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Ten tech trends driving transformation in 2022

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Introduction

While COVID-19 ushered in a world – and a way of living – that few were expecting, and even fewer were ready for, 2021 delivered (relative) stability and cause for hope. In-line with the initial experience, 2021 was another very good year for the technology industry. So what can we expect from the year ahead? What will be the main technology themes and topics driving the industry narrative? As in previous years, we offer a high-level take across the major channels and topics that 451 Research analysts cover. To dive into details of each further, please refer to the [individual channel previews](#) we just published.

The Take

Following two immensely disruptive, often chaotic and tragic years, 2022 begins with perhaps more optimism than at any stage since the pandemic began. The omicron curveball certainly lends a foggy hue to the outlook, but there's a growing sense that, as the global economy begins to spin back up to something approaching full speed, the 'new normal' will take shape and crystallize.

Uncertainties remain, but we can be sure that, whatever the future holds, the tentacles of digital technology will extend even further into it. The impacts of this on our lives as consumers are obvious, but the business (and B2B) world – including the humble IT department – is also being reshaped. Employee and client expectations of the corporate technology they use are changing massively, to the extent that all businesses need to raise their game to keep hold of and attract talent and customers. 'Table stakes' is an overused industry expression, but the bar of user experience is higher than ever, and the tolerance for anything other than seamless is rapidly waning.

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The use of multiple cloud venues – both on- and off-premises – to deliver modern applications in an increasingly coordinated fashion is now an expectation, and intelligent technology that can automate and predict requirements is moving to the core of the product and service experience. Doing all of this in a way that encompasses myriad endpoints in a secure fashion is now a monumental task that will challenge organizations in 2022, and further opens the door for innovation. The expert team at 451 Research looks forward to keeping you abreast of developments and requirements over the coming year.

Future of work: Purpose drives employee engagement, other benefits

The last two years have transformed the way we work across almost all dimensions. From the scramble to support remote work and the rapid digitalization of frontline workers to the turbulence from the social justice movements of 2020, we accept that these events have long-term impacts on everything from company culture to productivity and workplace technology choices, and that there would need to be more intentional investments – and thought – into employee-experience strategies. In 2022 many organizations will aim to get off on the front foot by developing more engaging, sustained and action-oriented conversations with their employees.

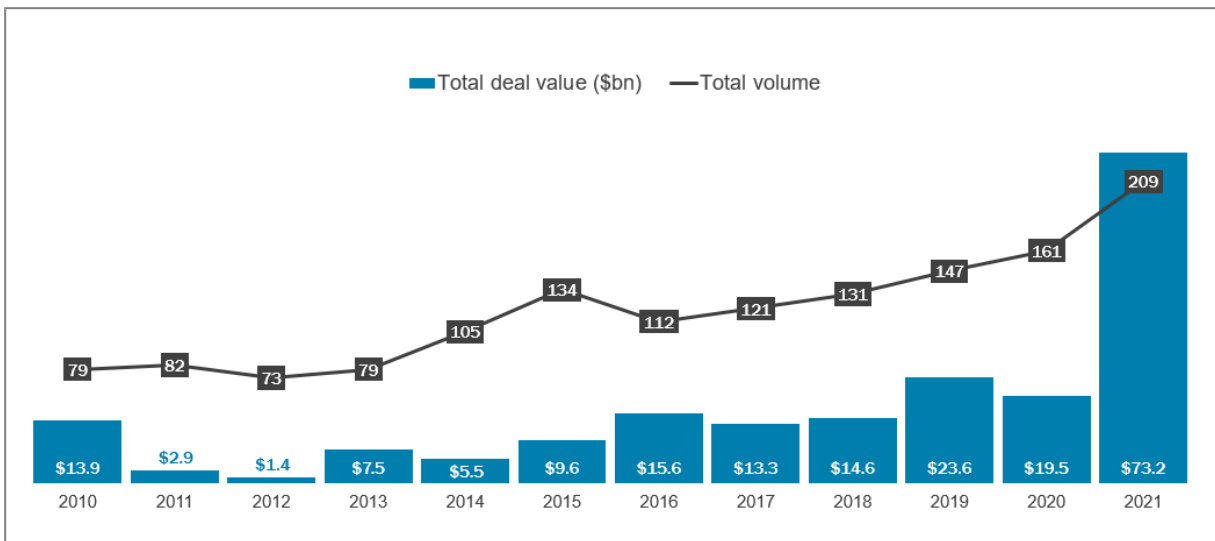
Employee engagement is highly leverageable, as demonstrated by a regression analysis we recently conducted on our Voice of the Enterprise: Workforce Productivity and Collaboration, Employee Engagement 2021 survey data. The analysis showed that, among 40 possible different drivers of positive engagement, seven were statistically significant. Among those seven were employees being proud of where they work, having a job that provides a sense of purpose and having a strong sense of belonging at work. Other drivers were having opportunities to grow at work, having the tools and technologies to succeed at work, and having time off the treadmill of daily tasks to think creatively and stay ahead of workloads. In 2022 businesses need to elevate the conversations they have with their employees with these factors in mind.

Particularly revealing is that purpose and values are intrinsically linked to engagement, which we know is closely linked to a range of important business outcomes, including talent acquisition and retention, workforce innovation and adaptability, and employees' advocacy for their employer. As employees look for more of a purpose-driven experience, there is growing pressure on businesses from investors and regulators to commit to different environmental, social and governance (ESG) initiatives. In 2022 we anticipate businesses looking for more granular and effective ways to address these bottom-up and top-down pressures and evolve their corporate purpose into a more valuable business asset.

The security imperative will continue to drive value creation and M&A

In security, the past year saw a variety of headline-grabbing incidents, from some of the most far-reaching nation-state campaigns to the ongoing scourge of ransomware, and one of the most pervasive vulnerabilities ever seen in the popular log4j open source module. These events helped to raise security tech M&A to its highest peak ever: At over \$73bn, total deal value in 2021 was more than three times that of the previous biggest year – 2019 – with almost 30% more deals than in 2020.

Figure 1: Infosec M&A Since 2010



Source: 451 Research's M&A KnowledgeBase. Includes disclosed and estimated values.

We see these trends continuing in 2022. High-impact attacks will continue to drive investment in threat detection and response – a trend that highlights one of security's primary themes in 2022: the need for greater coherence in security management. The attack surface is large, complex and growing. Security organizations face challenges sourcing and retaining expertise. Bringing coherence to a fragmented landscape of security tools and technologies will be a hallmark of trends such as extended detection and response (XDR), which seeks to align a variety of techniques into a more coherent whole. In identity and access management, the consolidation of a variety of segments under the aegis of IAM portfolio vendors may signal a sunset of 'best of breed.'

Technology vendors won't be the only ones serving these demands. Managed detection and response (MDR) represents one of the most active segments of security, with both technology vendors and service providers combining expertise with a growing range of telemetry and analytics to identify cyber threats and handle them more effectively. The tailoring of cloud security solutions to specific buyer needs will include continued demand for tools to identify and remediate threats to cloud-native environments, an area that has already seen high valuations and substantial funding, not least because that's where the money is.

Cloud-to-ground innovations reshape modern IT architecture, including the edge

As hybrid IT architectures in all forms gather momentum, traditional on-premises hardware is being redesigned to better support a cloud-to-ground execution environment run via a DevOps model of IT operations. Hyperscale public cloud providers are aggressively extending their cloud systems and software toward the edge for local and hyper-local service delivery. As a result, on-prem infrastructure OEMs are transforming their own solutions and business models to better compete, complement and protect.

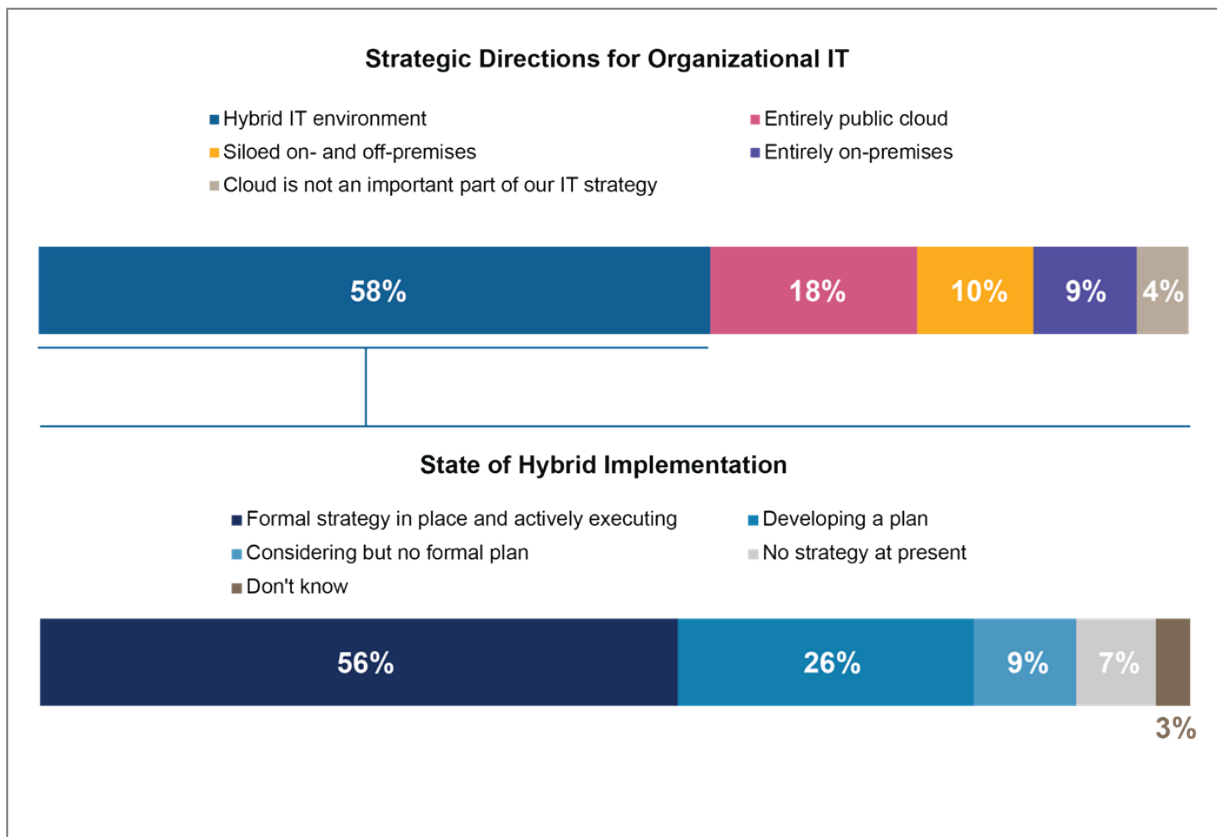
With public cloud as the de facto target IT architecture and business model, and cloud-native the default approach for application and service development, a natural conclusion could be that the market for on-premises IT solutions would enter a period of decline. What is happening is the opposite. On-premises environments are more critical and strategically relevant than ever, driven by the economic reality that sending every workload to the cloud is not viable for performance, economic or governance reasons.

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Emerging UIs and data sources such as AR/VR, as well as IoT and wireless innovations including 5G, conspire to drive edge cloud services to hundreds and ultimately hundreds of thousands of locations around the globe offered by an increasingly diverse ecosystem of edge computing 'frenemies,' including telecom operators, MTDCs, OEMs and cloud service providers. Hybrid, including edge, has won as the long-term target IT architecture, which means that building, running and securing systems is as complex a problem as ever. The good news is that powerful innovation forces are aligning to face off with such challenges, and 451 Research is actively tracking developments most germane to solving them: DevOps, observability, process automation and ongoing redesign of on-premises systems to support cloud-native app development and as-a-service solution constructs that weave together the best of all worlds.

Figure 2: Hybrid Remains the Organizing Principle of IT for Nearly Two-Thirds of Organizations



Source: 451 Research's Voice of the Enterprise: Cloud, Hosting & Managed Services, Vendor Evaluations March 2021

Q. Which of the following best describes your organization's existing or planned IT operating environment?

Base: All respondents (n=445)

Q. Which of the following best describes the state of your organization's strategy regarding hybrid IT?

Base: Hybrid as the organizing principle of IT strategy (n=147)

Note: In 2021's survey, we asked this question of all respondents, with 34% reporting 'active execution' on hybrid strategy. The comparable figure this year is 41%.

No longer an adjunct – for many, cloud is the IT strategy

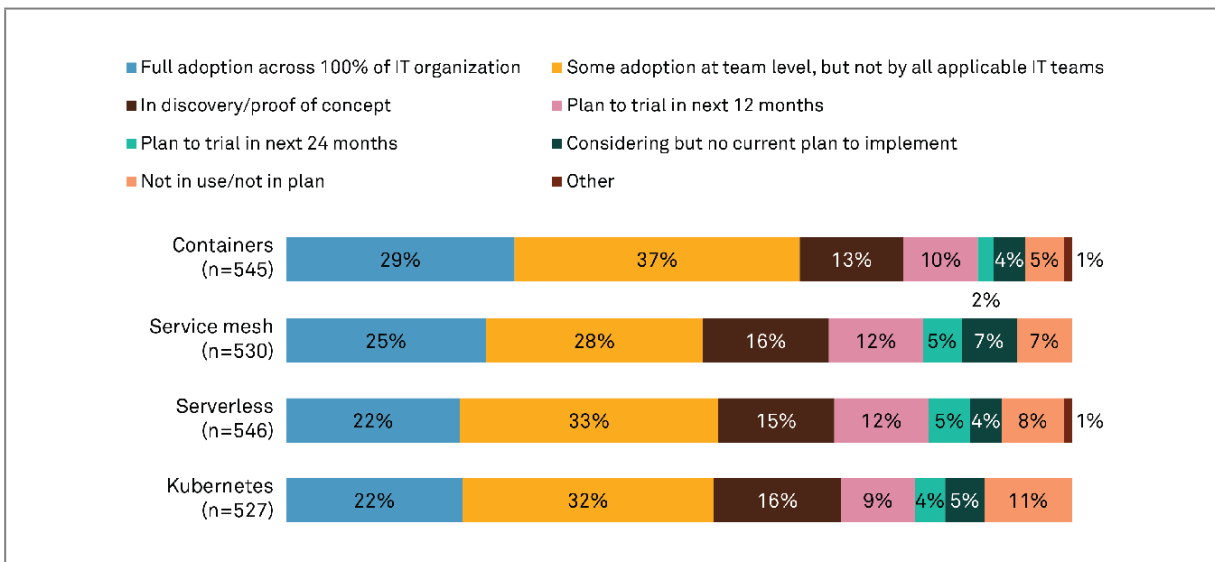
We are entering an era when cloud will no longer be seen as a separate IT category. Quite simply, it is the IT. Already the case for hosted environments and now on-premises infrastructure, it's the consumption-based, service-driven retail model discipline that delivers the cloud experience, not the

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venue. As for software (applications), cloud 'nativity' has become the default platform for deployment, and the industry is rotating to the aaS/subscription consumption model. In future all of this will likely be delivered together as a single bill with a unified customer experience regardless of the back-end architecture or the vendor fulfilling it.

It has taken less than a decade to reach the point where cloud native is the prevailing mindset for application and infrastructure architecture, with increased adoption by IT teams (see Figure 3). It is a process aided by the industry's ongoing enthusiasm for and continued leadership of the Cloud Native Computing Foundation, and in large part due to the ingenuity and enthusiasm of the open source community, arguably the cradle of cloud nativity. The re-platforming to cloud native is moving into the mainstream for all kinds of organizations – accelerating application modernization is seen as the way to secure the benefits of cloud – particularly for the telco market's transition to 5G, but it will take some years. The majority of work lies ahead, but a golden decade of opportunity beckons for those that can help deliver cloud-native benefits as advertised: better, faster and cheaper.

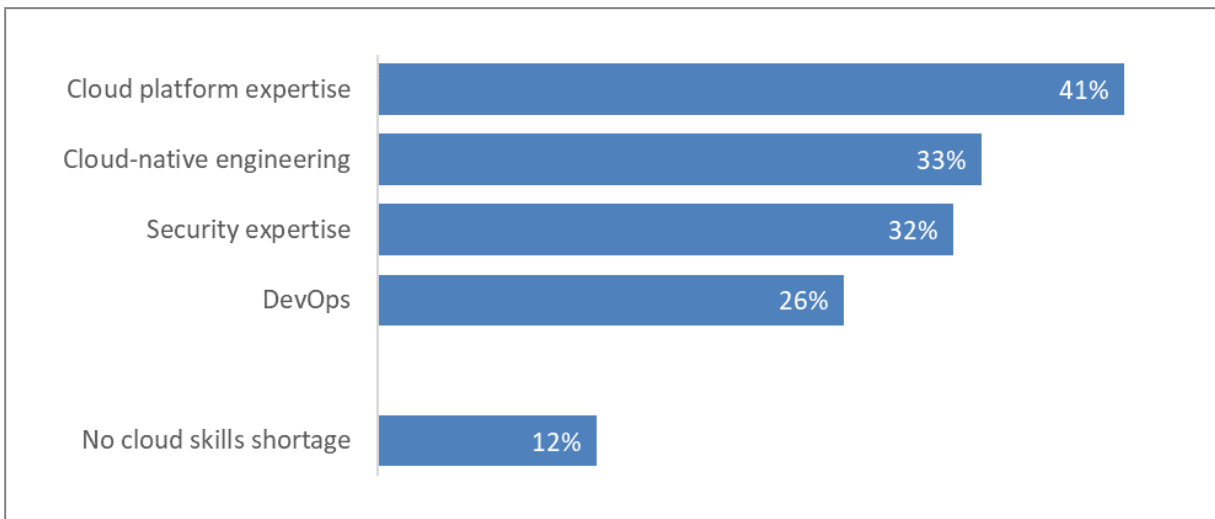
Figure 3: State of Cloud-Native Adoption



Source: 451 Research's Voice of the Enterprise: DevOps, Workloads & Key Projects 2021
 Q What is your organization's adoption status for the following technologies? Please select one status for each technology.
 Base: All respondents

The next steps and a focus for the industry in 2022 will be to continue to reduce the complexity of cloud native with additional abstractions and improved integration of its parts to drive increased developer productivity. We also expect to see increased use of systems' own data and intelligence to automate tedious and fiddly manual processes – a feat that surpasses human comprehension as things get more diverse and complex and ever more connections need to be managed and secured. With the increased use of AI and ML (aka automation) techniques, we are not far away from code that can write – or rewrite – itself, and there are numerous early-stage vendor projects to deliver this capability. However, this also requires organizational change, and the people side of the equation looms large as cloud-native engineering and DevOps talent remains in short supply (see Figure 4).

Figure 4: Top Cloud Skills Shortages



Source: 451 Research's Voice of the Enterprise: Cloud, Hosting & Managed Services, Organizational Dynamics 2021

Q. Which of the following skills categories are most acutely lacking when it comes to managing your organization's cloud environment? Select all that apply.

Base: Current/prospective IaaS/PaaS users, abbreviated fielding (n=330)

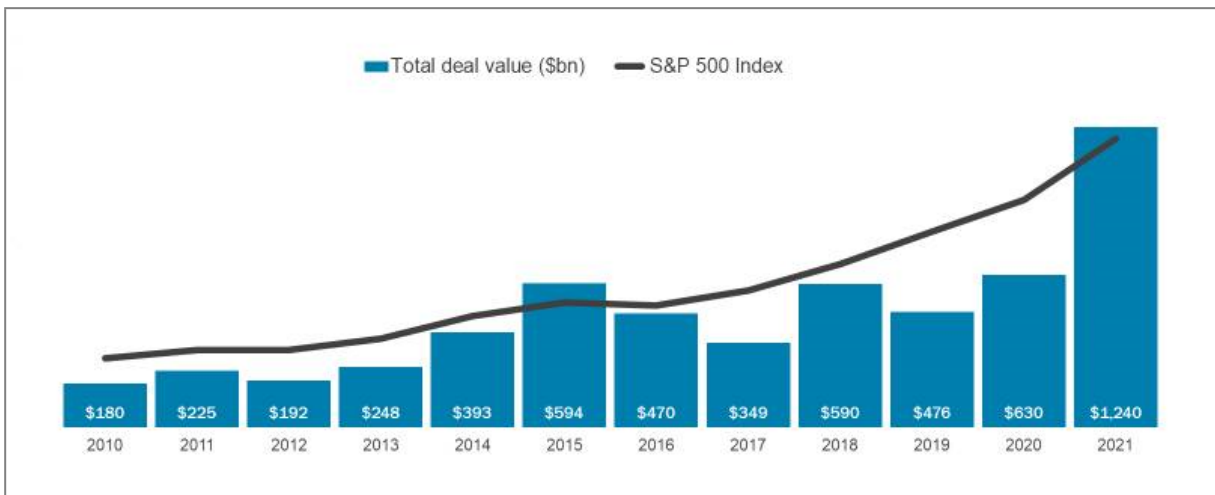
Already at record levels, tech M&A is poised for further growth

Buoyed by record spending by every type of shopper, annual tech M&A spending topped the \$1 trillion threshold for the first time in history in 2021, according to 451 Research's M&A KnowledgeBase. The collective spending from strategic acquirers, buyout firms and even unproven SPACs pushed the total value of 2021's tech transactions ahead of the total from the two previous years *combined*. In 2021's unprecedented shopping spree, everyone got into the mix.

Resurgent confidence, along with record amounts of M&A currency, gave buyers the will and the means to look through the (still-lingering) pandemic and pay valuations in 2021 that were more than twice as rich as any year in our M&A KnowledgeBase. While economists and investors spent much of 2021 worried about the possibility of inflation, tech acquirers were already pricing it in as the cost of doing business. Prices rose, records fell.

All of those trends look likely to continue in 2022, with no letup in the record-smashing pace for tech M&A. In an early January survey by 451 Research of some of the tech industry's busiest buyers and their silver-tongued advisers, two-thirds of the respondents forecast this year would either match or even top the frenzied rate from 2021.

Figure 5: Annual Tech M&A Spending vs. S&P 500 Performance Since 2010



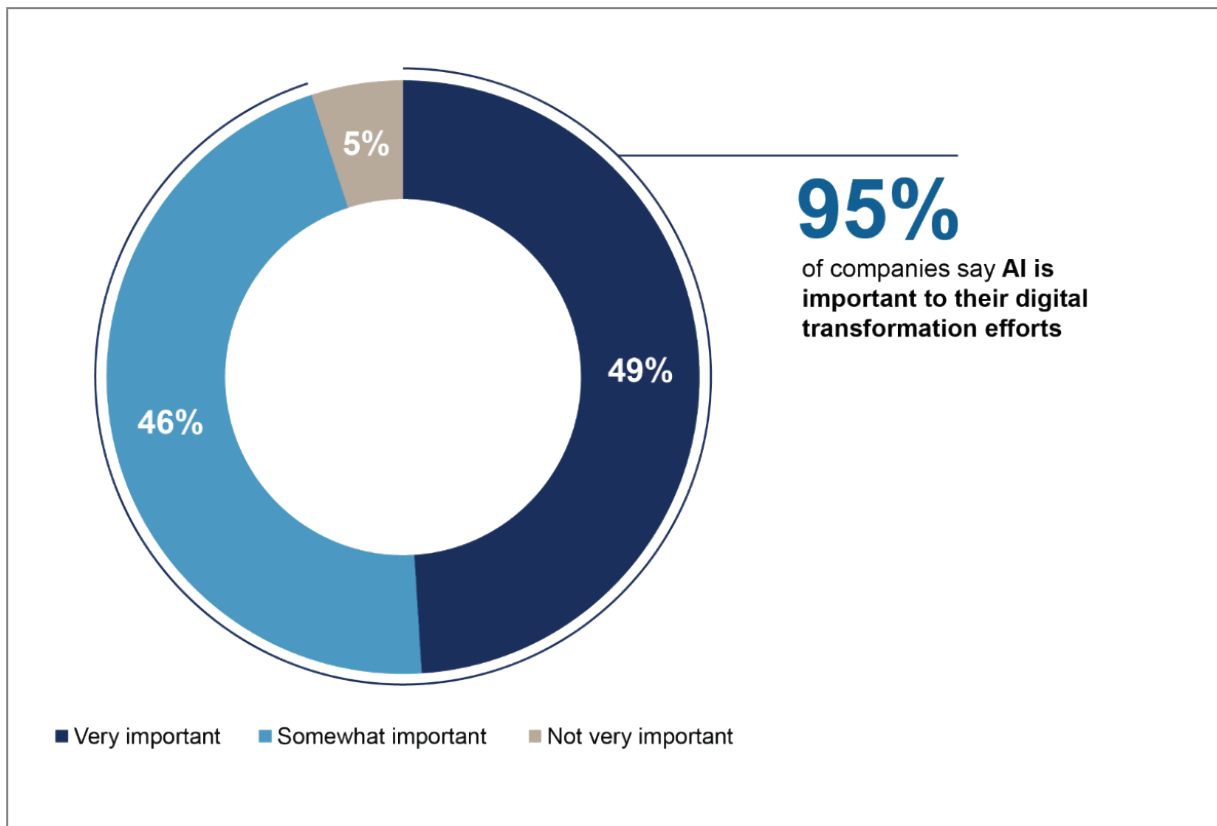
Source: 451 Research's M&A KnowledgeBase; S&P Global Capital IQ Pro

Note: Data compiled January 6, 2022. Closing year-end figures for S&P 500 Index.

Delivering the promise of AI requires challenges to be overcome

AI is a key factor in digital transformation (see Figure 6) and thus should remain at the forefront of technology adoption in 2022 as businesses implement digitalization plans, accelerated by the pandemic. However, that doesn't mean using AI at scale is easy – our research reveals that 39% of ML projects are abandoned at the proof-of-concept stage, never making it to production. To ameliorate some of the complexity, organizations are turning to MLOps tools to smooth the bumps between acquiring the data needed to train the models right and monitoring the performance of those models once they have been deployed and are making predictions for the business.

Figure 6: Importance of AI to Digital Transformation



Source: 451 Research's Voice of the Enterprise: AI & Machine Learning, Infrastructure 2021

Q. How important is artificial intelligence to your organization's digital transformation efforts?

Data is the fuel of AI, and getting it in a usable state for AI, analytics and other uses has long been a headache for organizations. Companies are establishing new roles, such as data engineers, to handle those issues. Given that data is also – depending on your point of view – something to be created, stored and protected, or stolen, exploited and held potentially for a hefty ransom, we expect a convergence of offerings from vendors concerned about data security, data privacy and data governance.

Technology as a whole is gradually becoming a regulated industry, as it starts to permeate all other sectors as governments around the world conclude that technology is too important to be left in the hands of technologists alone. Issues such as privacy and the explainability of AI are at the sharp end of that, and we expect more gradual movement toward more regulations in these areas and others this year, which will impact how and where AI – driven by data – is built and deployed in 2022 and beyond.

Delivering an immersive digital experience is increasingly considered table stakes

This will be a year of IT execution as companies establish a new 'business as usual' with fresh approaches to improving the customer experience. Once-aspirational views of innovative and immersive digital experiences have quickly transitioned into requirements for employees, customers and partners. Since the customer experience is a catalyst in many digital transformation projects, it is important to understand where businesses are making investments in new technologies to deliver differentiated and consistent CX.

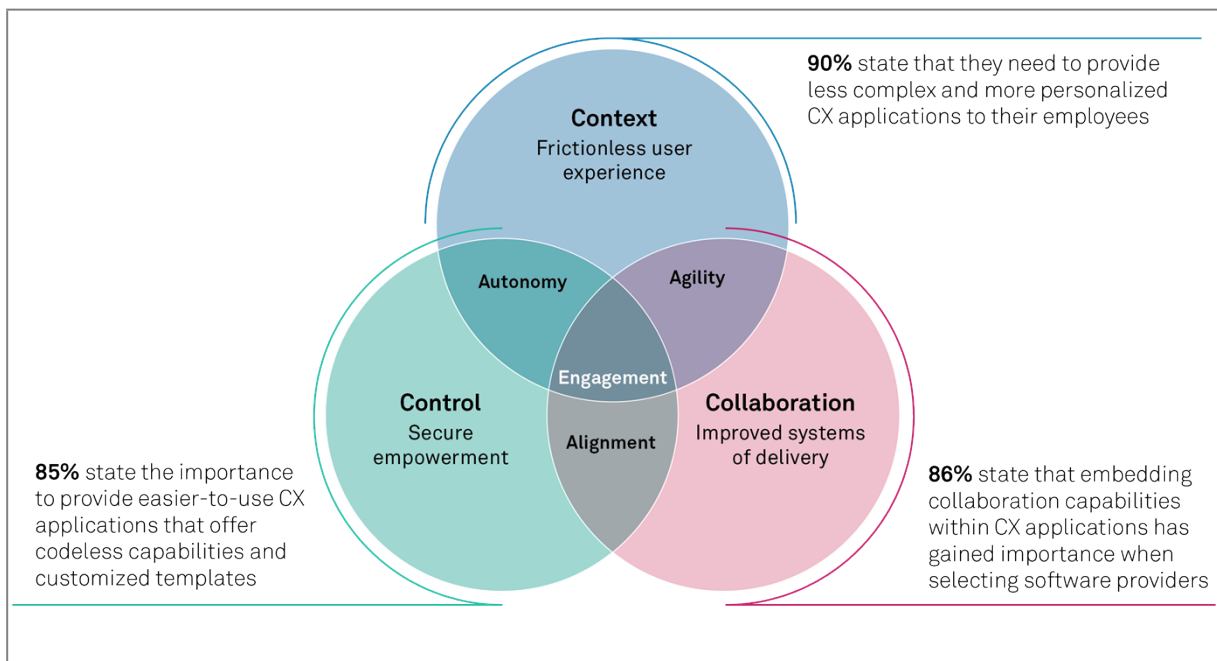
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The need for continuous improvement in operations requires a well-planned approach to business and IT innovation in order to remain relevant in the eyes of customers. As businesses increase their spending to create composable experiences, investment in modern technologies has emerged as the most prominent area of focus to improve business agility, reduce friction points, drive growth and manage risk. However, many businesses are hamstrung with legacy technology that is monolithic and rigid, inhibiting agility and innovation and resulting in IT struggling to keep up with line-of-business demands.

The human element is also becoming more important as business relationships become less transactional between people, and more nuanced, tangled interactions between people and the systems and devices that they use on a daily basis. This results in a heightened demand for context, collaboration and control across the enterprise and raises the importance of employee engagement on customer experiences, with 90% of businesses stating the importance of providing less complex applications for improving customer experience.

Figure 7: Context, Collaboration and Control Drive Investments in Software to Create Composable Experiences



Source: 451 Research's Voice of the Enterprise: Customer Experience & Commerce, Vendor Selection 2021

Q. How important do you think each of the following strategies for improving the customer experience is? (n=827)

Base: All respondents

The race for relevance means organizations must measure and align investments with the latest expectations for the customer experience. Many businesses embrace digital transformation to ensure greater organizational agility, employee autonomy and corporate alignment. While customer-facing employees crave more autonomy to improve business outcomes and customer success, that must be balanced by alignment with strategy, governance and security.

Execution is at a critical stage, and digital maturity matters as businesses focus on investments in cloud infrastructure, AI/ML and data-driven insight to deliver new experiences that will be more immersive, frictionless and contextual. A paradigm shift is also occurring, as more organizations shift the focus of their CX-driven business objectives to retention efforts to capitalize on long-term

relationships that build brand loyalty. Since emotion is the currency of experience, harnessing the power of customer data to understand intent will drive spending as businesses look to turn this emotion into brand loyalty.

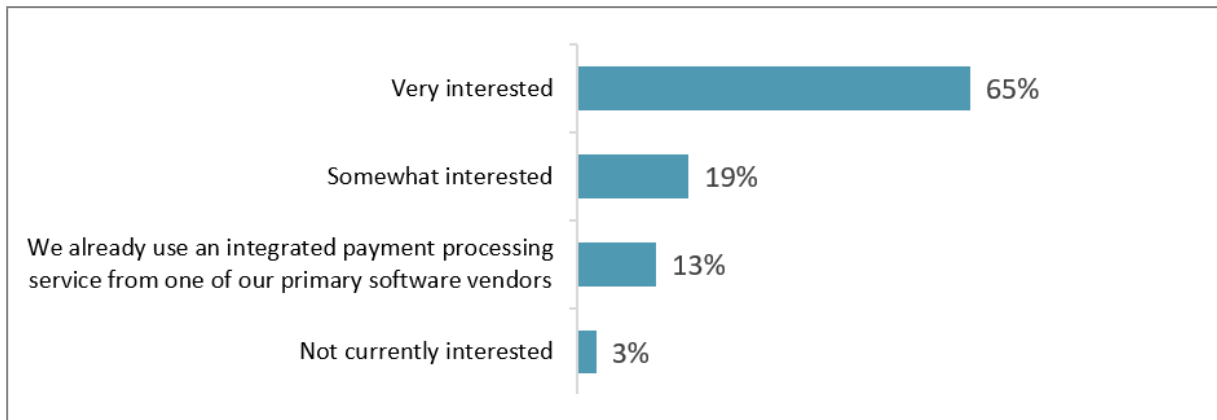
The SaaS platform payments opportunity heats up

The on-ramps into the payments industry are multiplying and shifting. Large SaaS platforms such as Shopify and Mindbody have evolved into operating systems for their customers and are now leveraging their trusted positions as a beachhead into financial services. They're starting by embedding payment processing into their software to accomplish three key business objectives: enhance the user experience, increase customer stickiness and capture a new revenue stream. Some are beginning to take this a step further by offering merchants adjacent financial products like loans and payment cards – a trend we only expect will pick up momentum in 2022.

The last 12-14 months alone have seen payment launches from SaaS heavyweights Salesforce, Adobe and HubSpot. This year we anticipate growth in the number – and variety – of SaaS platforms incorporating payments capabilities as they look to follow in the footsteps of recently public software companies like Toast, which now attributes more than 80% of its revenue to financial services. Considering that two-thirds of merchants express strong interest in processing payments through their software partners, the growth opportunity is latent.

SaaS platforms have already become a meaningful SMB payment acquisition channel; more than one in 10 merchants are now using an integrated payment-processing service from one of their primary software vendors. Payment processors will need to get serious about enabling SaaS platforms for payments in 2022 if they wish to secure and expand future transaction volumes. Those seeking to position themselves for this market opportunity should take steps to streamline payment-facilitator enablement, reduce operational complexities and provide banking-as-a-service capabilities.

Figure 8: Interest in Utilizing an Integrated Payment Processing Service From a Software Vendor



Source: 451 Research's Custom Global Merchant Survey Q4 2021

Q. How interested would your business be in using an integrated payment-processing service provided by one of your primary software vendors?

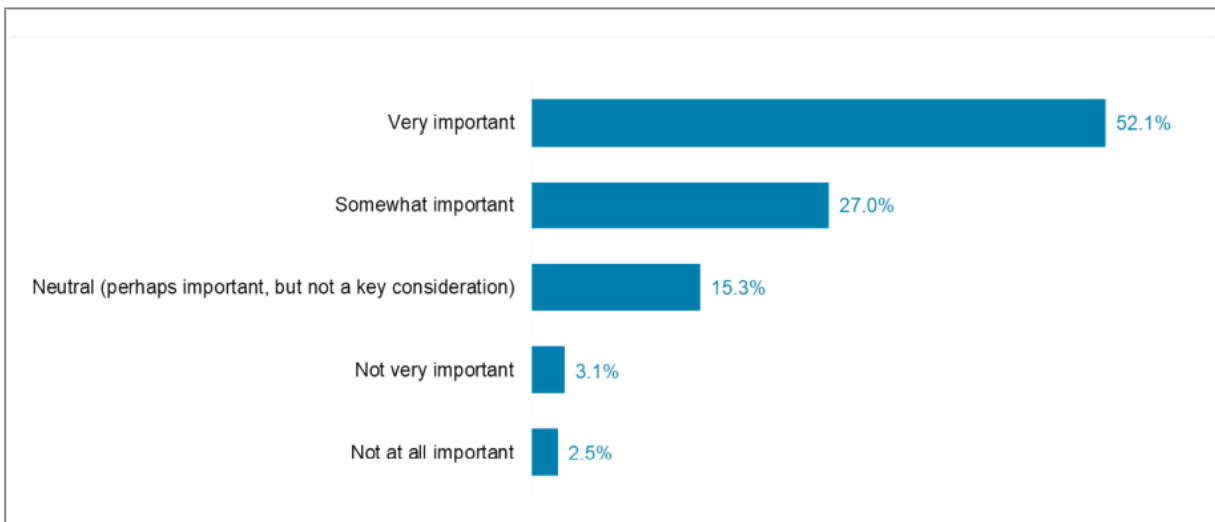
Base: All respondents (n=259)

The datacenter industry steps forward to help enterprises improve sustainability

Hyperscale cloud firms are driving innovations in the datacenter industry that improve sustainability. These include purchasing low-carbon energy (in some cases sponsoring new production), using more efficient cooling systems that also conserve water, plugging in to district heating systems and improving construction methods to reduce embodied carbon. This highly efficient infrastructure is available to enterprises in the form of cloud services, and increasingly via leased datacenter space, as new approaches are tested and adopted throughout the industry, including the use of AI/ML to enhance efficiency and management.

As enterprises look to operate more sustainably, using the public cloud will be one way to dramatically improve IT efficiency. However, for those workloads they do not want to move to the cloud, leased datacenters provide another option, offering much more efficient infrastructure than the typical aging enterprise datacenter. By combining sustainability with connectivity to multiple clouds and service providers, leased datacenters will enable enterprises to use environmental footprint as a factor when evaluating where to put workloads, in addition to more traditional criteria such as cost and performance.

Figure 9: Sustainability and Efficiency Are Becoming More Important to Enterprises



Source: 451 Research's Voice of the Enterprise: Datacenters 2021

Q. When selecting a colocation provider, how important are overall efficiency and sustainability of the energy available?

Base: Rents space in colocation center(s) (n=163)

There has been record demand in markets where cloud providers were already present, such as Northern Virginia, but also in smaller markets that had not seen cloud deployments previously. Cloud and IT service providers may need to work with small local datacenter suppliers they have not worked with before to reach new markets, and the demand will also likely encourage construction of larger-scale, purpose-built space not previously available in smaller markets.

Confronting the business and technology challenges of IoT

As enterprise IoT continues to mature, companies face two distinct tests: the IT challenge of deploying infrastructure robust enough to support the massive scale and mission-critical nature of

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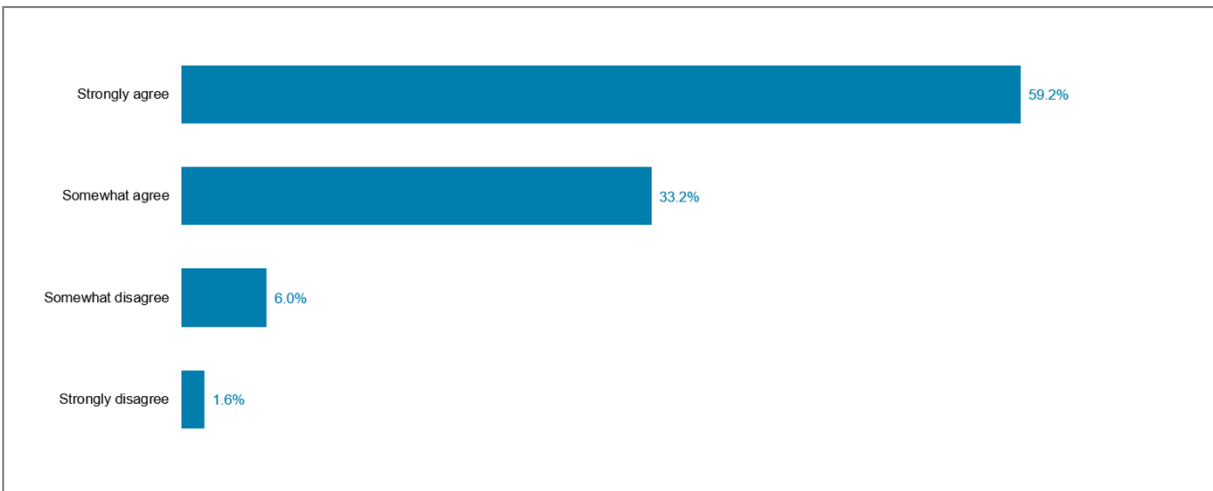
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many IoT projects, and the business challenge of virtualizing operations and leveraging new IoT data insight to drive digital transformation.

On the technology front, an expanding array of IoT connectivity options – from the growing adoption of LoRaWAN to the impending arrival of IoT-capable 5G options – offers flexibility, but also increases complexity. Similar dynamics are at play for IoT edge compute, where options are proliferating and enterprises must make critical bets on a variety of emerging IoT edge-as-a-service alternatives from cloud hyperscalers, datacenter providers, telcos and even traditional IT hardware vendors. While a more capable IoT edge is essential (see Figure 10), delivering the edge via as-a-service consumption models has yet to be proven and, like the IoT platform market before it, is sure to see consolidation among countless vendor contenders.

Figure 10: Executing IoT Workloads in the Proper Venue Is Critical for IoT Project Success



Source: 451 Research's Voice of the Enterprise: Internet of Things, Workloads & Key Projects 2021
 Q. Please indicate whether you agree or disagree: My organization's IT department believes that the location in which our IoT applications are deployed – edge, near-edge, cloud/core – has a major impact on our IoT project success.
 Base: All respondents (n=365)

At the same time, enterprise IoT deployments are as much (if not more so) business-driven as technology-driven. Enterprises across a variety of sectors – including manufacturing, transportation, energy, healthcare and more – continue to explore ways to put newfound IoT data insight to good use. We expect IoT's influence to drive even deeper into key corporate initiatives in 2022, helping businesses address some of the most critical challenges: sustainability and ESG, the repair and reinvention of global supply chains, manufacturing optimization (including virtualization of operations into the emerging metaverse), and helping to counter the shocks of the third year of the pandemic on industries ranging from healthcare to retail and the public sector.