

McKinsey Digital

The Future of Digital Innovation in China

Megatrends Shaping One of the World's Fastest Evolving Digital Ecosystems

The paths taken by Chinese companies have relevant implications for both digital and traditional players as they craft their strategies.

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Executive Summary

In a relatively short span of time, China has transitioned from a technological backwater to become one of the world's largest digital economies. On the back of its base of nearly one billion internet users, China's ecommerce sales grew to \$1.7 trillion in 2020, a number that is equivalent to 30 percent of all retail sales in China.

But this is not just a story of size. It is, above all, a story of innovation and disruption. In omnichannel retail, social media, on-demand services, mobility, fintech, healthtech, and other domains, the country is developing many "China-first" innovations.

In this report, we take a close look at these innovations, and the forces, trends, and technologies that enable them. We then identify six megatrends that are shaping the future of digital innovation in China.

Finally, we pose a series of quick questions that corporate leaders should consider when crafting their digital strategies in China. By asking the right questions, executives can set their priorities and allocate their resources.

Here's a quick snapshot of what's inside this report:

In **Chapter 1**, we set the context by highlighting four interconnected factors that have created the conditions necessary to give rise to China's digital ecosystem: A vast digital consumer base, intense pressure to quickly reach scale, a digital ecosystem that fosters innovation, and the shaping role of government.

In **Chapter 2**, we take a quick look at the current state of play in China's digital economy, breaking down its components and offering insight into the major forces and technological enablers that have brought us to where we are today. We look at eight of these forces: Ecommerce and omnichannel; social commerce; the on-demand economy; shared mobility; distribution; FinTech; EdTech; and HealthTech.

In **Chapter 3**, we explore six megatrends driving digital innovation in China: The great retail integration; The virtualization of services; The mobility revolution; Digitization of social life; Industrial IOT / supply chain digitization; and digital urbanization.

Finally, in **Chapter 4**, we share a checklist of eight questions that CEOs can use to start thinking through their strategies.

Of course, these insights may be relevant to companies that already have a presence on the ground in China. But is digital innovation in China relevant to the rest of the world? And how?

Companies elsewhere, even if they don't currently have a presence in China, might consider using the China experience as a reference point. The sheer speed and scale at which China's digital ecosystem players are driving innovations is redefining what it means to manage a company today's globalized, increasingly digitized economy.

There are at least four areas where Chinese players are pushing the boundaries of management:

First, winning players in China exhibit the nimbleness and agility of a small startup, while cultivating the organizational and operational capabilities they need to drive initiatives at the scale of a very large company.

Second, successful companies pursue an externally-driven, internally-focused Darwinian-style process of “creative destruction” and constructive competition that funnels resources toward the right engines of growth, while quickly casting aside businesses that fail to gain traction and reach scale.

Third, this process is often enabled by the installation of “middle office” capabilities that provide the platform to rapidly incubate and scale new business models.

And finally, leading players are blurring the organizational boundaries between strategy, organization, and execution. The idea that they are discrete areas of management no longer holds.

Recent moves by the government to regulate the activities of some of the largest internet players in China have cast a cloud of uncertainty over the digital ecosystem. Executives and investors around the world are closely watching this space. As in any market, regulators in China are trying to more closely manage the activities of the internet platforms in order to strike a balance between business model innovation and societal well-being. But the changes in China have happened so quickly, they have taken many players and investors by surprise.

The scale and momentum it has built across so many digital domains will likely continue to power further growth and innovation. Companies that know how China’s digital ecosystem works, and where it is headed, will be better positioned to succeed.





1.

The Foundations of China's Digital Ecosystem

In this chapter, we set the context by highlighting four interconnected factors that have created the conditions necessary to give rise to China's digital ecosystem: A vast digital consumer base, intense pressure to quickly reach scale, a digital ecosystem that fosters innovation, and the shaping role of government.

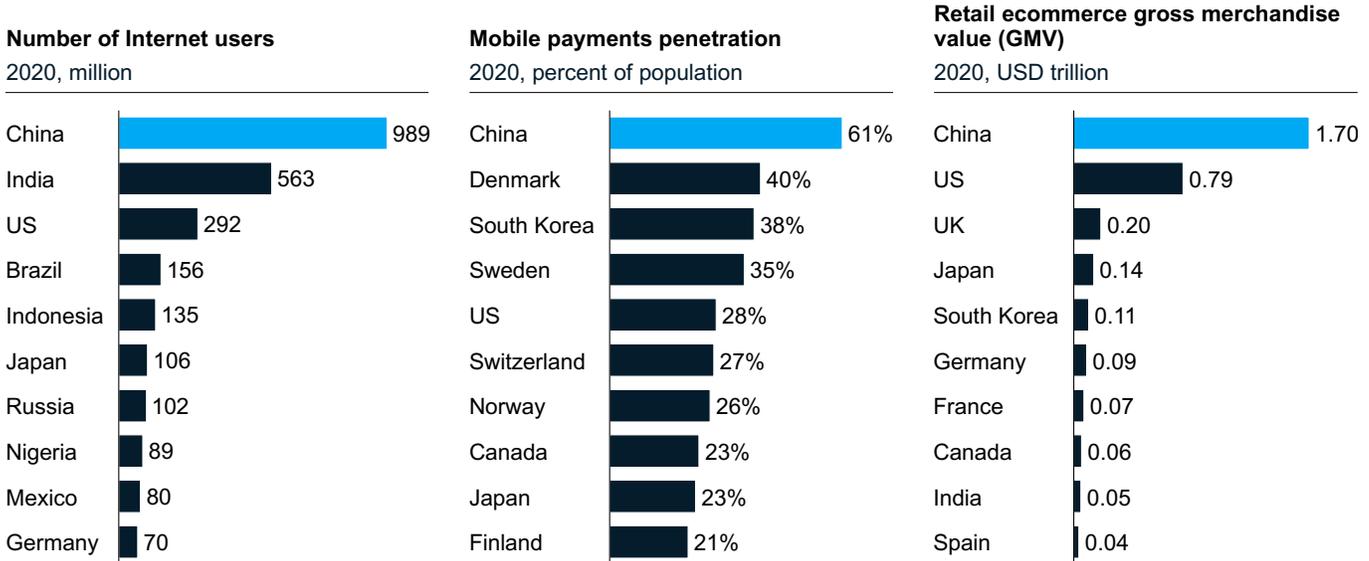
The depth of China's user base has supported its emergence as the world's biggest ecommerce market, reaching ~\$1.7 trillion in online transaction value in 2020. Explosive ecommerce growth and the rapid uptake of digital payments act in a virtuous circle that has spurred more than 800 million consumers to use mobile payments on a daily basis, about eight times more than in the US. (Exhibit 1)

1. A deep digital consumer base

China's scale advantage spans many domains, chief among them a vast pool of nearly one billion internet users that is larger than the US and EU combined. Of these, more than 200 million are digital natives who have grown up with computers, smartphones, and the internet, and are entirely comfortable trying out and trusting new technologies and apps.

Exhibit 1

China leads the world in major digital metrics



Source: iResearch, CNNIC, MOFCOM; eMarketer

2. Intense pressure to quickly reach scale

China's vast population is densely congregated in more than 100 cities of more than 1 million residents. Each one contains deep logistics networks that can be rapidly repurposed to serve a new business offering. This is both a blessing and a curse for entrepreneurs. While original concepts can be rapidly iterated and commercialized, there is also immense pressure to rapidly achieve nationwide scale, or risk losing out to a fast-following competitor. Ideas are tried and tested at breathtaking speed, enabling leaders to rapidly rise to the top—by, for example, locking in their user base, building up infrastructure, and attracting capital—as laggards fall by the wayside.

In the past 10 years, this cauldron has spawned an explosion of multifaceted lifestyle apps that act as top predators; creating or absorbing various vertical services and integrating them into their powerful platforms. The result is that consumers can seamlessly transact around every touchpoint of their physical and digital lives.

3. A digital ecosystem that fosters innovation

Beyond mere scale, China's emergence as the world's advanced digital economy is driven by digital ecosystems bolstered by market-moving internet players. The early-moving giants of Baidu, Alibaba, and Tencent, commonly referred to by the acronym "BAT", represented the first wave of digital champions, born in an internet era of text and photos, and rooted in their core disciplines of search, ecommerce, and social media, respectively.

At this point, China's digital landscape paralleled that of Western markets, where Google, Amazon, and Facebook mapped the functions fulfilled by BAT. Such similarity was short-lived, as Tencent created a new model in which Chinese players launched so-called super apps. With advanced digital payments services at their core, these apps boasted massive user bases and high-frequency engagement, enabling their developers to divert huge traffic into a portfolio of offerings, hosted in-house or via partners.

WeChat, which now boasts more than 1 billion users, is the most salient example of the all-encompassing app, revolving around its social messaging and Tenpay payments services. While Tencent's background was social and gaming, Alibaba was initially focused on ecommerce via its Taobao marketplace. But the launch of Alipay, its mobile payments service, facilitated the growth of a similarly sprawling ecosystem of payments, merchants, content, and on-demand services.

Now, a second and third wave of champions has arisen. Real-time, location-based internet services and artificial intelligence-enabled algorithms spawned "TMD"—Toutiao/Douyin (a Bytedance company), Meituan, Didi—a news feed, on demand lifestyle platform, and ride-hailing app, respectively. Meanwhile, the transition to multimedia gave rise to "PKB"—social ecommerce platform Pingduoduo, video-hosting platform Kuaishou, and mobile entertainment app Bilibili. These nine internet giants sit atop a group of 100-plus smaller but rapidly growing unicorns, with eight of them among the world's 20 largest internet companies by market capitalization.

New ecosystems continue to emerge in step with shifts in consumer behavior. (Exhibit 2) For example, Douyin (the Chinese version of TikTok) has captured the lion's share of consumer attention, enabling the short-video and live-streaming platform to expand into ecommerce, and location-based lifestyle services such as restaurant recommendations. Abundant capital will continue to allow ecosystem players to slingshot new business models into established audiences at low user acquisition cost, meaning we have not seen the last reshuffling of China's digital hierarchy.

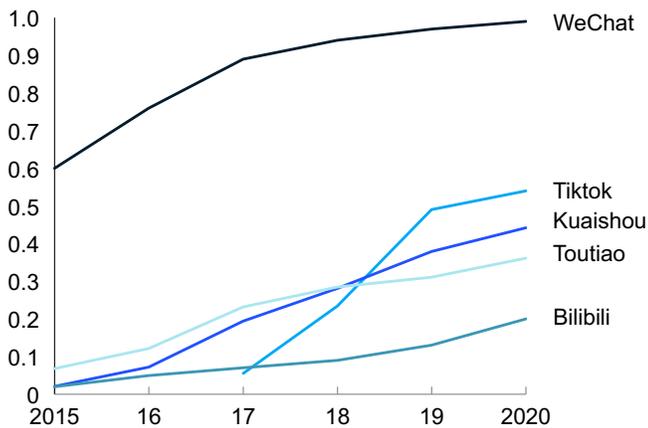
China's digital story is in no small part underpinned by its success in mobile payments. This growth can be attributed to a confluence of factors: a shortage of alternative payment services, notably credit and debit cards, the maturity of China's ecommerce and technological ecosystem, and an initially tolerant regulatory environment.

Exhibit 2

The rapid rise of China's internet and ecommerce giants

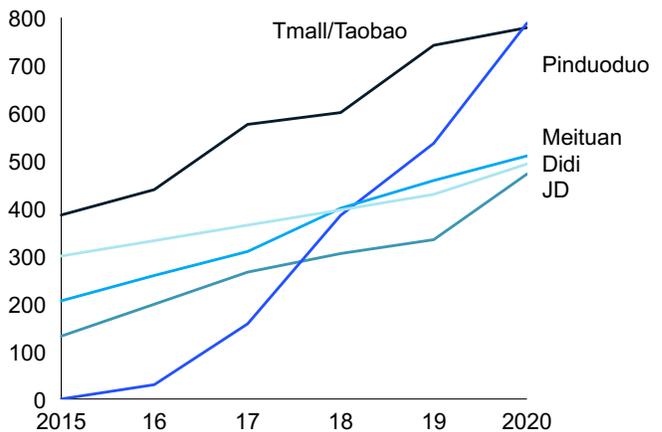
Social / content platforms

China monthly active users, billions



Online commerce platforms

Annual active buyers¹, millions



1. Completed a transaction at least once in the last 12 months

Source: Company quarterly reports, Enfordesk, McKinsey analysis

4. The shaping role of government

As much as market forces can claim responsibility for the success of China's digital economy, the government has also played an essential role. Pioneers are given leeway to experiment with new business models, with regulators implementing guardrails only once scale is achieved and negative impacts are identified.

Such ample "white space" to experiment sometimes spawns innovation and kick-starts economic activity along the way, evidenced by the rapid growth of mobile payments. China's central bank allowed third-party payments providers to operate free from regulation for several years after they first emerged, and only later tightened up licensing requirements, rather than implementing more stringent financial controls.

That said, the government will sometimes step in to protect consumers, disrupt perceived monopoly practices, and otherwise manage risk. For example, a crackdown on peer-to-peer lenders practically eliminated the sector after a wave of scandals and defaults in 2018. More recently, the market regulator has tightened oversight of ecommerce platforms after reports of monopolistic behavior, and problems related to the sale of fake goods online.





2.

Key Forces Shaping China's Digital Ecosystem

Having examined the broader forces underlying the expansion of China's digital economy, it is worth taking a closer look at how these have played out across sectors. Below, we identify eight forces that are driving China's digital ecosystem:

Force #1: Ecommerce and omnichannel

Ecommerce is a dominant force in China's retail market, with 30 percent of the annual retail value spent online. While ecommerce is well understood globally, there is less consensus over the definition of omnichannel. One way of looking at it is having a multichannel approach to customer fulfillment—making sure that products and services can reach consumers by a variety of different channels. (Exhibit 3)

But in China, omnichannel has taken on a wider significance, oriented around four main components:

- **Omnichannel decision-making:** Traditionally, Chinese consumers are fickle when it comes to trusting retailers, a legacy of fragmented trade, the lack of an established credit system, and an absence of appeal mechanisms when goods and services failed to meet expectations. As such, they are relatively demanding when it comes to researching prior to purchase; and typically tap a variety of sources when seeking information. According to McKinsey research, 75-80 percent of Chinese apparel shoppers consult multiple online and offline touchpoints before deciding on a purchase. This means the onus is on the merchant to provide an omnichannel service in terms of information presentation, with consistent branding, product information, and pricing across channels.
- **Omnichannel consumer engagement:** In-store experience and remote digital touchpoints are integrated, with the latter acting as an extension of the shop-floor. The outbreak of COVID-19 accelerated this trend as retailers kept contact with consumers through WeChat. Even now

that it is possible to shop in-person, consumers expect to navigate several online touchpoints, such as a WeChat brand store or digital personal shop assistant, before they visit a store. Brands leverage metrics such as store location, product interest, or demographic information to target consumers with suitable online activities such as interactions with key opinion leaders (KOLs). Group chats organized around local stores advertise in-store events, and provide avenues to keep in frequent touch with consumers. WeChat's ecosystem enables store-centric omnichannel engagement.

- **Omnichannel fulfillment:** Omnichannel fulfillment straddles store visits, home deliveries arranged in-store, online ordering and pickup in store, and seamless returns. Apparel is leading the charge in this respect, with some brands allowing consumers to try-on items at home before deciding whether to follow through with their purchase.
- **Omnichannel CRM:** Retailers and consumer packaged goods (CPG) players are increasingly basing their operations on information accessible through an omnichannel customer relationship portal. In the past, franchise stores presented a stumbling block to building a truly holistic relationship with customers, as they would operate independent membership schemes. Now, retailers and brands are extending control beyond their own stores and brands, websites and mobile apps, to bring franchise partners into a unified membership offering. This single window enables them to better use data analytics to serve consumers.

Retailers continue to create innovative solutions that meet Chinese consumers' omnichannel needs. In leading ecommerce categories such as consumer electronics and apparel, where online accounts for 40 percent of retail value, retail stores now focus on product experience complete with omnichannel fulfillment options.

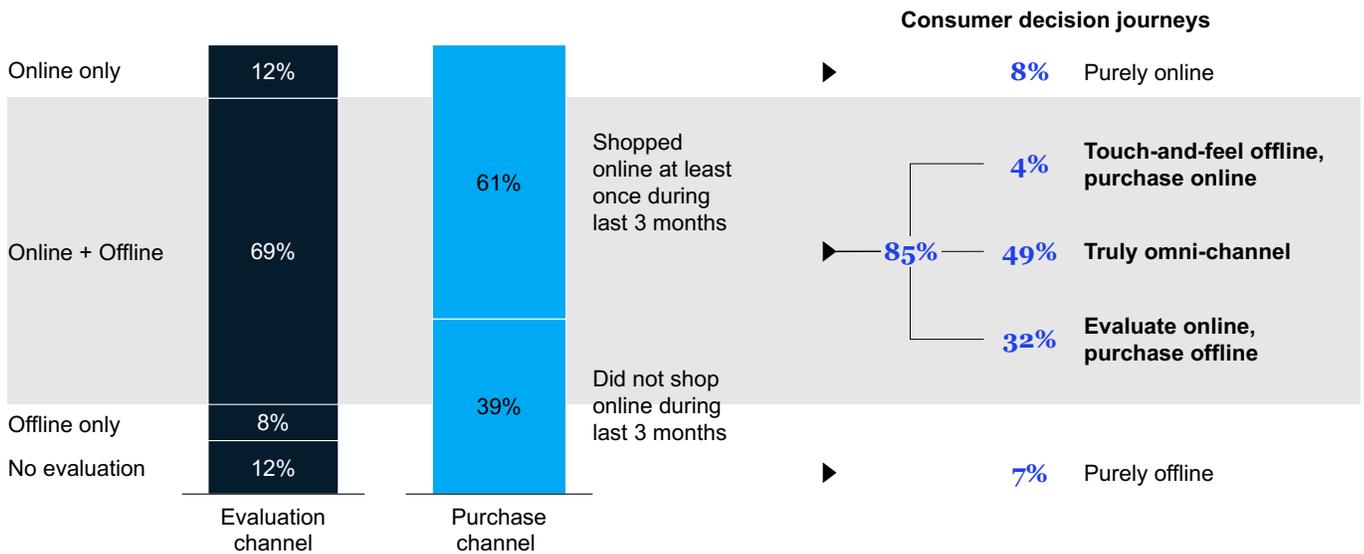
In-store digitization, sometimes known as “phygital”, solutions, provide a fully integrated digital-physical experience. For example, cosmetics brand MAC teamed up with Tencent to install interactive screens displaying real-time comments posted by KOLs via social commerce app RED (Xiaohongshu), while augmented reality (AR) screens allow consumers to apply make-up products virtually. On the digital side, home furnishings retailer IKEA collaborated with Alibaba to launch an immersive 3D shopping experience on Tmall, complete with a navigable virtual replica of a 3000-square-meter IKEA store.

In groceries, online retail was growing at 30 percent annually before the pandemic accelerated the frequency of online purchases by 70 percent. The result is that 15 percent of groceries are now ordered online and delivered to homes, with the shift most pronounced in lower-tier cities. More than 80 percent of that fresh food is delivered within one day. This rapid growth is the result of three major retail forces: digital ecosystems such as JD.com and Meituan evolving to offer last-mile grocery deliveries, the emergence of e-grocery start-ups like Alibaba’s Freshippo and Dingdong Maicai, and traditional retailers such as Yonghui and Wumart expanding their online express offerings.

Exhibit 3

Purchasing decisions in China are truly omnichannel

The majority of apparel shoppers engage both online and offline touchpoints prior to purchase



Source: China Digital Consumer Trends 2019

Force #2: Social commerce

Chinese consumers have a remarkably strong affinity for social commerce, or ecommerce in which social media is the primary driver of sales. The average consumer in China now spends more than seven hours a day on the mobile internet, a figure that increased by a fifth in the aftermath of COVID-19. About two-thirds of those seven hours is spent using social or content apps, as users seek out information from social media, influencers, and friends in order to make decisions about purchases. Remarkably, time spent using social or content apps is now driving half of shopping interest, and one-quarter of purchases. China's overall social commerce market is expected to more than double in size from 2019 levels to reach gross sales of US\$449 billion in 2021.

Put another way, consumers are spending more than 45 percent of their online time devoted to social apps such as WeChat, Douyin, Bilibili, and Kuaishou. (Exhibit 4) Content-based social entertainment is on fire, evidenced by Douyin's 700 million-plus monthly active users (MAU), and the millions of consumers who use social shopping app RED.

These social apps are spawning new business models predicated on consumers' established interest in engaging with KOLs. Social commerce has exploded, accelerated by the rapid rise of video livestreaming during the pandemic. In 2020, livestreaming-driven ecommerce contributed more than 10 percent of online gross merchandising value (GMV), and the share is rising rapidly.

Consumers encounter social commerce opportunities across four major channels:

- **Generic ecommerce platforms:** JD and Tmall have shifted their user interfaces to more Instagram-style platforms that facilitate social content and social interaction, particularly around buyers' experience of products. The home pages of leading cosmetics brands, for example, are constantly live streaming, reflecting how social consumer engagement has become the new normal.
- **Video and live-streaming apps:** China's leading video-hosting apps, Kuaishou and Douyin (TikTok), now attract more marketing spend than traditional digital channels such as search (Baidu) and ecommerce (Tmall).
- **Niche and vertical commerce players:** The social commerce trend is apparent across the board and includes players such as vertical apparel platform Dewu, and even discount ecommerce platforms such as Pinduoduo.
- **Retailers and brands:** WeChat enables brands to host direct to consumer (DTC) content, which feeds back into omnichannel customer engagement and experience. Even automakers have taken to livestreaming on platforms like Douyin and Tmall, as well as their own mobile apps, to introduce models and features to consumers, field questions, and sell vehicles.

The upshot is that brands must provide social content in order to attract consumers' eyeballs, pitting the platforms most adept at hosting that content against traditional ecommerce incumbents in the battle for marketing spend.

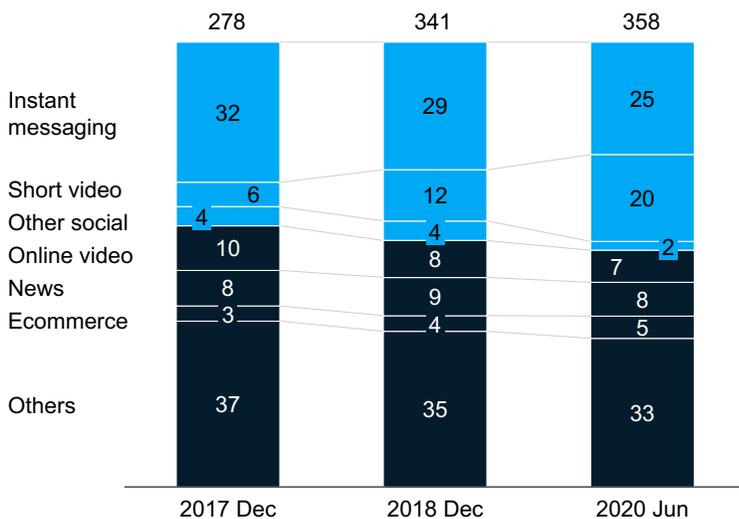
Just as with omnichannel, it is necessary to scrap traditional thinking: social commerce should not be viewed as an element of wider digital commerce, but as the core of how Chinese consumers want to transact online. This cuts across demographic and geographic boundaries: from Generation Z consumers in first-tier urban areas to middle-aged consumers in small towns and lower-tier cities.

Social media is also reshaping the relationship between brands and consumers. In the past, brands owned the customer relationship. Today, the influence equation is shifting as consumers increasingly buy directly from other consumers. KOLs are still a persuasive voice in a consumer's purchasing journey, but are now being complemented by Key Opinion Consumers (KOCs), a new set of trusted voices that consumers look to for advice and recommendations before making key purchasing decisions.

Exhibit 4

Chinese consumers spend half their mobile time on social apps

Daily time spent on mobile media in China, minutes, percent



~50% of time spent on mobile is social

TikTok and Kuaishou are riding a boom in short video and doubling down on live streaming

Social and live commerce accounted for **30%+** of total ecommerce GMV in 2020

Source: QuestMobile TRUTH 2018 & 2020H1 China internet database report, QuestMobile 2020 live streaming report; McKinsey analysis

Force #3: The On-Demand Economy

Global consumers are becoming more accustomed to online ordering via delivery apps, but in China the trend has taken off at a rapid pace.

The trend is supported by a steady rise in the proportion of relatively affluent families, defined as those with annual disposable income of at least 140,000-300,000 RMB. These upper aspirant and mass affluent households now account for more than one-third of the population in tier three and four cities, and about two-thirds in major urban centers, ensuring there is ample spending power to support touch-of-a-button ordering services.

Door-to-door meal providers have established efficient urban delivery networks that are being repurposed to serve virtually every major product and service category, from apparel and consumer electronics, to services such as housecleaning and drop-in chefs. Ele.me, which started as a food delivery specialist, now delivers OTC drugs to homes in as little as 30 minutes, thanks to a partnership with Alibaba Health. Indeed, OTC drugs are available for home delivery from any drug store, while digital doctors write prescriptions that can be filled online.

Meanwhile, Alibaba's Freshippo, Yonghui, and other major grocery players are embracing on-demand home delivery, which already makes up 15 percent of the market, up from just 2-3 percent three years ago. At least 15 percent of those orders are now delivered in less than an hour, with the proportion rising steadily as networks expand.

Even Apple is moving into the space, offering home delivery of products within a 1-2 hour window after a customer places an order. Personal services such as pet care are also widely available, as are chauffeurs to drive a car home should their owner have too much to drink.

Force #4: Shared mobility

Once populated by a myriad of hyper-competitive, sub-scale startups, China's shared mobility space is rapidly consolidating into a handful of at-scale, well-financed players backed by major ecosystem players. At 400 million MAU, Didi Chuxing has built the largest shared mobility platform in China, attracting 30 million rides per day via its app as of December 2020.

From taxis to premium sedans, light trucks to buses, and bicycles to motorcycles, nearly all forms of transport are now accessible on shared mobility platforms in China. Autonavi, the leading maps and navigation app, provides an integrated view that enables users to search for individual travel routes, and choose from a range of mobility options, from public transport to shared cars, trains, scooters or bicycles. The app also displays the time and cost for the various travel options.

Notably, shared mobility has strong central and local government backing, in part to relieve pressure on public transport, and as a means of stimulating sales of electric vehicles (EVs), which make up a significant share of China's ride-hailing fleet.

Force #5: Distribution

China's familiarity with and desire for direct services extends to business-to-business (B2B) digital platforms, which are increasingly integrating with consumer-facing platforms to improve supply chain efficiency.

Spurred on by cashflow challenges in the midst of the pandemic, companies in a host of industries accelerated the digitization of distribution in order to improve efficiency. Nowhere is this more apparent than in the nuts and bolts of consumer goods, where major ecommerce players are reaching beyond warehousing and logistics to empower mom and pop stores at street level. This enables both parties to hone sourcing capacity while improving data collection to better predict consumer behavior and preferences. Suppliers and retailers can track demand, optimize supply chain distribution, and improve product mix and pricing.

Alibaba's LST platform, for example, now covers more than 1.5 million small stores, and has processed annual sourcing value of more than 30 billion RMB. Today, even in lower-tier cities, 74 percent of general trade retailers source from third-party electronic B2B (eB2B) platforms, versus just 36 percent in 2019. These outlets have consequently increased their share of the overall eB2B wallet to 19 percent, up from just 4 percent two years ago. China is on the cusp of realizing the final piece of this puzzle: linking suppliers directly to consumers via community buying platforms led by local shop owners. Leveraging the direct sourcing capabilities offered by eB2B platforms, "anchor consumers," or those who exercise influence over a local community, could promote products with distinctive value directly to consumers in their e-community, and which are fulfilled through home delivery or community store pickup.

Force #6: FinTech

China represents about 30 percent of the global FinTech market by value, with Alibaba and Tencent accounting for much of that via their digital payment platforms, Alipay and Tenpay.

Alipay was born out of the need to safeguard payments between merchants and consumers, and initially served to link users' bank accounts. As consumers shifted to mobile, and took their affinity for ecommerce with them, Alipay transformed from payments bridge to mobile wallet. This spurred tremendous growth in mobile payments, such that China was a primarily mobile payments ecosystem as early as 2015. As of June 2020, China had about 802 million mobile payment users, and its mobile payment ratio among internet users is about 86.5 percent. Ant Group, Alipay's parent, is now the world's largest fintech, encompassing everything from money market funds to credit payments and online banking.

Alipay's primary challenger in the digital payments space is WeChat Pay, the adoption of which was galvanized by a stroke of marketing creativity. In 2014, Tencent enticed WeChat users to transfer traditional red-enveloped payments (virtual gift packets containing money) to each other for Chinese New Year, offering financial rewards for those who complied. WeChat Pay now boasts 800 million MAU. Both Alibaba and Tencent were quick to take the next logical step: converting their massive user bases into customers of a broader array of fintech services, while at the same time onboarding merchants to allow contactless payments at the point of sale.

FinTech in China rapidly evolved to encompass personal financial services such as fund and wealth management, credit, insurance, and lending, to business financing services such as crowdfunding, trade finance, and SME financing.

Chinese FinTech is consequently massively capitalized, and amply stocked in terms of digital talent, a fact that has forced traditional banks to commit comparable resources or risk losing relevance. Legacy financial institutions are likely to more fully embrace fintech going forward, both in terms of direct investment in the sector, and via mergers and acquisitions.

The result is a virtuous cycle of innovation, which until recently was taking place within a relaxed regulatory environment. China is rolling out data protection and security laws, but the seeds of its fintech strength were sewn prior to the current round of regulatory measures.

Drilling down reveals several major benefits from China's FinTech evolution:

- **Financial empowerment:** FinTech companies have filled sizeable gaps in the provision of personal financial services left by state-owned banks, which historically lacked incentives to innovate or address the underbanked. On the corporate side, the opportunity was even larger, evidenced by the fact that Ant Group is now the largest provider of loans to the SME sector. Moreover, regulators' primary concern is to ensure that Chinese citizens are well served by their banking and financial technology companies, suggesting that going forward both parties will likely have to sharpen their focus on the core aspects of financial services provision, with corresponding benefits for consumers.
- **Pro-credit culture:** Credit scoring services launched by leading payments players have cultivated a pro-credit consumer mindset, which has filtered through the digital ecosystem. Credit services are ubiquitous, available even on lifestyle apps like Meituan, and ride-hailing counterparts like Didi. Alipay's Sesame Credit and Tencent's WeChat Score provide instant consumer credit scores, helped to reduce expenses related to cash guarantees, under which lenders offer a financial backstop if a debtor fails to pay. This has freed up more than 400 billion RMB in cash flow that was previously tied up in backstopping payments related to things like shared bike rentals and hotel deposits. Notably, this trend still has some way to run; 50 percent of people in China have yet to lodge credit data with the central bank.
- **Wealth management democratization:** The digital payments tsunami also established a platform to onboard 170 million internet users to wealth management services. Leading players like Ant have more than 6,000 wealth management products online, and over 4 trillion RMB in wealth management assets under management.
- **Digital insurance boom:** Digital also plays an important role in traditionally under-penetrated financial services such as insurance. In 2020, over 200 million consumers used digital insurance in China. Ecommerce product return insurance is the most used digital product, with over 15 billion policies issued, or close to 25 percent of the total value insured. Digital health insurance enjoyed the highest growth, with the 30-50 age group spearheading an extraordinary expansion of Gross Written Premiums (GWP) to 37.5 billion RMB over the past six years.

- **Financial system efficiency:** AI plays an important role in driving efficiency across banking, insurance, and wealth management. For example, insurer Ping An said in its 2020 annual report that speech and text robots covered 82 percent of its customer service workload, and generated almost half of its customer service sales volume, while offering smart, paperless policy and claims services. Ping An Property and Casualty Insurance has pioneered an AI solution that enables drivers to make insurance claims by uploading photos that AI will assess for damage, together with drivers' records.
- **Blockchain advances:** China is also pushing blockchain technology to the front of its efforts to streamline financial services. Ant Group was the largest holder of blockchain patents in 2020 worldwide, with 2,298 blockchain patents in total. The group last year launched a blockchain-powered platform for cross-border trade settlements based on its proprietary AntChain technology, which has been deployed across more than 50 use cases, including supply chain finance, cross-border remittance, charitable donations, and product provenance.
- **Digital currency leadership:** China's familiarity with cashless payments has helped support the People's Bank of China (PBOC)'s efforts to become the first major central bank to launch a digital currency. The PBOC has already conducted real-world trials of a digital RMB, opening the door to lower costs, improved monetary policy transmission, and a reduction of financial risks and crime.

Force #7: EdTech

The COVID-19 pandemic galvanized growth of China's already burgeoning online education sector. The Chinese Academy of Social Sciences suggests that K12 online education achieved a penetration rate of 85 percent during the nationwide lockdown. K12 online education penetration (excluding the temporary lockdown), reached 23.2 percent in 2020 compared to 15 percent in 2019 (according to iiMedia).

Backed by multi-billion-dollar financing, China's EdTech platforms offer massively attended online courses, as well as lessons and one-on-one tutoring for homework. As the sector has matured, online has also developed into an essential component of many traditional course formats, and now serves as the central platform for course delivery.

For students, advantages include having access to a broader array of teaching options based anywhere in the country. Large-scale courses can host thousands of students, and are taught by charismatic teachers. Meanwhile, assistants monitor student progress in smaller groups using WeChat. This model, along with the pioneering of AI classrooms in which there is no need for a teacher at all, are driving efficiencies in education delivery. One service can identify incorrect answers to math problems and propose a correct solution based solely on a cellphone photo, for example.

To be sure, China's K12 EdTech segment is experiencing regulatory headwinds. Recent government policies have been prescribed to address some of the issues buffeting the market, such as intensified competition for scarce teaching resources, as well as peer pressure among families to sign up their kids for after-school programs. These measures are intended to preserve the quality of public schools, eliminate inequalities in access, and ease the burden on stressed-out students.

Beyond the K-12 segment, online education for adults continues to flourish, with providers offering practical courses across a range of topics such as stock investment strategies.

Digital is also expected to play a vital role in China's drive to reskill its workforce, according to the McKinsey Global Institute (MGI). More than two million people could deliver micro curricula through digital platforms, while tools such as AI and virtual reality improve the efficiency of delivery. More than 900 million internet users can benefit from digital technology and enjoy enhanced quality through hybrid online-offline learning, MGI suggests. MGI envisions a constantly live digital platform that is available to workers across industries, backed by both government and employers, creating an environment in which workers would have to opt-out out of reskilling, rather than opt-in.

Force #8: HealthTech

Against the backdrop of an underdeveloped and at times hard-to-access healthcare landscape in China, digital technology is helping the government and private players to dramatically advance healthcare coverage.

From advanced contact tracing and vaccination orchestration systems, to the proliferation of online doctor consultations and service bookings, to innovative collaborations between digital pharma companies and doctors, China's HealthTech sector is exploding, with far-reaching impacts. These can be broadly segmented as follows:

- **Advanced COVID-19 controls:** Technology companies assisted the government to rapidly rollout China's app-based health code system in the wake of the outbreak of COVID-19. More than 800 million people used the tiered, traffic light system, enabling authorities to quickly check travelers' status to ensure quarantines were being properly observed, and public safety maintained. The pioneering apps continue to assist with contact tracing efforts as China battles local outbreaks.
- **Broader access to primary care:** Emerging healthcare platforms such as AliHealth, Ping An Good Doctor, WeDoctor, and JD Health host hundreds of millions of registered users between them, offering underserved populations a combination of telemedicine and e-pharmacy services. Uptake accelerated during the pandemic when they started offering free consultations, revolutionizing a sector that had so far lagged China's broader digitization drive. Ping An Good Doctor, for example, allows users to see a doctor online in minutes rather than waiting in line at a hospital for hours, with no guarantee of an appointment. At the peak of COVID-19, Ping An's platform attracted over 1.1 billion visits, with online consultations rising nine times over the previous year.
- **Digitization of hospital services:** Hospitals are establishing digital gateways to engage with patients, providing a comprehensive portal for them to book appointments, order medicines, and access records. By some estimates, there are now as many as 1,000 so-called "internet hospitals" in China, comprising offerings from traditional hospitals and technology leaders such as Alibaba, Tencent, and Ping An. Hospitals are leveraging digital channels to revamp care delivery through online consultations and e-pharmacies, while bringing hospital information support systems (HISS) online, and out of the paper and ink era. This process will present exciting opportunities in tandem with an expansion of big data analytics using patient data.

— **Patient and physician-facing digital solutions:**

COVID-19 also hastened the adoption of AI applications and automation systems to support medical staff, including cleaning robots, food delivery bots, temperature-screening systems, and health chatbots. AI-equipped diagnostic assistants have significantly improved efficiency in identifying the coronavirus through automatic detection and quantitative analysis, a process that takes just 2-3 seconds, compared with up to six hours when handled manually. Venture investment has also surged, with more than 4 billion RMB in funding flowing into Chinese start-ups in the health AI sector in 2020, helping digital solutions to scale. AI systems increasingly offer diagnoses and image reading, while pathology and diagnostics labs are being automated. Disease prevention, as well as post-treatment chronic disease monitoring, are also improving as a result of digital applications that assist doctors and facilitate communication with patients. Examples include technology to screen early-stage cancer patients, and diabetes management systems for use after hospital discharge.

In biopharmaceuticals, China-based players such as Deep Intelligent Pharma have already attracted tens of millions of dollars in funding for services that leverage big data and deep learning to assist researchers by predicting and evaluating small molecule and protein structures, and organic synthesis routes. This is likely the leading edge of a trend with vast potential as China's healthcare system further digitizes, providing broader access to patient data sets that will help refine drug discovery and clinical trials. AI-based early disease detection startups will further improve the quality and efficiency of the healthcare system. For example, AliHealth is testing an AI-based "Medical Brain" to help physicians diagnose and propose treatment options for various diseases.





3.

6 Digital Innovation Megatrends to Watch

Having offered a snapshot of where we are in terms of digital innovation in China, we pooled the collective insights of McKinsey China's Digital Practice to peer into the future. The list below curates their thoughts around six megatrends that will direct digital innovation in the years ahead, and provide China-facing executives with food for thought as they consider their corporate strategy.

Digital innovation megatrend #1: The great retail integration

The consolidation of previously discrete retail sectors will likely continue, integrating omnichannel retail with the on-demand economy, the social economy, and the retail supply chain. The result will be a massive and seamlessly integrated retail and social landscape. Social commerce will continue to flourish and account for an ever larger share of online GMV. This trend will be governed by improvements in consumer fulfilment; the desire for convenience and efficiency will rapidly narrow the gap between on-demand and traditional ecommerce.

Meanwhile, consumers will continue to tap trusted sources for product information, including channels extending across short videos, social media, billboards, mobile, web, and TV. Opportunities to transact will be increasingly direct, meaning that spending on social and brand-building should generate immediate positive impacts for GMV.

Content-based ecommerce is set to explode across video-sharing platforms like Douyin (the Chinese version of Tiktok) and Bilibili, as well as other content-heavy services like Toutiao. While livestreaming and broadcasting still accounts for a minority of ecommerce sales, this is set to change as China advances into the 5G and internet-of-things (IOT) era.

The final piece of the great retail integration will be improved supply chain agility. Supply chains will have to become more agile to fulfill more frequent and diverse on-demand orders, as well as better forecast consumer trends and sources of demand.

Digital innovation megatrend #2: The virtualization of services

Just as ecommerce has taken China by storm, the provision of services online will take center stage as breakthroughs in consumer adoption, in part driven by COVID-19, are accelerating the digitization of service provision across a range of sectors. As we have seen, the virtualization of services in healthcare and education is underway, but there is enormous potential for digital innovation to continue driving efficiencies, while addressing wide imbalances in the distribution of resources.

In education, digitization will help compensate for uneven public expenditures that are 3.3 times higher in tier-one cities than in China's smaller tier three and four urban centers. This should drive more equitable access to education resources. Platforms like Alibaba's DingTalk, an enterprise communication and collaboration app, will facilitate greater convergence of online and offline education delivery for schools. Now that students have become accustomed to integrated online to offline (O2O) models, the potential to expand this habit as the digital-native generation progresses along their learning journey is enormous. This will offer peace of mind to parents, some 68 percent of whom prefer the integrated online-and-offline approach, according to a survey conducted by O2O education platform Aixuexi.

Meanwhile, China will continue to experiment with AI to create personalized, interactive, and immersive learning experiences. As 5G becomes the norm, AI will enable adaptive learning, offering more personalized services based on individual patterns of learning and study preferences.

The same is true in healthcare, where digital innovation has only just begun to address wide disparities in the distribution of top-notch doctors. Almost 80 percent of medical resources are concentrated in just 20 percent of hospitals in China, so grassroots clinics and hospitals in remote and lower-tier cities lack high-quality supplies. Currently, less than 5 percent of total consultations are online, indicating a growth opportunity that should reduce

the tendency for patients to travel long distances to reach general hospitals in major cities, and resolve related overcrowding issues.

Even traditionally offline experiences such as real estate viewings shifted online during the pandemic. For example, Beike, an online residential real estate platform, hosted more than 10 million virtual property showings through its virtual reality (VR) technology during the peak of lockdown, 35 times the number conducted prior to the outbreak of COVID-19.

The virtualization of services is unlikely to stop there. Government services and legal advice may follow suit, as a wave of sectors that traditionally required face-to-face interactions go digital. This should provide greater transparency of provider quality through public ratings systems, helping stoke competition and elevate standards.

Digitization will also make it possible for service providers to work anywhere, breaking down traditional regulatory and financial barriers to labor mobility, and revolutionizing the availability and quality of services. Automation will also play a larger role, with service robots debuting across the service-driven consumption market.

Digital innovation megatrend #3: The mobility revolution

China's highly developed shared mobility network will increasingly be powered by the availability of electric vehicles (EVs) and connected "smart vehicles", with full autonomous driving fleets on the horizon. As the hardware behind mobility solutions becomes increasingly commoditized, digital innovation will become the lynchpin in the battle for market share, driving innovation in software, solutions, and services, and spawning new opportunities for nimble and creative companies.

The Chinese consumer will drive disruption, bringing their renowned adaptability and desire for new

innovations into the auto arena. New entrants are leading, evidenced by the success of local EV brands like Nio, Li Auto, and Xpeng. Unencumbered by traditional business models and networks, they are defining the game in terms of customer experience (for example, Nio institutionalized customer operations and widened consumer interactions at experience centers and battery swap stations), and will continue to do so going forward, even as traditional automakers race to catch up. Expect to see sustained improvements of in-vehicle technology, revolving around smart features that improve connectivity and safety, and allow vehicles to upgrade via OTA (over the air).

On the macro level, China's advantage hinges on state support for smart transportation. Further deployment of vehicle-to-everything (V2X) technology, comprising both vehicle-to-vehicle and vehicle-to-infrastructure components will likely occur. The application of AI could reduce traffic congestion by 10-20 percent, as local governments partner with ride-hailing services to analyze road user data.

AI applications in transportation and autonomous driving will also facilitate the acceleration of mobility as a service (MaaS). Notably, Beijing plans to reduce passenger car transportation usage by 30 percent by 2035. This push should promote the commercialization of MaaS services, centered around EVs. China's pledge to reach peak carbon emissions by 2030, and carbon neutrality in 2050, may spur EV MaaS offerings to reach the next level.

The commercialization of autonomous driving will be the next stage. By 2030, China expects to reach 20 percent L4 penetration in cities. The government envisions large-scale autonomous, electric vehicle (EV) fleets on China's streets within the next decade. With this in mind, Didi will partner with GAC Aion, an offshoot of GAC Group, to develop a fleet of self-driving EVs, as it aims to host 1 million robotaxis on its platform between 2025 and 2030.

6 Digital Innovation Megatrends to Watch in China

1



The great retail integration

The consolidation of previously discrete retail sectors will continue, integrating omnichannel retail with the on-demand economy, the social economy, and the retail supply chain.

2



The virtualization of services

Just as ecommerce has taken China by storm, the provision of services online will take center stage as breakthroughs in consumer adoption, in part driven by COVID-19, are accelerating the digitization of service provision across a range of sectors.

3



The mobility revolution

China's highly developed shared mobility network will increasingly be powered by the availability of electric vehicles (EVs) and connected "smart vehicles", with full autonomous driving fleets on the horizon.

4



Digitization of social life

Chinese consumers are moving more and more of their social interactions and leisure activities into virtual domains.

5



Industrial IOT / Supply chain digitization

There's massive scope for efficiency gains, as the industrial internet of things (IIOT) is deployed at scale to transform digital manufacturing, digital supply chain development, and blockchain-based inventory management.

6



Digital urbanization

While smart city applications have focused initially on areas like security and traffic management, 5G networks and edge computing advances are likely to usher in a new era for cities as integrated digital platforms.

In 2035, the government is targeting the large-scale roll-out and commercialization of robotaxis and L5 (fully automated) autonomous vehicles. Consequently, commercialization may occur faster than expected: autonomous based robotaxis could account for 22 percent of the shared mobility passenger kilometers by 2030 in tier 1 cities like Shanghai and Beijing. (Exhibit 5) Autonomous driving will enable an entirely new mobility experience, one that is less about getting from A to B, and more about the activities and experiences passengers can enjoy during their trips. The era of cars as entertainment centers and workstations on wheels is close at hand.

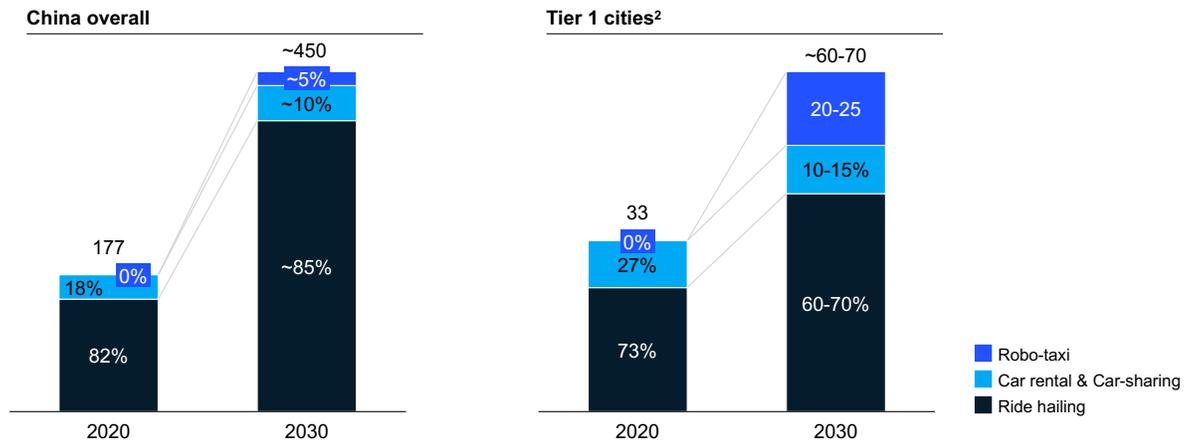
EVs, drones, self-driving delivery vans, and eco-packaging will combine to improve delivery speeds, lower costs and emissions, and open up infrastructure and capacity sharing. This in turn should support the further integration of China's retail and ecommerce ecosystem, making it smarter and more efficient.

These developments will eventually solve high cost-to-serve issues. For example, Beijing has given the greenlight for JD.com and Meituan to partner with autonomous delivery vehicle start-up Neolix to pilot driverless grocery deliveries, building on advances made during a mid-pandemic push for contactless services.

Exhibit 5

Robotaxi adoption could reach 20-25% of shared mobility mileage by 2030 in tier-1 cities

China shared mobility¹ passenger kilometers, Billion kilometers, percent



1. Excluding shared micromobility e.g. bikes, eBikes, walking, and e-scooters
 2. Shanghai, Beijing, Guangzhou, Shenzhen

Source: McKinsey Future of Mobility forecast model

Digital innovation megatrend #4: Digitization of social life

The fictional stories of people living in virtual reality worlds as depicted in popular novels are rapidly transitioning into the “real” world. Chinese consumers are moving more and more of their social interactions and leisure activities into virtual domains. Virtual and physical social activities are also merging, as offline social interactions are increasingly orchestrated through virtual communities. Life itself is becoming O2O, where offline meet-ups more frequently spillover from communities and connections initially formed online. This may be particularly prevalent in lower-tier cities, where opportunities to network face-to-face are more limited.

In Shanghai, an app-linked bicycle community has expanded its activities into other areas of social life. On online games streaming sites such as Huya and DouYu, people brought together by the love of a particular title, genre or livestream host are taking chatroom interactions into the real world, organizing yoga classes and running clubs. Leading digital players like Tencent are building portfolios that merge gaming, ecommerce, and social, creating a decentralized, competitive, and creator-friendly ecosystem, a “metaverse” if you will, that will have meaningful impacts in the physical world.

More communities may form around social apps; respondents to our latest China Auto Consumer survey told us that lifestyle apps, including those that facilitate gatherings of owners of a particular brand, were the second-most popular value-added service overall, and the most desirable among EV owners by some margin.

Digital innovation megatrend #5: Industrial IOT / Supply chain digitization

We have explored how digital innovation is transforming distribution in consumer retail, but this is just the tip of the spear when it comes to the potential for digitization to streamline B2B operations and processes.

We view this as a frontier of China’s digital development with massive scope for efficiency gains, as the industrial internet of things (IIOT) is deployed at scale to transform digital manufacturing, digital supply chain development, and blockchain-based inventory management.

In pharmaceuticals, for example, Yaoshibang, an online B2B drug sales platform, processed 1.6 million orders in February, triple the level registered in the same month of 2020, and hinting at the potential for such platforms to thrive as more and more Chinese healthcare orders are processed and fulfilled online.

Manufacturing companies will increasingly embrace IIOT-enabled digital manufacturing to improve efficiency and sustainability. In 2020, China hosted 11 “lighthouse” manufacturing bases, exemplars of industry 4.0 advanced manufacturing processes identified by McKinsey and The World Economic Forum, the highest of any country.

White goods maker Midea deploys IIOT technologies to improve manufacturing processes and support product innovation. In Midea's sensor-enabled "flexible automation" assembly lines, the manufacturing process is not only fully automated, but also dynamically adjustable to address differences in machine models, processing requirements, and materials. Machine vision is applied to detect errors in manufacturing processes, while IIOT-enabled machines send back customer usage data to R&D teams, providing valuable input and insights that help drive a continuous process of innovation.

SAIC, a leading automaker, has shown how committing to digital manufacturing can enable entirely new, customer-to-business (C2B) models, where digital solutions enable buyers to customize their orders via 3D digital car simulations. Car configuration and production queue information is then transmitted to suppliers to initiate just-in-sequence shipment, reducing time to market by 35 percent. All the while, AI tools continuously monitor build progress to identify errors, helping lift order configuration accuracy to 99.8 percent. So far, we have seen the majority of lighthouses spring up among consumer-facing industries like autos, consumer goods, and home appliances, but the next phase will be to extend the revolution to traditional industries such as steel, machine tools, and manufacturing.

Digital innovation megatrend #6: Digital urbanization

Almost half of the world's smart cities are in China, some 500 in total. While initially smart city applications have focused on areas like security and traffic management, 5G networks and edge computing advances are likely to usher in a new era for cities as integrated digital platforms.

Imagine the digital innovations highlighted in Chapter 2 of this report—in education, healthcare, logistics, and omnichannel ecommerce for example—being applied at massive scale across China's cities to improve public service provision. In Shenzhen, Tencent is building a smart city that puts people and the environment first, aiming to cut down on car usage by using AI to improve public access, while integrating green space into a huge campus for employees.

At the international AI City Challenge in March 2021, Chinese companies or research institutions took the top two places across five categories. Douyin (TikTok), for example, took second place in a challenge to identify road accidents and stalled vehicles from freeway video feeds. Alibaba's City Brain tool will continue to bring environmental analysis, visual search, and urban planning tools to municipal authorities nationwide. Government services are likely to be a primary beneficiary, as digitization solves pain points such as overcrowding and resource misallocation.



A person is sitting at a wooden table, looking at papers. A smartphone is on the table. In the background, there is a window with a plant. The text '4. A Digital Innovation Checklist for CEOs' is overlaid on the image.

4.

A Digital Innovation Checklist for CEOs

Capturing the full potential of these digital innovation trends should not be the preserve of a chief digital officer or digital innovation team. Instead, a fundamental rethink of company strategy is required, comprising a reassessment of value chains, operating models, and organizational structure. To help executives frame their thinking, we propose eight questions that CEOs and their executive team should be considering as they prepare for the next wave of digital disruption in China:

Question 1: Are you ready to elevate your connected device strategy?

Is your company ready to take a unified approach to reach consumers and provide offerings seamlessly across connected devices such as smart devices (smart phones, computers), smart living rooms (TVs and appliances), as well as smart mobility (smart vehicles)? Will you be able to plan your marketing activities and offerings along “a day in the life” journeys of consumers across these interconnected devices? What alliances of hardware, app development, and ecosystems would be required to realize this seamless vision?

Question 2: How will you build your omnichannel supply chain?

An agile and omnichannel supply chain is going to be a real advantage amid the great retail integration. Your supply chain should be able to understand and react to shifts in demand in as close to real-time as possible. Chinese consumers want choice across home delivery as well as store and community center purchases and pick-ups. As such, supply chain logistics and warehouse systems, including store fronts, must be dynamically aligned. The key to this puzzle is building a holistic, data-led picture of your entire supply chain across all channels. Opportunities will exist for providers that can most rapidly solve pain points, such as a rising incidence of refunds and returns as consumers adapt to increased impulse buying in reaction to more on-the-move content.

Question 3: How do you manage data and unify customer management?

This question is especially relevant in the omnichannel era. Consumers are leaving digital footprints everywhere, and it is incumbent on companies not just to track them, but serve consumers better with data as well. User-centricity, or putting a single user first and foremost in the design of your marketing strategy, marketing content, consumer outreach, and sales conversion is a must. Maintaining a customer data platform (CDP) is essential across all channels, from ecommerce to social, leveraging its power to home in on a micro-segmented audience. Moreover, the CDP should drive innovation by tapping into Chinese consumers' willingness to share data for practical benefits (while fully preserving data privacy and security). Data strategy should aim to serve a customer of one, across every touchpoint, at all times.

Question 4: Which assets should you own and which should you share?

How can your company best use the shared economy to reduce costs and improve efficiency? Do you really need to own that logistics fleet or could you tap into shared vehicle resources? Will you need private servers, or will you leverage the public cloud for spiky computing demands? An economy in which ever more services are shared demands a reassessment of asset ownership models. A thorough review of asset allocation should create opportunities to cut physical assets.

Question 5: How much R&D stays in-house versus open collaboration?

Have you considered open source, open platform collaboration, and its potential to mobilize research and development resources? Specialist teams working together will be more productive, and the likelihood is there is knowledge outside your organization that could significantly reduce the time your product or service spends in development.

A Digital Innovation Checklist for Executives in China



✓ **Question 1:** Are you ready to elevate your connected device strategy?

✓ **Question 2:** How will you build your omnichannel supply chain?

✓ **Question 3:** How do you manage data and unify customer management?

✓ **Question 4:** Which assets should you own and which should you share?

✓ **Question 5:** How much R&D stays in-house versus open collaboration?

✓ **Question 6:** How do you best provide ubiquitous services?

✓ **Question 7:** How do you manage risk and governance?

✓ **Question 8:** How do you reorganize your business structure?

Look to open source collaborative tools for opportunities to gain an innovation edge and cut costs. Investing in corporate accelerators and venture funds can also help cultivate new ideas and talent outside your business domain, opening up synergies further down the line.

Question 6: How do you best provide ubiquitous services?

The era in which you need a physical space to provide a service is over. When considering your asset ownership structure, also ask how you can virtualize service provision, ensuring that it can be accessed by anyone who is online, in any part of China. We have seen this process happening with education and healthcare, but this is just the start. Work spaces and service provision are moving into the cloud, and the race is on to create flexible solutions that address the needs of both service providers and their end-users.

Question 7: How do you manage risk and governance?

China's increasingly interconnected and shared economy presents significant challenges when it comes to managing risk, ensuring regulatory compliance, and protecting consumers' data and privacy. With the regulatory landscape constantly evolving, how will you coordinate your corporate governance at both the company and country level to ensure you stay ahead of the game?

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The authors would like to acknowledge the contributions of Glenn Leibowitz, Jeongmin Seong, Selina Teng, Ting Wu, Lei Xu, and David Green.

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Question 8: How do you reorganize your business structure?

Following through on the megatrends presented in Chapter 3 will entail a major reorganization of business structures. Establishing the capability to manage and link consumers and their data with your supply chain and service operations requires significant investment in technology, but also multiple new business pillars and "middle office" capability platform functions. A traditional, vertically integrated value chain, or siloed model, will impair your ability to scale. Instead, consider how you can create a middle-layer, or platform, to build and manage digital capabilities, serving to pool capabilities and replicate experiences, with the flexibility to grow organically as your business footprint expands.

Digital innovations that emerge in China will not only shape its own ecosystem, but also serve as a reference for digital ecosystems that are evolving elsewhere. Understanding the path that these innovations take is, consequently, more important than ever.