2021 Forrester Top Trends & Emerging Technologies

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- Need to respond to digital acceleration in **7 key areas**
  - **AI**
  - **Business automation & robotics**
  - **ERM**
  - Human experience & productivity
  - New compute architectures
  - Next-generation communications
  - **Zero trust security**

- **5 Key Trends**
  - Demand for ethical AI (**Responsible AI** by another name)
  - Recasting of automation roadmaps   ..using momentum from Covid-19 experiences
  - Moving toward hyperlocal business operations
  - Driving innovation using **cloud-native technologies**   …container platforms, serverless computing
  - **Shifting cloud strategies to the edge**
    https://www.technologymagazine.com/digital-transformation/forrester-5-key-tech-trends-next-decade
    https://go.forrester.com/press-newsroom/forrester-top-emerging-technology-trends-to-watch-in-2021-and-beyond/

KPMG 2021 Disruptive Technologies

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- **Digital Assistants**
  - Enable quickly scalable, differentiated customer experience
  - Reduce human error & increase efficiencies
  - Free employees from mundane tasks –allow strategic & innovative work

- **Biometrics**
  - Sees it on par with 5G, robotics & Blockchain and ahead of VR and edge computing as tech to transform business
  - Leverage for: safety, security & access, social distancing & occupancy limits enforcement
  - Contactless ordering & payment systems; integrated with digital assistants

- **Virtual Reality**
  - For both remote work & customer interaction use VR to make interactions more personal & immersive
  - Immersive training
  - Innovative product demos, media, gaming & sports
  - Virtual offices to increase employee involvement & productivity

- Note: KPMG did not do their classic "Top 10" but rather appears to have done this Disruptive Recap
  - Their Malta office has written and published a top 10 for 2021…. https://home.kpmg/mt/en/home/insights/2021/01/the-top-10-tech-trends-of-2021.html
- Mid-2019 Top Transformational Tech: IoT, RPA, AI&ML, Blockchain, AR, VR, Social networking, Biotech

https://info.kpmg.us/techinnovation/disruptors.html (and 3 links inside)
https://www.information-age.com/kpmg-transformational-technologies-123482292/

Deloitte – Tech Trends 2021

Summary: The theme of the report focuses on *resilience* and being able to adapt and thrive in the face of change. With 2020 and the COVID-19 pandemic set as the backdrop, several topics are discussed, including:

- **Enterprise technology and the importance of aligning corporate and technology strategy**

- **Data and how organizations are industrializing their AI initiatives to manage data for machine rather than human**
  - Includes a focus on cybersecurity as well

- **Emerging Trends in human and machine interation, including digital experience and technology that supports DE&I**

The report covers 9 digital trends with case studies on each:
1. Strategy, engineered
2. Core revivial
3. Supply unchained
4. MLOps: Industrialized AI
5. Machine data revolution: Feeding the machine
6. Zero trust: Never trust, always verify
7. Rebooting the digital workplace
8. Bespoke for billions: Digital meets physical
9. DEI: Tools for equity

Executive summary

Case studies, insights, and the trends

Strategy, engineered

- Joseph Fuller, Harvard Business School
- Peter Schwartz, Salesforce

Core revival

- Albemarle
- Sogrape
- GM Financial
- Justin Kershaw, Cargill

Supply unchained

- Pactiv Evergreen
- John Tomblin, PhD, Wichita State University

MLOps: Industrialized AI

- National Oceanic and Atmospheric Administration
- Morgan Stanley
- Anthem
- Swami Sivasubramanian, AWS

Machine data revolution: Feeding the machine

- AT&T
- Loblaw
- ABN AMRO
- Lutz Beck, Daimler Trucks North America

Zero trust: Never trust, always verify

- Takeda
- Halliburton
- John Kindervag, Palo Alto Networks

Rebooting the digital workplace

- Thomson Reuters
- Lloyd's of London
- JLL
- Dan Torunian, PayPal

Bespoke for billions: Digital meets physical

- Hans Neubert, Gensler

DEI tech: Tools for equity

- Deloitte US

Digital Trend Highlights (#1 - Strategy, engineered)

Summary

- Strategists are turning to strategic technology platforms equipped with advanced analytics, automation, and AI.
- As a result, companies are transforming strategy development from an infrequent, time-consuming process to one that's continuous and dynamic

Key Highlights:

- Having a strategy sitting on the shelf isn't enough – **effective execution is critical**
- Companies need to invest in an empowered executive strategy leader
- Key components to success:
  - There needs to be a tech-savvy C-suite
  - There needs to be business savvy tech leaders
  - Aligned technology and partners
  - Collaborative list of strategic assumptions
  - Agile funding
- Leading organizations are engineering their strategic function to be more agile, scalable, andstable, giving them an array of strategic options in their back pocket for whatever the future holds.
- Everyone has access to similar technologies, but it's how you use them that makes the competitive difference

Key Questions to ask:

1. Does your technology limit your organization's strategic options? If so, how can that be addressed?
2. How can strategy and tech leaders work better to understand the strategic plan as well as the opportunities and constraints of your technology architecture?
3. What assumptions must hold true for your strategy? How do you monitor these and make timely adjustments when needed?

EXECUTIVE PERSPECTIVES

STRATEGY // The playbook for using technology to create competitive advantage is changing from, "Who owns the best tech?" to, "Who uses technology the best?" As a result, CEOs are realizing that their collaboration with IT needs to go a level deeper to understand whether and how their tech is providing an advantage. Strategy executives should find the right balance of education, control, and delegation when making decisions about technology adoption or implementation. In understanding what's possible within the bounds of their organization's tech stack, CEOs can develop an overall strategy that plays to their strengths or allows time for needed investments. As strategy becomes more dynamic in the coming months, CEOs would be wise to remember that their responses to trends will be only as good as their organizational technology permits.

FINANCE // Finance leaders are playing a larger role in strategy, with some even wearing both lead strategist and CFO hats. These leaders are drawing a fine line with technology-enabled strategy by making it dynamic without pivoting constantly. As capabilities such as market sensing and constant monitoring point to new directions, CFOs can actively manage the capital allocation available for such experimentation. This means placing some limits on the options available to the CEO, while helping to identify strategies that can generate robust profit streams in the future. Ultimately, the finance team may be responsible for communicating its decisions to the public in a way that emphasizes purposeful experimentation and profit potential, especially at a time when analysts and investors are highly attuned to uncertainty.

RISK // The COVID-19 pandemic has forced many companies to dramatically change their strategies or adopt more dynamic approaches to the annual planning cycle. Chief risk officers (CROs) should consider updating their organization's risk profiles around key assets (cyber, brand, core technology systems, etc.) to match changing strategies. For example, companies that relied heavily on brick-and-mortar business models require new risk profiles as they shift more to e-commerce. Going forward, strategy may become even more agile and dynamic, bolstered by market sensing and new technology capabilities. Moreover, an organization's demonstrated ability to manage risk amid uncertainty and disruption could become a strategic differentiator. CROs can decide which kind of leader they will be: one who manages risk by using governance to slow down adoption of new technologies, or one who optimizes risk in new technologies to deliver stronger business outcomes.

Digital Trend Highlights (#2 - Core revival)

Summary

- Modernizing legacy enterprise systems and migrating them to the cloud may help unleash an organization's digital potential.
- In what we recognize as a growing trend, some pioneering companies are beginning to use clever outsourcing arrangements to reengineer traditional business cases for core modernization

Key Highlights:

Over the next 18 to 24 months, we expect to see trend participants:

- Reengineer costs, project funding models, and the desired outcomes associated with their core (and, potentially, data center) modernization use cases by focusing on third-party platform management services.
- Explore opportunities to accelerate the discovery of the internals of black-box legacy systems to facilitate modernization.
- Support a platform-first strategy by deploying leading-edge system analysis tools to identify redundant or extraneous code within legacy ERP systems, and either move this code to another platform or delete it altogether.

Common areas of focus:

- More bang for fewer bucks
- System rationalization – how less is more
- Improved low-code platforms
- Modernized business rule extraction
- Improved incremental modernization

Key Questions to ask:

1. Where would negotiating operate-to-transform arrangements with your technology vendor(s) be most useful?
2. Would you benefit from moving legacy applications to more modern platforms (for example, low-code or cloud options)?
3. What is your strategy for eliminating technical debt in your legacy ERP system?

EXECUTIVE PERSPECTIVES

STRATEGY // Ongoing investments in core systems are necessary for IT to be an enabler of business value. Too often, executives view such investments in terms of immediate cost rather than future value. This is shortsighted: In many digital nonnative organizations, legacy core systems provide essential foundations for critical digital and business transformation initiatives. Several nontraditional approaches for financing core projects can help cost-focused CEOs find a different path to modernization. For example, working with the CFO, they can identify more cost-friendly opportunities to partner with hyperscaler cloud vendors or major ERP vendors and pursue smaller revitalization projects using low-code platforms. These and similar approaches can fundamentally rework the traditional business case for modernization by transforming a line-item cost into an investment in the company's future.

FINANCE // Many CFOs may have to make a crucial strategic decision about the future of their organization's core systems: procrastination or proactive modernization? The larger and more complex an entity is, the harder—and more expensive—an enterprise-level project such as core revival can be. Some CFOs may choose to wait for existing systems to break or become untenable before acting, but they can accumulate technical debt along the way. By contrast, finance leaders who are eager to modernize can consider a variety of approaches beyond large-scale migrations. For example, exploring creative deal structures with large cloud vendors or moving existing capabilities to low-code platforms can lead to cost-neutral options for establishing a future-ready foundation within core systems. Leveraging these and other core revival approaches, CFOs can become catalysts for fiscally responsible digital transformation and avoid being painted as a financial hurdle to the IT department's big goals.

RISK // Many core modernization initiatives today introduce leading-edge technologies into existing IT ecosystems. Risk officers should expect risks to emerge when old and new technologies intersect; they can work closely with CIOs to anticipate and manage risk in a manner that doesn't impede modernization efforts. Likewise, they can collaborate with the business side to identify opportunities to leverage risk management in new tech-enabled products and services as a strategic differentiator that helps build consumer trust. With these twin objectives in mind, CROs can help their organizations balance technology priorities and consumer sentiment against risks and regulatory concerns.

Digital Trend Highlights (#3 – Supply unchained)

Summary

- Supply chains are moving out of the back office and onto the value-enabling front lines of customer segmentation and product differentiation.
- They are extracting more value from the data they collect, analyze, and share across their supply networks.

Key Highlights:

Over the next 18 to 24 months, we expect to see manufacturers, retailers, and others take supply chain transformation to the next level by optimizing their supply chain ecosystems for resilience and risk. Moreover, they will begin transforming their supply chains from traditional back-office cost centers into value-driving operations.

Predicted areas of focus on **data**:
- Leverage IT/OT convergence
- Boost data capabilities at the edge
- Enhanced data visibility and speedier data processing

New tools predicted:
- Autonomous robots and collaborative cobots
- Aerial drones
- Computer vision

Key Questions to ask:
1. What technologies and techniques can you deploy to capture and analyze more internal and external data from across the supply and value chains?
2. How could you benefit from sharing information more freely across your supply network?
3. Which nonrepetitive supply chain tasks carry elevated safety risks? Which of these tasks could be performed by robots, cameras, or other technologies?

EXECUTIVE PERSPECTIVES

STRATEGY // Transforming an organization's supply chain from cost center to profit driver can have a significant impact on overall business strategy. While CEOs may not dive too deeply into the minutiae of data interoperability and demand signal capture, they should focus on the potential value that data-driven customer segmentation, digital optimization, and ecosystem transparency can help create. Taken together or individually, these opportunities are relevant to business and financial planning, risk management, and organizational efficiency. Notably, they can also help organizations optimize their supply chains for resilience and flexibility, which in the current global economic environment should be on every CEO's priority list.

FINANCE // To manage current supply chain disruptions, and to make supply chains more resilient for the future, CFOs can explore opportunities to invest in new technologies for greater integration. Case in point: blockchain.[12] The CFO, along with the broader C-suite, may be interested in the possibilities of increasing blockchain adoption for greater supply chain resilience in the postpandemic world. In fact, 40% of CFOs in a recent Deloitte survey expected their supply chains to be more diversified after the effect of coronavirus.[13] To achieve this diversification—and stay profitable—CFOs may need to dive deep into tactical items such as supplier payment terms, vendor assessments, and interest rate negotiations. No technology or reassessment should be out of bounds in the transformation from supply chain to network.

RISK // Global supply chains have faced acute disruption and increased regulatory scrutiny as a result of the pandemic; risk leaders today may not even be aware of all the points of risk in their supply chains. Even so, they may be able to respond effectively to future disruptions by learning more about vulnerabilities in their supply chain. Technology now makes it possible for organizations to understand the risk profile of their vendor landscape, share data in real time, protect IP, and track contractual terms. More disruptions are inevitable in increasingly complex supply networks, but forward-thinking CROs can take steps today to reduce potential points of failure throughout all parts of their supply chains.

Digital Trend Highlights (#4 – MLOps: Industrialized AI)

Summary

- Machine learning models are increasingly becoming key drivers of organizational performance.
- However, many are hamstrung in their efforts by clunky, brittle development and deployment processes that stifle experimentation and hinder collaboration among product teams, operational staff, and data scientists.
- To realize the broader, transformative benefits of AI and ML, the era of artisanal AI must give way to one of automated, industrialized insights.

Key Highlights:

- 28% of AI/machine learning projects fail, with lack of necessary expertise, production-ready data, and integrated development environments cited as the primary reasons for failure.
- Organizations may need to rethink cultural norms, organizational structures, and governance mechanisms to more efficiently leverage AI resources

MLOps optimizes development, deployment, and management
- MLOps helps organizations monitor model performance and manage model drift's predictive inaccuracies by helping standardize processes for maintaining alignment of AI models with evolving business and customer data.
- Bringing the discipline of DevOps to machine learning can help AI adopters scale model development and deployment, but they must also tackle a significant skills gap. In a recent Deloitte study, **68% of executives surveyed described their organization's skills gap as "moderate-to-extreme**," with 27% rating it as "major" or "extreme."

Key Questions to ask:
1. Do you have the skill sets and organizational structure needed to meet your AI goals today? In two years?
2. How can you improve the time to market of models and improve their performance in production?
3. How can you improve models' governance, accountability, and transparency? What precautions can reduce developer and data bias? How can you better protect sensitive data?

EXECUTIVE PERSPECTIVES

STRATEGY // With ML adoption growing across industries, CEOs—particularly those whose companies operate in low-growth sectors—are exploring how to use machine learning to grow market share and lower costs. CEOs may want to speak to their CIOs and IT teams about their vision for applying AI/ML to boost the bottom line. For example, if they hope to increase earnings per share by 10 points, CEOs should make their priorities clear and spend time understanding what can be achieved and/or what investments are needed. As the organization hires AI/ML talent to scale capabilities, leaders should provide a clear mandate to these new teams for how and when technology should augment human decision-making.

FINANCE // As organizations are increasingly pressed to make good decisions faster and develop better models for demand forecasting, finance leaders are quickly realizing that their organizations need machine learning at scale. Assuming that technology speed and capability will continue to increase exponentially, making a machine-based decision in the future will cost a fraction of a nonscalable human decision today. Indeed, 67% of executives in Deloitte's State of AI survey are already leveraging ML for efficiency gains, such as faster account reconciliation or more accurate accruals.[15] To ready their organizations for this change, CFOs can choose between becoming more technically savvy or buying financial planning and analysis as a service. Whether they sponsor data officers or take on the task themselves, finance leaders may soon rely on the power of machine-driven insights for their regular updates to analysts and shareholders.

RISK // ML deployments are quickly scaling up and enabling algorithms to make key decisions for the organization. Yet trust remains an issue: Humans are undeniably prone to bias, but the press and the public often take particular notice of biases in machines and biased outcomes of ML models.[16] CROs can work with their CIOs, CDOs, and other IT leaders to anticipate potential brand risks and suggest design workarounds. They can also make purposeful choices with AI and ML algorithms not only to help maintain public trust in their organizations but to position risk management protocols for AI/ML as a competitive differentiator.

Digital Trend Highlights (#5 – Machine data revolution: Feeding the machine)

Summary

- A growing number of AI pioneers are realizing that legacy data models and infrastructure—all designed to support decision-making by humans, not machines—could be a roadblock to ML success.
- This is driving a new approach to data management, capture, and use

Key Highlights:

In the next 18 to 24 months, we expect to see companies begin addressing this challenge by reengineering the way they **capture, store, and process** data. As part of this effort, they will deploy an array of tools and approaches including advanced data capture and structuring capabilities, analytics to identify connections among random data, and next-generation cloud-based data stores to support complex modeling.
- Over time, speed and capability will increase so dramatically that making that data-based decision in the future will cost a fraction of what it does today.

Capture and store:
- Cloud data warehouses: This permissions-based, centralized system eliminates the need for colocated data and data pipelines.
- Feature stores: In the near future, it will be commonplace for an organization to have hundreds or thousands of data models operating independently of each other, and in parallel.

Key Questions to ask:
1. How have you reevaluated data governance and data management as you move to increase the use of AI and ML?
2. What mechanisms support accessing data from key legacy systems? Do they meet your current and future needs?
3. Which untapped sources of data could have the greatest impact on your decision-making?

EXECUTIVE PERSPECTIVES

STRATEGY // CEOs are rarely involved at the deeper levels of data management. But those whose companies are deploying ML and other data-dependent AI tools may want to spend some time thinking about data strategy. Existing enterprise systems and data pipelines were not designed with AI needs in mind, so CEOs can engage their IT teams to lay the groundwork for this shift. They should hold the CIO or chief data officer accountable to carry out preparations for turning the organization's MLOps vision into a reality. They can also expect ongoing investments, as data is gradually prepared for algorithms first instead of humans. These new investments in data can eventually be paid back through increased profits or lowered cost per decision.

FINANCE // As the capabilities of modeling and ML become more robust (as detailed in our MLOps trend), finance leaders are leaning into data stewardship and even sponsoring data governance roles. With better data comes better modeling, which means CFOs can more accurately produce internal reports, predict quarterly performance, and shape the perceptions of market analysts and shareholders. However, the data needed for good modeling is not always internally owned— consider the example of parts manufacturers that monitor flight statistics to predict aluminum demand. Such combinations of raw, external data with company data can lead to actionable insights amid uncertainty. To enable these insights in the next 18–24 months, CFOs may need to think outside of the box to source new types of data, enable agile model governance, and optimize for modeling outcomes.

RISK // In the Age of With,[22] data strategies focus on providing analysis and insights that augment human decision-making. In this construct, algorithms—rather than data scientists and executives—may be consuming raw and unstructured data, but the inherent risks associated with managing large volumes of data remain constant. CROs can play a key role in defining risk parameters around protection, confidentiality, and integrity of large volumes of ML-optimized data. They can also develop separate risk strategies for more sensitive customer data and determine whether and how such data can be used in ongoing MLOps efforts. By delving deeper into these issues, CROs can help their organizations become more deliberate about where to apply AI in the business and, perhaps, explore opportunities to monetize risk data with new products and services.

Digital Trend Highlights (#6 – Zero trust: Never trust, always verify)

Summary

- Data, applications, workloads, and other resources are treated as individual, manageable units to contain breaches, and access is provided based on the principle of least privilege
- But the move to zero trust could require significant effort and planning, including addressing foundational cybersecurity issues, automating manual processes, and planning for transformational changes to the security organization, the technology landscape, and the enterprise itself.

Key Highlights:

The anticipated growth of smart devices, 5G, edge computing, and artificial intelligence promises to create even more data, connected nodes, and expanded attack surfaces.

In one study, 59% of companies surveyed had experienced a data breach due to a vendor or other third party;1 another study concluded that multiparty security incidents result in 13 times the financial losses of single-party events.

The zero trust mindset shift brings with it a set of design principles that guide security architecture development and build on existing security investments and processes. To enforce access control, companies must have situational awareness of their data and assets; companies that lag on basic cyber hygiene principles and practices may be challenged to realize the full benefits of zero trust. **Fundamentals include**:

- Data discovery and classification
- Asset discovery and attack-surface management
- Configuration and patch management
- Identity and access management
- Third-party risk management
- Logging and monitoring

Key Questions to ask:

1. How far are you on your journey moving away from network and server "zones of trust"? What is your next step?
2. How could you improve the skills and capacity of your cybersecurity organization relative to today's challenges? What about tomorrow's?
3. How can you better involve business-function system owners in security planning? Would their help in identifying areas requiring more restricted access improve the overall security posture?

EXECUTIVE PERSPECTIVES

STRATEGY // The stakes are high for CEOs when it comes to cyber risk. Beyond the damage that security breaches can have on companies, shareholders, and customers, they can end careers. CEOs are often answerable to the public for their organization's security posture, especially as it relates to consumer data, and they should thus approach this topic as the stewards of the organization's brand reputation and trust. By appointing a CRO, CISO, or other appropriate leader, they can look to new security postures such as *zero trust* that simplify protection of data, people, and networks without sacrificing user experience. Setting security priorities from the top can help the organization align on the importance of strengthening cyber defenses.

FINANCE // Reporting on cybersecurity breaches is among the CFO's more unpleasant responsibilities. When these events happen, CFOs are often on point, reporting to auditors and answering to the board, regulators, and the public. In a time when cyber risk is increasing and bad actors regularly test organizational defenses, CFOs should develop and maintain technology fluency and the awareness they will need to mitigate cyber events. Moreover, they should clearly understand the risks and rewards of their company's security posture—particularly as it applies to key strategic, physical, and financial assets—and then improve security by enabling zero trust adoption. Ultimately, the CFO—working in tandem with other risk and security leaders—can become a de facto crisis manager, working to predict and prevent threats to brand reputation, shareholder trust, and more.

RISK // Zero trust is fast becoming the modern standard for managing infrastructure, network, and data in a more secure manner. Despite the concept's broad benefits, many see it as solely a technology issue. To change that, over the next 18–24 months, CROs should consider placing zero trust adoption at the top of their agendas. CROs can first clarify the security benefits to the organization and then work with the CIO, CISO, and other leaders to enforce the new approach. Thorough adoption can eventually help risk posture and processes evolve in lockstep with innovation while reducing the frequency of cyber incidents.

Digital Trend Highlights (#7 – Rebooting the digital workplace)

Summary

- When the dust settles, will remote work become the rule or the exception?
- Companies may be able to overcome the digital workplace's deficits and ambiguities by more intentionally embracing its positive aspects, including the data generated by workers' tools and platforms.

Key Highlights:

One study found that only 15% of those employed pre–COVID-19 worked from home; these workers were joined after the pandemic by an additional 35%, suggesting that fully half of the employed labor force now works from home.

Some leaders approach the prospect of the digital workplace with a number of concerns:

- Productivity
- Relationship building and onboarding
- Development and learning
- Impact on innovation

Workplace social media can help teams tap into the power of the entire workforce, regardless of location, to generate ideas and collaborate, democratizing formerly privileged exchanges of ideas

With **collaboration tools now** ubiquitous, a collaboration ecosystem strategy can help optimize technology investments

The next-level ability to measure and manage will drive new ways of working:

- Employee engagement and well-being
- Flexible workplace 2.0
- Digital serendipity

Key Questions to ask:

1. How do you assess employee and team performance of remote workers? What steps are you taking to improve performance?
2. What steps have you taken to virtually nurture the spontaneous employee connections and dialogue that drive innovation?
3. What have you concluded about the long-term role of physical workspace? How will office design and technology tools support optimal collaboration and productivity?

EXECUTIVE PERSPECTIVES

STRATEGY // For many CEOs, this year's comprehensive shift to remote work remains top of mind. Leaders who are eager to improve the work experience can look to new digital tools that monitor online interactions to explore short-term improvements such as better collaboration as well as longer-term innovation. The virtual office also offers an opportunity for leaders to practice and promote radical transparency in communication. Still, CEOs should be highly purposeful in architecting their goals for remote work, as the choices they make can affect company culture well beyond the pandemic. They can either help employees feel more connected than ever to each other and to the company's vision or leave them feeling disconnected and alone in the new normal.

FINANCE // The challenges of the rapid-onset digital workplace continue to be top of mind throughout the C-suite and broader organization. CFOs should consider the potential financial impacts of these challenges, including the downsizing of large, urban offices into dynamic, smaller workspaces. But they should also anticipate potential costs of diminished productivity and creativity, as employees no longer congregate physically. In virtual settings, we often lose the ability to read social and facial cues, or to brainstorm during informal, water-cooler conversations. Finance leaders can lead differently in remote work by setting a strategy to address some of these gaps in the new workplace—for example, they can implement AI tools to analyze meetings in real time and nudge decision-makers to solicit opinions from quieter participants.[15] Whether or not companies adopt such technology measures, people will look to CFOs to find ways to support employees' well-being and their ability to deliver outcomes that sustain the company.

RISK // This year's jarring shift from onsite to remote work offers CROs an opportunity to redefine security standards for remote collaboration. For example, home networks now process the same level of workloads as corporate networks, and the increase in VPN usage means increased commingling of company data and personal devices. As digital collaboration and file-sharing become routine, risk leaders should try to respond constructively to the increasing pace of change without hampering the organization's ability to keep pace with the market. They can work closely with the CIO and CTO to assess upcoming changes to collaboration tools and decide on a risk posture that works for the near term. Risk leaders can also anticipate further challenges and changes as a broad return to corporate offices takes place.

Digital Trend Highlights (#8 – Bespoke for billions: Digital meets physical)

Summary

- The prevalence of digital interactions has left many of us pining for the days of in-person interactions. As we look to the future, we expect consumers will no longer be satisfied with distinct physical or digital brand experiences: They will expect a blend of the best of both
- In the next 18 to 24 months, we expect in-person and digital experiences to become more seamless and intertwined.

Key Highlights:

Yet our growing reliance on digital interactions has left many of us pining for more personalized human experiences. In Deloitte surveys conducted during the pandemic's early months, more than half of the participants said they wanted their virtual experiences to feel more "human."

- In a January 2020 survey, 3,000 C-suite executives said that they believe elevating the human experience should be a top organizational priority, yet 96% of them have struggled to design and launch anything resembling human-centered experiences
- There's a new breed of human experience creative: designers who use code as their medium, eliminating the gap between design and execution.
- To drive increasingly powerful—and personal—human interactions, algorithms and systems will need vast amounts of personal data and information. To build the trust that's essential to the interaction, organizations will need to carefully design technologies to behave in trustworthy and ethical ways

Tech Tools of the bespoke experiences trade:
- Omnichannelmarketing platforms
- Handheld devicesas platforms
- Affectivecomputing
- Spatialweb
- Next-generationidentity management

Key Questions to ask:
1. How agile are your customer journeys? Are they seamless and consistent across all channels, both physical and digital? What does it feel like from your customers' perspective?
2. Is your organization experimenting with technologies that will lead to offering more personalized experiences, both in-person and digital?
3. Is your customer data formatted in a way that is machine-readable? Can you access customer data beyond demographic and transactional data to include behaviors, attitudes, emotions, and preferences? How can you use technology to build customer trust?

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- **Data and how organizations are industrializing their AI initiatives to manage data for machine rather than human**
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- **Emerging Trends in human and machine interation, including digital experience and technology that supports DE&I**

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Source: https://www2.deloitte.com/content/dam/insights/articles/6730_TT-Landing-page/DI_2021-Tech-Trends.pdf

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- As a result, companies are transforming strategy development from an infrequent, time-consuming process to one that's continuous and dynamic

Key Highlights:

- Having a strategy sitting on the shelf isn't enough – **effective execution is critical**
- Companies need to invest in an empowered executive strategy leader
- Key components to success:
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  - There needs to be business savvy tech leaders
  - Aligned technology and partners
  - Collaborative list of strategic assumptions
  - Agile funding
- Leading organizations are engineering their strategic function to be more agile, scalable, andstable, giving them an array of strategic options in their back pocket for whatever the future holds.
- Everyone has access to similar technologies, but it's how you use them that makes the competitive difference

Key Questions to ask:

1. Does your technology limit your organization's strategic options? If so, how can that be addressed?
2. How can strategy and tech leaders work better to understand the strategic plan as well as the opportunities and constraints of your technology architecture?
3. What assumptions must hold true for your strategy? How do you monitor these and make timely adjustments when needed?

EXECUTIVE PERSPECTIVES

STRATEGY // The playbook for using technology to create competitive advantage is changing from, "Who owns the best tech?" to, "Who uses technology the best?" As a result, CEOs are realizing that their collaboration with IT needs to go a level deeper to understand whether and how their tech is providing an advantage. Strategy executives should find the right balance of education, control, and delegation when making decisions about technology adoption or implementation. In understanding what's possible within the bounds of their organization's tech stack, CEOs can develop an overall strategy that plays to their strengths or allows time for needed investments. As strategy becomes more dynamic in the coming months, CEOs would be wise to remember that their responses to trends will be only as good as their organizational technology permits.

FINANCE // Finance leaders are playing a larger role in strategy, with some even wearing both lead strategist and CFO hats. These leaders are drawing a fine line with technology-enabled strategy by making it dynamic without pivoting constantly. As capabilities such as market sensing and constant monitoring point to new directions, CFOs can actively manage the capital allocation available for such experimentation. This means placing some limits on the options available to the CEO, while helping to identify strategies that can generate robust profit streams in the future. Ultimately, the finance team may be responsible for communicating its decisions to the public in a way that emphasizes purposeful experimentation and profit potential, especially at a time when analysts and investors are highly attuned to uncertainty.

RISK // The COVID-19 pandemic has forced many companies to dramatically change their strategies or adopt more dynamic approaches to the annual planning cycle. Chief risk officers (CROs) should consider updating their organization's risk profiles around key assets (cyber, brand, core technology systems, etc.) to match changing strategies. For example, companies that relied heavily on brick-and-mortar business models require new risk profiles as they shift more to e-commerce. Going forward, strategy may become even more agile and dynamic, bolstered by market sensing and new technology capabilities. Moreover, an organization's demonstrated ability to manage risk amid uncertainty and disruption could become a strategic differentiator. CROs can decide which kind of leader they will be: one who manages risk by using governance to slow down adoption of new technologies, or one who optimizes risk in new technologies to deliver stronger business outcomes.

Digital Trend Highlights (#2 - Core revival)

Summary

- Modernizing legacy enterprise systems and migrating them to the cloud may help unleash an organization's digital potential.
- In what we recognize as a growing trend, some pioneering companies are beginning to use clever outsourcing arrangements to reengineer traditional business cases for core modernization

Key Highlights:

Over the next 18 to 24 months, we expect to see trend participants:

- Reengineer costs, project funding models, and the desired outcomes associated with their core (and, potentially, data center) modernization use cases by focusing on third-party platform management services.
- Explore opportunities to accelerate the discovery of the internals of black-box legacy systems to facilitate modernization.
- Support a platform-first strategy by deploying leading-edge system analysis tools to identify redundant or extraneous code within legacy ERP systems, and either move this code to another platform or delete it altogether.

Common areas of focus:

- More bang for fewer bucks
- System rationalization – how less is more
- Improved low-code platforms
- Modernized business rule extraction
- Improved incremental modernization

Key Questions to ask:

1. Where would negotiating operate-to-transform arrangements with your technology vendor(s) be most useful?
2. Would you benefit from moving legacy applications to more modern platforms (for example, low-code or cloud options)?
3. What is your strategy for eliminating technical debt in your legacy ERP system?

EXECUTIVE PERSPECTIVES

STRATEGY // Ongoing investments in core systems are necessary for IT to be an enabler of business value. Too often, executives view such investments in terms of immediate cost rather than future value. This is shortsighted: In many digital nonnative organizations, legacy core systems provide essential foundations for critical digital and business transformation initiatives. Several nontraditional approaches for financing core projects can help cost-focused CEOs find a different path to modernization. For example, working with the CFO, they can identify more cost-friendly opportunities to partner with hyperscaler cloud vendors or major ERP vendors and pursue smaller revitalization projects using low-code platforms. These and similar approaches can fundamentally rework the traditional business case for modernization by transforming a line-item cost into an investment in the company's future.

FINANCE // Many CFOs may have to make a crucial strategic decision about the future of their organization's core systems: procrastination or proactive modernization? The larger and more complex an entity is, the harder—and more expensive—an enterprise-level project such as core revival can be. Some CFOs may choose to wait for existing systems to break or become untenable before acting, but they can accumulate technical debt along the way. By contrast, finance leaders who are eager to modernize can consider a variety of approaches beyond large-scale migrations. For example, exploring creative deal structures with large cloud vendors or moving existing capabilities to low-code platforms can lead to cost-neutral options for establishing a future-ready foundation within core systems. Leveraging these and other core revival approaches, CFOs can become catalysts for fiscally responsible digital transformation and avoid being painted as a financial hurdle to the IT department's big goals.

RISK // Many core modernization initiatives today introduce leading-edge technologies into existing IT ecosystems. Risk officers should expect risks to emerge when old and new technologies intersect; they can work closely with CIOs to anticipate and manage risk in a manner that doesn't impede modernization efforts. Likewise, they can collaborate with the business side to identify opportunities to leverage risk management in new tech-enabled products and services as a strategic differentiator that helps build consumer trust. With these twin objectives in mind, CROs can help their organizations balance technology priorities and consumer sentiment against risks and regulatory concerns.

Digital Trend Highlights (#3 – Supply unchained)

Summary
• Supply chains are moving out of the back office and onto the value-enabling front lines of customer segmentation and product differentiation.   • They are extracting more value from the data they collect, analyze, and share across their supply networks.

Key Highlights:

Over the next 18 to 24 months, we expect to see manufacturers, retailers, and others take supply chain transformation to the next level by optimizing their supply chain ecosystems for resilience and risk. Moreover, they will begin transforming their supply chains from traditional back-office cost centers into value-driving operations.

Predicted areas of focus on **data**:
- Leverage IT/OT convergence
- Boost data capabilities at the edge
- Enhanced data visibility and speedier data processing

New tools predicted:
- Autonomous robots and collaborative cobots
- Aerial drones
- Computer vision

Key Questions to ask:
1. What technologies and techniques can you deploy to capture and analyze more internal and external data from across the supply and value chains?
2. How could you benefit from sharing information more freely across your supply network?
3. Which nonrepetitive supply chain tasks carry elevated safety risks? Which of these tasks could be performed by robots, cameras, or other technologies?

EXECUTIVE PERSPECTIVES

STRATEGY // Transforming an organization's supply chain from cost center to profit driver can have a significant impact on overall business strategy. While CEOs may not dive too deeply into the minutiae of data interoperability and demand signal capture, they should focus on the potential value that data-driven customer segmentation, digital optimization, and ecosystem transparency can help create. Taken together or individually, these opportunities are relevant to business and financial planning, risk management, and organizational efficiency. Notably, they can also help organizations optimize their supply chains for resilience and flexibility, which in the current global economic environment should be on every CEO's priority list.

FINANCE // To manage current supply chain disruptions, and to make supply chains more resilient for the future, CFOs can explore opportunities to invest in new technologies for greater integration. Case in point: blockchain.[12] The CFO, along with the broader C-suite, may be interested in the possibilities of increasing blockchain adoption for greater supply chain resilience in the postpandemic world. In fact, 40% of CFOs in a recent Deloitte survey expected their supply chains to be more diversified after the effect of coronavirus.[13] To achieve this diversification—and stay profitable—CFOs may need to dive deep into tactical items such as supplier payment terms, vendor assessments, and interest rate negotiations. No technology or reassessment should be out of bounds in the transformation from supply chain to network.

RISK // Global supply chains have faced acute disruption and increased regulatory scrutiny as a result of the pandemic; risk leaders today may not even be aware of all the points of risk in their supply chains. Even so, they may be able to respond effectively to future disruptions by learning more about vulnerabilities in their supply chain. Technology now makes it possible for organizations to understand the risk profile of their vendor landscape, share data in real time, protect IP, and track contractual terms. More disruptions are inevitable in increasingly complex supply networks, but forward-thinking CROs can take steps today to reduce potential points of failure throughout all parts of their supply chains.

Digital Trend Highlights (#4 – MLOps: Industrialized AI)

Summary

- Machine learning models are increasingly becoming key drivers of organizational performance.
- However, many are hamstrung in their efforts by clunky, brittle development and deployment processes that stifle experimentation and hinder collaboration among product teams, operational staff, and data scientists.
- To realize the broader, transformative benefits of AI and ML, the era of artisanal AI must give way to one of automated, industrialized insights.

Key Highlights:

- 28% of AI/machine learning projects fail, with lack of necessary expertise, production-ready data, and integrated development environments cited as the primary reasons for failure.
- Organizations may need to rethink cultural norms, organizational structures, and governance mechanisms to more efficiently leverage AI resources

MLOps optimizes development, deployment, and management

- MLOps helps organizations monitor model performance and manage model drift's predictive inaccuracies by helping standardize processes for maintaining alignment of AI models with evolving business and customer data.
- Bringing the discipline of DevOps to machine learning can help AI adopters scale model development and deployment, but they must also tackle a significant skills gap. In a recent Deloitte study, **68% of executives surveyed described their organization's skills gap as "moderate-to-extreme**," with 27% rating it as "major" or "extreme."

Key Questions to ask:

1. Do you have the skill sets and organizational structure needed to meet your AI goals today? In two years?
2. How can you improve the time to market of models and improve their performance in production?
3. How can you improve models' governance, accountability, and transparency? What precautions can reduce developer and data bias? How can you better protect sensitive data?

EXECUTIVE PERSPECTIVES

STRATEGY // With ML adoption growing across industries, CEOs—particularly those whose companies operate in low-growth sectors—are exploring how to use machine learning to grow market share and lower costs. CEOs may want to speak to their CIOs and IT teams about their vision for applying AI/ML to boost the bottom line. For example, if they hope to increase earnings per share by 10 points, CEOs should make their priorities clear and spend time understanding what can be achieved and/or what investments are needed. As the organization hires AI/ML talent to scale capabilities, leaders should provide a clear mandate to these new teams for how and when technology should augment human decision-making.

FINANCE // As organizations are increasingly pressed to make good decisions faster and develop better models for demand forecasting, finance leaders are quickly realizing that their organizations need machine learning at scale. Assuming that technology speed and capability will continue to increase exponentially, making a machine-based decision in the future will cost a fraction of a nonscalable human decision today. Indeed, 67% of executives in Deloitte's State of AI survey are already leveraging ML for efficiency gains, such as faster account reconciliation or more accurate accruals.[15] To ready their organizations for this change, CFOs can choose between becoming more technically savvy or buying financial planning and analysis as a service. Whether they sponsor data officers or take on the task themselves, finance leaders may soon rely on the power of machine-driven insights for their regular updates to analysts and shareholders.

RISK // ML deployments are quickly scaling up and enabling algorithms to make key decisions for the organization. Yet trust remains an issue: Humans are undeniably prone to bias, but the press and the public often take particular notice of biases in machines and biased outcomes of ML models.[16] CROs can work with their CIOs, CDOs, and other IT leaders to anticipate potential brand risks and suggest design workarounds. They can also make purposeful choices with AI and ML algorithms not only to help maintain public trust in their organizations but to position risk management protocols for AI/ML as a competitive differentiator.

Digital Trend Highlights (#5 – Machine data revolution: Feeding the machine)

Summary

- A growing number of AI pioneers are realizing that legacy data models and infrastructure—all designed to support decision-making by humans, not machines—could be a roadblock to ML success.
- This is driving a new approach to data management, capture, and use

Key Highlights:

In the next 18 to 24 months, we expect to see companies begin addressing this challenge by reengineering the way they **capture, store, and process** data. As part of this effort, they will deploy an array of tools and approaches including advanced data capture and structuring capabilities, analytics to identify connections among random data, and next-generation cloud-based data stores to support complex modeling.

- Over time, speed and capability will increase so dramatically that making that data-based decision in the future will cost a fraction of what it does today.

Capture and store:

- Cloud data warehouses: This permissions-based, centralized system eliminates the need for colocated data and data pipelines.
- Feature stores: In the near future, it will be commonplace for an organization to have hundreds or thousands of data models operating independently of each other, and in parallel.

Key Questions to ask:

1. How have you reevaluated data governance and data management as you move to increase the use of AI and ML?
2. What mechanisms support accessing data from key legacy systems? Do they meet your current and future needs?
3. Which untapped sources of data could have the greatest impact on your decision-making?

EXECUTIVE PERSPECTIVES

STRATEGY // CEOs are rarely involved at the deeper levels of data management. But those whose companies are deploying ML and other data-dependent AI tools may want to spend some time thinking about data strategy. Existing enterprise systems and data pipelines were not designed with AI needs in mind, so CEOs can engage their IT teams to lay the groundwork for this shift. They should hold the CIO or chief data officer accountable to carry out preparations for turning the organization's MLOps vision into a reality. They can also expect ongoing investments, as data is gradually prepared for algorithms first instead of humans. These new investments in data can eventually be paid back through increased profits or lowered cost per decision.

FINANCE // As the capabilities of modeling and ML become more robust (as detailed in our MLOps trend), finance leaders are leaning into data stewardship and even sponsoring data governance roles. With better data comes better modeling, which means CFOs can more accurately produce internal reports, predict quarterly performance, and shape the perceptions of market analysts and shareholders. However, the data needed for good modeling is not always internally owned—consider the example of parts manufacturers that monitor flight statistics to predict aluminum demand. Such combinations of raw, external data with company data can lead to actionable insights amid uncertainty. To enable these insights in the next 18–24 months, CFOs may need to think outside of the box to source new types of data, enable agile model governance, and optimize for modeling outcomes.

RISK // In the Age of With,[22] data strategies focus on providing analysis and insights that augment human decision-making. In this construct, algorithms—rather than data scientists and executives—may be consuming raw and unstructured data, but the inherent risks associated with managing large volumes of data remain constant. CROs can play a key role in defining risk parameters around protection, confidentiality, and integrity of large volumes of ML-optimized data. They can also develop separate risk strategies for more sensitive customer data and determine whether and how such data can be used in ongoing MLOps efforts. By delving deeper into these issues, CROs can help their organizations become more deliberate about where to apply AI in the business and, perhaps, explore opportunities to monetize risk data with new products and services.

Digital Trend Highlights (#6 – Zero trust: Never trust, always verify)

Summary

- Data, applications, workloads, and other resources are treated as individual, manageable units to contain breaches, and access is provided based on the principle of least privilege
- But the move to zero trust could require significant effort and planning, including addressing foundational cybersecurity issues, automating manual processes, and planning for transformational changes to the security organization, the technology landscape, and the enterprise itself.

Key Highlights:

The anticipated growth of smart devices, 5G, edge computing, and artificial intelligence promises to create even more data, connected nodes, and expanded attack surfaces.

In one study, 59% of companies surveyed had experienced a data breach due to a vendor or other third party;1 another study concluded that multiparty security incidents result in 13 times the financial losses of single-party events.

The zero trust mindset shift brings with it a set of design principles that guide security architecture development and build on existing security investments and processes. To enforce access control, companies must have situational awareness of their data and assets; companies that lag on basic cyber hygiene principles and practices may be challenged to realize the full benefits of zero trust. **Fundamentals include**:

- Data discovery and classification
- Asset discovery and attack-surface management
- Configuration and patch management
- Identity and access management
- Third-party risk management
- Logging and monitoring

Key Questions to ask:

1. How far are you on your journey moving away from network and server "zones of trust"? What is your next step?
2. How could you improve the skills and capacity of your cybersecurity organization relative to today's challenges? What about tomorrow's?
3. How can you better involve business-function system owners in security planning? Would their help in identifying areas requiring more restricted access improve the overall security posture?

EXECUTIVE PERSPECTIVES

STRATEGY // The stakes are high for CEOs when it comes to cyber risk. Beyond the damage that security breaches can have on companies, shareholders, and customers, they can end careers. CEOs are often answerable to the public for their organization's security posture, especially as it relates to consumer data, and they should thus approach this topic as the stewards of the organization's brand reputation and trust. By appointing a CRO, CISO, or other appropriate leader, they can look to new security postures such as *zero trust* that simplify protection of data, people, and networks without sacrificing user experience. Setting security priorities from the top can help the organization align on the importance of strengthening cyber defenses.

FINANCE // Reporting on cybersecurity breaches is among the CFO's more unpleasant responsibilities. When these events happen, CFOs are often on point, reporting to auditors and answering to the board, regulators, and the public. In a time when cyber risk is increasing and bad actors regularly test organizational defenses, CFOs should develop and maintain technology fluency and the awareness they will need to mitigate cyber events. Moreover, they should clearly understand the risks and rewards of their company's security posture—particularly as it applies to key strategic, physical, and financial assets—and then improve security by enabling zero trust adoption. Ultimately, the CFO—working in tandem with other risk and security leaders—can become a de facto crisis manager, working to predict and prevent threats to brand reputation, shareholder trust, and more.

RISK // Zero trust is fast becoming the modern standard for managing infrastructure, network, and data in a more secure manner. Despite the concept's broad benefits, many see it as solely a technology issue. To change that, over the next 18–24 months, CROs should consider placing zero trust adoption at the top of their agendas. CROs can first clarify the security benefits to the organization and then work with the CIO, CISO, and other leaders to enforce the new approach. Thorough adoption can eventually help risk posture and processes evolve in lockstep with innovation while reducing the frequency of cyber incidents.

Digital Trend Highlights (#7 – Rebooting the digital workplace)

Summary

- When the dust settles, will remote work become the rule or the exception?
- Companies may be able to overcome the digital workplace's deficits and ambiguities by more intentionally embracing its positive aspects, including the data generated by workers' tools and platforms.

Key Highlights:

One study found that only 15% of those employed pre–COVID-19 worked from home; these workers were joined after the pandemic by an additional 35%, suggesting that fully half of the employed labor force now works from home.

Some leaders approach the prospect of the digital workplace with a number of concerns:

- Productivity
- Relationship building and onboarding
- Development and learning
- Impact on innovation

Workplace social media can help teams tap into the power of the entire workforce, regardless of location, to generate ideas and collaborate, democratizing formerly privileged exchanges of ideas

With **collaboration tools now** ubiquitous, a collaboration ecosystem strategy can help optimize technology investments

The next-level ability to measure and manage will drive new ways of working:

- Employee engagement and well-being
- Flexible workplace 2.0
- Digital serendipity

Key Questions to ask:

1. How do you assess employee and team performance of remote workers? What steps are you taking to improve performance?
2. What steps have you taken to virtually nurture the spontaneous employee connections and dialogue that drive innovation?
3. What have you concluded about the long-term role of physical workspace? How will office design and technology tools support optimal collaboration and productivity?

EXECUTIVE PERSPECTIVES

STRATEGY // For many CEOs, this year's comprehensive shift to remote work remains top of mind. Leaders who are eager to improve the work experience can look to new digital tools that monitor online interactions to explore short-term improvements such as better collaboration as well as longer-term innovation. The virtual office also offers an opportunity for leaders to practice and promote radical transparency in communication. Still, CEOs should be highly purposeful in architecting their goals for remote work, as the choices they make can affect company culture well beyond the pandemic. They can either help employees feel more connected than ever to each other and to the company's vision or leave them feeling disconnected and alone in the new normal.

FINANCE // The challenges of the rapid-onset digital workplace continue to be top of mind throughout the C-suite and broader organization. CFOs should consider the potential financial impacts of these challenges, including the downsizing of large, urban offices into dynamic, smaller workspaces. But they should also anticipate potential costs of diminished productivity and creativity, as employees no longer congregate physically. In virtual settings, we often lose the ability to read social and facial cues, or to brainstorm during informal, water-cooler conversations. Finance leaders can lead differently in remote work by setting a strategy to address some of these gaps in the new workplace—for example, they can implement AI tools to analyze meetings in real time and nudge decision-makers to solicit opinions from quieter participants.[15] Whether or not companies adopt such technology measures, people will look to CFOs to find ways to support employees' well-being and their ability to deliver outcomes that sustain the company.

RISK // This year's jarring shift from onsite to remote work offers CROs an opportunity to redefine security standards for remote collaboration. For example, home networks now process the same level of workloads as corporate networks, and the increase in VPN usage means increased commingling of company data and personal devices. As digital collaboration and file-sharing become routine, risk leaders should try to respond constructively to the increasing pace of change without hampering the organization's ability to keep pace with the market. They can work closely with the CIO and CTO to assess upcoming changes to collaboration tools and decide on a risk posture that works for the near term. Risk leaders can also anticipate further challenges and changes as a broad return to corporate offices takes place.

Digital Trend Highlights (#8 – Bespoke for billions: Digital meets physical)

Summary

- The prevalence of digital interactions has left many of us pining for the days of in-person interactions. As we look to the future, we expect consumers will no longer be satisfied with distinct physical or digital brand experiences: They will expect a blend of the best of both
- In the next 18 to 24 months, we expect in-person and digital experiences to become more seamless and intertwined.

Key Highlights:

Yet our growing reliance on digital interactions has left many of us pining for more personalized human experiences. In Deloitte surveys conducted during the pandemic's early months, more than half of the participants said they wanted their virtual experiences to feel more "human."

- In a January 2020 survey, 3,000 C-suite executives said that they believe elevating the human experience should be a top organizational priority, yet 96% of them have struggled to design and launch anything resembling human-centered experiences
- There's a new breed of human experience creative: designers who use code as their medium, eliminating the gap between design and execution.
- To drive increasingly powerful—and personal—human interactions, algorithms and systems will need vast amounts of personal data and information. To build the trust that's essential to the interaction, organizations will need to carefully design technologies to behave in trustworthy and ethical ways

Tech Tools of the bespoke experiences trade:
- Omnichannelmarketing platforms
- Handheld devicesas platforms
- Affectivecomputing
- Spatialweb
- Next-generationidentity management

Key Questions to ask:
1. How agile are your customer journeys? Are they seamless and consistent across all channels, both physical and digital? What does it feel like from your customers' perspective?
2. Is your organization experimenting with technologies that will lead to offering more personalized experiences, both in-person and digital?
3. Is your customer data formatted in a way that is machine-readable? Can you access customer data beyond demographic and transactional data to include behaviors, attitudes, emotions, and preferences? How can you use technology to build customer trust?

EXECUTIVE PERSPECTIVES

STRATEGY // The pandemic has given fresh importance to the CEO's role as an end-user ethnographer.[12] Organizations are scrambling to respond to customers' values, risk appetites, and preferences as they design safe experiences that blend the physical and digital. CEOs are on point for directing this human experience strategy. They should consider shifting trends on what technology is enabling (for example, increases in virtual shopping and service) as well as the differences in what people are expecting from brands. Ultimately, a consistent, humane experience is the goal, and setting direction from the top down can help CEOs lead their organizations in line with their values—and their vision for responding to unprecedented times.

FINANCE // As human-centered design improves and IT brings more use cases to the finance team, CFOs should be mindful of the business case: Which metrics (ROI, cost per impression, etc.) will justify investments, and which products or services are ripe for disruption? Moreover, in a primarily digital economy, CFOs should consider how human connections drive accounting and valuation. They may need to revisit concepts of impairment or sales tax implications to assess whether such standards preclude them from showing strong financial statements. Likewise, the value of high-quality human experience platforms may be difficult to quantify, but it can also become a leading indicator of an organization's performance.

RISK // Physical and digital are blending to create hybrid user experiences. In this new environment, privacy-related issues may be amplified relative to purely physical or digital customer interactions. This shift can lead to CROs rethinking traditional forms of security such as the password and opting for newer methods such as mobile biometrics. They should pay close attention to privacy as technology enables organizations to increasingly identify unique customers and their data across channels. Risk leaders may also be dealing with a generational divide on human experience, as expectations vary widely between digital natives and older generations.[13] Leaps in cybersecurity and blended experiences may require organizations to bring along customers who aren't ready for the change. Accordingly, the CRO's role in creating trust among consumers becomes more important than ever.

Digital Trend Highlights (#9 – DEI Tech: tools for equity)

Summary

- While HR professionals often lead DEI strategies, technology leaders play a critical role as a strategic partner by designing, developing, and executing tech-enabled solutions to address increasingly complex DEI workforce challenges
- Over the coming months, we expect enterprises to adopt new tools that incorporate advanced analytics, automation, and AI, including natural language processing and machine learning, to help inform, deliver,and measure the impact of DEI.

Key Highlights:

Diversity, equity, and inclusion are important to current as well as potential employees worldwide. A 2020 Lenovo/Intel global employee study suggests that an organization's DEI policies and performance are significant factors in a candidate's decision to apply for or accept a job.

- More than half of employees across all markets said that DEI performance is "extremely" or "very" important when deciding where to apply and whether to accept an offer. This percentage is even higher for employees in China (89%),Brazil (88%), and the United States (75%).
- AI capabilities can help leaders understand individuals' behaviors and how they change over time, helping them reinforce and optimize behaviors that promote DEI

DEI tech designed to address workforce challenges *(chart on next page)*

- Recruitment and advancement
- Leadership and culture
- Measurement and insights

Key Questions to ask:

1. Which tools and platforms are you evaluating to support your overall organizational DEI efforts?
2. How can your DEI technology efforts focus on spanning the employee life cycle rather than standalone initiatives such as reducing recruitment bias?
3. How are DEI and tech leaders collaborating to implement technology that will provide meaningful DEI outcomes?

DEI tech designed to address workforce challenges

DEI technology solutions may use AI/ML and advanced analytics to provide granular insight into such areas as talent acquisition, advancement, well-being, and retention. Others offer feedback and coaching capabilities for leaders and decision-makers. All seek to make decision-making less prone to human errors and biases while improving organizational performance and innovation. Here are just a few examples of how organizations are using technology tools to support DEI outcomes.

AREA	DESCRIPTION	OPPORTUNITIES
Recruitment and advancement	Tools can help identify, recruit, develop, and advance a more diverse talent pool.	• Identify and address biased language in job postings using natural language processing (NLP) • Nudge recruiters at key points in the hiring process to increase awareness of potential bias using AI • Access pools of qualified, diverse candidates through candidate search platforms • Objectively identify "optimal" candidates for jobs or promotions using AI, machine learning, and automation[5]
Leadership and culture	Tools can help leaders build inclusive cultures, including engagement and retention of diverse talent.	• Support efforts to build inclusion and belonging within work groups using organizational network analysis and community-building social platforms • Encourage more objective performance reviews using NLP and ML • Gain insight into behavior changes needed to develop inclusive leaders using behavioral assessment tools and learning platforms
Measurement and insights	Data and analytics tools can be used to establish organizational baselines, measure progress, and deliver actionable insights.	• Monitor DEI KPIs, including compensation and advancement equity, using advanced analytics, data visualization, and interactive dashboards • Match people to diverse workplace opportunities and coaches using data insights • Predict which workers are likely to leave using predictive forecasting models to proactively intervene • Evaluate qualitative and quantitative outcomes of DEI efforts using advanced analytics

EXECUTIVE PERSPECTIVES

STRATEGY // A growing number of CEOs have set ambitious goals for DEI but have struggled to measure progress. Emerging DEI tools can help CEOs make the cultural shifts needed to reduce bias and create inclusive workplaces. For this to be successful, CEOs should fully understand DEI tech capabilities and require CIOs and diversity leaders to design purposeful constraints so that tools are used for good. In some cases, organizations with advanced DEI analytics have struggled to act on their new insights and created more complex problems. With this in mind, CEOs should work with stakeholders to develop tailored strategies and informed teams for each inclusion issue they'd like to address.

FINANCE // More than ever, leaders are answering to the public for the organization's vision of social responsibility. Accordingly, many forward-thinking CFOs are taking a stronger role in defining what that vision is, since talent remains a top-five priority for them. With new workforce entrants aware of employers' commitment to DEI, social responsibility may soon play a stronger role in retaining talent. CFOs may be less concerned than others with the granular details of inclusion technologies used to monitor recruiting bias, but they should keep a keen eye on tools that can help train and develop a diverse workforce with needed skill sets. Especially in the current virtual environment, CFOs can also capitalize on remote work models to identify and recruit diverse candidates who would normally be unavailable.

RISK // In the arena of social issues, many often see technology as being biased. However, the fundamental issue with workplace bias lies not with software tools but with the biased humans who build or use them. Tools such as those discussed in this chapter can provide the nudges or insights needed to reduce human bias. They can also manage the data that can help hold an organization accountable to its vision of diversity, equity, and inclusion. When chief risk officers (CROs) manage the inherent risks of transparency, data gathering and analysis from such tools may help organizations measure progress on DEI. Risk leaders can then look for ways to use predictive risk analytics to intervene before issues arise.

EXECUTIVE PERSPECTIVES

STRATEGY // The pandemic has given fresh importance to the CEO's role as an end-user ethnographer.[12] Organizations are scrambling to respond to customers' values, risk appetites, and preferences as they design safe experiences that blend the physical and digital. CEOs are on point for directing this human experience strategy. They should consider shifting trends on what technology is enabling (for example, increases in virtual shopping and service) as well as the differences in what people are expecting from brands. Ultimately, a consistent, humane experience is the goal, and setting direction from the top down can help CEOs lead their organizations in line[13] with their values—and their vision for responding to unprecedented times.

FINANCE // As human-centered design improves and IT brings more use cases to the finance team, CFOs should be mindful of the business case: Which metrics (ROI, cost per impression, etc.) will justify investments, and which products or services are ripe for disruption? Moreover, in a primarily digital economy, CFOs should consider how human connections drive accounting and valuation. They may need to revisit concepts of impairment or sales tax implications to assess whether such standards preclude them from showing strong financial statements. Likewise, the value of high-quality human experience platforms may be difficult to quantify, but it can also become a leading indicator of an organization's performance.

RISK // Physical and digital are blending to create hybrid user experiences. In this new environment, privacy-related issues may be amplified relative to purely physical or digital customer interactions. This shift can lead to CROs rethinking traditional forms of security such as the password and opting for newer methods such as mobile biometrics. They should pay close attention to privacy as technology enables organizations to increasingly identify unique customers and their data across channels. Risk leaders may also be dealing with a generational divide on human experience, as expectations vary widely between digital natives and older generations.[13] Leaps in cybersecurity and blended experiences may require organizations to bring along customers who aren't ready for the change. Accordingly, the CRO's role in creating trust among consumers becomes more important than ever.

Digital Trend Highlights (#9 – DEI Tech: tools for equity)

Summary

- While HR professionals often lead DEI strategies, technology leaders play a critical role as a strategic partner by designing, developing, and executing tech-enabled solutions to address increasingly complex DEI workforce challenges
- Over the coming months, we expect enterprises to adopt new tools that incorporate advanced analytics, automation, and AI, including natural language processing and machine learning, to help inform, deliver,and measure the impact of DEI.

Key Highlights:

Diversity, equity, and inclusion are important to current as well as potential employees worldwide. A 2020 Lenovo/Intel global employee study suggests that an organization's DEI policies and performance are significant factors in a candidate's decision to apply for or accept a job.

- More than half of employees across all markets said that DEI performance is "extremely" or "very" important when deciding where to apply and whether to accept an offer. This percentage is even higher for employees in China (89%),Brazil (88%), and the United States (75%).
- AI capabilities can help leaders understand individuals' behaviors and how they change over time, helping them reinforce and optimize behaviors that promote DEI

DEI tech designed to address workforce challenges *(chart on next page)*

- Recruitment and advancement
- Leadership and culture
- Measurement and insights

Key Questions to ask:

1. Which tools and platforms are you evaluating to support your overall organizational DEI efforts?
2. How can your DEI technology efforts focus on spanning the employee life cycle rather than standalone initiatives such as reducing recruitment bias?
3. How are DEI and tech leaders collaborating to implement technology that will provide meaningful DEI outcomes?

DEI tech designed to address workforce challenges

DEI technology solutions may use AI/ML and advanced analytics to provide granular insight into such areas as talent acquisition, advancement, well-being, and retention. Others offer feedback and coaching capabilities for leaders and decision-makers. All seek to make decision-making less prone to human errors and biases while improving organizational performance and innovation. Here are just a few examples of how organizations are using technology tools to support DEI outcomes.

AREA	DESCRIPTION	OPPORTUNITIES
Recruitment and advancement	Tools can help identify, recruit, develop, and advance a more diverse talent pool.	• Identify and address biased language in job postings using natural language processing (NLP) • Nudge recruiters at key points in the hiring process to increase awareness of potential bias using AI • Access pools of qualified, diverse candidates through candidate search platforms • Objectively identify "optimal" candidates for jobs or promotions using AI, machine learning, and automation[5]
Leadership and culture	Tools can help leaders build inclusive cultures, including engagement and retention of diverse talent.	• Support efforts to build inclusion and belonging within work groups using organizational network analysis and community-building social platforms • Encourage more objective performance reviews using NLP and ML • Gain insight into behavior changes needed to develop inclusive leaders using behavioral assessment tools and learning platforms
Measurement and insights	Data and analytics tools can be used to establish organizational baselines, measure progress, and deliver actionable insights.	• Monitor DEI KPIs, including compensation and advancement equity, using advanced analytics, data visualization, and interactive dashboards • Match people to diverse workplace opportunities and coaches using data insights • Predict which workers are likely to leave using predictive forecasting models to proactively intervene • Evaluate qualitative and quantitative outcomes of DEI efforts using advanced analytics

EXECUTIVE PERSPECTIVES

STRATEGY // A growing number of CEOs have set ambitious goals for DEI but have struggled to measure progress. Emerging DEI tools can help CEOs make the cultural shifts needed to reduce bias and create inclusive workplaces. For this to be successful, CEOs should fully understand DEI tech capabilities and require CIOs and diversity leaders to design purposeful constraints so that tools are used for good. In some cases, organizations with advanced DEI analytics have struggled to act on their new insights and created more complex problems. With this in mind, CEOs should work with stakeholders to develop tailored strategies and informed teams for each inclusion issue they'd like to address.

FINANCE // More than ever, leaders are answering to the public for the organization's vision of social responsibility. Accordingly, many forward-thinking CFOs are taking a stronger role in defining what that vision is, since talent remains a top-five priority for them. With new workforce entrants aware of employers' commitment to DEI, social responsibility may soon play a stronger role in retaining talent. CFOs may be less concerned than others with the granular details of inclusion technologies used to monitor recruiting bias, but they should keep a keen eye on tools that can help train and develop a diverse workforce with needed skill sets. Especially in the current virtual environment, CFOs can also capitalize on remote work models to identify and recruit diverse candidates who would normally be unavailable.

RISK // In the arena of social issues, many often see technology as being biased. However, the fundamental issue with workplace bias lies not with software tools but with the biased humans who build or use them. Tools such as those discussed in this chapter can provide the nudges or insights needed to reduce human bias. They can also manage the data that can help hold an organization accountable to its vision of diversity, equity, and inclusion. When chief risk officers (CROs) manage the inherent risks of transparency, data gathering and analysis from such tools may help organizations measure progress on DEI. Risk leaders can then look for ways to use predictive risk analytics to intervene before issues arise.

Accenture: (Note: Accenture presents theirs as a "top 5 trends" as a result of their survey)

- 2020 Top Technology Trends:
    - o **The "I" in experience**: Redesign digital experiences that are custom tailored to individuals – turning passive audiences into active participants
        - ▪ Providing immersive and meaningful digital experiences is how leading businesses are connecting with their customers. But as demand for customized experiences grows, people are becoming increasingly wary of the methods enterprises use to provide it.
        - ▪ McDonald's offering drive thru menus that update based on weather, time of day, trends and customers' past purchases
        - ▪ Tinder has been successful with this model
        - ▪ Accenture predicts in 5 years there could be a blurred line between media entertainment and gaming. Think movies that you can navigate and discover an array of different endings, etc.
    - o **Reimagine the business through human and AI collaboration**: Move beyond deploying AI or automation alone and push into the new frontier of co-creation between people and machines
        - ▪ Collaborate, don't just automate: Companies need to find ways to have AI and people work together
        - ▪ To collaborate more successfully, humans and machines need to better understand one another
    - o **Overcome the "beta burden"**: Address the new reality of product ownership in the era of "forever beta".
        - ▪ Products are becoming more conduits for experiences. The business continues to have ownership after the customer purchases it.
            - • An example would be a Nest thermostat. As Google updates software and changes how you access the control module (app), they are demonstrating a certain level of control of the use of the product.
    - o **Growing the enterprise's reach and responsibility**: introduction of robots that go beyond the walls of the enterprise and into the world
        - ▪ Advances in robotics, falling hardware costs and 5G are enabling a major shift. Businesses are starting to extend their robotic capabilities into uncontrolled environments.
        - ▪ Examples would include Amazon delivery drones and other self-driving delivery vehicles
    - o **Create an engine for continuous innovation**: Tap into the unprecedented scale of disruptive technology available today. Build the capabilities and the ecosystem partnerships necessary to assemble the organization's unique innovation DNA
        - ▪ Enterprise leaders must carefully construct their organization's unique combination of technology innovation.
        - ▪ Determine where you hold the advantage or lagging and set future ambitions.
        - ▪ Innovation must be an ongoing practice – building innovation hubs, centers of excellence, etc.

Ernst & Young: (Note: presented as 6 Habits of Digital Transformation)

This survey included 570 companies: 500 Corporations of over $1B in revenue and 70 start-ups between $50M and $1B in revenue and less than 5 years trading. 96 of the 500 corporations were considered leaders in the survey. These 570 companies spanned across 12 countries – 40% Americas, 30% Europe, 30% Asia-Pac.

- Focus on Customers:
    - Customer centricity is essential to companies that want to thrive.
    - Continuous, closed feedback lop between the customer and company
- Accelerate AI
    - Use of AI to drive advancement in customer centricity
    - Adoption of AI to develop new business models
- Drive Innovation Ecosystems
    - Barriers to innovation usually are caused by lack of collaboration across departments and cultural resistance to transformation
    - Building partnerships is key to unlocking innovation
- Nurture Talent
    - 6 of 10 leaders believe there's an industry-wide shortage of the type of skills that would help accelerate their digital transformation efforts
    - Companies must create a culture of continuous learning – paying close attention to creating a workforce that encompasses a diverse set of skills at all levels.
- Activate Governance
    - The best way to build trust is through the concept of "trust by design" – a methodology which ensures that trust is embedded into services and products from the outset by instilling a risk-optimization mindset into all technology.
    - Robust standards and policies around governance, privacy and the ethical use of technology enables innovation.
- Leverage Data and Agility
    - Leaders are using data to define business requirements and outcomes
    - Data is being used to evaluate skills gap and develop a resource upskilling roadmap
    - Leaders must ensure data is trusted and has meaning.

Gartner Top Strategic Technology Trends for 2021

https://www.gartner.com/smarterwithgartner/gartner-top-strategic-technology-trends-for-2021/

Top 5
>
> Internet of Behaviors (IoB)
> Total Experience
> Privacy Enhancing Computation
> Distributed Cloud
> Anywhere Operations

1) Internet of Behaviors (IoB)
   o Capture, analyze, understand, and monetize behaviors
   o Can monitor and incent behavior
   o Significant social and ethical implications based on how it is implemented and used
   o Ex. Monitor and coach hand washing, mask wearing, driving the speed limit

2) Total Experience
   o A unified approach which combines traditionally siloed disciplines such as multi-experience, customer experience, employee experience, and user experience and combines them to create an overall better experience for all involved parties.
   o Ex. Company deployed an appointment system within an existing application to guide customers on how to enter store when with 75' of door.

3) Privacy Enhancing Computation
   o Provides a trusted environment in which sensitive data can be processed or analyzed
   o Performs processing and analytics in a decentralized manner
   o Transforms data and algorithms before processing or analytics
   o Allows companies to safely share data in an untrusted environment
   o Ex. Homomorphic encryption enables 3rd parties to process encrypted data and return an encrypted result to the data owner while providing no knowledge about the data; allows for proprietary algorithms and data to be kept private

4) Distributed Cloud
   o Provides public cloud options to different physical locations
   o Today's distributed clouds include on-prem public cloud, IoT edge cloud, metro-area community cloud, 5G mobile edge cloud, global network edge cloud
   o Ex. Public cloud provider executes physically at the point of need to reduce latency issues and accommodate geographic regulations

5) Anywhere Operations
   o An IT operating model designed to support customers everywhere, enable employees everywhere, and manage deployments across distributed infrastructure
   o Known as 'digital first, remote first'
   o Requires: collaboration and productivity solutions, secure remote access, cloud and edge infrastructure, digital experience monitoring and analytics, automation to support remote operations

PwC Emerging Technology

https://www.pwc.com/us/en/services/consulting/technology/emerging-technology.html (The Essential Eight)

The Essential Eight
        Artificial Intelligence
        Augmented Reality
        Blockchain
        Drones
        Internet of Things
        Robotics
        Virtual Reality
        3-D Printing

1) Artificial Intelligence
   - There is a need to focus on fundamentals before enlarging AI initiatives
   - Companies are focused on getting value from AI
   - Most believe that AI offers more opportunities than risks
   - Recommend deploying AI in house first, rethink how you will upskill employees, lead on risk and responsibility, operationalize AI and integrate it at scale, reinvent your business model

2) Augmented Reality
   - A visual or audio overlay on the physical world that uses digitized information to augment the user's real-world view.
   - Technological advances are creating an improved user experience, ex. Lighter headsets, haptics (touch)
   - Frequently used for training and testing procedures, ex. simulation of realistic scenarios
   - Potential to utilize in product and service development, healthcare front line patient care and training, development and training including immersive experiences, process improvements, retail engagement with customers including entertainment.

3) Blockchain
   - Distributed digital database that uses software algorithms to record and confirm transactions with reliability and anonymity.
   - The number of companies engaging in blockchain is increasing; most are in research and development stages
   - 4 strategies for blockchain success: make the blockchain business case, build an industry ecosystem, design deliberately, navigate regulatory uncertainty
   - Holding blockchain back – regulatory uncertainty, lack of trust among users, ability to bring network together, separate blockchains not working together

4) Drones
   - Drones vary in capacity (some need wide take off spaces, some are water based), how they are operated (semi-autonomously or fully autonomously), and use (surveillance, survey, sport, delivery, etc.)
   - An increasing number of businesses are expecting or planning to buy drone services
   - Impediments to broader use include regulatory challenges (including aviation laws and varying aviation laws by country) and trust with the public (concerns of improper use, misuse by criminals, and risk of accident)

- o Drones are not just a tech add on, but rather an important source of data and insights for the physical world; data can be surveilled, processed, analyzed, interpreted to improve existing business processes

5) Internet of Things
   - o IoT is a network of physical objects (devices, vehicles, appliances) embedded with sensors, software, network connectivity and computing capability to enable them to collect and exchange data
   - o Cybersecurity issues, privacy concerns, and an uncertain regulatory environment have slowed the progress of IoT adoption
   - o IoT trailblazers recommend including the following in your organization's IoT strategy:
     - o Invest in trust – be proactive on privacy, design cybersecurity and data privacy into IoT initiatives from the beginning, make an executive accountable for trusted tech issues, develop a comprehensive responsible technology strategy that addresses data and tech ethics
     - o Embrace the everyday IoT – accurately and securely collecting IoT data enhances trust, everyday use of the technology includes using sensors to keep track of equipment, improving facilities management, enhancing security and safety of employees
     - o Do more with tech combos – integrating IoT with mature or emerging technologies can answer new questions and solve business challenges, the combination of IoT, blockchain, and AI can even automate additional types of trust, examples include a digital birth certificate tied to a device which includes specifications, cost, place of origin integrated with blockchain
     - o Don't go it alone – engage with regulators to help shade emerging regulations, collaborate with technology partners to develop shared standards, reassess in house practices for cybersecurity, data, and privacy