2024 Research Agendas

Key topics and coverage areas

451 Research and Kagan, research groups within S&P Global Market Intelligence, provide essential insight into key trends driving digital transformation across the entire technology, media and telecommunications landscape.

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S&P Global Market Intelligence provides essential insight into the pace and extent of digital transformation across the global technology, media and telecommunications landscape. Through the 451 Research and Kagan products, S&P Global Market Intelligence offers differentiated insight and data on adoption, innovation and disruption, backed by a global team of industry experts, and delivered via a range of syndicated qualitative and quantitative research, strategic consulting solutions, go-to-market services and live events.

Our research is organized into channels that align with the prevailing topics driving digital transformation. The research agenda for each channel outlines key themes, questions our research will address, analyst coverage and planned deliverables over the coming year to support our clients' critical business decisions. The nature of this transformation means that many trends, such as generative AI, span multiple channels. Our research approach encourages analyst collaboration both within and between channels and other deep sector business units across S&P, allowing us to surface emerging trends before anyone else.

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Applied Infrastructure & DevOps


Cloud & Managed Services Transformation


Cloud Native


Consumer Technology


Customer Experience & Commerce


Data, AI & Analytics


Datacenter Services & Infrastructure


Fintech


Global Media Research


Global Mobile Research


Global Multichannel and Broadband


Information Security


Internet of Things


Mergers & Acquisitions


Workforce Productivity and Collaboration

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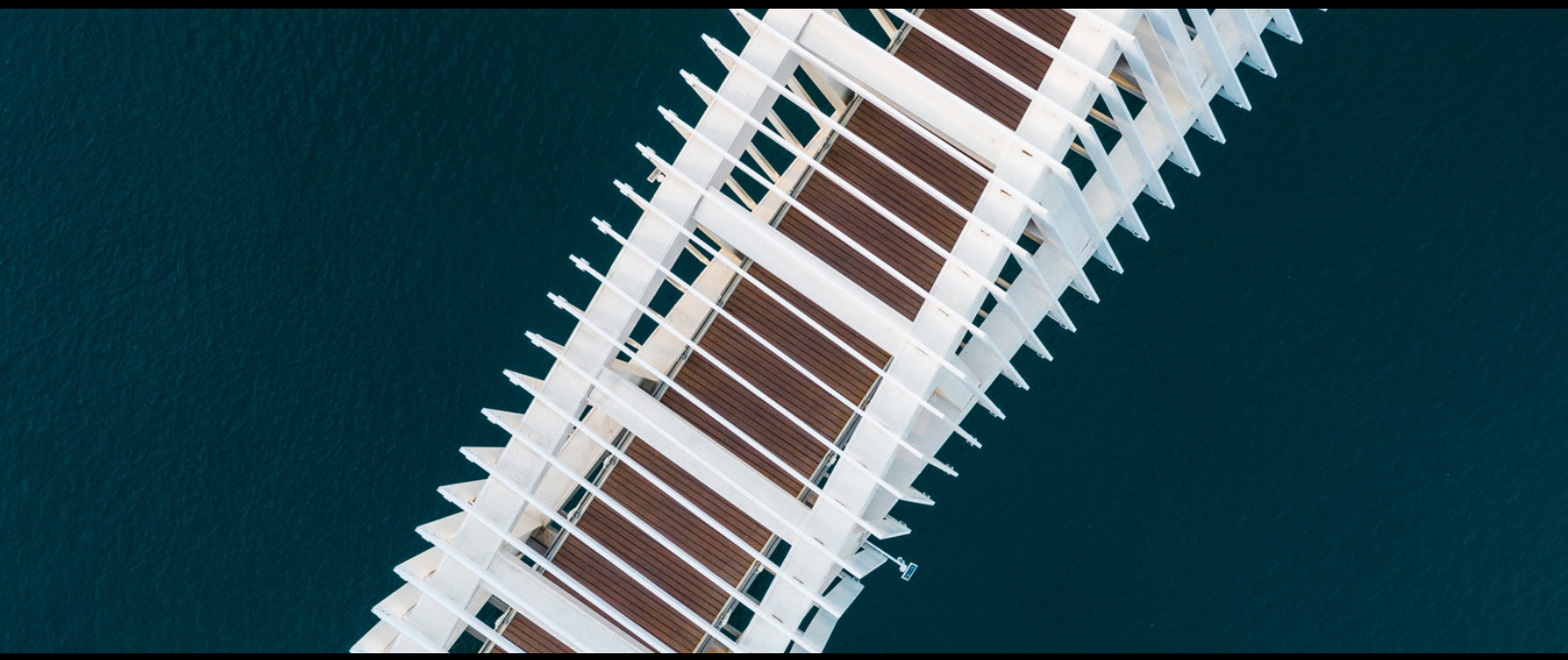

Applied Infrastructure & DevOps

The applied infrastructure and DevOps sector plays a critical role in enabling digital transformation. The hybrid IT journey underway continues to push IT operating models toward cloud-native technologies, and the DevOps and continuous integration/continuous deployment (CI/CD) design philosophy is having a dramatic impact on the design and engineering of on-premises infrastructure.

Digital automation platforms, hybrid integration platforms, operations and observability management platforms, telecommunications and networking, discrete and converged infrastructure platforms (storage, networking and servers), edge computing, chip-level hardware accelerators — they all have a part to play in making hybrid IT a reality and enabling the development of agile real-time applications and data-driven decision-making.

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Key Issues for 2024

Hybrid cloud storage for a hybrid IT landscape

Hybrid IT, which leverages on-premises and public cloud resources interchangeably, is the desired state for most organizations. A comprehensive approach is required to facilitate efficient resource consumption while keeping in mind the performance and resiliency requirements of production workloads.

Enterprise edge infrastructure: Innovation and opportunity

In our coverage, we will track innovations in the environment, hardware, network, provisioning and management of edge infrastructure, along with the business cases used to justify ongoing investment. We will examine the infrastructure requirements to support edge deployments (compute, storage, networking, accelerators, power, footprint, noise level, ruggedization), as well as the colocation market's efforts to adapt to meet edge demand.

Securely and reliably interconnecting the edge

Our coverage will: examine the additional physical and logical security concerns edge deployments will require, along with the necessary management and oversight overheads; take a look at the nascent edge security technologies and their adoption; map the competitive and cooperative landscape for edge networking; and consider the role of wide area networking (SD-WAN), cloud-native WAN, wireless and traditional connectivity for the edge.

Assessing workload venues for AI — the rise of the edge

Explosive growth in AI is affecting edge locations in terms of workload placement as well as infrastructure requirements. Edge can mean many things, whether device edge, enterprise edge or network edge. By any of these definitions, the edge is important in the evolution of AI both as a point of data collection and model inference. However, challenges persist for organizations that want to do more inference and training at the edge.

A total approach to enterprise automation — total automation

The "easy wins" achieved by automating workflows and building software robots to automate repetitive manual tasks are nearly exhausted and represent only a partial approach to enterprise automation. Business and IT leaders now seek a more total approach to enterprise automation. Total automation helps leaders think and act strategically, holistically and creatively about how the entirety of their enterprises can be intelligently improved, automated and differentiated.

The current and future state of hybrid integration platforms

The enterprise workforce needs data to flow effortlessly and on demand as a self-service. Yet data remains highly distributed in different formats across enterprise IT estates composed of a diverse range of execution venues such as public clouds, on-premises infrastructure, hosted private clouds, managed services and at the network edge. Several technologies that enable data to flow across such hybrid IT architectures are converging and being equipped with generative AI technologies to put enterprise data within easier reach.

Impact of AI on observability

AI and machine learning are used for and by observability platforms. How they are used will likely remain a differentiating factor for the next two years. Early uses of AI and ML revolve around anomaly detection and early detection of impending failure in applications and infrastructure. However, AI is being developed to better understand application topologies and to predict the impacts of changes to applications more accurately. Generative AI is being applied to support more natural interactions with data, including searching and copilot assistance with queries and report building.

Cloud-native networking to support dynamic connectivity

Enterprises continue to increase their use of cloud-native application architectures and services, which is driving new demands for networking within enterprises. Networking vendors and cloud services offer a variety of networking designs and products to support dynamic connectivity and security requirements while simultaneously being easier to provision and manage compared with traditional networking. Cloud-native networking includes advanced services that rely on automation such as self-service delivery, support for autoscaling and the ability to adapt the network as quickly as application requirements change.

Generative AI-assisted software development and IT operations

Generative AI technology such as ChatGPT is poised to disrupt how enterprise software applications are developed, as well as how they are deployed and managed. Enterprises must understand the tools, trends, challenges and opportunities around this much-hyped technology that is poised to touch all aspects of software development and IT operations.

Serverless matures and evolves in the enterprise

While adoption of cloud-native technology and approaches such as containers, microservices and Kubernetes has grown in the enterprise, serverless is now poised to proliferate across more use cases and enterprises alongside these other technologies and, in some cases, without them. Serverless technology has evolved beyond functions as a service and compute. Additional serverless services including storage, database and monitoring are expanding the applicability of serverless to more software and teams.

Enterprise utility and readiness for a quantum future

Quantum technology (quantum computers, networks and sensors) is anticipated to exponentially speed up certain classes of workloads. Identifying business problems suitable for quantum computers and devising algorithms to convey those problems is essential to extract value from this emerging technology, particularly as quantum hardware and software continue to develop and quantum networks begin to emerge.

Semiconductor innovations and disruptions

The silicon industry faces unprecedented disruptions and opportunities. Supply chains are too complex and distributed for a world facing natural disasters and major geopolitical shifts. Demand to return to localized chip manufacturing and packaging is being backed by massive government funding. This has major implications for the predominant fabless semiconductor model of many leading vendors. Meanwhile, technology continues to evolve rapidly in areas such as cloud-native silicon, specialist AI accelerators, edge inference, open-source silicon, embedded security, quantum computing and new rapid design tools.

The AI infrastructure arms race

The explosion of interest in generative AI has kickstarted a rapid build-out of hardware capable of training large language models — mostly in the form of massive graphics processing unit (GPU) clusters at hyperscalers, cloud service providers and enterprises. The performance and economics of these clusters is key to the future delivery of both AI model training and inference. It involves not just the GPU (or equivalent) itself, but also the systems, networking and memory architecture surrounding the processor engine. Decisions made only a few years ago by vendors, high-performance computing research labs and cloud datacenter operators may now be open to question, given the sudden shift of the goalposts. Our coverage tracks these shifts and looks at infrastructure trends and deployments in the light of the new AI landscape.

Tracking telecom industry transformation: Network cloudification must drive monetization

The global telecom industry has entered the next critical phase of 5G market development, and we expect a distinct shift in focus from monetizing consumers to enterprises. For most tier 1 operators, the long-term ROI of 5G depends on enterprises recognizing its potential as a platform to support digital transformation that can also include exposing IT capacity on integrated edge computing nodes (multi-access edge computing). With billions spent on 5G spectrum and infrastructure, the next few years will be critical for all 5G stakeholders to develop new ecosystems, attract new application developers and experiment with new business models that optimally expose the profit potential of 5G in both private and public deployment models. While building new revenue pools with B2B users and developers is a high priority, it is also important to accelerate the use of cloud-native practices and technologies in core networking and radio access networking and IT operations to reduce costs and enhance agility.

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Cloud & Managed Services Transformation

Cloud is no longer a separate category from IT: quite simply, it *is* IT. The consumption-based, as-a-service cloud operating model continues to extend its reach across the IT landscape, including hardware, systems, software and services. Organizations now face more choice (and complexity) as they build, integrate, manage and transform their digital infrastructure stacks while also optimizing for cost efficiency. As a result, hybrid/multicloud/"cloud anywhere" has become the organizing principle of IT strategy, bringing cultural and organizational change for IT buyers and suppliers.

The Cloud & Managed Services Transformation channel tracks how enterprises are reinventing their IT environments as the focus shifts from "cloud building" to "cloud operations." IT vendors and service providers are also evolving, with increased focus on flexible infrastructure, platform-based services, cost optimization, unified management, and ecosystem-driven solutions development, go-to-market and service delivery.

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Public cloud's third decade: From disruptive technology to building block of the digital economy

The cloud wars are over, and cloud has emerged victorious. While cloud is still about infrastructure, architectural approaches and "Day 0" thinking are starting to displace basic migration and operational considerations. In addition, as cloud comes into its own as a platform for digital innovation and transformation, the analytics, edge/IoT, AI/ML and other specialized tools built on top are changing the game — resulting in shifting organizational dynamics, new technology roles, greater IT-business alignment and increasingly partner-led cloud ecosystems.

FinOps and the changing dynamics of cloud optimization

The emerging discipline of FinOps is taking center stage in organizations' IT planning processes — public cloud spending is growing to the point where it has a noticeable impact on organizations' bottom lines. As ongoing economic uncertainty prompts organizations to search every corner of their operations for greater efficiency, the combined impact of public cloud's pay-as-you-go pricing model, ongoing data-driven business transformation and the advent of generative AI requires greater visibility into usage to avoid budget-busting surprises. The benefits of cloud outweigh the risks, but the need for cost optimization is universal. Momentum is gathering around ways to address this issue, with increasing emphasis on FinOps to maximize cloud's value to organizations.

Selective application modernization: The role of hybrid architectures

As businesses continue to take advantage of public-cloud–based services, many are discovering that they have a choice not only in terms of which applications to update, but also which functions within an application are most amenable to modernization. A workload consists of compute plus data, and many organizations are loath to move their primary storage volumes off-premises (or they simply cannot, for regulatory or governance or performance reasons). Hybrid architectures are becoming more sophisticated and complex as vendors refine the functionality of and connections between on- and off-premises services to accommodate customer needs.

It takes a village: The role of partner ecosystems and marketplaces in digital infrastructure

Hyperscalers are often at the center of cloud discussions, but multiple entities participate in the emerging "cloudverse," including systems integrators, managed service providers, independent software vendors, hardware vendors, resellers and distributors. In addition, as hyperscalers' cloud marketplaces shift from storefronts to partner-led enablers, new competitive dynamics emerge in cloud ecosystems.

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Cloud Native

Cloud-native technologies and practices are becoming increasingly common among enterprises, with operational efficiency, sustainability and security among the key objectives that are now driving adoption. 2023 has highlighted just how much Kubernetes has transformed the IT landscape — and how far it has to go. Vendors and end users are wrestling with the complexity and limitations of deploying and maintaining containerized applications in production, security, improving integration of parts and driving increased developer productivity. Bridging these "Day 2" gaps will be the industry's focus in 2024. The rise of platform engineering will continue, fresh approaches to application networking are emerging, the need for cost governance (aka FinOps) is rising, and options at the edge are expanding. The potential for AI to flatten the learning curve, reduce cognitive load and speed time to value is creating excitement and some trepidation in cloud native as it is across all sectors.

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Driving the next wave of cloud-native adoption

Organizations investing in cloud native are deepening their commitments, with these practices spreading to a greater portion of their applications. Homegrown cloud-native software development is strong with the rise of platform engineering. Improvements to IT operations efficiency is accelerating as cloud native's biggest benefit, while FinOps and optimization in cloud native is becoming an imperative. Security, complexity and cost are considered the biggest barriers, and mastering cloud-native skills and capabilities now involves using some kind of managed services. Our coverage will look at impacts and opportunities.

Optimization: Governing and controlling cost in cloud native

As long as cloud-native infrastructure supports pay-as-you-go pricing, performance will have a key role to play in controlling costs (and feeding FinOps processes) as well as improving sustainability. A handful of vendors are combining cost and performance measurements with machine learning for pre-production and production workloads to determine ideal configurations for Kubernetes clusters based on user priorities. With cost awareness being built into the observability stack, the option to intelligently scale usage based on application demand and business priorities can enable true pay-per-use (rather than pay-per-provision) economics. Cost optimization capabilities are also being built into the cloud-native software development life cycle, bringing cost metrics to the fore before code is launched into production.

Expanding cloud use cases for observability

Cloud-native application life cycle management is a significant driver for the adoption of observability tools. Observability data is being used for more than application and infrastructure monitoring; it is being used by diverse stakeholders including developers to aide in troubleshooting and security practitioners for anomaly and event detection. We will be exploring these and other use cases throughout the year, highlighting the ways observability vendors and services can open new opportunities in enterprise IT.

Applying AI for application modernization

With its affinity for language and capacity to learn, artificial intelligence has the potential to be a gamechanger in the application modernization space. As an organization refactors its code bases to take advantage of cloud's flexibility and scalability, domain-specific data can be applied to accelerate the process. Deconstructing and modularizing monolithic code bases is neither easy nor straightforward, and return on investment is difficult to predict. How are enterprises (and supplier ecosystems) tackling this challenge?

Cloud-native application protection platforms continue rapid growth as cloud security budgets increase

The cloud native application protection platform (CNAPP) market has emerged as one of the hottest markets in the cybersecurity industry in terms of venture capital funding, customer budget growth, vendor revenue growth and acquisitions. The CNAPP market includes major security platform vendors, highly funded start-ups that are now well-established, and also newer startups looking to find a market niche. We plan to track the CNAPP market closely as it evolves.

The evolving role of platform engineering

The concept and practice of platform engineering (PE) has emerged as the latest contributor to improving the quality, consistency and speed of cloud-native application development and deployment. It joins the earlier practices of DevOps and site reliability engineering. Some believe PE potentially replaces either or both, others believe it's integral and all are required. Our coverage will examine the capabilities and differences of each, discuss the technologies and vendors that enable them and postulate what all this means to an enterprise.

The evolution of resiliency and disaster recovery

Meeting disaster recovery and business continuity requirements continues to be a top challenge for organizations that are under pressure to enhance their infrastructure and application resiliency. Just as the rise of virtualization forced organizations to rethink their data protection strategies, the advent of cloud native technologies, such as containers, will drive change and the potential to improve infrastructure resiliency in the future. Site reliability engineering has risen to become a key addition for many organizations to enhance resiliency.

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Consumer Technology

S&P Global Market Intelligence's Consumer Technology research covers the connected devices, software platforms and broadband infrastructure that are driving how consumers around the world access entertainment and interact with one another and are fueling the development of new business models. Deliverables include a mix of annual reports, quarterly updates and detailed global forecasts, as well as results and analysis of in-depth surveys of both consumers and service providers.

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Connected devices: Analyzing the evolution of smart products and connected media experiences

Connected device coverage from S&P Global provides in-depth analysis of leading consumer electronic products such as smartphones, smart TVs, streaming media devices and video game consoles. Our research deliverables include five-year device forecasts by geographic region, along with coverage of key market issues, product development trends, technology shifts and end-user behavioral changes.

Broadband infrastructure and platforms: Tracking disruption and ecosystem opportunities

Our broadband infrastructure research provides insight into how product and platform vendors, along with telecommunications service providers, are providing enhanced broadband connectivity around the world. Quarterly and annual reports include coverage of both broadband customer premises equipment devices and key infrastructure platforms, highlighting the market sizes and key events shaping the telco, cable, fiber and 5G mobile industries. We also examine how rapidly, or not so rapidly, global service providers are adopting next-gen technologies into their existing services. Coverage includes results and analysis of an annual survey of global telco, cable and 5G service providers.

The development of the metaverse and other connected ecosystems

Constant change is a hallmark of the consumer technology industry, and product and service ecosystems are evolving to provide consumers with new and enhanced experiences. These ecosystems can be company-based, industry-based or lifestyle-based. Our coverage of this topic includes an examination of ecosystems ranging from the consumer IoT market to the video gaming market to the evolution of the metaverse. Our metaverse coverage includes an annual global consumer survey that tracks usage of and engagement with virtual environments.

Gaming and smart TV software platforms drive new business models

Software platforms are becoming integral to the connected consumer experience, and we have expanded our market coverage beyond devices, infrastructure and ecosystems. Our software platform research coverage includes the connected TV operating system (OS) market, tracking the growth of platforms such as Google TV/ Android TV, Amazon Fire TV and Roku. We also cover the burgeoning market for video game software, including analyzing and sizing the video game content market.

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Customer Experience & Commerce

Businesses are increasingly competing in an experience economy where success is defined by the ability to generate and monetize sustained emotional engagement among consumers. Delivering these personalized experiences at scale with growing precision and velocity results in a multidimensional approach to achieve transformational outcomes for the business, from the employee to the customer and partner ecosystem. A key part of the strategy is going beyond business as usual to ensure a well-planned approach for continuous improvement in both business and technology innovation to remain relevant to customers.

The acceleration of digitization, cloud and data is underpinning innovation as businesses require easier-to-use enterprise applications that can securely empower lines of business with codeless capabilities. Execution is at a critical stage, and digital maturity matters as businesses focus on investments in modern platforms to leverage generative AI and data-driven insight to deliver new experiences that will be more immersive, frictionless and contextual.

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The state of advertising technologies shifts to be more connected

The advertising industry has been on the verge of major change for several decades. Now, there is heightened demand for better technologies, especially for digital channels such as streaming, social media and e-commerce. The future is applying new technology to critical areas including convergent television (CTV, linear, FAST, etc.), retail media and creative tools. Generative AI scales creative assets, adjusting content in real time based on the context of individual users, and improves placement with data-driven measurement tools. New AI and machine learning tools, including the use of generative AI, is changing how marketers activate content across a multitude of platforms to improve not only campaign success, but also operations.

The age of the creator economy

Social media is a major source of growth for both brands and individuals. Influencer marketing and user-generated content have become important components for brand awareness. Social media operates on paid media (company-sponsored), earned media (unaffiliated users post on their own) and owned media (content from an organization's own channels). A mix of all three is key to good brand presence, but there is increasing reliance on the ecosystem of content creators.

Better B2B sales and marketing through technology

The next generation of B2B marketing tools will leverage cutting-edge technology to deliver highly targeted, measurable campaigns. Businesses can now customize messaging across multiple channels by utilizing a blend of AI (including generative AI), analytics and workflow automation. Email automation, content generation, search engine optimization and social media apps will work in tandem to nurture leads through the sales funnel. Additionally, they will capture data useful for future campaigns.

Composable architectures accelerate digital maturity

Roughly half of organizations are investing in more composable and/or headless architectures to reduce complexity, create manageable components and drive operational improvements. Composable architecture is a set of modular components, such as microservices, APIs and headless applications, that can be easily assembled and configured to meet specific needs of businesses. Getting digital experiences right is influenced in large part by how quickly and effectively businesses can roll out these new features, touchpoints and front-end capabilities. Composable architecture provides organizations with the ability to iteratively tack on functionality or phase it out without the need to re-platform, affording IT agility on the back end without disrupting key workflows/processes for front-end digital experiences.

Embedded commerce and its future for creating shoppable experiences anywhere

Customers can buy products anywhere across a multitude of channels: social media, advertisements, TV, chatbots and customer service agents. Instead of relying on an independent service to power those purchases, companies with the right technology can process them using the same underlying catalog, inventory, fulfillment and order management infrastructure. By creating more opportunities for customers to make purchases and removing friction, embedded commerce is a powerful and efficient way to increase revenue and improve customer experiences. There has been a shift occurring behind the scenes regarding integrated commerce to deliver a more advanced in-media shopping experience. Shoppable commerce is the next stage of shopping in digital media, in which users can buy products directly from the medium they are engaging with. This includes channels such as streaming services, TV, advertisements, social media posts and livestreams, removing extra steps to find and purchase products.

Data-driven experience economy

Over the past year, businesses that allocated a larger portion of their IT budgets to digital transformation also accelerated the pace of strategic projects, such as cloud-native technologies and data analytics initiatives, which are needed to support real-time, data-driven goals. The continual degrading of third-party data tools such as cookies is inevitable. Although the American Data Privacy Protection Act has made little movement in the US federal government, organizations are shifting to privacy-focused, homegrown data efforts such as first-party/zero-party data. Requirements for a modern customer 360-degree view and real-time profile to improve the customer experience across the entire journey will accelerate investments in customer intelligence platforms.

FinTech vs. financial institutions: Competing in the digital economy

Fintech is becoming increasingly ubiquitous in the US, with most consumers now using at least one financial service from fintech providers. As consumers are now going digital by default, once-aspirational views of innovative digital experiences have become requirements for the ideal experience based on a real-time, data-driven foundation. As a result, financial institutions face a competition based on digital experiences, not products or price. Many fintechs are harnessing digital technologies to specifically target the accessibility and usability problems that have long existed in banking. Incumbent financial service providers must recognize that the new battleground is the end-to-end digital experience.

The middle office tech stack is the future of B2B revenue generation

CRM, sales enablement and account-based marketing all remain foundational technologies for revenue generation. However, systems of action based on predictive analytics, large amounts of client data and easy-to-understand dashboards have increasingly informed strategies and tactics. Armed with those strategies, sales teams can discern patterns and opportunities in customer behavior and use them to their advantage. This momentum is pushing some sales-enablement technology beyond the confines of the front office into a new “middle office” market, which is the glue for operational efficiencies and revenue gains.

The growing maturity in the customer success market

Despite having a disappointing year by only growing at about half its expected rate, the customer success market is reaching a new level of maturity. Underpinned by new offerings and a refined understanding of customer life cycles, it is no longer just an extension of customer service. Customer success now has a strategic focus, often influencing product development and marketing. Customer success management platforms still integrate with CRM systems of record, yet organizations increasingly see them as a vital part of the revenue-generation stack and essential for predictable growth.

Service is the new marketing

The advancements in AI and machine learning, including generative AI, have had a transformative effect on operational improvements for customer service through the use of large language models and prompt-based interactions that not only can perform the mundane tasks, but also act as an agent to gather the information. AI/ML can summarize and analyze complaints and customer journeys, allowing agents to dedicate more time to customers. Customer data is also changing the trend for storytelling as businesses strive to connect with customers who demand more personalized and immersive engagements across mobile, social platforms and video channels. The human element is becoming more important as business relationships become less transactional between people and more nuanced interactions between people and the systems and devices they use daily. Using real-time conversations to discover, engage and transact through SMS, video and chat is now the norm.

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Data, AI & Analytics

While it would be tempting to just put “generative AI” as the title of a research agenda and be done with it, that would be too simplistic and not reflect the interdependencies between the various fields of data, AI and analytics. For sure, generative AI is — or will soon — pervade all aspects of the technology stack and has impacts way beyond the choices organizations make about how to build, buy and deploy technology. But it is an enabling layer — and one that relies on data to work. Having highlighted the potential of large language models in our 2022 and 2023 research agendas, now we will be focused on how the underlying platforms are morphing to support the generative AI explosion, as well as other key issues such as skills, the economy, supply chains and the global political and regulatory environments.

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Enterprise data-driven decision-making in age of generative AI

Generative AI is increasingly pivotal in data science and analytics. It addresses current and upcoming use cases, shaping the industry's trajectory. Employing generative AI presents advantages and hurdles for enhancing enterprise data-driven decision-making on a larger scale. The question remains: Can generative AI truly facilitate easier access to data-driven choices? Defining user personas and their engagement with generative AI is crucial for effective targeting. This technology's impact hinges on understanding its role across varied user groups and tailoring strategies accordingly.

DataOps value: Business outcomes in data management

DataOps methodology is largely defined by automated approaches to data management, but true "ops" style operationalization requires understanding of business outcomes. Trying to orchestrate all the relevant tools and processes without understanding their full downstream impact on business performance is largely impossible. But to understand the efficacy of data management functions such as data quality and metadata management, organizations also need to invest in identifying and measuring the appropriate metrics. DataOps strategy requires understanding the relevant business challenges, organizational processes, stakeholder roles, available technologies, vendor market segments and broader automation trends.

The evolving discipline of AI governance

The domain of AI governance has evolved beyond regulations, laws and internal mandates, extending to encompass all model types, leading to the emergence of a new software category known as AI governance. Data science and analytics vendors are actively adopting AI governance principles. This introduces advantages and complexities to enterprise data-driven decision-making. The integration of generative AI raises questions about its impact on AI governance software. However, AI governance software alone is insufficient. Corporate culture, legislation and regulatory guidance also play vital roles in ensuring ethical and equitable utilization of AI across corporate data-driven choices.

Shifting blockchain from pilot projects to in-production networks

Many organizations have engaged in blockchain pilots, but few have scaled these initiatives meaningfully. As the dust settles on TradeLens, one of several landmark enterprise blockchain networks to be depreciated in recent years, what learnings are a new ecosystem of blockchain initiatives bringing forward?

Wrapping generative AI in enterprise-grade tooling

Generative AI uptake has been rapid, but governance concerns and a desire to more finely tune outputs is limiting the levels of integration within business workflows. A generative AI stack is starting to form, building up from foundation models, tying in governance, data management and development tools. While some vendors are positioning themselves to address the entire stack, others are building out niche capabilities, focusing on single modalities or specialist capabilities.

Pivot for privacy and governance: From policy to tech?

Privacy and governance practices were once overwhelmingly associated with policy and legal skills. But is that changing? Supporting technology and supporting practices are rapidly accelerating downward into the data stack and code development layers to enforce policies on living data. Meanwhile, privacy expectations and concerns rapidly evolve as an array of emergent technologies (e.g., generative AI, metaverse) disrupt life. Enterprise data governance and privacy practitioners are forced to consider how these technologies will not only be safely addressed, but also potentially even be used in the data governance and privacy effort itself: to help put the "ops" in PrivacyOps.

Vectors and large language models, a match made in generative AI heaven

The vector data model is rapidly gaining traction because it complements large language models (LLMs) and drives generative AI applications. Both pure-play vector database vendors and incumbent database vendors have embraced vectors. Enterprises are eager to embrace and develop generative AI applications, but how to take advantage of generative AI is a different matter. Two use case scenarios are emerging: enabling better prompt context for LLMs and adding long-term memory for LLMs. Will there be other applications for vectors and LLMs?

The immediacy mindset drives data architecture innovation

The immediacy mindset refers to the ever-growing appetite for faster time to insight and greater reactivity in fast-changing business environments. This will require a transition of data architectures in a real-time direction. We are seeing it manifested in three key and closely related areas: analytics, stream processing and real-time machine learning.

A single cloud environment for all your database workloads and more

Database workloads — whether operational or analytical — have traditionally been systems-based. The adoption of cloud, new data table formats and high enterprise interest in all things AI is flipping that model. Gravity is pressing in on enterprise data and driving it to the cloud where it sits in object storage. A handful or industry leaders and the cloud hyperscalers have openly embraced the so-called "data cloud" model where the data sits in cloud object storage and multiple workloads operate on data. Data management and associated security are part of these data clouds, but so too are data marketplaces and app stores as enterprises find new ways to leverage their data.

Regulating AI — do try to keep up

Regulation of AI has been evolving slowly over the last few years. But the launch of ChatGPT and ensuing alarm it caused in national governments has accelerated the scramble to understand the impact of generative AI on society and figure out the best framework to address it. The EU AI Act is the farthest along in terms of offering some sort of template, but every national government and supranational body will spend many days and weeks in 2024 trying to keep up with developments in generative AI.

Shifting skills — end of the data scientist supremacy?

Enterprise adoption of machine learning has been dependent on many things, but one of them has been the relative scarcity of data science skills. Generative AI may be set to change that. That is not because data science talent is not needed; for those building their own foundation models, it is essential as it is for those that want to practice fine-tuning of existing foundation models. After years of attempting to create a new category of "citizen data scientists," which never really took off, generative AI is redefining who can be called an "AI developer." Application developers of all types not only have code-generation tools at their disposal to make them more efficient and multi-lingual, but vendors will also build tools to enable application developers to use models via APIs using conversational interfaces, in addition to techniques such as prompt engineering.

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Datacenter Services & Infrastructure

The Datacenter Services & Infrastructure channel focuses on the global datacenter market, with research covering critical metrics such as capacity and utilization, as well as products, technologies, strategies and trends used by companies building and managing advanced, resilient and efficient datacenters. Technologies covered include cooling, connectivity, demand-side energy approaches, redundancy, IT hardware and software for the management of datacenters (such as DCIM), prefabricated and modular datacenters, and edge datacenters. Services covered include leased datacenter services, managed services and interconnection.

Much of our research is segmented by regions, countries and key city markets. Specific deliverables include profiles of vendors, geo-specific evaluations, examinations of key trends, analysis of M&A activity and tracking of the ongoing expansion activity of datacenter operators and hyperscalers. Aimed at executives from datacenter providers, as well as vendors, investors and real estate professionals, the Datacenter Services & Infrastructure channel covers the overall size, scope and growth of multiple aspects of the datacenter industry.

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Datacenter growth: Locations, impacts and demand drivers

The team tracks datacenter markets around the world and analyzes what is happening in those markets and how they compare. Coverage includes the current and potential impacts of cloud providers and IT firms on each market, as well as other market drivers such as access to subsea cables, local enterprise demand, access to electricity and land, permitting and government regulation. We publish detailed insight reports on 30-40 city-level markets per year, with more than 150 other markets tracked in our database and written up when necessary.

The impact of artificial intelligence on infrastructure requirements

Artificial intelligence, high-performance computing and workloads that use high-powered chips often require specialized infrastructure or configurations that can be challenging to cool. We analyze potential demand for these workloads and the technology developments related to them, such as new chips, approaches to networking and innovations in cooling, to evaluate how these could impact datacenter design.

Sustainability requirements will transform the datacenter industry

As enterprises evaluate their infrastructure and focus on improving sustainability, newer and more efficient leased datacenters may have an edge over enterprise-owned facilities. We expect that environmental footprint will become a key element of enterprise infrastructure strategy, along with more traditional criteria such as cost and performance. We survey datacenter customers to understand their requirements and goals; we also discuss with providers their efforts to improve datacenter sustainability. In addition, we examine various technology trends in detail, including liquid cooling, using datacenter waste heat for district heating, battery design and chemistry, alternatives to diesel generators and other technical changes in datacenter construction and operation.

Datacenter providers and business models

As the datacenter industry matures, datacenter providers are seeking new ways to differentiate and adjust their business models. We track more than 2,000 providers in our database and engage with them via interviews, datacenter tours and online updates, publishing more than 120 provider-specific analyses per year as well as spotlights covering multiple providers, for instance, in a particular market.

Edge computing: Impacts for datacenter providers

Edge computing will provide growth opportunities for datacenter operators as enterprises seek to place workloads outside the cloud not only for low-latency purposes, but also for reasons tied to governance, cost and data gravity. Operators will need to satisfy requirements for low maintenance and tight power conservation, and network innovations will impact what data will be processed and stored at the edge and what can be moved elsewhere.

Cloud in Asia-Pacific

Public cloud is increasingly adopted throughout Asia-Pacific but at different rates in different countries. This has implications for the cloud market and for the datacenter infrastructure in each area.

Blockchain and cryptocurrency: Pros and cons for the datacenter industry

Cryptocurrency mining has one thing in common with typical leased datacenter customers: the need for space and power. However, following dramatic cryptocurrency price crashes, some datacenter operators that had leased space to cryptocurrency miners saw their customers go bankrupt. In other cases, miners have expanded their business model to include providing datacenter services.

S&P Global
Market Intelligence

Fintech

The fintech sector was flush with venture capital and unabated enthusiasm for much of 2020 into mid-2022. That stands in stark contrast to the reality check that has settled in over the past 18 months. For many fintechs, this period has tested their staying power and relevance. The line between those that have found product-market fit and those that haven't is now more distinct than ever.

We envision 2024 as a "getting back to business" year for the sector. With secular tailwinds proving resilient, battle-hardened fintechs will have a fresh perspective on what's needed to power long-term sustainable growth. Our research will assess the strength of fintechs' market position and their ability to drive meaningful outcomes for consumers, enterprises and financial institutions. In doing so, we aim to shine light on the trends, technologies and partnerships that will create specific opportunities for fintech market participants to develop financial products that more effectively serve the needs of their customers.

VIEW FULL AGENDA

Key Issues for 2024

The future of embedded financial experiences

The proliferation of embedded finance has given rise to a vibrant "as a service" market opportunity centered on enabling enterprises to outsource the capabilities and infrastructure required to deliver financial products and services to their customers. Our research will explore the dynamics surrounding the various fintech-as-a-service segments, running the gamut from banking and lending to payments and cards.

Converting payments into a competitive advantage

High-performing enterprises are harnessing payments to distance themselves from the competition. We assess the payment strategies, technologies and vendors that can help to increase transaction success rates, drive operational efficiencies and deliver improved commerce experiences.

Taking a CX-centric approach to fraud prevention

Effective fraud-prevention strategies minimize losses while driving revenue and customer experience improvements. Our research focuses on the key fraud-related challenges facing fintechs and merchants, fraud trends and the impact of fraud prevention on customer experience.

Fintech end-user needs and requirements

Fintechs have set out to reinvent the experience of using financial services, but they must recognize that end users are the North Star guiding the direction of the market. Our Voice of the Customer research provides a detailed view into the emerging financial needs and requirements of small and medium-sized businesses (SMBs), enterprises, financial institutions and consumers.

Streamlining B2B payments to create operational efficiencies

Digital payments are streamlining how businesses pay and get paid, and how they access and optimize capital. This is driving cash flow improvements and creating various bottom-line efficiencies, while at the macro level, it contributes to a healthier economy. Investors and vendors are increasingly gravitating toward the large-scale opportunity of B2B payments transformation, and our research will unpack what this means for SMBs and enterprises.

The rise of bank and fintech partnerships

Banks and fintechs, traditionally considered competitors, are increasingly collaborating to jointly bring financial services to market. We will assess the opportunities and best practices for partnerships.

Financial health and inclusion initiatives drive innovation in financial services

Fintechs and financial institutions have an opportunity to bring more people and businesses into the global financial system by making financial services more accessible. These financial inclusion initiatives — running the gamut from earned wage access to mobile money — are disrupting traditional business models and helping to take fintech mainstream.

The perennial challenge of cross-border payments

Fintechs are still searching for ways to provide seamless, low-cost international payment experiences while ensuring that compliance is watertight and that customers are protected from exchange rate volatility. The industry has yet to truly crack this challenge.

CBDCs — payments in a world of "two-tier" money

Countries around the world are experimenting with central bank digital currencies — wholly digital versions of fiat money. CBDCs are already live in several countries including Nigeria, the Bahamas and Jamaica, and more are set to follow in 2024. Our research will assess both the market potential and implications of CBDCs.

Banks, fintechs must prepare for the reality of instant payments

Real-time account-to-account transfers, driven by private market initiatives and central-bank-led public infrastructures, are gaining popularity. We will track global real-time payment usage trends, use cases and innovations. Our research will evaluate the evolving market opportunity for financial institutions and fintechs integrating with instant payment networks.

Evolution of the Asia-Pacific fintech landscape

The Asia-Pacific region is leading the world in digital transformation of financial services. Our research will highlight venture capital flows, payments trends, emerging technologies and business models, and leading players in the APAC financial technology space.

Following the fintech money

The recent downturn in the venture capital environment may have caused some deceleration in fintech funding, but underlying fintech trends remain strong, and the sector will likely continue to garner significant VC attention. Funding received by fintechs globally amounted to $23 billion in the first half of 2023, according to S&P Global Market Intelligence data. Our research will follow global fintech venture investment trends, detailing activity and fundraising volume across fintech verticals and geographies.

Tracking the progress of open banking

Countries worldwide are adopting different flavors of "open banking" either through government mandates or market-driven efforts. Banks are opening the data pipes via APIs to third parties —primarily fintechs — which could lead to significant changes in the realm of payments and banking. While uptake has been slow in most markets, several tailwinds suggest that adoption rates will speed up. Our research focuses on identifying and assessing banks and fintech firms operating in the expansive open banking ecosystem.

The role of banking technology vendors in driving digital transformation at financial institutions

Banking technology players comprise a range of legacy and cloud-based vendors, including core banking, digital banking engagement, cards and payments processing, and modernization platforms. In spite of the current market downturn, digital transformation could see momentum due to the latest messaging standards, instant payments, and open and embedded finance. Our assessment involves examining the various strategies, technologies and vendors that may accelerate modern technology adoption roadmaps for banks.

S&P Global
Market Intelligence

Global Media Research

The media business has transformed over the past decade as consumers embrace digital technologies. TV, radio and film content can now be accessed in the home and on the go across almost any connected device. Assessing, tracking and forecasting media markets remains critical as streaming video; free, ad-supported TV (FAST); NextGen TV and podcasting pave the way for growth. Our TV network and broadcast station economic models, streaming service operator profiles, consumer insights surveys, industry projections and expert analysis from our global media team are vital for navigating the digital entertainment landscape.

VIEW FULL AGENDA

Key Issues for 2024

OTT goes global as the streaming model evolves

Netflix and Hulu set the stage for the streaming revolution in the US more than a decade ago, and consumers around the globe are now embracing streaming video. The over-the-top (OTT) model is evolving past subscription video to encompass ad-supported tiers as well as free, ad-supported TV (FAST) services such as Tubi, Pluto TV and the Roku Channel. This evolution presents challenges and opportunities for broadcasters, networks and media owners around the world as they look to leverage their assets and adapt to consumers who increasingly opt to stream entertainment, sports and news programming.

Digital transformation in TV distribution and economic models

As consumers turn away from legacy multichannel subscriptions (cable, direct broadcast satellite, telco video), TV network owners are facing declining affiliate and advertising revenues. Many network owners have launched direct-to-consumer services to help mitigate losses from traditional declines as they follow consumers to streaming platforms. For broadcasters, the shift has impacted growth in their retransmission fee revenue from multichannel subscriptions, with their own distribution model being reshaped to include live station streaming and FAST services.

Sports rights evolve with emergence of broadcast and streaming distribution models

Professional sports leagues and teams are exploring alternative distribution options for their local games, with regional sports networks (RSNs) under pressure from declining subscribers and rising sports rights costs, leading to bankruptcy restructuring, transfers or liquidation. Local TV stations coupled with a direct-to-consumer streaming model have become a viable alternative to the traditional RSN with recent deals between broadcasters and teams such as the NBA's Phoenix Suns and Utah Jazz and NHL's Las Vegas Golden Knights.

Broadcasting could see a resurgence as free over-the-air TV and radio gain in popularity

Opportunities for broadcasters to boost revenue and relevance include NextGen TV, new Diginets, broadcast OTT launches, live station streaming and podcasting. One major advantage that broadcasters hold against their digital rivals is the ability to serve and build trust with communities, including through local news. Over-the-air (OTA) households have been growing as budget-tightening consumers cancel pricey pay TV subscriptions and opt for OTA access to essential local news. Ownership cap relaxation could also pave the way for new investors and M&A.

Global advertising outlook based on changing demographics and shifts in media consumption

TV network ratings have undergone massive swings in recent years as viewing behavior has shifted from live to on demand. Sports and news networks have seen explosive ratings growth, while general entertainment networks and children's networks have experienced declines. The $40 billion US TV advertising market remains reliant on Nielsen as the primary ratings currency to drive deals, but companies such as ComScore are gaining market share. For US broadcast TV stations, record-breaking political advertising over the past few election cycles has mitigated some of the decline in national and local core spot advertising. On the radio side, ratings have been flat, but listening share has remained steady despite an uptick in streaming audio alternatives.

The outlook for the US film industry, home entertainment market

The US film industry continues to adjust to a post-pandemic environment with the slow recovery of the domestic box office coupled with the effect of shifting movie release windows to support direct-to-consumer streaming platforms. In addition, the US home video market is evolving with physical media (DVDs, Blu-Ray) declining as streaming and on-demand alternatives grow.

S&P Global
Market Intelligence

Global Mobile Research

The mobile industry sits at the heart of the consumer economy and is increasingly embedded in the business world as connectivity through the internet of things (IoT) and smart devices proliferate. Advances in mobile technology are driving new possibilities via 5G and edge computing, to support the metaverse and automotive connectivity, for instance, as well as consumer retail and financial applications.

The advent of higher bandwidth and gigabit-speed networks is driving significant changes and opportunities in how operators position their mobile business in a saturated consumer sector. This step transformation is nascent, and we will continue to track the key developments globally as we expand our mobile market coverage beyond the US, Europe and Asia to Latin America, the Middle East and Africa in 2024.

Insights will include modeling and forecasting the dynamics of each mobile market — the networks and the subscriber composition and associated revenues — while also tracking regulatory developments such as spectrum auctions and ownership. Tower sales have been a key theme, and we will continue to grow our extensive coverage of tower economics.

VIEW FULL AGENDA

Key Issues for 2024

Mobile industry leverages new revenue streams with 5G development

The surge in popularity of mobile services since the onset of the COVID-19 pandemic — and the associated revenue boost for mobile providers — has mellowed as people adjusted to the new normal. In many markets, the introduction of 5G services offers new revenue streams, especially in data and value-added services. In others, the demand for 5G services, especially among consumers, is yet to mature, so operators are pivoting to enterprise 5G for revenue opportunities. Private 5G networks, network slicing and edge computing are some of the new technologies enabling this pivot.

Expanding 5G commercial services: Stand-alone deployment, open radio access network, millimeter wave

There are 249 operators across 97 markets worldwide that actively operate commercial 5G services as of June 2023. With many markets having at least one commercial 5G service deployment, we expect future launches to shift from the current non-stand-alone mode relying on 4G to the ideal stand-alone mode. While big technology vendors still dominate the 5G infrastructure business, there is a movement to adopt open radio access network (RAN), which allows companies to be more flexible with their technology vendor partners. The opportunity of launching millimeter wave 5G in stand-alone mode remains on the table, and this could unlock new use cases promised by 5G.

Tower deals among telecom and tower companies

The launch of commercial 5G services marked a turning point for many companies worldwide as they finally had to reckon with servicing the debt they have accumulated after years of hefty capital expenditures. Tower deals have become a popular choice among telecom companies as the cost of raising new capital remains high. Both telecom and tower companies benefit from this development, as the former raise cash and can focus on improving mobile services, and the latter develop economies of scale with their expanding tower portfolios and build on the assets in their tower real estate.

Saturation and slowdown in the US wireless market

It remains uncertain whether the US wireless carrier industry can sustain the aggressive growth rate of postpaid phone subscriptions it has seen in the last decade — especially in a slower economy. At the end of 2022, total postpaid phone subscriptions reached more than 247 million, or 74% of the US population, while total subscriptions reached 417 million, or 125% of the population. Kagan datasets forecast minimal growth in postpaid phone subscriptions — the most profitable customer segment — with a compound annual growth rate of 1.2% through 2033 amid market saturation and an economic slowdown, to account for 79% of the population. The pressure is on for carriers to find new services, product bundles and consumer hardware to drive revenue. While US carriers have largely rolled out their networks, 5G is still in its infancy in terms of monetization.

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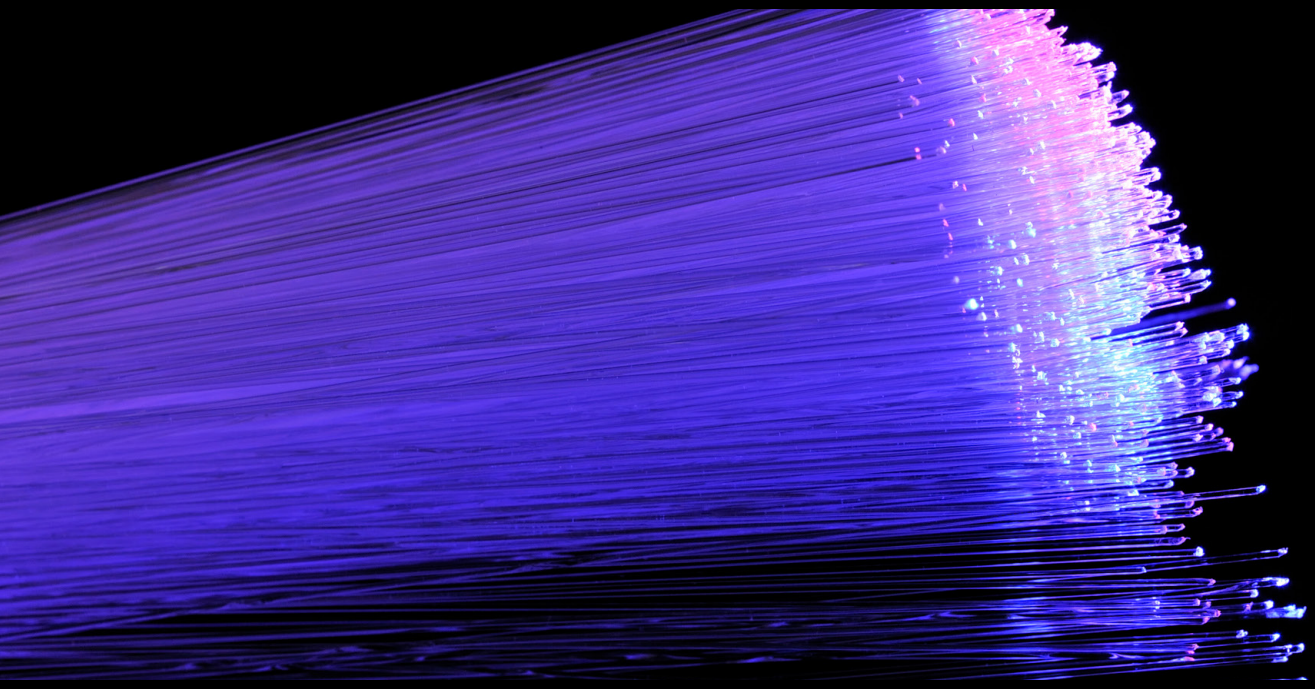

Global Multichannel and Broadband

The ongoing transformation of global telecommunications through fiber and 5G infrastructure upgrades will continue to define our 2024 research coverage. We have seen a substantial increase in expenses related to building and maintaining fiber networks, given the higher cost of borrowing, energy, raw materials, equipment and labor, primarily driven by inflationary pressures. We expect telecom network operators to struggle to achieve network upgrade plans as related costs rise. We will monitor network upgrades and track new entrants closely as operators look to secure new fiber network investment partners, renew loans and focus on energy-efficient equipment.

Falling or stagnating subscriptions and revenues from traditional pay TV services will also continue to push multichannel service providers to look for new revenue streams while offloading much of the burden of delivering pay TV services to third-party platforms, as well as smart TVs and OTT video services. Our research provides an overview of telecom and multichannel TV industry evolution at both operator and market levels for more than 90 markets.

VIEW FULL AGENDA

Key Issues for 2024

Fiber cements its position as preferred broadband service

Nearly 65% of homes worldwide are forecast to use fiber broadband service by end-2034. Partnerships with local and national governments and consumer demand for higher speeds will continue to drive broadband network upgrades. Asia-Pacific is the leading fiber region with more than 86% of homes projected to be broadband-connected by end-2024, driven by incumbent telcos' universal fiber coverage targets. Meanwhile, in the US, cable operators continue to successfully bundle branded mobile phone services while competition from low-Earth orbit (LEO) satellite and fixed wireless access (FWA) dampen demand for traditional wired broadband options, cable and fiber.

Traditional multichannel TV's streaming transformation

The proliferation of high-speed connectivity is a critical driver in shifting consumer habits away from traditional pay TV services. Subscriptions and household penetration are stagnating or trending down across all regions. Consequently, operators have moved away from proprietary pay TV services, preferring third-party services and platforms, as well as shifting their focus to B2B services, virtual multichannel and fixed-mobile convergence in bundles, as fixed telephony loses relevance and pay TV becomes a non-core offering. Our historical and forecast datasets quantify these transformations across 90+ markets.

M&A trends: Telco groups divesting infrastructure in Europe and Latin America

Top telco groups in Europe and Latin America will continue to pursue M&A activity as the industry looks to streamline operations by restructuring assets to focus on core businesses. This trend includes spinning off wholesale fiber networks while seeking investment partners to fund rollouts, as other infrastructure asset sell-offs, such as mobile towers and datacenters, continue to attract suitors.

Federal funds are here: Broadband Equity, Access and Deployment (BEAD) Program

The $42.45 billion program, created through the Infrastructure Investment and Jobs Act in November 2021, is set to play a major role in stimulating economic development and closing the US digital divide. It is expected to bring more homes into the connected economy, create jobs and spur demand for technology made domestically through its "Buy America" preference. The federal grant is estimated to start funding projects as soon as 2024, where BEAD will add onto the already ambitious homes-passed targets of top cable and telco providers. The federal program aims to deliver broadband that will sate the demand for speed, with a focus on unserved and underserved areas.

Closing the US digital divide with fixed wireless and LEO

Most of the roughly 15% of non-broadband homes in the US will likely opt for low-Earth orbit (LEO) satellite or fixed wireless access (FWA) technologies, including point-to-point terrestrial fixed wireless. Starlink launched in the US in 2021 and has accumulated almost 1 million US subscribers. Fixed wireless has been a niche broadband option for decades, struggling to cross the 2 million subscriber mark until the involvement of heavyweights Verizon and T-Mobile. Their respective FWA offerings launched in 2020, with subs now topping 8 million. In the last year, fixed wireless and Starlink subs have grown by 98% and 20%, respectively, while coaxial cable and telco fiber growth struggled at 0.3% and -0.7%, respectively. Fiber is by far the fastest broadband technology, but less-capital-intensive wireless options are likely to lead the way in closing the digital divide.

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Information Security

Information security has always been a high priority for organizations. From the evolution of IT and cloud-native technology to the powerful disruptions of artificial intelligence and its implications for both enhancing security and posing new risks, we see the importance of security reflected in technology and services markets again and again.

In the coming year, cybersecurity will assume even greater proportions. The risk of high-profile attacks has expanded, from ransomware to threats already evident in the IT supply chain. Cybersecurity has become a national and international priority, with new mandates for everything from public sector strategy to the disclosure of material breaches. Our analysts will track the evolution of technologies and services that enhance and strengthen resilience, threat detection and response, as well as incidents across a hugely diverse and growing attack surface.

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Key Issues for 2024

AI for security and security for AI: Disruptive intersections reshaping the technology landscape

For many years, security has been a primary concern affecting far more than technology — but few factors have been more thoroughly disruptive than artificial intelligence with its impact extending beyond technology. These powerful forces meet on two main fields: the application of AI for better security and securing (where possible) AI as it evolves. Our research will tackle both of these fields as AI evolves security practices while simultaneously introducing both new risks and new opportunities for security.

Threat detection and response: Disruption and evolving architecture in security operations

According to recent 451 Research survey data, the proportion of respondents planning to significantly increase spending on security analytics is more than 50% higher than for any other segment of cybersecurity technology. This has spurred the evolution of architecture as organizations recognize the many resources in telemetry, data management, analytics and user experience that they can now call upon. On the horizon is generative AI for optimizing security operations (SecOps) and enabling perpetually scarce expertise to deal with overwhelming volumes of security-relevant data.

Managed detection and response: Reshaping both security technology and managed services

Threat detection and response continues to undergo significant evolution, but making the most of the investment remains a challenge for many organizations. Where will they find the required experience to maximize the advantages of new techniques when they struggle to attract and retain expertise already? This is the opportunity for managed detection and response — an opportunity being seized by startups, pure plays and major vendors alike.

Cloud-native application protection platforms continue rapid growth as cloud security budgets increase

The market for cloud-native application protection platforms (CNAPP) has become one of the hottest in the cybersecurity industry in terms of venture capital, customer budget growth, vendor revenue growth and acquisitions. The CNAPP market includes major security platform vendors, highly funded startups that are now well established and newer startups looking to find a niche. We plan to track the CNAPP market closely as it evolves and matures.

Cloud-native privileged access management

Traditional privileged access management (PAM) products were mainly designed to control access to on-premises infrastructure. Cloud-native computing architectures have introduced new challenges that many existing PAM products are ill-equipped to handle. Additionally, PAM is no longer just for the "privileged few" such as database administrators, developers, engineers and IT admins, but for anyone that needs access to cloud infrastructure, including marketing teams and data scientists. Cloud-native PAM addresses this gap by applying both existing and novel tools to both on-premises and cloud-native environments.

Passwordless authentication's holy grail: Improved security and user experience

Due to several common factors (cost, complexity, poor user experience), MFA adoption still trails more common security tools such as network and endpoint security. Many firms, therefore, only rely on MFA for certain user groups and use cases. Not surprisingly, "passwordless" authentication methods have gained traction, in part thanks to the growing popularity of the Fast Identity Online Alliance and new authentication standards. We are tracking the subsector of vendors that offer a variety of passwordless or "advanced" authentication methods to help address the limitations of traditional MFA.

Authorization: Access management's next frontier

The authentication industry has reached elevated status in recent years, though "AuthN" solves only half of the access management problem ("Who are you?") and does nothing to address the issue of what users, services or machines can do once they have been authenticated. This is what authorization ("AuthZ") is all about. We are tracking more than a dozen authorization vendors that have emerged in the last few years, as well as technical standards such as Cedar and Open Policy Agent.

Customer identity and access management: Onboarding, retaining and managing external identities

Onboarding external identities, such as customers and prospects, is different from managing identity within an enterprise. These accounts aren't often onboarded by an employment function. The scale may be significantly greater when reaching out to large numbers of targeted individuals. Users typically self-report their information — and the extent of that information must be balanced with privacy and regulatory priorities. Our research will explore how user experience encourages people to complete the registration process and keep customers returning while supporting industry specifications, regulatory mandates and security requirements.

Secure access service edge/security service edge vendors vie for the high ground

Zero-trust network access (ZTNA) remains a priority for planned security spending. Yet stand-alone ZTNA vendors risk being subsumed within the emerging secure access service edge (SASE) and security service edge categories. At a high level, SASE combines security and networking features delivered as a service to help enforce security policies for highly distributed infrastructure, data, applications and users. Practically speaking, SASE combines several core features into a "unified" offering, including secure web gateway, cloud access security broker, ZTNA, SD-WAN and firewall as a service.

Trends in data security: Universally essential, diverse in implementation and practice

Data is among the enterprise's most permanent and valuable assets, but the challenge of securing those assets grows with increasingly complex operations. Our research will review existing and emerging use cases for encryption, key management, confidential computing, developer experience and digital sovereignty, as well as the implications for the industry. We will explore drivers for adoption, vendor strategies and the impact of the data security discipline on other aspects of information security, governance and product development.

DevSecOps, "shift left" and the evolution of application protection

The move toward greater integration of security into developer pipelines continues to advance as developers and security teams approach parity in the use of application security tools. The integration of security testing into continuous integration and code construction becomes a factor as organizations seek to coordinate their preferred tools to the needs of their specific enterprises, as well as integrate shift-right and shift-left strategies.

A pure-play market emerges to secure web APIs

API usage is nothing new, but modern microservices architectures structure applications as a series of separate services, glued together by a communication layer of APIs. This has triggered exponential growth in API use and previously unseen levels of dependency. Unique security challenges have emerged and become more widespread with this growth, as shown by well-publicized attacks and data breaches. These challenges include automatically documenting and mapping usage, as well as identifying and protecting vulnerabilities in web APIs. A product space has emerged to meet this challenge.

The evolving connections of insurance and cybersecurity

Cybersecurity teams have long sought to achieve an elusive goal: measure the cybersecurity investment. Insurers, however, set a value on cybersecurity with every organization they cover for losses due to breaches. This gives them distinct potential to influence the nature of cybersecurity implementation and measurement in ways no other industry can. This year, we look at developing trends uniting cyber insurance with cybersecurity technology and services, as both seek to optimize cyber resilience among insured organizations and reduce where possible the burdens of obtaining and maintaining coverage.

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Internet of Things

Enterprise Internet of Things (IoT) focuses on the opportunity to virtualize the physical world into insightful, actionable digital representations created by connecting and analyzing the massive data flows captured from enterprise devices, machines and business processes.

Enterprise IoT deployments encompass a range of infrastructure technologies including IoT sensors, edge compute, enterprise platforms, datacenters and the cloud while serving as the launchpad for new IT innovations such as metaverse visualization, AI and machine learning, private and public 5G networks, digital twins and digital threads, computer vision analytics, autonomous robots and vehicles. But the goal of enterprise IoT — and the focus of our IoT research channel — is not just the data captured and managed, but the business-altering insights and use cases it can deliver. To that end, the IoT channel seeks to highlight sector-specific digital transformation enabled by enterprise adoption of IoT technologies in industries including manufacturing, energy, supply chain, transportation, automotive, healthcare, the public sector and retail.

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Key Issues for 2024

The evolution of the IoT edge

With the "edge" growing to swallow a large swath of the infrastructure market, it's easy to forget that at one point, IoT and the edge were largely synonymous. Given the market's evolution, where are enterprises that need IoT infrastructure turning these days? Embedded edge compute? On-premises servers and gateways? As-a-service nearby infrastructure? Our coverage includes an analysis of the evolution of edge compute for IoT workloads.

The new IT+OT equation

Collaboration, or lack thereof, between IT and operational technology (OT) departments is a story as old as IoT itself. Cooperation between the two groups has improved, with IT teams growing their understanding of operational needs and concerns, and OT living and learning from early IoT deployments. We examine the state of this uneasy alliance, as well as the emergence and early successes and failures of digital engineering and operational IT approaches to the challenge.

IoT platforms revisited

In the early days of enterprise IoT, vendors touted their IoT platforms, and IT departments centered deployments on their capabilities. But a lot has changed: key vendors have exited the market; IoT platform capabilities have moved upstream into infrastructure services; and easier-to-consume SaaS applications have come to the fore. What role do IoT platforms play today, and what role might they play in the future?

The evolution of OT security

For four consecutive years, security has been the No. 1 concern for enterprises scaling their IoT deployments. During these years, the OT security market has seen many new entrants, and in this topic, we look at the evolution of the vendor landscape, the maturing rules and regulations in operational technology security, and the evolving threats that companies face.

IIoT to industrial metaverse evolution

Heavy industry is on a journey toward detailed instrumentation with industrial IoT (IIoT). For some, digital twins are a key contextualization of IIoT data. Operations benefit from the workforce interacting with IIoT data in real time, which is driving the development of richer industrial metaverse applications. Digital-first approaches using digital twins, AI and simulations are also emerging for greenfield developments. Not every industry sector is at the same level of adoption, but industrial metaverse represents joined-up digital transformation combining plants, people, data and AI.

Where is the enterprise and consumer metaverse?

Metaverse hype may have died down, but the number of platforms and the user base for typical avatar-based 3D interactions in consumer and enterprise spaces continues to grow. Generative AI is simplifying previously complex content creation from objects to entire worlds, and this is opening more user-generated content options in applications that are ever easier to access. Interoperability standards from the industrial world are also influencing these environments. What impact does this have on how we work and play?

Automotive IoT and the software-defined vehicle opportunity

Automotive IoT and the software-defined vehicle opportunity describes the evolution of the domain from basic safety and driver-assistance functions to autonomous driving, advanced safety and AI-powered connected services. It also considers the implications of the vast quantities of data generated on- and off-vehicle, which underpin the monetization opportunity for the automotive industry and the physical and digital infrastructure ecosystem.

Electric vehicles: The digital opportunity

Digitalization and EVs are intrinsically linked. Thanks to EVs' new platforms and powertrains, innovative in-vehicle architecture technologies required for software-defined and autonomous-driving vehicles are easier to implement in electric than in combustion engine vehicles. New players are entering the automotive digital ecosystem such as battery providers, charging infrastructure vendors and mobility operators, opening doors to new market opportunities, collaboration and revenue sharing.

Autonomous operations in critical infrastructure

Enterprises in the energy sector often have a large geographic footprint, and they increasingly deploy drones and robots to perform autonomous inspection and monitoring (AIM) services to reduce maintenance cost, lower downtime and reduce carbon emissions. This topic examines the evolution of the vendor and operator landscape.

Digital twins in energy

In this topic, we explore how the use of digital twins can help utilities improve their grid balancing, increase the maximum power capacity of the existing grid, support decarbonization and sustainability efforts, and help with resiliency and recovery in the face of extreme weather conditions.

Advanced telematics in transportation and supply chain

Vehicle telematics — the collection of data from vehicles — has been around for decades. While its initial purpose of location tracking is as relevant as ever, vehicles and other endpoints crucial to downstream supply chain operations are collecting more types of data for a rapidly increasing number of reasons.

The maturation of intelligent transportation systems

Cities are increasingly turning to intelligent transportation systems (ITS) to realize benefits in enhancing the safety of roadways and cutting back on transit-related emissions. These systems rely on sensors embedded in roadway infrastructure and vehicles to collect and transmit real-time data on traffic flow, roadway conditions and incidents. As ITS move out of their nascency, we will examine public sector buying patterns, ITS vendors, regulations impact and the role auto OEMs will play in the realization of smart infrastructure.

Smart cities empowered by AI

As cities manage growing amounts of data and face IT staffing shortages, AI and generative AI will play a key role in automating processes and delivering analytics for smart city use. The public sector is currently in wait-and-see mode when it comes to outlining city-wide AI or GenAI adoption policies. While most city exposure to AI is on an application-by-application basis, more cities will look to generative AI to optimize resources and deliver personalized city services, shoring up the need for public-sector-equipped solution providers.

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Mergers & Acquisitions

The M&A team focuses on mergers and acquisitions across the technology sector, analyzing individual deals as well as broad trends across subsectors and the technology industry as a whole. Deliverables include estimates of deal and enterprise values in the M&A KnowledgeBase; annual survey results that help reveal buyer and seller sentiment; overviews of key trends; forward-looking reports on which firms might be acquiring or selling and why; and summaries as well as longer in-depth pieces that provide insight on specific deals.

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Key Issues for 2024

The "new normal" for tech M&A

After years of soaring above the economy, tech got dragged down in 2022-23. Growth stalled, markets sputtered, stocks plunged. That snapped tech's decade-long up-and-to-the-right trajectory, which had helped fuel a record run for M&A in the sector. Is this a "new normal" for tech M&A, or will the sector regain its momentum?

The role of financial sponsors

Over the past two years, we have seen private equity firms pay higher-than-ever premiums for bigger and brawnier targets. As tech M&A slows, despite record cash on hand, will financial sponsors be more competitive in 2024 processes than strategic buyers and continue to expand their stake in the market? Or will a crisis of confidence and rising costs hamper these buyers and reverse recent trends?

AI as a driver of deal flow

Everyone wants to do more with less, and these days, that means investing in AI. With the labor market tight, digitally driven enterprises are investing in AI and other automation technologies that enable greater levels of collaboration and productivity. They want to go beyond mere process automation to instead bring together business and IT leaders, developers, and process stakeholders to think more strategically and creatively about how the entirety of their digital business operations can be improved and differentiated from rivals. As demand for AI grows and broadens, M&A will likely reshape the sector.

Software's growing share

Application software makes up the largest individual subsector of technology M&A. In 2022, one in every three transactions involved a software target, a proportion that is likely to keep growing as software companies mature and become more ambitious buyers themselves. In 2024, market conditions may well foster continued consolidation and activity, even as valuations potentially crash back toward the historical mean.

The state of information security M&A

A decade ago, information security was a cottage industry with a smattering of small deals here and there. Now, in the wake of the pandemic, information security is a key part of tech M&A and is likely to maintain that status as companies large and small continue to arm themselves against emerging threats.

M&A KnowledgeBase (MAKB) tracks global tech transactions

The M&A KnowledgeBase (MAKB) is a global online database of roughly 70,000 tech M&A transactions. With its proprietary insight on undisclosed private-company valuations and in-depth analysis of the rationales for key deals, the MAKB helps dealmakers make smarter, more accretive deals. The MAKB also classifies deals into more than 650 granular tech industry categories, making it easier to see emerging trends in real time. In 2024, the MAKB will continue to grow as new deals are announced. Our analysts expect to see between 4,500 and 5,000 tech deals made during the year.

S&P Global
Market Intelligence

Workforce Productivity & Collaboration

Work is undergoing major, rapid transformation. An aggregation of challenges in accomplishing work is clashing with demands from leaders for more operational agility and from department leaders for more strategic clarity and stronger planning processes. These demands are coming amid growing expectations from employees regarding their day-to-day work experience.

Resolution of those clashing forces will require more than piecemeal change. Organizations need to adjust their operational cultures, improve planning processes and gain a more nuanced understanding of how modern effective collaboration happens. They also need more intentional technology strategies to underpin these things. Navigating this shift will require significant change management efforts, and technology will be integral to how businesses redefine the value they create for their employees and customers. Work has changed. Expectations regarding work have changed. Optimal ways of working are being defined right now.

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Key Issues for 2024

The experience economy increasingly informs technology investments

Businesses are competing in an experience economy where success is defined by the ability to generate and monetize emotional engagement among consumers. Delivering the personalized experiences that will drive that engagement with precision, velocity and scale raises the bar for how organizations need to operate across their business domains. Bringing strategy and execution together more predictably to close the gap between customers' expectations and their actual experiences is the new battleground for digital transformation. Efforts to achieve that outcome are causing organizations to radically rethink how work happens and to reevaluate technology investments collectively across employee and customer experiences.

Frontline digitization integrates employee and customer experience outcomes

The convergence of digital operations, mobile technologies and embeddable communications is increasing the value that frontline workers can deliver in new seamless customer service experiences. Improved operational efficiencies — including access to more embedded digital training options — can increase engagement and retention rates among frontline workers, commonly a volatile cohort in the labor force. The digitization of the front line provides one of the clearest opportunities for strategic technology investments to support both the customer and employee experience since improvements in one also generate better outcomes in the other.

HR shifts its focus to talent, skills and the digital employee experience

Shifting corporate priorities and HR's evolution to a more strategic business partner are changing HR technology investments. Organizations are demanding new approaches to talent acquisition and retention, skilling and performance management, and people analytics, and AI is beginning to reach critical mass. HR and IT departments are also collaborating more to improve the digital employee experience as the quality of the tools powering the day-to-day work experience becomes a stronger driver of employee engagement.

Innovation across the project, portfolio and work management categories

Project and portfolio management tools are receiving a second wind as organizations focus more on connecting macro-level strategy with micro-level work execution, and collaborative work management tools remain among the more dynamic productivity software categories. The energy is evident in strategic M&A, product innovations, a raft of new vendors, a widening set of buyers, growing partner and channel ecosystems, and widening competition as categories overlap. This space will continue to grow as more of the dots between strategy, goals and execution are joined in tools that become more common currency in day-to-day work.

Strategic planning becomes modular, integrated and agile

The past several disruptive years have pushed many organizations into more flexible planning cycles. New planning software tools are addressing this need, helping to reshape cross-organizational processes. These tools typically support continuous participation from stakeholders outside of finance, based on deeper integrations with their own systems of record and other critical applications. Long planning cycles are collapsing as real-time exchanges of data more accurately match financial planning, budgeting and forecasting goals with the current state of business execution.

Product management tools unite business and technical domains

Responding to both external market and internal workforce demands is requiring new operational cultures, a rethinking of collaboration between business and technical domains, and more intentional technology strategies. At the heart of these shifts sit modern product organizations, which are evolving into strategically important "bridge" functions pivotal to winning in a fast-changing market and the growing experience economy. Without product organizations facilitating strategic alignment and coordination across the entire business, costly issues arise, such as lack of product-market fit, delayed delivery, and subpar products and experiences that fail to deliver business outcomes. Technologies that serve product teams and their adjacent colleagues in engineering, design, marketing and other domains are becoming more valuable.

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