital business.

Network architectures and infrastructures must adapt to proliferating cloud applications by transforming into a modern digital nervous system that is aligned with cloud principles and cloud requirements, including the capacity to connect and integrate with globe-girding cloud cores and middle miles to provide greater bandwidth, throughput, security, availability, responsiveness, and on-demand elastic scalability for cloud applications. Cloud WANs, after all, offer ubiquity, proximity, and unprecedented scale, and they are continuing to be built across regions, countries, and major cities and business centers worldwide.

Traditional middle miles and cores, such as MPLS, were not designed for the cloud era, and their limitations (cloud architectural complexity, limited bandwidth, hairpinning, inefficient backhauling, operational inefficiencies, lack of operational or architectural agility, relatively high costs for cloud, etc.) are exposed by cloud application requirements. Today, many enterprises with traditional WANs are forced to procure, deploy, and manage a complex array of networks, as well as employ a variety of tooling and skill sets that accompany each discrete segment of the crazy-quilt WAN tapestry.

Cloud WANs, which can accommodate site to cloud, site to site, and even cloud to cloud (in some cases), provide a compelling alternative for enterprises, delivering advantages in application availability and performance, elastic scale, reduced latencies, greater throughput and bandwidth, and enhanced reliability, especially for global organizations doing business spanning geographic regions.

Associated Drivers

- **Digital business** – Stepping stone to the future enterprise
- **Everything as a service** – Thriving through the change

IT Impact

- Network operators will have to adopt cloud APIs, infrastructure as code, cloud network constructs, and a software-defined approach to designing, configuring, deploying, and managing enterprise WANs.
- The use of global cloud networks will allow the network to better serve the needs of cloud applications, data, and workflows, expediting provisioning, reducing latency, delivering greater performance and throughput, boosting digital resiliency, and generating operational efficiencies.
- Vendors of SD-WAN infrastructure, multicloud networking, interconnection-oriented colocation providers, and security products and services are providing integrations that help enterprises derive greater value from cloud WANs and cores.

Guidance

- Use cloud WANs as middle miles and core backbones as your center of application gravity shifts to cloud environments. This will be particularly effective in hybrid scenarios where your organization is leveraging a single public cloud.
- Consider using cloud WANs for site-to-site as well as site-to-cloud and cloud-to-site use cases. Global cloud providers offer consumption-based, as-a-service access to their networks for site-to-site and site-to-cloud scenarios.
- For multicloud networking, consider how cloud networks can be used in conjunction with interconnection-oriented colocation providers and multicloud-networking software solutions, including those delivered as a service.
- Encourage your SD-WAN and other network and security infrastructure providers to continually enhance their integrations with cloud WANs to improve the simplicity, agility, flexibility, and resiliency of modern cloud networking.

Prediction 6: By 2027, 80% of Organizations Will Invest in Specialized Cloud-Based Performance-Intensive Computing Environments to Gain Agility, Scale, and Faster Business Insights

CIOs are under constant pressure to better serve the principal needs of their business, which is to provide solutions for the business to differentiate and remain competitive in the digital economy, via data-driven insights. These insights enable the business to improve their internal processes, products, and services and better serve the needs of their customers. For the business to be agile, the IT services their teams rely on must be fit for purpose, cutting edge, and highly performant. Unfortunately, many of these services are expensive when built and delivered internally, using capex-intensive procurement models. The pace at which technology is refreshed makes it difficult for IT organizations to maintain service quality during the life of the solution. As a solution, IT increasingly turns to cloud-based – and particularly public cloud-based – services, especially for performance-intensive computing infrastructure.

A recent study validates IDC's position that digitally transformed or transforming businesses are increasing investing in cloud-based advanced computing technologies. Further, an associated study found that more than half of surveyed respondents prefer to rely on public cloud for accelerated computing services. Roughly half of the respondents prefer alternate AMD-based x86 compute (which feature high core count instances) or virtualized accelerated compute. Accelerated and high core count computing services are used for building artificial intelligence and machine learning, modeling, and simulation and data analytics environments. They are increasingly used for engineering and industry-specific applications, many of which are custom built or highly customized. The top 5 purchase criteria

include (in order of priority): better performance than on-premises installations, better security, access to adjacent services that are part of the public cloud catalog and ecosystem, global reach with faster access to customers in other regions and, last, better data protection than on-premises installations.

There is no doubt in IDC's mind that the aggressive build out by leading cloud service providers to deliver performance-intensive computing infrastructure and platform services is a boon for businesses seeking aggressive digital transformation. No longer do their developers, applications teams, and architects be held hostage to the extended procurement and provisioning times for the right type of infrastructure, often due to internal and inelastic evaluation and budgetary approval processes. They can partner with their IT organizations to "spin up" services for evaluation, development, testing, and as necessary production. IT organizations no longer need to worry about optimization and scaling challenges, as much of these issues are taken care of by the service provider. Last, businesses can make use of the latest technologies as they are made available by the provider.

Associated Drivers

- **Storms of disruption** – Accelerating, interconnected uncertainty
- **Digital business** – Stepping-stone to the future enterprise

IT Impact

- IT staff will increasingly play an advisory role, guiding their stakeholders through evaluation and selection process for the various performance-intensive computing services offered by leading service providers.
- Technical and associated business evaluation criteria for making investments in new products and services will now include deployment scenarios for specialized cloud infrastructure services.
- Data integration, governance, analytics, and data science expertise across IT teams (and lines of business) will take center stage as their performance-critical workloads migrate to the cloud.
- IT architects and platform teams will need to develop new cloud-centric architectural frameworks to ensure seamless adoption of new services as they become available.

Guidance

- As with any new technologies, proper planning and execution is necessary to ensure return on investment. Businesses must start with the business problem, expected outcomes, and then evaluate the kinds of products and services that best service these outcomes.
- A contingency plan must be put in place, especially during the initial adoption phase, to ensure contingency and failover scenarios are adequately dealt with. For example, the lack of service availability in one region or at a provider can be countered via a multicloud or hybrid cloud environment.
- Development teams must be brought in early on to ensure that the proper software stacks and development kits and tools are evaluated and incorporated into the development and deployment workflow.
- Partner with professional and managed service providers to augment or complement staff skills to make rightsized investments and to ensure service quality and service-level agreements are aligned to business needs.

Prediction 7: By 2026, 45% of the G2000 Will Adopt Cyber-Recovery as a Service as Ransomware Attacks Increase and Require Sophisticated Recovery Strategies Not Readily Available Through DIY Efforts

Cyber-recovery as a service (CRaaS) is a market whose time has come. Currently, most organizations utilize their disaster recovery (DR) systems to recover from ransomware, but those systems have proven to be inadequate. Our research shows nearly half of organizations are compelled to pay the ransom and fewer than a third were able to fully recover without paying the ransom.

Cyber-recovery (CR) and disaster recovery differ in very important ways. First, DR and most data recovery assume data integrity, whereas CR assumes data compromise. Second, unlike a disaster, a cyberattack may be ongoing during the recovery. As a result, CR requires the ability to detect the attack and isolate it from unaffected systems, establish an isolated "sanitary" recovery sandbox, and forensics to examine the attack and its impact plus system and backup scanning to avoid a reinfection.

Because most recovery efforts have fallen short, IDC believes organizational leaders will begin turning to cloud providers who have the CR-specific systems and expertise needed to perform a full recovery. These services will inherently have a high-services content as IT leaders engage experts in the field and eschew DIY efforts. In many cases, the CRaaS will be layered on top of backup as a service (BaaS) and DR as a service (DRaaS) to leverage common infrastructure requirements and system knowledge. CRaaS will be additive to IDC's data protection as service (DPaaS) competitive market, which includes archive as a service (AaaS). The forecast for the CRaaS market is expected to reach \$317.7 million by 2026 (149.3% CAGR).

Associated Drivers

- **Cybersecurity and risk** – Scaling and evolving threat environment
- **Ecosystem-based innovation** – Driving enterprise value

IT Impact

- IT buyers will face a learning curve related to CRaaS. Because these solutions are nascent today, selecting the right one will require research and comparative analysis.
- Effective cyber-recovery plans and systems reduce the risk of data loss, lower the probability of paying a ransom.
- Cloud-based CRaaS benefits from cloud economics and on-demand resources to minimize up-front costs with the ability to scale as needed.

Guidance

- Engage with trusted suppliers that bring the right resources to bear. Cyber-recovery is highly sensitive to the organization, and utilizing suppliers in whom organizational leaders have the highest confidence is paramount. Those with a breadth of CR experience will be at a premium.
- Leverage recovery guarantees as available and appropriate. Some vendors are now offering monetary compensation if their customer cannot fully recover.
- View data recovery and data security as a continuum to address cyber-recovery. Utilizing the NIST cyber-recovery framework (identify, detect, protect, respond, and recover) can help put context to solutions and assure full coverage.

Prediction 8: By 2024, 80% of IT Buyers Will Make Their Decision to Work with a Cloud Services Provider on Their Ability to Demonstrate How They Can Help Reduce Their Client's Indirect Carbon Emissions

IT vendors' ability to help clients improve their sustainability performance has emerged as one of the top vendor selection criteria, according to IDC research. IT buyers are increasingly looking for technology vendors that can help them on their sustainable transformation journey and demonstrate a measurable impact and ROI, not only in financial terms but also regarding their ESG impact. While professional services firms are still at the forefront of helping organizations set targets and goals and related sustainability strategies, IDC's survey data shows that software and IT infrastructure companies are also being perceived as important partners.

Cloud infrastructure plays a significant role in organizations' journey to a carbon-free future, as the vast majority of carbon emissions are being produced outside their core operations (which includes emissions caused by third-party cloud infrastructure). Scope 3 emissions constitute a material challenge to many organizations, from a reporting as well as an operations perspective. They are reliant on their partners and vendors to provide the necessary data and, more importantly, changes to their energy sources and power consumption. As a result, decisions to work with a cloud services provider will be very deliberately focused on its ability to demonstrate its use of renewable energy sources as well as provision of quantified, metrics-driven environmental information that clients can use for their reporting and planning purposes.

Associated Drivers

- **Storms of disruption** – Accelerating, interconnected uncertainty
- **Digital business** – Stepping-stone to the future enterprise
- **Everything as a service** – Thriving through the change

IT Impact

- Purchasing decisions for IT infrastructure will have a nonfinancial (ESG-related) ROI element that IT vendors need to be able to quantify.
- IT buyers will need to understand the sustainability-related impact of the technology they purchase and how it fits into their organization's larger sustainable business strategy.

Guidance

- Assess cloud services providers based on their quantified environmental sustainability goals and impact on your organization's sustainability goals.
- Collaborate with other sustainability stakeholders within your organization regarding understanding the impact that cloud services providers can have on your organization's sustainability targets and the strategic importance that sustainability-related IT purchases have.

Prediction 9: By 2027, AI Will Dramatically Increase Developer Velocity by Automatically Generating Code to Meet Functional Business Requirements for 80% of New Digital Solutions in Development and Early Deployment

Developer tools throughout the application development life cycle will increasingly incorporate the ability to automatically generate code during the next five years. By 2027, this technology will be so pervasive that IDC believes it will be capable of generating code to meet business requirements for the large majority of new digital solutions. Examples of automated code-generation technologies that

leverage machine learning include AI pair programming tools such as GitHub Copilot and AWS CodeWhisperer, chatbot assistants, and automated test generation tools.

For the past several years, automation efforts have focused on replacing the manual repetitive work of business users with bots. Decision making formerly performed by business users is increasingly replaced or supplemented with AI. Today, this technology is rapidly shifting to do the same for developers. Automation will change development by lowering the cost and increasing the speed of development. It will reduce the number of developers needed to complete projects. Just as business users have not disappeared from the workplace, the same is true of developers. Just as business users saw their jobs and responsibilities change, the same will be true in development.

Drivers of the proliferation of automated code generation tools include organizational initiatives to achieve digital innovation in the face of the continuing struggle to fill developer positions. This is in part because of the expansion of the scope of developer responsibilities and in part due to the proliferation of tools, languages, APIs, and frameworks available to developers. This expansion in complexity puts added pressure on developers and the velocity with which they can deliver digital products and services. As a result, developers increasingly need tools that simplify or eliminate development tasks so that they can focus their skills on the most challenging development problems that provide the highest level of differentiation to their business.

AI offerings supporting the developer persona are usually enabled by and facilitated by cloud services. Use of these solutions to build cloud-native solutions means that organizations will need to adopt a strong cloud platform strategy and to embrace cloud native development practices for new digital solutions. At the same time, developers will still carry responsibility for making sure that this automatically generated code is sound. This will not be a matter of pressing a button and automatically trusting the code that comes out. Developers will need to objectively review code to make sure it meets business functional requirements and does so securely and with high quality, which will also depend on getting the cloud-native architecture right and appropriate, continuous testing approaches.

Associated Drivers

- **Storms of disruption** – Accelerating, interconnected uncertainty
- **Digital business** – Stepping stone to the future enterprise

IT Impact

- The development experience will shift to accommodate increasing levels of abstraction, freeing up developers' time to focus on identifying and curating high-quality software resources that meet customer requirements and provide business value.
- The number and types of developers increases, with new developers having varying levels of knowledge and proficiency in specific development languages and general computer science and IT concepts.

Guidance

- Quantify and mitigate the risks introduced into business operations by automated code generation from different tools and applications, including the ethical risks inherent in current AI models
- Evaluate the performance of services and applications created using automated code generation tools to optimize cloud spending and to avoid overspending due to excessive or nonoptimized code

- Continuously evaluate the increasing ability of automated code generation tools to increase developer productivity and velocity

Prediction 10: Complexities of Digital Business and IT Budget Pressures Will Drive 70% of G1000 Companies by 2024 to Increase FinOps Maturity with Granular Chargebacks, Benchmarking, and Multiple Cloud Optimization

Enterprises are moving from point digital transformation projects to a fully digital business model. This change is driving the need to better optimize cloud resources and costs. Digital companies utilize cloud-native technologies such as containers, distributed web services, and multiple public clouds to improve the customer experience. However, this adds complexity and increases costs to the business if not properly managed.

FinOps is a culture change focused on people, processes, and collaboration. A centralized tool that provides a single source of truth for the FinOps team is also essential. Visibility across multiple clouds to see costs in a business-friendly dashboard can provide valuable insights into an enterprise's spending. Moving from a showback to chargeback model increases accountability. Keeping cloud costs and product revenue together in the proper budget and P&L ensures line-of-business owners are responsible for both supply and demand of cloud resources. Once proper metrics are defined, a FinOps team can benchmark against past performance and industrywide results for cost savings and optimization levels. However, increasing the collaboration between IT, finance, procurement, and line-of-business product owners via a FinOps team provides even greater business value.

FinOps teams can track their maturity levels using the common framework of the "crawl," "walk," and "run" approach. In the "crawl" phase, enterprises establish the team and tool to manage their FinOps processes. This phase includes basic KPIs like forecast accuracy with 20% variances common and cost allocation of 50% of cloud spending as a target. The "walk" phase involves a comprehensive understanding of FinOps principles and active participation across the organization. Moreover, KPIs are improving to include forecast variances of less than 15% and cost allocations over 80%. The final phase is "run," which contains advanced capabilities, including managing edge costs and automation of FinOps processes such as tag management. As a result, KPIs are 90% cost allocations and spend forecasts under 12% variance.

Associated Drivers

- **Storms of disruption** – Accelerating, interconnected uncertainty
- **Geopolitical reality** – Sovereignty in a digital world
- **Digital business** – Stepping stone to the future enterprise

IT Impact

- **Costs:** IT should identify requirements and aid in selecting a cloud cost transparency tool if the organization has not yet implemented one. These solutions have the quickest payback of any IT investment, so the impact should be minimal. Also, moving to a chargeback model will push costs to the line-of-business owners who create the demand for cloud services/products.
- **Culture change:** The FinOps practitioner is typically a former IT staff member. The practitioner needs executive sponsorship and coaching to be successful. DevOps teams will need additional training from FinOps teams to understand the impact of coding and architecture on cloud costs. Collaboration between all groups is essential, with a culture of accountability expected.

Guidance

- **Identify FinOps maturity level:** IDC finds approximately 60% of organizations report using a FinOps teams today. Organizations not started on the FinOps journey should start today. If FinOps is active, then do an assessment to determine maturity level based on metric and KPI levels.
- **Mature FinOps processes and team:** After determining the level of maturity, identify the gaps to achieve the next level. Focus on a step-by-step approach to improve metrics and evangelize the benefits of FinOps. Celebrate recent successes and savings of the FinOps team to build trust and enthusiasm for increasing its maturity.

ADVICE FOR TECHNOLOGY BUYERS

Initial adoption of cloud at enterprises was often seen primarily as an alternative IT purchasing model and a shift from capex-based to opex-based consumption models. The justification has since evolved. The potential of cloud is truly unlocked when cloud is adopted as both a technology platform and an operational model, jointly enabling agility and responsiveness for the business. This requires changes in skill sets, processes, and organizational structures, bringing together IT and business to deliver agility and responsiveness.

IDC believes the following action can help organizations maximize the value potential of cloud:

- IT organizations must proactively prepare for a cloud strategy that includes use of foundational cloud resources distributed across platforms and premises but unified in a manner that allows consistent governance, policies, and automation across this distributed footprint.
- As cloud usage has increased, spending on cloud is now highly visible in an organization's overall IT budget. Management of spend will be critical to control costs while maintaining budget flexibility for new digital initiatives. Implementing a cost management strategy that leverages automation is an imperative.
- Cloud-native frameworks and cloud-native services are increasingly proving their applicability and relevance for both traditional enterprise use cases and new digital initiatives. But modernization exercises need to be planned carefully because of skill set and tooling limitations.
- Organizations must prioritize applications that can quickly demonstrate the value of new frameworks and services to communicate the value broadly, as they expand the availability of cloud-native skill sets and tools across the organization.
- Data compliance and regulation to ensure control over end customers' data are gradually emerging across the globe. Digital services and SaaS providers need to actively increase their awareness of these needs and build controls and evaluations that ensure they meet emerging cloud governance requirements in their areas of operation.
- Organizational structures need to evolve to minimize silos across cloud operations and business operations. Colocating IT as a partner within the business and increasing the level of engagement between business planning and cloud planning will help the enterprise deliver business outcomes and customer experiences in an agile and responsive manner.

Storms of Disruption – Accelerating, Interconnected Uncertainty

- **Description:** It's an extraordinary moment: We have our most impactful pandemic in 100 years, our first invasion in Europe in 75 years, and our first global inflation in 40 years. While change and disruption are nothing new, this year feels faster, more wide ranging, and farther reaching – the most dramatic change in a generation – affecting the psychology of leaders. It's not just a few things but the interconnected nature of them together, the domino effect, and the unexpected yet consequential impacts that generate a perfect storm of instability. The global order is under threat from the Russia-Ukraine War. The war's impact on energy has shocked markets, resulting in both a renewed interest in expanded fossil fuels and a greater clean energy imperative. "Climate action failure" and "extreme weather" are cited as severe immediate and long-term risks. Disruptions in grain and fertilizer exports are adding to inflation and threatening massive food insecurities. Rising interest rates challenge the economy and IT spending. While some adaptations from the COVID-19 pandemic are now integrated into global business and operating models, impacts are still felt in supply, labor, and more. Supply chain difficulties and chip shortages are expected to continue until at least 2024. Developing economies, seeking to digitize rapidly, have limited resources, while the speed of technology-enabled solutions marches on. It's undeniable that these external forces are increasingly interwoven, not temporary, impacting organizations' business and digital plans concurrently, becoming storms of disruption.
- **Context:** With storms of disruptions, there is a lot of complexity, but it cannot be teased apart easily. The multidimensional interactions among issues/people/companies drive constant change and redefine competition continuously. In addition to individual drivers, seeing the whole of the system is important. Concern about the future is heightened and growing. WEF reports that 84% of experts are either "concerned" or "worried" about the outlook for the world (www3.weforum.org/docs/WEF_The_Global_Risks_Report_2022.pdf). Yet 95% of business leaders report that their crisis management needs improvement, according to PWC (www.pwc.com/gx/en/issues/crisis-solutions/global-crisis-survey.html). Global supply chain pressures increased in 2Q22. Global GDP growth is projected to slow sharply in 2022, to about 3%, and remain at a similar pace in 2023. Crude oil prices have almost doubled since 2021, while natural gas prices in Europe have increased 4x to 5x, according to OECD (www.oecd.org/coronavirus/en/data-insights/energy-prices-are-spiking). Fertilizer prices surged in March, up nearly 20% since January 2022 and almost 3x higher compared with a year ago. Currently, 193 million people globally are acutely food insecure, but FAO predicts insecurity will worsen in at least 20 countries in 3Q22 (www.fao.org/3/cc0364en/cc0364en.pdf).

Geopolitical Reality – Sovereignty in the Digital World

- **Description:** In many ways, technology has brought the modern world closer together, yet geopolitical realities are strengthening a widening divide. The Russia-Ukraine War sparked a global crisis and unprecedented reaction. Western democracies and NATO responded with a strengthened and reunified resolve, at least temporarily. China seems to have taken a wait-and-see approach to its heightened cooperation with Russia, but the threat of a bifurcated global landscape – the United States/Europe/West versus China/East (with an advantage in low-cost labor) – has increased dramatically. Control and the reassertion of digital sovereignty is becoming an imperative for many. Even the gig economy is affected due to the impact on hundreds of thousands of highly skilled Russian and Ukrainian tech workers. The influx of millions of displaced migrants creates new demands and strains governments' ability to

provide services. Cyberwarfare, already an everyday occurrence, is an increasingly visible component of the projection of nation-state power and the new hybrid war. Social, economic, and political divisiveness and widespread misinformation – driven internally and from cyberactions – fuel the accelerating erosion of "social cohesion." Global competition and divergence in outer space, with growing commercialization, militarization, and weaponization, is threatening existing systems and complicating collaboration for the common use of space, adding risk to a divided geopolitical reality.

- **Context:** Certainly, the Russia-Ukraine War is the highlight of geopolitical tensions in 2022. IDC's First Take (see *The Impact of the Russia-Ukraine War on the Global ICT Market Landscape – IDC's First Take, March 4, 2022*, IDC #EUR148926122, March 2022) predicts multiple impacts, including significant slowdowns in both countries' IT markets and major operational issues for their businesses, digital skills emigration, exchange rate fluctuations, inflationary pressures, supply chain issues, cybersecurity attacks, digital sovereignty issues, accelerated decarbonization, and Chinese tech vendors focusing on Russia. BlackRock and others consider accelerated "global technology decoupling" as one of the highest risks for 2022 and beyond. So just as globalization and new technologies have provided unprecedented connectedness around the globe, other factors are creating new or exacerbating existing "us versus them" mentalities, often fed by misinformation. And that's just the start of it. Accelerating climate change is being felt in terms of water, fire, crops, migration, and more, whereas the World Economic Forum reports "climate action failure" to be an immediate and severe risk.

Cybersecurity and Risk – Scaling and Evolving Threat Environment

- **Description:** The exponential proliferation of digital transformation, the increasing distribution of data and workflows, hybrid work models, hybrid multicloud, edge computing, and so on have thrust the world onto a new trajectory of digitalization and interconnectedness, accompanied by the increasingly frequent, costly, and damaging occurrence of cyberincidents, sometimes even paralyzing critical services and infrastructure. Data breaches add to the increasing concerns and governmental interventions regarding privacy. Ransomware has increased exponentially, while the texture of attacks is much more targeted and personalized. The dark web is teeming with hacking services that offer comprehensive skills, affordable pricing, and quick engagements. At the same time, organizations find it challenging to respond to cybersecurity incidents due to the severe shortage of skilled professionals. Small and medium-sized enterprises, most affected by the skills shortage, represent a weak link that puts the whole ecosystem at risk. Beyond zero trust approaches, cyber-resilience – the ability of an organization to anticipate, withstand, recover from, and adapt to any threats to its resources – is the new name of the game in not only defending against cyberattacks but also preparing for swift response and recovery when an attack does occur. Artificial intelligence will permeate all aspects of cybersecurity, both in attack and defense. In a deeply connected society, digital trust is the currency that facilitates future innovation and prosperity.
- **Context:** Nation-state attacks – such as NotPetya, originally targeted at Ukraine but which quickly wreaked havoc globally – are increasingly common. Ransomware, the most common cyberthreat today, saw a significant increase in the first half of 2021, with global attack volume increasing by 151% (per the World Economic Forum (WEF) Global Cybersecurity Outlook, 2022). Also, 70% of attacks in 2021 were personalized and targeted, not malware based. Cybercriminals – "black hat" hackers – can be hired to break into social media accounts (for about \$230), erase debts, and even change students' grades (for \$394-526), according to the same report. In the past several years, the WEF report says that indirect attacks – successful breaches coming into an organization through third parties – have increased from 44% to

61%. And 43% of attacks are aimed at SMBs; only 14% are prepared to defend themselves, according to Accenture. At the same time, 53% of cyberleaders say they have gaps in key talent and skills. IDC reports that 45% of organizations would need to increase spending by 20% to maximize risk mitigation.

Digital Business – Stepping Stone to the Future Enterprise

- **Description:** A digital business sees value creation based on the use of digital technologies for both internal and external processes, including stakeholder engagement, employee commitment, and product and services experiences. Building and leading a digital business is the next step toward the future enterprise, with CEOs indicating that digital product and service revenue will jump from the current 30% factor to over 40% by 2027. While some parts of operations may never be purely digital, digital businesses are committed to a digital-first strategy that builds value and growth by aligning all parts of the business and IT landscape with digital workflows. Both the supply side and consumption side face increased scrutiny for investment, and development strategies for both digital and nondigital assets demand omnichannel leverage for the digital business to get support or funding. Implications include reprioritization of digital customer experience, evolution to fully digital operating models, more resilient digitally enabled supply structures, and automation to address risks and challenges. Regulatory factors are also driving digital business focus, where the use of data and the trusted engagement with automation drive new risk mitigation investments. Businesses that are launched or relaunched in the digital universe are gaining measured operational and competitive advantage, driving digital-native considerations across most sectors. Digital business is bringing together business and digital strategy, where technology is both a common denominator and a dominant driver of value and growth.
- **Context:** According to IDC's 2022 *Worldwide CEO Survey*, "technology" is the number 1 word of the year for CEOs. In 2021, the dominant solutions for major monetization workflows were manual/custom, indicating a high greenfield focus. A 2021 *IDC Survey of Monetization* indicates that digital investment is a focus for 95% of CEOs, and 27% self-assess as "pioneers." According to McKinsey, in the next step in the digital journey, integration of digital and operations capabilities will drive step change improvements in revenue, customer experience, and cost (see *IDC PeerScape: Future IT – Practices to Establish a New Digital Business Operating Model*, IDC #US47857221, June 2021). According to IDC's *Future Enterprise Resiliency and Spending Survey, Wave 7*, operational efficiency (43%) and customer satisfaction (42%) are higher priorities than profits (37%) (see *Market Analysis Perspective: Worldwide Digital Business Models and Monetization, 2021*, IDC #US46247521, September 2021). In the drive to the future enterprise, digital businesses will prioritize deeper understanding of consumption models, recognizing usage intelligence as a critical driver for development of value and growth strategies, with an expected 60% of IoT-using organizations creating new data-driven offerings and recurring business models (see *IDC FutureScape Webcast: Worldwide Digital Business Models and Monetization 2021 Predictions*, IDC #US47028620, December 2020).

Ecosystem-Based Innovation – Driving Enterprise Value

- **Description:** Innovation has shifted from tactical DX investments that aggregate siloed strategies to holistic, ecosystem-aligned enterprise commitments. Strategic innovation, led by the CEO, boards, and C-suite, now demands clear and measured links between technology innovation and outcomes. IT organizations are seeing a shift in investment priorities, with ecosystem-driven models now materially impactful to strategy, planning, and execution. Ecosystem commitments carry new challenges including consideration of IP protection and

cybersecurity, where intelligent innovation has hastened business evolution across the workload, enterprise, and ecosystem control planes. Accelerated digitalization has also forced companies to fundamentally reimagine how they can leverage ecosystem relationships. The enterprise that is positioned to be bold has the most ecosystem leverage, realizing high-value outcomes to the benefit of both the enterprise and discrete workloads. This next generation of innovation has moved beyond bridging historic gaps and siloed investments with respect to customers, cost, and supply chain; it is now driving long-term and measurable strategic integration of enterprisewide business functions. Successful ecosystem alignment is now leading the C-suite discussion in terms of driving enterprise value and what success looks like. Organizations are investing in creative ways to leverage the ecosystem for both co-innovation and industry leadership.

- **Context:** Trusted ecosystem models are leading organizational response in the drive to digital business, empowering high-value innovation and tangible outcomes that can be delivered at scale. Ecosystem-based, multipartner solutions will drive speed and value through commercial intelligence, operational value, and increased value and differentiation, with insights driven by AI/ML (48%) and value metrics for pricing (49%) at the top of immediate digital business priorities (see *IDC FutureScape Webcast: Worldwide Digital Business Models and Monetization 2021 Predictions*, IDC #US47028620, December 2020). Tech spend by business leaders will overtake spend by IT by 2023 (see *Worldwide Line-of-Business Forecast, 2021-2025: C-Suite Tech Spending in a Digital-First World*, IDC #US48459721, December 2021). The need to reassess use cases and ensure alignment will drive commitment across the "digital dream team." Planning and budget cycles will be driven to become more dynamic in response to evolving ecosystem models. Technology architectures will be driven to support the needs on the broader C-suite for business models of the future (see *The C-Suite Tug of Digital Value in the Future Enterprise*, IDC #US48052721, August 2021).

Everything as a Service – Thriving Through the Change

- **Description:** Everything as a service (XaaS) is a driver for change in every sector and ecosystem, with real impacts on both the supply side and the demand side of every business. Organizations are adopting as-a-service models at varying speeds out of necessity, but the multidimensional delivery strategies make requirements more complex and impacts less predictable. The shorter decision cycles of on demand are letting industry leaders do things differently, but the commitment models are fundamentally changing. On the supply side, demand and customer expectations are rising, so suppliers are driven to convert and enable offerings more quickly in a secure services-based model. Change is rampant in terms of accountability and control, as suppliers are more committed in a shared-responsibility model. Buyers are now making decisions based on commitments to measured outcomes in terms of optimization, reliance, and financial models. Architecture and solution strategies are now critical to the service provider, where proprietary systems that are being maintained or migrated can materially impact the efficacy of the as-a-service solution. Nonproprietary requirements are serving as a starting point for integration, so solutions and vendors are pressed to be dynamic and interchangeable. Leaders are challenged to find new financial, operational, and governance models that support success in an iterated move to as a service. Critical factors for organizations to thrive through the as-a-service change landscape include solution control, contractual clarity on roles and responsibility, and accountability alignment including geoeconomic assurance and data sovereignty risks.
- **Context:** Typical 2020 enterprise workloads had 5 to 15 dependencies; that is expected to be 6x greater by 2025 (see *IDC FutureScape: Worldwide Future of Digital Infrastructure 2022 Predictions*, IDC #US47441321, October 2021). According to the IDC worldwide forecasts,

CAGR in spending is materially shifting toward as-a-service constructs over the next three years, with infrastructure as a service projected to be up 21%, dedicated cloud projected to be up 31%, and the services to support as-a-service investments projected to be up 16.9%. Software as a service is projected to have CAGR at 15.3%. To support an as-a-service foundation, software-defined everything will drive attention to policy automation, programmability, and analytics instead of hardware-specific configuration and control. There is also extensive evidence that the as-a-service segment is building in dominance: SaaS-based APM solutions are expected to increase at a five-year CAGR of 23.7% compared with 2.8% for on-premises solutions (see *Worldwide Application Performance Management Software Forecast, 2021-2025: Market Pivots to Observability*, IDC #US48353021, November 2021); SaaS-based network security solutions are creating traction, estimated to bring greater than 7% annual growth in the sector (see *Worldwide Network Security Forecast, 2021-2025: SaaS Adoption Brightens Market Outlook*, IDC #US48185721, September 2021); the IoT security market, enabling autonomous operations across all segments, has a CAGR of 16.3% (see *Worldwide IoT Security Forecast, 2021-2025: Critical Applications Accelerate Demand for Contextualized Security*, IDC #US48347020, December 2021).

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- *Market Analysis Perspective: Worldwide Dedicated Cloud Infrastructure and Dedicated Cloud Infrastructure as a Service, 2022* (IDC #US49687622, September 2022)
- *IDC Market Glance: Cloud-Native Infrastructure Platforms, 3Q22* (IDC #US49642322, September 2022)
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