Mizuho Americas
Investment & Corporate Banking

MIZUHO

Digital Horizons

The influence and impact of technology on industry

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Contents

Expand Your Digital Horizons

In a post-pandemic world, business leaders are refining their strategies to meet evolving opportunities and market demands, while addressing the inescapable technological transformation that has stirred the status quo in every sector. Those able to see beyond the obvious are poised not only for outsized returns but to also help shape and influence the future.

The age of powerful governments and corporate monoliths determining which technological pursuits to prioritize is over. Decades of steadily-expanding digital horizons and growing accessibility to affordable technologies have changed the narrative on a century's worth of paradigms. The ubiquity of the cloud, lower-cost computational processing power, increasing capabilities of artificial intelligence and the sorting of unimaginable amounts of data are not fleeting trends, but the foundations of our new normal.

Digital Transformation 3.0

The first two stages of this digital transformation, the rise of mass automation and maximization of value, have each fundamentally changed our lives. Digital Transformation 3.0 is certain to have an even more profound impact, with further democratization of these technologies providing a competitive asset for growth. This includes anticipating consumer behavior as well as delivering value and real-time insights in a holistic and personalized fashion. A recent global Workday survey[1] found more than 80% of leaders believe they will be "deriving at least half their revenue from digital products and services" within three years. Further, 68% of CEOs reported having "designs on up-skilling more than half their workforce in the next five years" to meet these needs.

While the ambition is clear, the path forward may be less so. An agile, collaborative and iterative mindset will allow leaders to partake in the digital evolution weaving its way through the economy.

[1] https://forms.workday.com/content/dam/web/en-us/documents/reports/organisational-agility-global-report.pdf

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The architecture around which we collectively construct our lives, businesses and society is undergoing a profound conversion."

Each sector of the economy and industry will have its own unique characteristics.

In healthcare, this may manifest as highly-individualized diagnosis and treatment plans based on genomic breakthroughs. Across the power and utility landscape, a more efficient and cost-effective "smart" grid, increasingly fueled by renewable energy is already taking shape. In financial services, new platforms open the aperture of banking and investing to a broader audience. It encompasses carbon-neutral real estate development that utilizes materials from recyclables, ever more customized entertainment and media consumption, factory automation, electrification and autonomous vehicles, the reinvention of the mall shopping experience, the rise of plant-based and sustainable and ethical foods, vertical farming and so much more.

Digital transformation is everywhere, and emerging brands and upstarts are challenging incumbents, disrupting the marketplace and re-imagining the future.

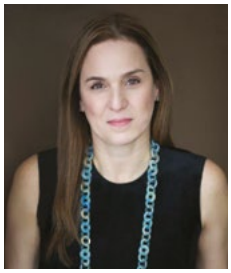
Look Beyond the Obvious

The question for forward-thinking business leaders in this moment of transition is how to best leverage their core competencies and resources to positively contribute to our rapidly changing world, not only take advantage of the multitude of commercial and organizational opportunities. A foundational element of this transformation is for organizations to think holistically about the impact of their strategy on their broader constituent base including their employees, customers, investors and society at large. Industry leaders that make this transformation part of their DNA, their purpose, will be the ones able to recruit and retain talent, evolve and deliver alpha to their stakeholders.

The opportunity lies in adopting agile and innovative ways that both respect and build upon our interconnected world. This is how we will embed today a purpose that has the potential to transform tomorrow.

Ready to find out what Digital Transformation 3.0 could mean for your business?

Read on, to consider what lies beyond the obvious.



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Technology, Media and Telecommunications

Technology, Media and Telecommunications in an Age of Mass Disruption

When it comes to Technology, Media and Telecommunications (TMT), the underpinning ethos for the foreseeable future is *learn* and *adapt*.

"In an era where technology is ever-present with lower barriers to entry, iterative innovation is key to enduring leadership, creativity and disruption."

In every nook and cranny

In little over a generation, technology saturation has progressed from the introduction of the first personal computer to today's cloud computing, edge computing and mobile proliferation. The world has witnessed the democratization of digital technology. From urban jungles to rural farmlands, humanity has been stitched together. And as a whole, this development is largely seen as a net-positive, even as we continue to grapple with the downsides of technological progress, such as cyber and security threats. Over the next decade, technology will move from mass adoption to a state of pervasiveness, where we live in ubiquitous connectivity. How this reality is utilized by consumers, corporations and governments will have dramatic implications for the future of our economy and our society.

The 5G revolution

At the heart of this new age of connectedness, and central to one of the most anticipated developments in the TMT landscape, is the infrastructure buildout around 5G. Unlike the previous four generations of mobile technology, 5G will enable massive leaps forward primarily due to faster data speeds, reliable low-latency connectivity and massive machine communications.

Faster data speeds will allow media platforms to dramatically expand their reach, provide access to mobile users, upgrade quality and provide more options for consumers. The ability to stream content anywhere will come to define demand, and businesses will have to integrate seamlessly across platforms. Media will continue to see a proliferation in offerings, and we can expect that technology will also lower some barriers to content creation and allow for new formats and consumption patterns to emerge. Personalization, through individually tailored and high-quality content on-demand, will explode. The power of behemoth studios, traditional broadcasters and movie theaters is likely to be eclipsed.

Low-latency connectivity will also shake up our world. By reducing the lag of data transmission to milliseconds, the universe of things that can be truly wireless gets much, much larger. Autonomous vehicles and drones have the required connectivity to go mainstream; smart cities and remote surgeries come to life as time differentials are eliminated; massive machine communication enables whole supply chains to be synced on a network, and the Fourth Industrial Revolution kicks off in earnest.

The shift to 5G is already creating new opportunities. According to research by IHS Markit[2], the global 5G value chain will generate $13 trillion in economic output and support 22 million jobs by 2035.

Data is the new currency

Intelligent edge is poised to be a game-changer as the proliferation of data will redefine commerce and our society at large. With data being the new currency of the global economy, integration of Big Data, artificial intelligence (AI) and machine learning into the heart of an organization is no longer optional. As humans and machines alike generate unimaginable amounts of data around the clock, the ability of any given company to consume that data effectively will be a key indicator for success. Accessing, managing, analyzing, deploying and storing data in service of the organizational goal is

[2] https://omdia.tech.informa.com/OM005180/5G-technology-will-enable-132-trillion-of-global-economic-output-by-2035

> Going forward, the ability to support increasingly decentralized work and education environments through technology... will define whether organizations remain relevant or fall behind the pack."

no longer a capability of "tech" firms, but of all firms. And AI deserves special attention. AI is being embedded across organizational functions, processes and operations, including marketing and sales (segmentation, more personalized offerings, pricing), logistics (fleet optimization), inventory, R&D and more. As we move from "narrow AI" to widespread adoption of the technology, be prepared for a wholesale disruption of our economy. One example is our current workforce allocation. Rapid innovation and widespread adoption of AI is expected to redefine nearly 40% of work humans do today. IDC[3] predicts that by 2025, 75% of organizations will be investing in employee retraining in order to fill skill gaps caused by the need to adopt AI. As the proliferation of data, and its importance, accelerate so will its disruptive power, reconfiguring every industry and economy on the planet.

Innovation required

The clearest storyline in technology has been the twin forces of creation and destruction. COVID accelerated trends and spurred new innovation. An example of this is work from anywhere (WFA). While remote work and learning was a topic of conversation before February 2020, COVID forced TMT firms to move from futuristic talk to actually enable remote capabilities. In doing so, they have permanently changed the world. Going forward, the ability to support increasingly decentralized work and education environments through technology will define whether organizations remain relevant or fall behind the pack.

[3] https://www.idc.com/research/viewtoc.jsp?containerId=US45576319

Beyond the Obvious Takeaways

1. Different realities finally emerge

If Pokemon Go still has you captivated, the next 10 years are going to blow your mind. With the advent of 5G and improved cloud processing and sleeker hardware, immersive technologies are set to change the way we consume and recreate and how we conduct business, learn and socialize. In 2025, Zoom meetings may involve holograms of people or product prototypes; history classes may take place in virtual on-sites; or you could check out the latest car model with your friends from opposite sides of the country. Virtual, augmented and mixed reality, collectively known as extended reality, is coming online, and companies and organizations that embrace it successfully will have a leg up in the next decade.

2. Chip wars

The pandemic's lasting impact on supply chains and the ongoing boom in advanced technologies have brought a key issue to the forefront: the humble semiconductor. Every sector depends on them. Headlines about shortages have ricocheted around global media as everyone from automakers to phone manufactures to representatives under the Capitol dome have worked to grapple with the dearth of these tiny items that are the beating heart of the modern economy. Watch for this recent bottleneck to be on the minds of national security leaders and corporate titans alike as they work to increase manufacturing capacity and geographic diversity beyond mainland China and Taiwan.

3. Guardrails required

There are downsides to technology's integration into our lives and the operations of businesses and governments. Recent ransomware attacks by non-state actors have shut down a critical pipeline supplying fuels to the Gulf Coast and Eastern Seaboard, as well as stifling the operations of one of the largest meat suppliers in America. Personal information is exposed daily in data breaches of companies large and small. Beyond cyberattacks, the erosion of privacy at home and at work seems certain to continue as Internet of Behavior systems, which utilize commercial customer data, publicly available citizen data, social media, facial recognition and location tracking to collect and monitor activities, become ever-more prevalent. And increasing dependence on technology makes individuals, companies and countries vulnerable to cyberattacks or disruptions from other events. Such events sap confidence and can have significant financial, psychological and societal consequences. Building in resilience, and with it trust, will be imperative in the coming years.

Healthcare

Advancing Wellness Through Technology

The integration of technology and treatment reaches a new frontier in healthcare offering opportunities and advances that will profoundly change our lives.

> In healthcare, democratized technology is driving better health outcomes and creating new business opportunities through improved access, diagnosis, treatment and tools."

State of play

The mass adoption of digital technology has set the stage for what is likely to be the greatest acceleration of healthcare innovation in a generation. While many Americans already associate their healthcare system with technology (LASIK and MRI scans elicit little more than yawns in the United States), the upcoming trends in the sector are truly awe-inspiring. And they are being driven by the ability of doctors, researchers and companies to harness technology to allow them to engage more deeply with patients on their own terms, deliver more tailored, 360-degree coverage and utilize data and artificial intelligence (AI) to develop new proactive practices and treatments. From patient-specific treatments to drugs developed by AI, it is clear that the walls between various stakeholders within the healthcare industry are coming down, the opportunities for companies to develop new services are going up, and that data will be the connective tissue of healthcare systems going forward.

Engaging in ways once unthinkable

As our everyday way of life was shattered and we were forced to separate due to COVID-19, the democratization of technology enabled us to reinvent how we interact with colleagues and professionals. But nowhere has that been more apparent and impactful than in healthcare. Over the course of last year, the use of digital platforms to reach patients exploded. Look no further than the Department of Veterans Affairs[4]. In 2020, the VA provided more than 5.6 million telehealth experiences (across video visits, asynchronous telehealth exchanges and remote patient monitoring) to more than 1.6 million veterans, nearly twice as the year prior. But it was not just about providing patients with care. Digital platforms advanced medical progress during the pandemic as medical experts from around the world leveraged technology, partnered with technology companies and data scientists to model the spread of COVID, develop vaccines and therapeutics and design response plans for governments and companies alike. St. Louis[5] established a COVID-19 data commons (regional data for operational and research use such as institutional dashboards, registries, data sharing networks and ad-hoc data exchanges) to inform real-time decision-making by researchers and policymakers alike. The ability to meaningfully engage across digital platforms has massive consequences for healthcare in 2030. We can expect technology will lead to healthcare access for underserved populations around the globe, faster response times to health crises, new treatments for old diseases as collaboration and cooperation become commonplace and more accurate healthcare data sets and modeling as a result of improved representation and penetration.

Breakthroughs at a breakneck pace

Connectivity is not the only technological trend advancing healthcare. AI and Big Data are emerging as the technologies that will drive the next healthcare breakthroughs. In the case of COVID, these technologies were key to understanding the disease and developing a vaccine in record time. For example, machine learning played an important role in the clinical trial process for the Johnson & Johnson COVID-19 vaccine[6]. AI is now being used to diagnose cancer and, in a world first, was used to develop

[4] https://www.theatlantic.com/sponsored/accenture-2020/health-care-wont-go-back-to-way-it-was/3511/
[5] https://rdx.stldata.org
[6] https://news.mit.edu/2021/behind-covid-19-vaccine-development-0518

"Together with the revolution in personal technology, we are on the verge of the mass deployment of individualized medical treatments unimaginable just a decade ago."

a new drug for Alzheimer's treatment last year[7]. Together with the revolution in personal technology, we are on the verge of the mass deployment of individualized medical treatments unimaginable just a decade ago. Access to massive troves of data also means that pharmaceutical and biotechnology startups are able to get off the ground more easily. Resource and process requirements around research and trials once made niche startups in the space a pipedream. Now, innovations in trial recruitment and real-time digital data capture have removed significant barriers to entry, setting the stage for a new generation of biotech companies to emerge, from which we can expect to see treatments, drugs and devices that would not have existed before the third wave of digital transformation.

Finally, the combination of democratized technology and data proliferation has resulted in quantum leaps in predictive analytics in healthcare that allow health providers to anticipate outcomes and interventions, reduce risk and improve patient wellness, comfort and satisfaction. For example, by harnessing the power of predictive medicine to spot warning signs, a hospital in Wales reported a reduction in adverse events by 35%, and a cardiac arrest reduction of more than 86%[8]. During the pandemic, these tools have been used to optimize hospital capacity management. Looking ahead, we can expect that healthcare providers and institutions, along with healthcare insurers, will continue embedding Big Data into their systems for better outcomes, efficiency and risk-mitigation.

[7] https://www.europeanpharmaceuticalreview.com/news/153839/first-ai-designed-alzheimers-drug-to-enter-clinical-trials/
[8] https://www.philips.com/a-w/about/news/archive/case-studies/20180315-early-warning-score-reduces-incidence-of-serious-events-in-general-ward.html

Beyond the Obvious Takeaways

1. A global telehealth network emerges

As telehealth emerges, international borders in the world of healthcare may fall away. People now visit different countries for lower cost or alternative treatments, but what happens when they can get consults from any expert around the world? The current model of public health knowledge is centered on physical interactions. Telehealth could potentially disrupt the current price and fee-for-service model. Access to technology and data, along with the need for rapid answers have rewritten the playbook. Collaboration is now the name of the game, and we can expect investment strategies in healthcare will reflect this new state of play, rewarding integrative and inclusive models of innovation.

2. Blockchain transforms healthcare

Blockchain technology is making it possible to keep incorruptible medical records in a transparent and decentralized log while keeping it secure. This means it can be private by concealing the identity of an individual while allowing access for healthcare providers and patients, all while being easily shareable. In 2012, Estonia began implementing blockchain to secure consumers' data and process transactions[9]. Today, the country does all medical billing with the technology and 95% of health information is ledger-based. For the US, the potential for blockchain to secure medical data, prevent costly breaches and streamline billing, while at the same time ensuring patient safety through accurate medical records, is enormous. By providing verifiable, customizable and secure records, it's possible to envision a safe and fast way to transmit comprehensive patient information around the globe, meaning diagnosis and treatment can be more accurate and faster in the coming years.

3. AI and your genome

Forget home DNA test kits confirming your aversion to cilantro is pre-ordained; we are on the cusp of an era in which your genome can be scanned for potentially harmful genes and genetic mutations[10]. We can now use machine learning algorithms to replace humans in analyzing DNA. With this technology, it is possible to compare genetic expression in different tissues and identify genetic mutations within tumors. One technology is able to identify the presence of a glioma using brain scans of patients with a very high rate of accuracy. The automation of diagnosis prevents human error and can help avoid the need for surgery, broadening access to expertise in the process. In addition to diagnostics, AI is also helpful in genomic treatment, being able to identify which genes have been affected and then predict the repairs that could be made by enzymes such as Cas9. In the next 10 years, we will see technologies emerge that may be able to predict and treat diseases before they are even symptomatic.

[9] https://www.utsouthwestern.edu/labs/ansir/news/20200420_AI_May_Help_Brain_Cancer_Patients_Avoid_Biopsy.html
[10] https://ysjournal.com/the-role-of-ai-in-gene-technology/

Power & Utilities, Energy & Infrastructure

Unprecedented Upheaval in Power and Energy

From efficiency to safety, technologies like artificial intelligence and machine learning are transforming our energy infrastructure, from the way we generate power to the security of the delivery system.

"From extraction and capture to storage and deployment, capabilities and efficiencies achieved through digitalization are at the heart of the energy sector's future."

Few segments of the economy are as critical to modern life as energy. This fact only serves to highlight the challenges the power & utilities and energy sectors face in the coming decade: resilience and de-carbonization. Creating an energy industry that is stable and secure is an imperative. And the need to reduce emissions and transition to greener energy sources have moved from nice-to-have to must-have as the effects of a warming planet are more evident each month. Digitalization will be critical to these efforts, and will need to penetrate to the core of energy sector operations if they are to succeed.

Resiliency reigns supreme

The past 12 months have demonstrated the stakes of these dual transitions. In recent months, extreme weather patterns pushed the grid in Texas to its limits, first seeing it buckle in polar conditions in February, then suffer through a brutal heatwave in June. We recently saw one of America's critical fuel pipelines shuttered at the hands of non-state cybercriminals, causing gas shortages across the Southeast and Eastern seaboard. Technology is key to securing our energy infrastructure going forward. For example, as we anticipate more frequent and severe weather events, deploying remote-sensing and data-gathering solutions to create geospatial maps of the energy grid's conditions in real-time allow energy companies to predict and avert incidents – think freezing gas lines in Texas – that could compound problems. Giving customers visibility to outages and other potential problems in real-time, allowing providers to focus on the most critical problems. And pairing these solutions with smart microgrids that have alternative power options can take stresses off the system.

When it comes to cybersecurity, artificial intelligence (AI) will play a leading role going forward. Deploying AI and automated domain expertise to monitor and detect threats to operating technologies can give companies a more complete picture of anomalous activity, and provide time to prevent attacks before they disable critical infrastructure. At present, such practices are only deployed by the biggest utilities and producers in the world, but more comprehensive adoption will be key to building ubiquitous cybersecurity resilience in the energy sector.

The transition away from carbon

When people think about the move toward a carbon neutral economy, the focus tends to fall on generation; wind turbines and solar panels are at the forefront of conversations while grid management and storage fade into the background. Yet generation is not the end-all be-all when it comes to energy. Instead, to truly decarbonize we will need to move away from one-way generation and transmission toward an integrated, flexible generation and distribution network with visibility into the ecological impact of energy production and consumption at each touchpoint in real time. Put simply, de-carbonization demands data, and digitalization allows us to get there. Injecting data-gathering systems into the energy infrastructure will bring about greater efficiency and security. AI is already used to monitor and analyze demand patterns, identify storage and distribution needs, anticipate grid maintenance ahead of time and better integrate renewables into the grid network. These efficiencies save significant energy, and the data generated enable better planning for future carbon neutral and carbon free generation to be brought online.

> At the moment, when push comes to shove, green technologies do not offer the most competitive ROI. But technology is beginning to change that."

The benefits of digital technologies are also seen in the energy infrastructure in the form of innovations in transit. In 2019, transportation accounted for 24% of global carbon dioxide emissions[11]. In order to decarbonize, the world has turned toward electric vehicles, and digital technology is playing a key role in design and operational capabilities, as well as autonomous and shared transit systems that use AI and machine learning. From engineering to charging network maps, the efficiencies achieved through digitalization are at the heart of the green transit revolution.

Balancing going green and making green

Even as many stakeholders are pushing for more rapid movement toward sustainability, the pace of the transition to a carbon-neutral economy will be driven by feasibility and revenue. The pace of adoption will pick up as options emerge that can be both sustainable and profitable for companies and investors. At the moment, when push comes to shove, green technologies do not offer the most competitive ROI. But technology is beginning to change that. Digital modeling is allowing companies to design virtual generation plants using data from other facilities and grids in order to understand operations and cost structures. Similar technologies are also being used to model transmission system design to reduce deployment costs. And AI is ensuring efficient integration of renewables into grid systems. All of these will be critical to build accurate capital requirements and revenue estimates for leadership teams and shareholders as companies move toward carbon neutrality in the coming years.

[11] https://www.iea.org/topics/transport

Beyond the Obvious Takeaways

1. Roughneck to smart tech

From the gas wells of the Rockies to the underwater drilling operations in the Gulf of Mexico, technology is transforming how energy producers handle safety procedures, monitor infrastructure integrity and environmental protections. The advent of precision robotics paired with AI is moving tasks away from the tough hands of onsite staff toward the keyboards of office towers. As one example, MIT and ExxonMobile[12] are collaborating on the development of AI-powered submersible robots that can map the ocean floor and analyze changes over time, finding new locations to drill. Using software that applies technologies first used by NASA on Mars, Exxon expects to increase its discovery rate and utilize the data to detect problems ahead of time. The AI-enabled Iron Roughneck, made by National Oilwell Varco Inc., replaces humans in the work of connecting drill pipes, improving safety and increasing efficiency[13]. And regulators and producers alike are embracing drone and sensing technology to find leaks in oil and gas pipelines and monitor emissions.

2. Lithium bust, green energy boon?

The transition to electric cars, the dependence on electric gadgets and the demand for energy storage that will accompany the transition to renewables like wind and solar all have one thing in common: a huge need for batteries. The most common form of batteries in use for all of these purposes is lithium ion, which means the supply of lithium will be a significant concern going forward. The markets are coming to terms with this. After hitting a low of around $6,000 per ton last July, the price of lithium carbonate has surged to $13,000 per ton, and continues to rise. This dynamic is driving several responses. First, higher prices, along with supply concerns, have created intense interest in mining the element at home and abroad. Just in the first three months of 2021, U.S. lithium miners raised nearly $3.5 billion from investors, seven times the amount raised in the prior 36 months, according to data assembled by Bloomberg[14]. Second, the pursuit of a replacement for lithium has become intense. Whether it be sodium, sulfur or iron, batteries that utilize more common, cheaper mediums to store energy are being developed and coming online at a rapid clip. But finally, the challenges of the lithium supply chain have created opportunities beyond batteries. From hydrogen (as a fuel and as fuel cells) to carbon capture technology to mitigate the impact of current fossil fuels, the bottleneck that lithium created is spurring more diverse innovation in the green energy sector. Simply, the shortage of the world's main battery material has seeded a diverse set of carbon-neutral solutions that could come to fruition in the coming years.

3. Everyone is storing energy everywhere

Just as digital content has become pervasive, as we move towards a world with electric cars, solar panels and large devices, individual households will be part of a two-way grid rather than solely receivers. Everything with a battery also has the potential to be a consumption point or a storage point. This will be the next step in microgrids. This concept of a decentralized group of electricity sources and loads connected with the traditional generation and transmission system, but capable of operating independently of the system, will move toward an Internet of Things model where interconnectivity means autonomy as necessary. Such autonomy builds system resilience and we are likely to see it incentivized in ways great and small in the coming decade.

[12] https://insights.globalspec.com/article/7831/exxonmobil-and-mit-spearheading-ai-ocean-exploration
[13] https://www.emi-magazine.com/sections/columns/1434-robotics
[14] https://www.bloomberg.com/news/articles/2021-03-19/investors-flock-back-to-lithium-as-battery-bust-turns-to-boom

Financial Services

Transformation in Financial Services

Digital technology is revolutionizing the ways that central banks, financial institutions and consumers conceptualize and interact with money and financial tools and services.

"Eliminating traditional friction points for clients and consumers is driving incredible value creation in the financial sector. Going forward, legacy institutions will need to determine which path they will take to best adapt and thrive in the new digital finance landscape."

Over the next decade, digitalization in the financial services sector will rear new players, create new business models and open up new markets as the industry changes how consumers interact with their finances and, perhaps, money itself.

An emerging ecosystem

When it comes to digitalization and financial technology, it is important to level set where financial services are at the moment. The sector, in many ways, has always understood the importance of data. Consider what a bank knows about a consumer: their income, cost of living, where they spend their money, what they spend it on and how frequently – the list goes on. Banks also have scale, resources and invaluable client trust. Collectively, these considerations equate to be a potent moat for value creation. Yet, those attributes have come up short in the digital age where agility and innovation trump scale and incumbency, and forward-intent and preferences prevail over antecedent data. While a bank can quantify your grocery dollars spent over the past year, social platforms gain insights into upcoming financial needs and purchases of a soon to be college graduate via media posts or searches online. Further, banks continue to operate under a restrictive regulatory framework. This has created an opening for new technology upstarts. Enter the neobank. As Forbes describes, neobanks are "fintech[15] firms that streamline mobile and online banking. . . [and] tend to be more nimble and transparent than their megabank counterparts, even though many of them partner with such institutions to insure their financial products." And right now, nimbleness is at a premium. Indeed, the neobank concept is one big reason behind soaring valuations for payments companies like Afterpay, which has made a huge splash in e-commerce with a buy-now-pay-later (BNPL) installment payment option. A couple of weeks before Square acquired Afterpay, Mizuho analyst Dan Dolev noted that Square's Cash App "may be en route to becoming the ultimate neobank and the money center bank of the future," and that buying Square stock today could be "analogous to buying J.P. Morgan in 1871." Indeed, firms like Square, PayPal and Chime have emerged to capture access to a $5.5 trillion market opportunity.

These innovative startups emerge at points of friction in the legacy banking system and utilize technologies and processes not endemic to traditional financial institutions. Take platforms like Venmo/PayPal. These upstarts are disintermediating services that traditional banks have offered, meeting customers at the point of transaction. Allowing rapid transactions between people and business and among individuals while providing tracking goes to the heart of the customization and immediacy consumers demand in the digital age. The same is true for BNPL options. Companies like Affirm have made subscription purchases much easier and cheaper than the legacy route of credit cards or personal loans. Another example of an offering gaining popularity as a result of ease of use and straightforward transactions enabled by digitalization is online brokerage services such as Robinhood, Wealthfront and other discount brokers or asset managers. These platforms offer customers insights using computer algorithms that analyze the markets. Their use and market share has exploded, particularly during the pandemic. Over $460 billion in assets were managed using these platforms in 2020,

[15] https://www.forbes.com/advisor/banking/what-is-fintech/

> Understanding and embracing the reality that no one company has the expertise to dominate in the new digital financial sector will determine which firms survive, and which thrive."

a 30% increase year-over-year. And some projections expect that number to surpass $1 trillion by 2025[16]. And companies like Current, which launched as a bank for teens but now cater to the previously unbanked, offer basic services, access to education and guidance and flexible low-fee structures.

So, can traditional banks leverage their opportunities in this era of fintech and neobanks? Banks have already moved beyond the branch to the digital world and continue to invest but also partner, collaborate and acquire. We are seeing banks create new divisions and products and ring-fence innovation labs that specialize in fintech with moonshot projects necessary to stave off the disruption and remain relevant. They have also collaborated with competitors forming consortia in areas such as blockchain. Notable examples include R3, HQLAx, Fnality, Axoni and Digital Asset. As put in a Harvard Business Review[17] article, "Not so long ago… mass collaboration, often involving direct competitors would have seemed strange, if not hopelessly naive. Yet today, high performing firms, from corporate VCs to corporate accelerators, are increasingly aware that they need to connect or get shut out." Understanding and embracing the reality that no one company has the expertise to dominate in the new digital financial sector will determine which firms survive, and which thrive. And banks, as well as new players, have also been participating in the M&A boon to capture the opportunity at hand. Since the beginning of 2020, there have been over 850 transactions valued at over $230 billion and over 3,700 venture capital investments valued at over $65 billion in the fintech sector as organizations seek technologies to solve frictions endemic to finance, innovative solutions and new models[18]. Whether it is through buying, building or partnering in the digital space, banks are moving aggressively to smooth rough points in their own processes, finding ways to address regulatory hurdles and deliver cutting-edge services to their clients.

Blockchain takes root

Much as digitalization has created space for new financial firms to launch solutions addressing new consumer demand, blockchain's distributed architecture is democratizing finance, eliminating the need for a centralized trusted arbiter due to the encrypted algorithms that make transactions secure. The transparency and traceability that blockchain provides can dramatically reduce grift, allowing robust modern financial systems to take root. Due to the irreversible nature of blockchain, data has a comprehensive incident trail, making it easier to handle errors and audits. Beyond our shores, blockchain could be transformative for developing nations with digital penetration but weaker institutions, spurring commerce and financial empowerment. Cryptocurrencies are another example of blockchain's role as a foundation of new financial frontiers. By providing a decentralized ledger, the technology eliminates many of the middlemen, potentially allowing for faster payments, more efficient international trade processing and greater interoperability of capital markets. Finally, blockchain provides for immutable digital identification, which can dramatically reduce financial fraud in the device era. As digitalization progresses, the technology will prove critical to speed and security of financial services, provide access to capital systems to new players and allow for lower barriers and costs to consumers and businesses alike.

[16] https://www.cnbc.com/2021/04/12/why-robo-advisors-may-never-replace-human-financial-advisors.html
[17] https://hbr.org/2019/12/why-move-fast-and-break-things-doesnt-work-anymore
[18] https://pitchbook.com/news/reports/q2-2021-emerging-tech-indicator?utm_medium=nl-na&utm_source=daily_pitch&utm_campaign=market_update&utm_content=q2-2021-emerging-tech-indicator&utm_term

Beyond the Obvious Takeaways

1. The end of paper money?

330 years after the Massachusetts Bay Colony released notes, and over a millennium after it was introduced at scale in China, paper money may be going out of style. For the past decade, technology has been shaking up the payment environment, enabling consumers to link bank accounts and cards to devices to pay for most anything these days. But now the world's central banks are getting in on the action, and this may signal the decline of physical currency. Perhaps it is fitting that China is leading the way. Since 2016, the People's Bank of China (PBOC) has been pursuing plans to launch a digital currency. In April, the PBOC, the nation's central bank, announced it will issue the digital yuan, the first central bank digital currency, meaning computer code that is literally legal tender[19]. Advantages of such an approach include the ability to reach individuals who do not have access to bank accounts, to instantaneously transfer money for any purpose and for governments to understand the exact nature of cash flows through the economy. However, there are downsides, particularly around privacy, and also ramifications for commercial banks. Banks depending on deposits to fund loans may have to find new sources of revenue and struggle if the policy environment surrounding the process by which a country's central bank mints new digital currency is cumbersome or restrictive. But regardless of the upsides and the drawbacks, the next decade will see the largest experiment in the nature of money since the Tang Dynasty. And it was brought to you by digitalization.

2. International trade

Digital technologies are enabling numerous transaction points, and another place this will play out in a big way is in international trade. Trade and globalization have had a rough go since the global financial crisis. However, blockchain and digital currencies may reduce bureaucratic drag, in import and export processes, duties at ports and international borders, as well as compliance and currency-exchange costs. So, we might expect international trade to get a boost in the coming years. And technologies including e-commerce and mobile banking and on-demand digital translation facilitate cross-border payments and communications. Finally, digital technologies are fueling the trade in services between countries, particularly in the wake of the pandemic. Put simply, digitalization will prove to be the driver of trade growth in the next decade.

3. No more third parties

Blockchain and cryptocurrencies are poised to decentralize finance in a big way, vastly reducing the need for third parties, creating new markets and changing transaction structures. This will create significant turbulence in parts of the financial sector, from which winners and losers will emerge. Take foreign exchange firms and other incumbent networks whose business model is predicated on third-party fees. These companies are set to struggle to maintain revenue streams in this new environment. The decentralization of finance will have regulators playing catch-up as they adapt to a world where their efforts to monitor and oversee the financial services industry are increasingly difficult. The disintegration that blockchain and cryptocurrencies will cause will have huge ripple effects in the coming decade.

[19] https://www.wsj.com/articles/china-creates-its-own-digital-currency-a-first-for-major-economy-11617634118

Industrials

The Fourth Industrial Revolution

Greater device and tool connectivity will enable massive changes in how things are designed, made, shipped and deployed, with huge consequences.

"While consumer technology has grabbed much of the headlines, the digitalization of the industrial sector will have a much greater impact on our lives and our planet than any technology we can hold in our hand."

The digitalization and adaptation of the technological transformation of industrials has been slower due to the scale of the undertaking, existing investments in legacy infrastructure, associated costs and a mindset of "if it isn't broken, don't fix it." Despite this, most companies have been undergoing significant disruption for some time. The way they design, manufacture and transport goods are being transformed by technologies like 5G, artificial intelligence, machine learning and others. The Fourth Industrial Revolution may not be televised, but it will be digitalized.

Connectivity transforms industrials

When you hear Internet of Things (IoT), your mind may jump to the speaker on your counter or your doorbell and camera. But over the next 10 years, IoT will likely reach its full potential in the industrial sector. According to Transforma Insights, between now and 2030 the number of connected devices in the world will grow from 7.6 billion to 24.1 billion[20], with the market opportunity more than tripling to over $1.5 trillion. The significant growth in device connectivity will reach beyond our home, merging factories, transportation and logistics and autonomous machines, essentially linking all pieces of the manufacturing economy into a shared network. And this connectivity is changing the way products are created and delivered. Take supply chain and inventory management, IoT technology enables everything from networked forklifts at point of production, to hand-held tablets and trackable RFID tags used during transit and in-store, to robots and connected delivery trucks in the "last mile". Interconnectedness is the name of the game. As a result of the IoT, the next thing you order online may be manufactured by a robot, shipped by a computer program and arrive at your door via rover or drone without a human being ever touching it.

Flexibility for manufacturing sector

Much has been made about the pandemic's effects on the workforce and retailers. Much less attention has been paid to industrials. Yet COVID shined a light on the ways that technology enabled companies to be flexible in developing, making and transporting goods. Many manufacturers reinvented themselves in real time last year thanks to digitalization. In Vietnam, VinFast, an automotive startup with no medical manufacturing experience, used software to switch over to produce ventilators[21]. Similarly, Spectrum Brands converted an assembly line to produce hand sanitizer rather than insect repellent[22]. Beyond changes in production demand, the pandemic exposed companies to the costs and risks of a distributed supply chains and the need for greater visibility into their production pipelines. As overseas producers were impacted by labor shortage and logistical bottlenecks, the appeal of smart, transparent and reliable supply chains grew and digital technology provide a path forward for industry. In some ways, the old model of globalization itself took a hit.

Rather than viewing supply chains as rigid and set in stone, a new approach is emerging where supplier networks look less like a chain and more like a constellation. Many companies moved to re-home production lines using automation, providing dual health and labor advantages. The need for flexibility and resiliency has pushed companies to embrace a dispersed network model for suppliers. For example,

[20] https://transformainsights.com/news/iot-market-24-billion-usd15-trillion-revenue-2030
[21] https://www.voanews.com/covid-19-pandemic/unlikely-story-first-made-vietnam-ventilators-fight-covid-19
[22] https://investor.spectrumbrands.com/node/25186/pdf

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It is not just the design process that technology is transforming. Building site efficiency and safety are benefiting from digitalization in big ways."

chemical producer BASF[23] stablished a system of manufacturing plants around the world managed and connected by intelligent, data-driven networks, enabling them to shift capacity from one region or node to another depending upon demand or curtailed or altered production abilities. Not only does this build resiliency, it also allows for rapid response to local demand changes and customer preferences in regular operating environments. Over the past year and a half, digitalization has proved invaluable for companies, enabling flexibility, efficiency and certainty in production during a period of great uncertainty. Going forward, these lessons will stick, and we can expect these changes to become deeply rooted in the minds of corporate managers, and in the globalized economic model.

Building smarter

Construction, one of the largest sectors of the economy with over $10 trillion annual spend on construction-related activities, remains one of the least digitalized[24]. That is set to change over the course of the next decade. The pervasiveness of individual devices and advances in technologies like high-performance computing, data analytics, artificial intelligence, simulation and automation are opening new pathways in the industry that will drive efficiencies across the board, as McKinsey has discovered[25]. Take AI: currently, building information modeling (BIM) allows teams from designers and architects to contractors and manufacturers to collaboratively ideate and build projects in 3D. Now, within such a program, AI is being deployed to check and improve designs. Specifically, machine learning algorithms are used to QC the process and "explore all the variations of a solution and generates design alternatives…the generative design software creates 3D models optimized for the constraints, learning from each iteration until it comes up with the ideal model."

It is not just the design process that technology is transforming. Building site efficiency and safety are benefiting from digitalization in big ways. Technologies like cloud, low code/no code and robotic process automation are allowing builders to capture efficiencies. Examples include monitoring and coordinating subcontractors, assigning priorities, deploying robots and drones to collect and analyze data at construction sites to assess project progress and offer suggestions for improvement or alternatives and even developing plans for optimal labor distribution, an especially helpful tool during tight labor markets. And, digital technology is being used in service of site safety, as data collection and AI are being used to reduce laborer risk.

[23] https://mitsloan.mit.edu/ideas-made-to-matter/post-pandemic-supply-chains-retool-a-new-abnormal
[24] https://www.businesswire.com/news/home/20210111005587/en/Global-Construction-Industry-Report-2021-10.5-Trillion-Growth-Opportunities-by-2023---ResearchAndMarkets.com
[25] https://www.mckinsey.com/~/media/McKinsey/Industries/Capital%20Projects%20and%20Infrastructure/Our%20Insights/The%20next%20normal%20in%20construction/The-next-normal-in-construction.pdf

Beyond the Obvious Takeaways

1. The future of building

While AI is currently driving efficiency gains and safety improvements as we speak, the next 10 years hold even more futuristic developments in the construction sector. Specifically, intelligent tech is coming to a building project near you. From off-site factories staffed by autonomous machines that build the components of a building to remote controlled vehicles that can prepare a building site to robots that can assemble the superstructure, automation is poised to play an ever-increasing role in the construction sector. But it doesn't stop there. Expect to see drones and other digital technologies collecting data on buildings after the ribbon cutting monitoring the "operation and performance of a building, bridge, roads and almost anything in the built environment."[24] In doing so, digital tech will help humans identify maintenance targets and safety concerns, and perhaps prevent mishaps before they occur.

2. Printing to spec

Additive manufacturing, also known as 3D printing, will become commonplace and customizable, deployed at scale, diversified in the materials and designs used and affordable. The ability to reduce delivery time, reduce inventory needs and enable production oversight from afar will drive mass adoption of the technology. From NASA to Nike, 3D printing is playing an ever-greater role in future plans and is expected to grow its presence in industrial supply chains going forward – think the energy and aerospace fields – and is likely to become as commonplace as injection molding. Beyond hard industry, the applications for softer on-demand, customization in the sector are enormous. From printed heart valves to whole homes, additive manufacturing is poised to transition from novel to normal.

3. Autonomous become ubiquitous

By the end of the decade, autonomous transport will become ho-hum. Headlines about Tesla drivers napping while driving may grab the headlines now, but as 5G, artificial intelligence and machine learning hit their stride, transportation will be revolutionized. For confirmation, look no further than the SPAC action in the sector. In the last 18 months, SPACS have poured billions into automotive vehicle companies and adjacent companies developing the necessary technology like lidar. Mobility as a service (MaaS) companies are also seeing significant investments. Electrification of transit in the U.S. got a big boost with the passage of the bipartisan infrastructure bill through the Senate, allowing for greater automated EV fleet deployment. Major automakers are leaning in to driverless technology that will minimize human involvement. Demand for delivery is also associated with much of the action. In the next 10 years automation utilized to close the "last mile" gap will become commonplace. Startups and established heavyweights are in a race to capture the evolving opportunity in transit, transportation and logistics.

Consumer & Retail

Building the Consumer Future

The relationship between consumers and suppliers has been upended by technology, new consumption habits and expectations. Product quality, options, customer service and organizational purpose have become table stakes; winning share of wallet and mind will require consumer-facing companies to think beyond the obvious to establish differentiated brand values and targeted approaches to meet shopper demands. Leveraging technology, Big Data and a personalized approach will be key to success.

> We are on the brink of the next great revolution in consumer product provision with the pendulum swinging decidedly toward goods and services tailored to individual preferences."

A century after mass production transformed the way we live, Americans are increasingly eschewing the one-size-fits-all approach for an individualistic ethos. The widespread adoption of technology is behind this transition, driving a fundamental shift in customer tastes and behavior, how companies develop and market productions, and the way modern consumer products supply chains function. In addition, information pulled from our interactions with one another and with companies is creating massive datasets that provide deep insights into our actions and preferences, allowing for predictive modeling of demand and trends in ways previously not possible.

Personalization required

Nearly 4.8 billion people around the globe can now get online[26], and nearly 5 billion have mobile phones[26]. The access to information, products and apps dramatically change the way consumers interact with, evaluate and purchase goods and services. Combined with the increasing demand for wraparound experiences from digital natives, the celebration of individuality provided by social media and the instantaneous nature of online fads, a great premium is now placed on personalization. This has fueled an explosion in the number of companies able to provide bespoke product offerings. A recent article in Forbes, which highlights the power of personalization, quoted one statistic that 80% of consumers are more likely to make a purchase from a brand that provides personalized experiences[27]. And this trend towards self-expression and personalization goes beyond the pattern on a shoe or the experience on a phone. Consumers also want their values to be part of their consumer experience. 5WPR's 2020 Consumer Culture Report[28] found that nearly two-thirds (65%) of millennials say they have boycotted a brand that took the opposing stance on an issue, and 62% favor products that show off their political and social beliefs. The democratization of technology has essentially put consumers, rather than companies, in the driver's seat when it comes to product offerings going forward.

Technology leads to the competitive advantage

The mass adoption of technology has been a story with many plotlines, but few more important than Big Data. Wherever companies can harvest data, they are doing so, and the result has allowed AI and machine learning tools to analyze and predict our decision-making in incredibly accurate ways, with the advantages for consumer product companies being immense. No one does this better than Amazon. The Seattle-based retailer uses consumer information[29] including what you place in your cart (regardless of purchase), shopping patterns and times, competitor pricing and product rarity to inform dynamic pricing and product recommendations that account for 35% of their annual sales. AI allows businesses to use data to adjust their service offerings as well. Disney[30], which utilizes "MagicBand" devices to track individual guest behavior in their parks and hotels, leverages the information to improve efficiency and guest experience. Digitalization 3.0 has also enabled manufacturers to transition from a legacy paradigm where demand was an estimated parameter to be met by a static supply chain to a new model where a dynamic supply chain responds to demand forecasting grounded in data gleaned from customers themselves. Companies that can capture accurate, relevant consumer data and use it to create virtuous cycles by continually improving products and experiences that

[26] https://www.statista.com/statistics/617136/digital-population-worldwide/
[27] https://www.forbes.com/sites/blakemorgan/2020/02/18/50-stats-showing-the-power-of-personalization/?sh=6
[28] https://www.5wpr.com/new/research/consumer-culture-report/
[29] https://www.bornfight.com/blog/7-real-world-examples-of-how-brands-are-using-big-data-analytics/
[30] https://digital.hbs.edu/platform-digit/submission/big-data-behind-disney-magic/

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The next decade will see companies revamp supply chains to better meet the requirements of mass customization, to be more responsive to data that consumers generate, and more technologically advanced in order to shift production on demand."

retain and attract consumers will be in the catbird seat going forward.

Customization is reshaping supply chains

Taken together, the production demands of customization and the evolution of Big Data in forecasting demand and emerging trends – both spurred by the mass adoption of digital technology – is transforming how companies conceive of supply chains. We are seeing firms work to build supply chains that are less centralized, more diversified and less people-intensive. Why? Because customization adds more variables and places greater emphasis on flexibility and speed rather than quantity produced. Therefore, we are likely to see supply chains with smaller, higher-tech production sites that rely upon technically skilled labor and that can be reimagined depending on consumer trends. These supply chains also take advantage of local vendors, both to cut delivery time to consumers and to take advantage of their own local knowledge in customer preferences and distribution channels. Finally, as technology advances, the next decade will witness an uptick in direct-to-consumer manufacturing as 3D printing and other tools allow individual components to be assembled without passing through a prolonged production line. Nike has been at the forefront of supply chain innovation[31] with the development and evolution of their Nike Direct organization and the Advanced Product Creation Center to test future manufacturing and digital innovation. Another company that has built responsive supply chains is Zara[32]. Their focus on responding to what they call "moment fashions" or time-specific short-lived trends taps into the desire to both be current and unique, and the result is a supply chain that produces hundreds of thousands of SKUs a year, compared to several thousand for their competitors. The next decade will see companies revamp supply chains to better meet the requirements of mass customization, to be more responsive to data that consumers generate, and more technologically advanced in order to shift production on demand.

The COVID e-commerce acceleration

With lockdowns around the world keeping us at home, e-commerce (and with it personalization, data collection and the reforming of supply chains) has expanded at a pace unimaginable before the COVID crisis. The ripples of this can be seen across industries. First, it is transforming the look and function of brick-and-mortar locations. Going forward, more locations will be transformed to semi-dark stores that serve as pick up points and logistical centers while also being retail locations. One study suggests that by 2023, more than 50% of all e-commerce purchases will be delivered from local inventory in flexible stores like these.
The pandemic has also transformed customer loyalty. While legacy brands had based their strategy around the barrier to entry that physical locations presented, the online shopping boom effectively leveled the playing field. Take mattresses: Virtual first mattress companies like Casper gobbled up market share during the past 18 months, hitting the well-known brands where it hurt, as they were caught flatfooted[33]. It shows that COVID accelerated another trend: brand loyalty that was perhaps taken for granted for years matters much less in a digital world.

[31] https://digital.hbs.edu/platform-rctom/submission/getting-personal-what-digitization-and-customization-mean-for-nikes-supply-chain/
[32] https://www.scmglobe.com/zara-clothing-company-supply-chain/
[33] https://www.forbes.com/sites/andriacheng/2019/05/07/casper-facing-growing-competition-wants-to-take-care-of-your-entire-sleep-business/?sh=791e2980fb11

Beyond the Obvious Takeaways

1. Lifestyle tech, fully integrated

Integration will be the name of the game in the consumer sector, and specifically home services, over the next decade as our homes are increasingly stocked with appliances and gadgets that communicate with us, with each other, and with brands we do business with. From smart clothes to smart washers and dryers, companies are integrating technology and connectivity into products with the aim of weaving them into our routines and building conveniences. Remember the novelty of the Amazon dash buttons that you would push to reorder detergent? We are now entering an era where sensors and edge computing will spare you from even pushing a button. Lights automatically turn on when you enter a room, thermostats adjust if you are baking or if you leave home, and refrigerators order milk to be delivered. Just remember, if it is connected and convenient, it is also collecting data.

2. Robots, robots, everywhere

Speaking of robots, they will not be solely relegated to supply chains. You may have seen the video of the robot that can make hamburgers[34] and been impressed. But that is just the beginning of the innovations in robotics that will emerge across the consumer product space in the next decade. We can expect to see robots become pervasive in retail spaces. A major European grocer is using them to conduct inventory monitoring in real time[35]. For some industries, robotics will be the key to developing factories that can rapidly adjust to personalization. Other robots will drive direct to consumer manufacturing, 3D printing products like medical devices to custom specifications, cutting out the middle man[36]. Robotic technology is coming of age, and will change the way companies and individuals complete tasks and solve problems.

3. Consumer experience embraces augmented reality

One of the hallmarks of omnichannel retail strategy has been to focus on customer experience. To this point it has meant ease of purchase and delivery, the ability of companies to provide customer service, allowing consumers to be able to engage and evaluate products and services and the integration of mobile technologies. But over the next 10 years we can expect to see consumer experience embrace new technology and personalized data to become immersive in nature. An example of what is to come is a recent collaboration between Bombay Sapphire and the Shazam music app, which provided viewers with augmented reality content and recipes when they scanned a code[37]. Gone are the days of single channel delivery. Consumers will expect experiences to be exciting and innovative going forward, and brands that do it well will benefit.

[34] https://www.latimes.com/business/technology/story/2020-02-27/flippy-fast-food-restaurant-robot-arm
[35] https://iotbusinessnews.com/2020/07/29/80121-auchan-retail-accelerates-digital-transformation-with-traxs-autonomous-shelf-monitoring-solutions-in-portugal/
[36] https://www.supplychaindive.com/news/robot-automation-orders-pandemic-investment-automotive-life-science-metals/600355/
[37] https://econsultancy.com/how-shazam-is-using-augmented-reality-to-help-brands-come-to-life/

Real Estate

Modernizing Real Estate

The pandemic has pushed technology to the forefront in the sector, driving a shift from offices to flex work, adoption of digital processes and broader insights from data analysis.

"Real estate, whether commercial (CRE) or residential, is about experience and return on investment. Digital technology has reshaped both for the better."

From the screaming hot housing market to the COVID-driven upheaval of commercial side, the real estate sector has experienced dramatic shifts recently. Digital technology is revolutionizing how real estate offerings are listed, marketed, viewed and sold.

COVID remakes an industry

Eighteen months after the pandemic came to America, the real estate sector is still feeling its effects. Spurred by COVID, work from home (WFH) has remained in effect for many non-essential workers. This labor transition has had consequences that have played out in several aspects of real estate. The recognition that WFH and lockdowns would be around longer than anticipated spurred a home-buying spree as people sought more space and comfort while they were confined to their house. This surge in demand saw interest boom in suburban and exurban neighborhoods as city dwellers sought less density and more room. It was paralleled by huge demand for digital hardware for home offices and increased internet capacity. WFH also transformed commercial real estate (CRE). It emptied office buildings in urban cores, leaving enormous vacancies and placing negative pressure on commercial real estate portfolios. Then as the downsides of working from home became clear, demand ticked back up, but workplace attendance became more flexible and transient. Tenant demands had shifted from extra features like gyms and coffee areas to epidemiological necessities like air filtration, cleaning standards and sufficient space for distancing. And, beyond office towers the surge in e-commerce dramatically increased demand for warehouse space and last mile distribution hubs. All of these changes have been underpinned by digital technology, which has not only enabled work from home, but powered the transition in nature of offices and the new e-commerce logistical supply chain.

Manual to digital across the board

Even pre-COVID, technology has been transforming the way real estate transactions take place; disintermediating how realtors, lenders, legal service providers and consumers interact. Realtors have embraced technologies from AI to augmented reality to bring listings to wider audiences. Consumers adjusted how they proceed through the buying process, embracing digital engagement with lenders for mortgages and refinancing. One survey found the importance of lenders offering digital solutions spiked last year, with "58% of respondents saying the availability of an online application would affect their lender decision,"[38] 10 points higher than the same survey in 2018. And AI software has smoothed the process of creating, finding and organizing the documentation necessary for sales through automation. 5G is also further blurring the lines between home office, work office and travel after nearly 20 months of COVID. This ability to seamlessly transition between work and home through increasingly reliable and consistent networks is especially helpful as we continue to manage the ongoing pandemic. Finally, technology is enabling build to order in commercial and residential real estate. Powered by AI, robotic process automation and augmented reality, end users are being assisted in design and builders assisted in construction by software and hardware that allows tailored results at every point in the process. Put simply, from vision to

[38] https://www.businesswire.com/news/home/20210513005319/en/

> Data is now the coin of the realm, and is being used to power tools in the real estate sector that collect and harness data in service of investors."

virtual closing, digitalization is being felt across the sector.

Predictive analytics over gut feeling

Beyond experience and engagement, digital technology is underpinning new approaches to real estate investments. Data is now the coin of the realm, and is being used to power tools in the real estate sector that collect and harness data in service of investors. Take property valuation. Some AI tools use traditional information available to the public including photos, tax records, nearby development projects and regional sales data. These platforms not only estimate current prices, but can be used to predict future valuations multiple years out. Other tools take a less standard approach. One company, Lofty, seeks to leverage data to help buyers make smart purchases in emerging neighborhoods focusing on highest single family residence appreciation[39]. They capture data other tools do not see as useful like "avocado toast, trendy bookstores, and French bulldog sightings" which point to a sociodemographic future of a neighborhood. Other approaches focus more on the number of data points rather than their specific nature in order to create value for clients. Specifically, these algorithms cast the broadest net, utilizing data on as many property characteristics as possible, from crime rates to walkability scores to historical pricing patterns to determine valuations.

[39] https://www.lofty.ai/blog/real-estate-investing-online-app

Beyond the Obvious Takeaways

1. The flexible office

There is one thing we can be certain of looking at the next decade: the nature of the office tower will never be the same. While the impact has varied across industries, COVID has accelerated the timeline of remote-working capabilities to such an extent that most office-based companies can now function in a remote environment. However, it also made clear the shortcomings of work from home. The result is that rather than abandoning offices, the future of work will adopt a hybrid model that fosters in-person collaboration while eschewing the rigidity of the old office environment. There won't be a one-size-fits-all approach, but rather a spectrum of responses that will spur a period of evolution for commercial real estate companies and tenants as they determine what works best for their business model. Fewer desks and less density are likely to balance out, so many firms may turn to the hoteling concept where workers reserve desks on days in the office and video conferencing capabilities take precedent over large all-staff gathering rooms. Touchless and antimicrobial technologies will also come to the fore to ensure employee health. What we can be certain of is that the measure of a promotion is unlikely to be a better office, but rather the ability to select which office, and which days you need to be in that office.

2. Greener builds

Digitalization has not only impacted transaction and management of real estate, it has also dramatically changed the building process from concept to components. In the next decade, technology will transform green construction. Expect to see an explosion of environmentally-friendly properties that incorporate planet-friendly materials and designs, from high-efficiency solar panels and accompanying storage batteries to automated heating and cooling systems that harness the Internet of Things for comprehensive monitoring. There will be more collaborative and agile tools to plan, design and develop buildings that can be prefabricated to lessen the environmental impact at the building site. Over the next 10 years, digital technology will help the real estate sector do its part to lessen impacts on the planet.

3. Twilight for office workers?

Automation is a theme for all sectors, and robotics and process management systems will come to the forefront in CRE. While few people associate office towers with automation and connectivity, the days of the hated copier being the pinnacle of networked tech are over. We are seeing tasks that were labor intensive and repetitive automated, particularly in commercial real estate. Drones are becoming more common in office towers around the world. Accelerated by COVID, companies are increasingly turning to robots for cleaning tasks, like sterilization, vacuuming, garbage collection and window washing. Sensors are being installed to monitor air quality, office supplies and plant moisture level. In this brave new world, we will see building maintenance move from evenings and weekends to ever-present, thanks to an army of Roombas on steroids.

Conclusion

Look Beyond the Obvious

Technological transformation is driving ever-greater connectivity, data capture and analysis and efficiencies across the economy, shaking up the status quo. The ability to thrive as a business is no longer simply a matter of bottom line, but rather organizational purpose and culture. It takes holistic, insightful companies capable of identifying and harnessing the energy generated during periods of change to succeed in this new era. Environmental, Social & Governance (ESG) have come to the fore as strategic imperatives for companies and their stakeholders including employees, customers, boards and society. Across all sectors companies are placing value on the environment, diversity in the workforce and governance. This call to action can be accelerated by technological advancements and institutionalizing core organizational values. Those organizations that embrace beyond the obvious opportunities will be well poised to rise above the short-term tumult of our 21st-century world and define our future.

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