



# Staying Competitive in the Post-pandemic Decade

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Transformative technologies to ignite innovation and  
accelerate your advantage

# Introduction

The World Economic Forum expects India to regain its position as the fifth-largest economy by 2025 and emerge as the third-largest economy by 2030 (Source: World Economic League Table 2021).

To achieve this goal, we will have to do more with fewer resources, scale up to international productive standards, and create unique differentiations that enable us to compete on global platforms. Technology - in the form of digital working and more - will play a crucial supporting role in this saga of achievement.

Even before the pandemic, organisations that truly embraced digital working experienced an increase in employee productivity even as the overall cost of operations reduced. The new work models also allowed them to access untapped talent pools and reduce staffing costs by hiring in Tier 2 and Tier 3 cities.

Moving forward, advancements in multiple emerging technologies will converge to create unprecedented value. It's up to us to anticipate and make the right strategic technology choices. So, what technologies should you be tracking and investing in?

Here's our definite round-up of the foundational technologies to keep on your radar:



**By Anuj Vaid**

Executive Director, CMS IT SERVICES

# Foundational Technologies for 2022



## Zero Trust architecture

India is the third-most cyber-attacked country in the world. Distributed workloads, remote working and connected devices make networks, services, apps and data more vulnerable than ever before. Fortification of endpoints and a zero trust posture is imperative.

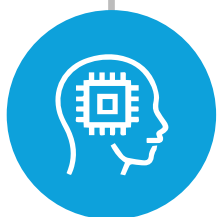
## Cloud maturity

Intelligent workload management and operational stability through custom cloud configurations is the way forward. According to Gartner, "The rapid pace of innovation in cloud infrastructure and platform services (CIPS) makes cloud the de facto platform for new digital services and existing traditional workloads alike, which is why 40% of all enterprise workloads will be deployed in CIPS by 2023, up from only 20% in 2020." (Source: Gartner Predicts the Future of Cloud and Edge Infrastructure, Katie Costello, February 8, 2021).



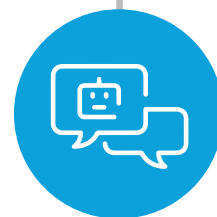
## Hyperautomation

Gartner expects that by 2024, organizations will lower operational costs by 30% by combining hyperautomation technologies with redesigned operational processes. (Source: Gartner - Forecast Analysis - Hyperautomation Enablement Software, Worldwide, Cathy Tornbohm, 22 March 2021). This will reduce/replace manual resource allocation, system tuning and configurations, data management and mining, service management and systems provisioning.



## Conversational AI

Just like cloud brought scale and speed within reach of small companies with small budgets, chatbots empower small teams with small budgets to deliver the 24/7 customer-first experience typically associated with enterprises.





## IoT everywhere

By 2022, there will be 29 million connected devices on the internet and 50% will be IoT devices (Source: Telecommunications Industry Association). Smart homes, wearables, smart cities, smart grid and industrial internet will be the most popular applications.

## Intelligence at the edge

Gartner predicts that by 2025, 75% of business-generated data will be generated and processed at the edge. (Source: Gartner - Technology Insight - Edge Computing in Support of the Internet of Things, Santhosh Rao, 13 July 2017). AI at the edge allows mission-critical and time-sensitive decisions to be made faster, more reliably and with greater security.



## Data

By 2024, we will have generated 149 zettabytes of data globally (Source: Statista). The velocity and quality of data enables businesses to think less sequentially and more disruptively.



## 5G connectivity

5G ushers in an era of unprecedented connectivity - superfast, ultra-reliable, low latency networks that seamlessly support up to 1 million devices per square kilometre. This 1000x increase in compute capacity (compared to 4G) is the foundation on which IoT, big data, AR/VR, etc deliver immersive experiences.



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The next frontier in IT services will evolve beyond the discrete consumption of service models and technologies, and instead will be driven by the nexus of cloud, edge, 5G, AI, IoT, and data and analytics.

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*Sid Nag, VP Analyst, Gartner*





# Trends in Banking & Financial Services Sector

## The future is Digital

Indians have a truly voracious consumer appetite for fintech.



India's fintech adoption rate is at 87%, the highest in the world



*Source: EY Global Fintech Adoption Index.*

From payments banks (Paytm, Airtel, etc) to micro financing & crowdfunding platforms, Indians happily indulge in innovative experiences. Neo banks - where you never enter a physical branch or operate an account in person, - are gaining traction, bringing with them free global money

transfers, official digital currencies and intense regulatory scrutiny.

## Industry evolution

In the coming decade, the industry landscape is expected to change fundamentally:

- Data will reshape the contours of the industry. Be it new business models, customer intimacy or a transformed ecosystem, data will underpin everything.
- Technology will be a key differentiator, delivering new business models, operational efficiencies, and enhanced customer experiences.
- Fintech and Bigtech entrants will leverage their agility and nimbleness to capture market share from older traditional operators. In time, there will be more niche operators, fewer one-for-all generalists.
- Innovative platforms like apps (and other yet-to-evolve platforms) will bring unbanked and underbanked communities into the fold.

- A new era of open banking and financial services will demand an interconnected, collaborative and friction-free ecosystem. Customers will expect a seamless stream of safe, fast and automated transactions across the entire value chain.
- Regulators will embrace automation and focus on regulating activities and outcomes rather than companies or products.

## Challenges

- Cybercrime is and will continue to be one of the most critical threats. All-encompassing connectivity and use of AI-based technology for attacks will increase vulnerabilities and the potential for data fraud.
- Customers will understand the value of their data and demand data protection and privacy. At the same time, they will also expect significant returns for sharing their data - either as compensation or enhanced experiences. Fulfilling their expectations and safely monetizing data will be a major challenge.
- Legacy infrastructure massively constraints the financial sector's ability to meet customer expectations, deliver truly differentiated services and scale operations efficiently.

To overcome these challenges, banks and financial companies will champion emerging technology, rapidly adopt new business models, and place customers at the heart of their strategy.



Machine learning (ML) is the most used AI technology in banking and investment services, with adoption and implementation spanning across the front, middle and back office. Risk management has real value by usage of machine learning in applications.



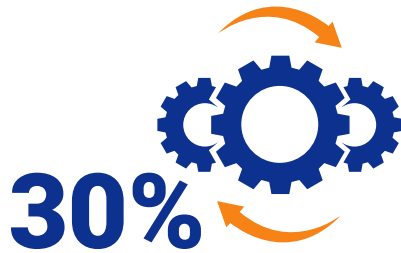
*Moutusi Sau, VP Analyst, Gartner*

## Enabling Technologies

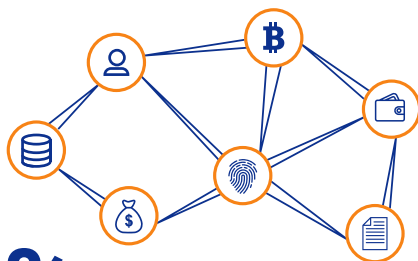
In the future, the pace and pervasiveness of technological advancement will be the innovation engine of the financial ecosystem. To succeed in this rapidly changing business environment, banks and financial companies need to accelerate their digital transformation. It's imperative to start now and build a foundation that emerging technologies can leverage in the 2030s.

- APIs to build a seamless interconnected ecosystem that will deliver to customer expectations.
- Cloud with the capability to perform core banking and financial operations (like digital account opening).
- Hyperautomation that completely replaces manual operations, enabling business operations to transcend the routine and support innovation.
- AI/ML births disruptive customer service software, fraud detection, robo-advisors for portfolio management, etc.

- Big data and advanced analytics that enable mass-personalization along with micro-consumption.
- Security that is built into the business from the ground up. Zero-trust architecture, digital identities, distributed ledgers/ blockchain etc. to power cyber-resilience and build trust



Hyperautomation cuts operational **costs by 30%**  
 (Source: Gartner)



**60%**  
**Blockchain**

60% of **blockchain implementation** is in BFSI sector (Source: NASSCOM)



**72%**  
**Account Opening process online**

**72% of banks** already support entire **account opening process online**  
 (Source: Digital Banking Report)



AI will **save** the banking industry more than **\$1 trillion**  
 (Source: Autonomous)



**320%**

In India, **digital payments grew 320%** between 2016 and 2019  
 (Source: GOI)



# Trends in Healthcare Sector

## Ushering in the eHealth era

eHealth is redefining healthcare in India, with technology making health accessible to all while sustaining the human aspect of care. E-consultations via apps/dedicated software have already started making healthcare accessible and affordable for rural, remote communities.

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over 1 million teleconsultations via eSanjeevani, Dec 2020

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*Source: Ministry of Health and Family Welfare, 14 December 2020*

Telemedicine is poised to become the preferred primary care option, with wearables alerting patients for the need to contact a physician. The National e-Health Authority and Health Stack are geared towards leveraging public health data for predictive and preventive health management.

## Industry evolution

- Disease prediction, detection, prevention and cure becomes more effective, in part due to genetic testing, electronic health records (EHR), data mining and analytics.
- Genome mapping, biobanks and access to population health data create opportunities to uncover preventable risks and make public health precise. This data can also be used to help governments prepare for future epidemics and inform citizens on healthcare issues.
- Genetic testing and genomic profiling could be used and cross-referenced against wearable technology data to create personalized care and targeted treatment plans for each individual patient.
- Health information technology generates greater quality data/intelligence, enabling communities to reduce hospital readmissions, build public health registries, and cut the cost of healthcare.



- Drug development is led by technology, making drug discovery and vaccine research more productive, accurate, and faster.
- Smart pills that promote compliance, 3D printed poly-pills, custom printed prosthetics, and tissue-engineered skin grafts for burns are on the way.

## Challenges

- Despite being one of the largest drug manufacturers, India ranks 145 in the list of 195 countries in terms of quality and accessibility of healthcare.
- Lack of infrastructure and dependence on legacy systems makes modernization an on-going journey. The immediate challenge is to expand the possibilities for extracting more value from legacy core assets.
- Society harbors serious concerns around data sharing and privacy because of inadequate data storage and protection systems. This could stall the advancement of public health initiatives that depend on big data.

Moving forward, the healthcare sector will adopt an increasingly digital mind-set in a push to deliver uninterrupted quality care at lower cost, remotely. The basic principles of healthcare delivery will continue to apply. Technology will free up resources, making it possible to truly achieve patient-centered care.

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Healthcare IT spending will grow by 7.9% in 2021 to reach \$128 billion in constant currency. Healthcare providers are gradually emerging from the COVID-19 pandemic with a renewed focus on digital transformation. AI, RPA, digital workplace and cloud are key deployment priorities in 2021.

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*Inna Agamirzian, Principal,  
Research, Gartner*

## Enabling Technologies

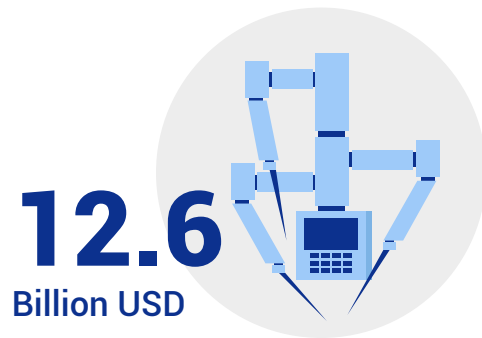
5G's ultra-reliable low-latency connectivity is a game changer for healthcare. Other emerging technologies leverage this capability to provide greater access and deliver the highest quality of care.

- Secure data infrastructure allows uninterrupted access to patient records, keeps data safe and supports advanced analytics and machine learning.
- Real-time sensory networks monitor patients, behaviors and compliance using body sensors, medical alert bracelets, health monitoring clothing, smartphones, and other connected devices.
- The Internet of Medical Things, advanced analytics and robotics integrate the capabilities of clinical staff, equipment, and the cloud to provide precise and personalized medicine.

- Robo companions will transform the patient experience.
- AI can be leveraged to deliver data-centered insights to decode neural activities of trauma patients, develop and research intelligent medical devices, drugs and vaccines or predict disorders and genetic flaws.
- Unprecedented enhancements in precision surgery, telemedicine, remote surgery, and even physical therapy are achieved through the application of AR.
- Blockchain technology and real-time cybersecurity with AI/ML augmented capabilities will create trust and protect patient privacy.



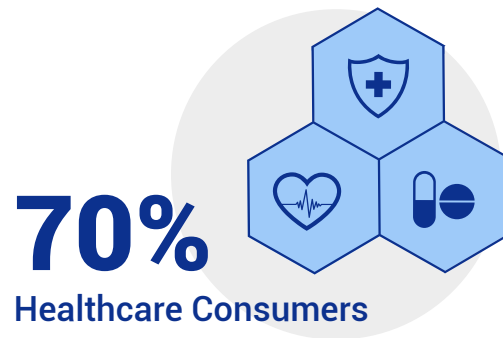
**74% consumers** favour telemedicine  
(Source: Cisco)



**Global surgical robots** market pegged  
at **12.6 billion USD** (Source: Statista)



**First AI-designed drug** enters  
clinical trials in Japan; to treat OCD



**70% healthcare consumers** are concerned  
about data privacy (Source: Digital Health  
Technology Vision reports)

# Trends in Government & Public Services Sector

## Friends with technology

Government customers have long been perceived as unfriendly and burdened with complexity (regulations, procurement processes and implementation cycles). In 2020, government agencies broke tradition to become friends with technology.

GovTech is emerging as a public-private innovation engine as technology startups, SMBs and professionals partner with government agencies to solve society's pressing problems. From smart cities to public health management, agriculture to law and order, and resource conservation to tax and regulation, GovTech is reshaping the way the state engages with citizens.

This is reflected in the speed, agility and responsiveness that Indian governments showed in supporting the use of technologies against COVID-19

## GovTech leads the war on Covid



**Aarogya Setu app**  
for contact tracing



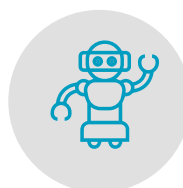
**GPS data simulation** to  
predict disease spread



**Drones for surveillance**  
and sanitization



**Cowin app** for  
vaccination drive



**Robots for contactless**  
service and  
housekeeping



**Launch of National**  
e-Health Mission and  
Health Stack

## Industry evolution

- Government agencies have started leveraging cloud and SaaS solutions to become faster, responsive and effective.
- Governments seek to enable a universal delivery model that places citizen experience at the center, uses digital information-gathering mechanisms, and maps public services to important life events like birth, education, employment changes, marriage status, etc. It requires no form filling by citizens, integrates life data and is proactive or predictive.
- "Digital by default" is the ambition for public services. However, cloud adoption is uneven and heavily dependent on demonstrating an obvious ROI.
- Citizens will demand and get more dialogue with the government. Every interaction will be recorded and transparent. Public service departments - the police, fire, schools, transport, etc. - will be rated by the public, like we rate restaurants.
- Local governments will rely heavily on data to make decisions, identify opportunities and estimate risks, especially in areas like public health, urban planning, climate change and resource conservation.
- The Government will be laser-focused on governance and big-picture developmental efforts. Public services will be delivered through leaner, agile and quicker not-for-profit organizations, not government departments.
- To beat resource constraints, cities will innovate and co-create solutions within their neighbourhoods and in partnership with other cities. This will effectively end the era of bespoke or custom solutions.

## Challenges

- Globally, governments have started accessing and storing more data. As governments become custodians of more sensitive and personal data, storing it in bare metal servers is becoming too risky.
- History of excessive controls and cumbersome procurement processes discourages new entrants and delays adoption of new technologies
- Government agencies are often locked into fixed, long-term contracts with legacy infrastructure systems. New technology has to wait for legacy contracts to expire.
- There is increasing interest in what future technology has to offer, but the evolution of government agencies' culture and competence hasn't kept pace with ambition.
- The government is a unique kind of customer, and not many venture capitalists understand and specialize in GovTech. This limits funding for GovTech startups.

GovTech flexes the power of digital transformation to reshape the government-citizen relationship. It places the citizen at the heart of governance and promotes transparency, responsiveness and innovation in the delivery of public services. Learning from the experiences of fighting the global pandemic, governments have started pushing the digital readiness agenda with unexpected speed.



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Vulnerabilities in government service continuity were exposed as a result of legacy applications, limited cross-agency application and business process interoperability, and legacy IT and communications infrastructures. The unprecedented emergency measures in 2020 further highlighted the importance of addressing long-standing business processes and technical gaps such as interoperability, collaboration and data exchange among multiple tiers of governments (national, regional and local levels).

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*Irma Fabular, VP,  
Team Manager, Gartner*

## Enabling technologies

- Artificial intelligence - combined with big data and machine learning - will have the greatest impact on public services. Smart cities, utilities and power grids, public health, crisis response, and security will lean heavily on these technologies.
- Real-time communication and collaboration for disaster relief, crisis management and public safety will depend on GIS technologies, predictive analytics and advances in connectivity. In national emergencies, lives will be saved with telemedicine being used for effective triage coordination.
- Drones will be omnipresent. Policing and law enforcement, rural land mapping, and e-asset management will be the first applications of drone technology.
- Natural language processing (NLP) and chatbots will usher in a new era of citizen service. From traffic violations to building permits, and financial assistance to health care, citizens will converse with AI-powered virtual agents to get their queries answered.
- Cloud computing is the universal enabler of advances in GovTech. Citizen portals, business registries, public delivery systems etc. will transition to hybrid multi-cloud to ensure efficiency, speed, control, and security.



**USD 400 billion industry**  
worldwide  
(Source: Accenture)



**India ranks 12<sup>th</sup>** in Global  
Robotics Readiness Index  
(2020)



100 smart cities with  
**INR 200,000 crore** investment  
(Source: GOI)



# Trends in Education Sector

## Out with the old school

Technology has completely changed what we learn and how we learn.

As automation and AI eliminates lower-skilled jobs, our education system needs to up-skill students to specialize in higher cognitive and social-emotional skills. Education - at all levels- is becoming more immersive and focused on real-world creativity and problem-solving, rather than rote learning. New-age pedagogy - smart classrooms, MOOCs, virtual labs, and more - places students in charge of their own learning. Skills training, especially, has migrated from classroom boards to personal screens.

A billion young Indians are loving it.



By 2022, India's EdTech market will be worth USD 3.5 billion



Source: EDTECH An Omidyar Network India - RedSeer Report 2019-20, June 2020

## Industry evolution

Education has been incorporated with tech for quite a few years now, but the rate of adoption has been accelerated in the 2000s.

- e-learning has made the pedagogy more flexible by introducing classes and learning techniques that are tailor-made for each student.
- EdTech start-ups that promote non-traditional perceptive learning will become a part of mainstream schooling.
- Protection of vital student information, intellectual property and other virtual data shall become a main concern.
- Academic achievements will cease to be the only yardstick of performance. AI-based technology allows social interactivity and other non-academic factors to be monitored.
- Biometric technology that tracks student-engagement, maintains access-security, and provides other analytical learning insights will be introduced.

- The sector will turn to Learning Management Systems (LMS) and Learning Experience Platforms (LEP) that are an extension of Big Data Analytics to provide valuable insights about students, curriculum-effectiveness etc.
- Gamification is an up and coming learning technique that pairs up social media and other modern tools to promote out-of-the-box thinking.

## Challenges

- Learning analytics, online collaborative tools etc all require massive data storage and maintenance.
- The sudden shift to digital learning platforms can disrupt the operations and work processes of institutions that have followed traditional methods of education up until now.
- Data security is not a guarantee and cyber threats can leak or misuse crucial information. This may be especially detrimental to ongoing research studies and intellectual property.
- The costs associated with setting up digital initiatives is also a major factor that seems to be holding back adoption.

The pandemic has set the precedent for zero-contact education. Education in the 2030s is expected to be a blend of the traditional and modern modes of learning, utilizing the best of both but with a sharp focus on e-learning.

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CIOs must leverage the disruption to evolve the recent modernization of administrative and academic systems to sustain the optimization and digital transformation that institutions have been seeking for years. Education should not attempt to return to pre-COVID-19 models. In higher education, past practices no longer support changing university business models. In K-12, past practices failed to support new demands for greater digitalization of schools. Education institutions – at both the K-12 and higher education levels – are working through how they develop, implement and deliver on existing and future plans

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*Robert Yanckello,  
Sr Director Analyst, Gartner*

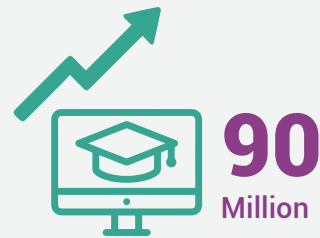
## Enabling Technologies

Educational digital technologies hold great potential and is likely to be a major contributor to the future of learning and seems to be carving itself a niche in the start-up ecosystem in India.

- AI-powered tools with features like speech-to-text have revolutionized the ability of differently-abled students to keep pace with peers.
- AR/VR automates learning resources and simulates real-life scenarios to promote trial-and-error-based experimental learning to improve students' cognitive capabilities
- Cloud is now the data depository of choice that has improved collaboration and ease-of-access to shared knowledge without sacrificing data security
- AI/ML supported by learning analytics has advanced the ability to diagnose curriculum weaknesses, automate grading, have surveillance during online examinations and provide customized tutoring for students.
- Blockchain technologies like DLT is used in Massive Open Online Courses (MOOCs) and ePortfolios to verify the skillsets and knowledge base of students.
- Cloud-based technologies like LMS and LEP deliver a self-directed, customisable digital experience to learners.
- Virtual technologies like Holograms can make even zero-contact meetups and collaborations a 'face-to-face' encounter.



Indian **EdTech start-ups** received a total investment of **\$2.22 billion in 2020**, compared to \$553 million in 2019 (Source: IVCA and PGA Labs).



EdTech user base has a growth from **45 million to 90 million** in k-12 & post k-12 sector 2019-20 (Source: RedSeer & Omidyar network India)



AI in the education market is projected to reach **USD 3.68 billion** by 2023, at a CAGR of 47% during the forecast period 2018 till 2023. (Source: Markets and Markets)



India's Smart Classroom Market is anticipated to grow with a **CAGR of 4.05% and reach USD 16.1 billion by 2026**. (Source: Blue Weave Consulting)



AR/VR Market size is expected to Reach **\$5.3 Billion in 2023** (Source: Leadsquared)



Student Information System (SIS) market share will reach **USD 9.0 billion by 2023** – indicating a 12.4% CAGR since 2018 (Source: Leadsquared)



# Into the resilient future: a path forward

Now that the pandemic has changed how we do business forever, it's time to find pathways to a responsive and resilient future. It's time to enable agility with scalable digital systems purpose-built for distributed workforces. It's time to embrace hybrid-computing and multi-cloud models as pivotal components of business infrastructure.

As you lay the foundation of a digitally transformed future, you will want to evaluate the technology and vendors you choose. Here are a few things to consider.

## What to look for in technology solutions

- You will want a technology stack - hardware, software and business applications - that **fits your business** just right, and keeps your customers happy.
- Your technology will need to integrate and work seamlessly with your existing infrastructure, so it augments and **amplifies your previous IT investments**.
- Solutions that are easily and quickly deployed substantially **accelerate your time to market** and drive quick returns.
- Cloud-native solutions offer you **unlimited elasticity** at an unbeatable price, allowing you to start small, learn what works for your business and scale fast.
- As threat actors become more sophisticated, **in-built security** may be the single-most critical consideration for your business's reputation and safety.
- Bespoke solutions that **automate and auto-learn** in your unique operating environment will drive higher ROI and keep your business future-fit.

## What to look for in a digital transformation partner

- **Culture fit** is critical. A win-win approach and a strong desire to create value are at the heart of every good vendor relationship.
- Pick a partner who brings a **complete team** to the table, not just techies. You will want to involve business enablers, domain consultants, and support teams to ensure you've built a holistic solution for your users
- A partner with the right **intellectual property, frameworks and best practices** will make your life immeasurably easier by delivering risk-free and error-free repeatable deployment models.
- A partner with **global know-how and local insights** is a strategic advantage for your teams and your customers.

**The bottom line** - be it technology or transformation partners, **long-term sustainability** is the key. You want technology solutions that scale and adapt to the future and relationships that last the distance.


We hope you find these insights and commentary as illuminating as we do, and we welcome the chance to discuss what they mean for your business.

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