

Executive Summary

# Digital India

Technology to transform  
a connected nation



# McKinsey Global Institute

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# Digital India: Technology to transform a connected nation

**Executive Summary**

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**Authors**

Noshir Kaka, Mumbai

Anu Madgavkar, Mumbai

Alok Kshirsagar, Mumbai

Rajat Gupta, Mumbai

James Manyika, San Francisco

Kushe Bahl, Mumbai

Shishir Gupta, Delhi

# Digital India: Technology to transform a connected nation

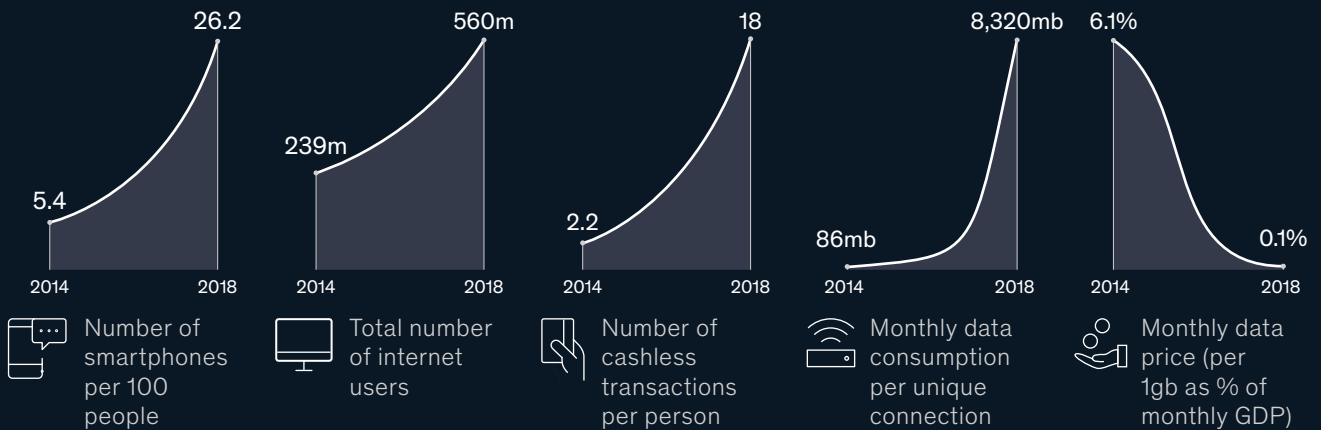
India's digital surge is well under way on the consumer side, even as its businesses show uneven adoption and a gap opens between digital leaders and other firms. This report examines the opportunities for India's future digital growth and the challenges that will need to be managed as it continues to embrace the digital economy.

- India is one of the largest and fastest-growing markets for digital consumers, with 560 million internet subscribers in 2018, second only to China. Indian mobile data users consume 8.3 gigabits (GB) of data each month on average, compared with 5.5 GB for mobile users in China and somewhere in the range of 8.0 to 8.5 GB in South Korea, an advanced digital economy. Indians have 1.2 billion mobile phone subscriptions and downloaded more than 12 billion apps in 2018. Our analysis of 17 mature and emerging economies finds India is digitising faster than any other country in the study, save Indonesia—and there is plenty of room to grow: just over 40 percent of the populace has an internet subscription.
- The public and private sectors are both propelling digital consumption growth. The government has enrolled more than 1.2 billion Indians in its biometric digital identity programme, Aadhaar, and brought more than 10 million businesses onto a common digital platform through a goods and services tax. Competitive offerings by telecommunications firms have turbocharged internet subscriptions and data consumption, which quadrupled in both 2017 and 2018 and helped bridge a digital divide; India's lower-income states are growing faster than higher-income ones in internet infrastructure and subscriptions. Based on current trends, we estimate that India will increase the number of internet users by about 40 percent to between 750 million and 800 million and double the number of smartphones to between 650 million and 700 million by 2023.
- Our survey of more than 600 firms shows that digital adoption among businesses has been uneven across all sectors. Digital leaders in the top quartile of adopters are two to three times more likely to use software for customer relationship management, enterprise resource planning, or search engine optimisation than firms in the bottom quartile and are almost 15 times more likely to centralise digital management. Firm size is not always a differentiator: while large firms are far ahead in digital areas requiring large investments like making sales through their own website, small businesses are leapfrogging ahead of large ones in other areas, including acceptance of digital payments and the use of social media and video conferencing to reach and support customers.
- Digital applications could proliferate across most sectors of India's economy. By 2025, core digital sectors such as IT and business process management, digital communication services, and electronics manufacturing could double their GDP level to \$355 billion to \$435 billion. Newly digitising sectors, including agriculture, education, energy, financial services, healthcare, logistics, and retail, as well as government services and labour markets, could each create \$10 billion to \$150 billion of incremental economic value in 2025 as digital applications in these sectors help raise output, save costs and time, reduce fraud, and improve matching of demand and supply.
- The productivity unlocked by the digital economy could create 60 million to 65 million jobs by 2025, many of them requiring functional digital skills, according to our estimates. Retraining and redeployment will be essential to help some 40 million to 45 million workers whose jobs could be displaced or transformed.
- New digital ecosystems are already visible, reshaping consumer-producer interactions in agriculture, healthcare, retail, logistics, and other sectors. Opportunities span such areas as data-driven lending and insurance payouts in the farm sector to digital solutions that map out the most efficient routes and monitor cargo movements on India's highways. In healthcare, patients could turn to teleconsultations via digital voice or HD video, and in retail, brick-and-mortar stores would find value from being part of e-commerce platforms.
- All stakeholders will need to respond effectively if India is to achieve its digital potential. Executives will need to anticipate the digital forces that will disrupt their businesses and invest in building capabilities, including partnering with universities and outsourcing or acquiring talent to deliver digital projects. Governments will need to invest in digital infrastructure and public data that organisations can leverage even as they put in place strong privacy and security safeguards. Capturing the gains of the digital economy will require more ease in creating, scaling, and exiting startups as well as policies to facilitate retraining and new-economy jobs for workers. Individuals will need to inform themselves about how the digital economy could affect them as workers and consumers and prepare to capture its opportunities.

# Digital India

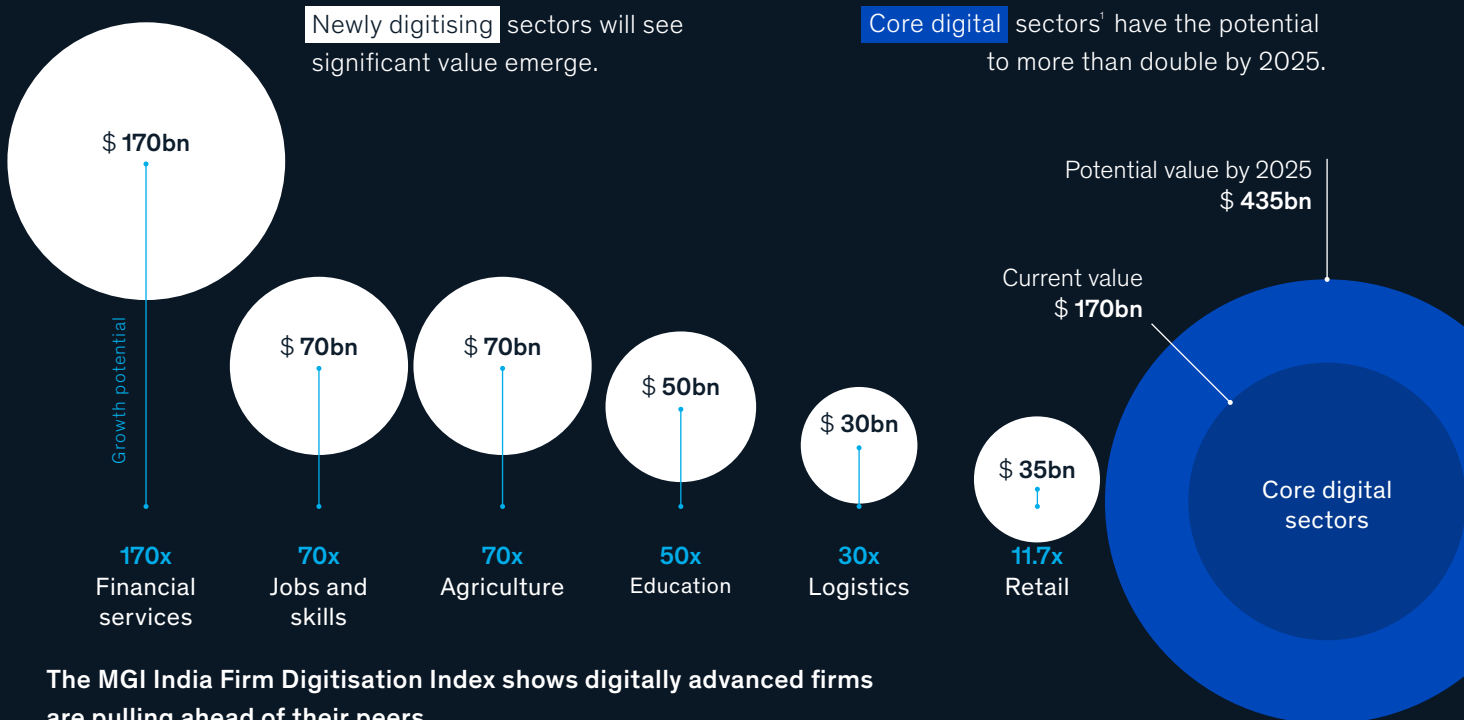
Unlocking the potential of technology

Digital usage in India is soaring as costs tumble



**By 2025, digital could transform India's economy, sector by sector**

(Values show upper limit of an estimated range)



The MGI India Firm Digitisation Index shows digitally advanced firms are pulling ahead of their peers.

■ Laggards (Index bottom quartile) ■ Leaders (Index top quartile)



<sup>1</sup> IT business process management, digital communication services, and electronics manufacturing.



# Executive summary

With more than half a billion internet subscribers, India is one of the largest and fastest-growing markets for digital consumers, and the rapid growth has been propelled by public and private sector alike. India's lower-income states are bridging the digital divide, and the country has the potential to be a truly connected nation by 2025. Much more growth is possible. As India's digital transformation unfolds, it could create significant economic value for consumers, businesses, microenterprises, farmers, government, workers, and other stakeholders.

Digital adoption by India's businesses has so far been uneven, but new digital business models could proliferate across most sectors. We find that core digital sectors such as IT and business process management (IT-BPM), digital communication services, and electronics manufacturing could double their GDP level to \$355 billion to \$435 billion by 2025, while newly digitising sectors (including agriculture, education, energy, financial services, healthcare, logistics, and retail) as well as digital applications in government services and labour markets could each create \$10 billion to \$150 billion of incremental economic value in the same period. Some 60 million to 65 million jobs could be created by the productivity surge by 2025, although redeployment will be essential to help the 40 million to 45 million workers whose jobs will likely be displaced or transformed by digital technologies, based on our estimates.

In India's new and emerging digital ecosystems of the future—already visible in areas such as precision agriculture, digital logistics management, and digital healthcare consultations—business will have to find a new way to engage with customers. All Indian stakeholders will need to gear up to capture the opportunities and manage the challenges of being a connected nation.

## India's digital leap is well under way, propelled by both public- and private-sector actions

By many measures, India is on its way to becoming a digitally advanced nation.<sup>1</sup> Just over 40 percent of the populace has an internet subscription, but India is already home to one of the world's largest and most rapidly growing bases of digital consumers. It is digitising activities at a faster pace than many mature and emerging economies.

India's internet user base has grown rapidly in recent years, propelled by the decreasing cost and increasing availability of smartphones and high-speed connectivity, and is now one of the largest in the world (Exhibit E1). The country had 560 million subscribers in September 2018, second in the world only to China.<sup>2</sup> Digital services are growing in parallel. Indians now download more apps—12.3 billion in 2018—than residents of any other country except China.<sup>3</sup> The average Indian social media user spends 17 hours on the platforms each week, more than social media users in China and the United States.<sup>4</sup> The share of Indian adults with at least one digital financial account has more than doubled since 2011, to 80 percent, thanks in large part to the more than 332 million people who opened mobile phone–based accounts under the government's Jan-Dhan Yojana mass financial-inclusion programme.<sup>5</sup>

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<sup>1</sup> In February 2019, the Indian government released a report highlighting the considerable economic opportunities from digital technologies and a detailed action plan for realizing them. *India's Trillion Dollar Digital Opportunity*, Ministry of Electronics and Information Technology, Government of India, February 2019.

<sup>2</sup> *Indian telecom services performance indicator report, June–September 2018*, Telecom Regulatory Authority of India.

<sup>3</sup> Priori Data, January 2019.

<sup>4</sup> We Are Social, *Digital in 2018: Southern Asia*, January 2018.

<sup>5</sup> Pradhan Mantri Jan-Dhan Yojana, November 20, 2018, [pmjdy.gov.in/account](http://pmjdy.gov.in/account); Asli Demirgüç-Kunt et al., *The Global Findex Database 2017: Measuring financial inclusion and the fintech revolution*, World Bank, April 2018.

## India is among the top two countries globally on many key dimensions of digital adoption.

India no. 1  
globally

1.2b

people enrolled in the world's largest unique digital identity program

India no. 2  
globally,  
behind China



12.3b

app downloads  
in 2018



1.17b

wireless phone  
subscribers



560m

internet  
subscribers



354m

smartphone  
devices



294m

users engaged in  
social media

SOURCE: Priori Data, January 2019; Strategy Analytics, 2018; TRAI, September 30, 2018; UIDAI, April 2018; We Are Social, January 2019; McKinsey Global Institute analysis

Our analysis of 17 mature and emerging economies across 30 dimensions of digital adoption since 2014 finds that India is digitising faster than all but one other country in the study, Indonesia. Our Country Digital Adoption Index covers three elements: digital foundation, or the cost, speed, and reliability of internet connections; digital reach, or the number of mobile devices, app downloads, and data consumption; and digital value, the extent to which consumers engage online by chatting, tweeting, shopping, or streaming. India's score rose by 90 percent between 2014 and 2017, second only to Indonesia's improvement, at 99 percent, over the same period (Exhibit E2). In absolute terms, India's score is low, at 32 out of a maximum 100, comparable to Indonesia's at 40, but significantly lagging behind the four most-digitised economies of the 17: South Korea, Sweden, Singapore, and the United Kingdom.

The public sector has been one strong catalyst for India's rapid digitisation. The government's effort to ramp up Aadhaar, the national biometric digital identity programme, has played a major role (see Box E1, "Aadhaar, the world's largest digital ID programme, has enabled many services"). The Goods and Services Tax Network, established in 2013, brings all transactions involving about 10.3 million indirect taxpaying businesses onto one digital platform, creating a powerful incentive for businesses to digitise their operations.

At the same time, private-sector innovation has helped bring internet-enabled services to millions of consumers and made online usage more accessible. For example, Reliance Jio's strategy of bundling virtually free smartphones with subscriptions to its mobile service has spurred innovation and competitive pricing across the sector. Overall, data costs have dropped by more than 95 percent since 2013: the cost of one gigabyte fell from 9.8 percent of per capita monthly GDP in 2013 (roughly \$12.45) to 0.37 percent in 2017 (the equivalent of a few cents).<sup>6</sup> Average fixed-line download speed quadrupled between 2014 and 2017.<sup>7</sup> As a result, monthly mobile data consumption per user is growing at 152 percent annually—more than twice the rates in the United States and China (Exhibit E3).

95%

Decline in data costs  
since 2013

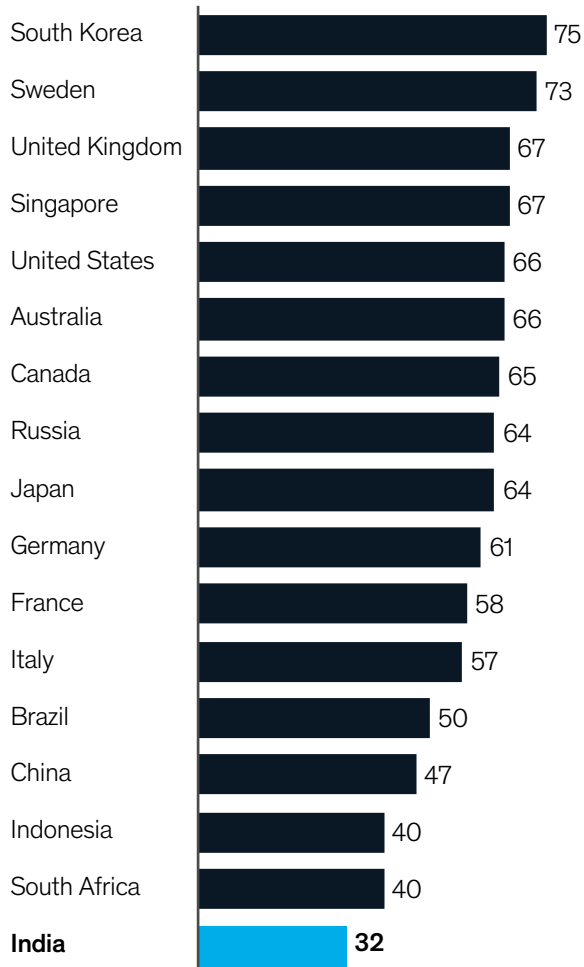
<sup>6</sup> Analysys Mason, January 9, 2019; World Bank, October 27, 2018.

<sup>7</sup> Akamai's state of the internet: Q1 2014 report, Akamai Technologies, May 2014; and Akamai's state of the internet: Q1 2017 report, Akamai Technologies, March 2017.

**India, coming off a low base, is the second-fastest digital adopter among 17 major digital economies.**

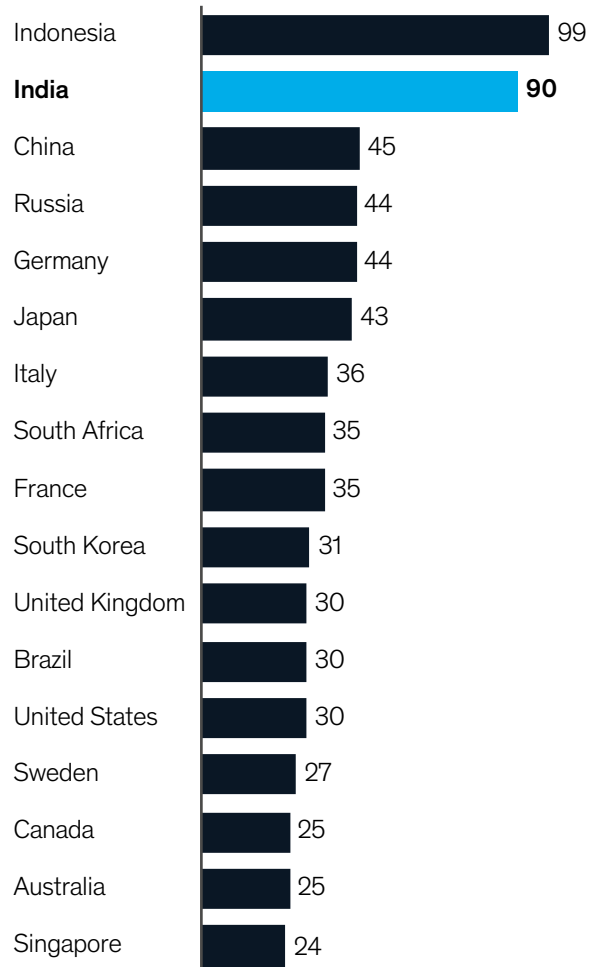
**Country Digital Adoption Index<sup>1</sup>**

Score (0-100), 2017



**Growth in Country Digital Adoption Index**

% growth, 2014–17



<sup>1</sup> MGI's Country Digital Adoption Index represents the level of adoption of digital applications by individuals, businesses, and governments across 17 major digital economies. The holistic framework is estimated based on 30 metrics divided between three pillars: digital foundation (eg, spectrum availability, download speed), digital reach (eg, size of mobile and internet user bases, data consumption per user), and digital value (eg, utilisation levels of use cases in digital payments or e-commerce). Principal component analysis was conducted to estimate the relative importance of the three pillars: 0.37 for digital foundation, 0.33 for digital reach and 0.30 for digital value. Within each pillar, each element is assigned equal value, with indicators normalised into a standard scale of 0–100 (0 indicating lowest possible value). A simple average of the normalised values was then used to calculate the index.

SOURCE: Akamai's state of the internet: Q1 2014 report; Akamai's state of the internet: Q1 2017 report; Analysys Mason; Euromonitor International consumer finance and retailing overviews, 2017 editions; International Telecommunication Union; UN e-Government Survey; Strategy Analytics; Open Signal; Ovum; We Are Social; Digital Adoption Index, World Bank; McKinsey Global Institute analysis

Box E1.

## **Aadhaar, the world's largest digital ID programme, has enabled many services**

Before the Aadhaar programme rolled out in 2009, most Indians relied on rudimentary physical documents, such as the “ration card” issued for food subsidies, as their primary source of identification; estimates suggest that more than 85 percent of the population had ration cards in 2011–12. Not only did 15 percent of the population not have any form of legally verifiable ID, but there was also no way to authenticate and verify the identity of ration card holders in real time at no cost. Today that has changed dramatically: more than 1.2 billion Indians have Aadhaar digital identification, up from 510 million in 2013.<sup>1</sup> Aadhaar has become the largest single digital ID programme in the world—and a powerful catalyst of digital adoption more broadly in India.

Aadhaar is a 12-digit number that the Unique Identification Authority of India issues to Indian residents based on their biometric and demographic information. To obtain an Aadhaar ID, applicants permit the authority to record their fingerprints, scan their irises, take their photograph, and record their name, date of birth or age, gender, and address.<sup>2</sup>

The IDs were created to provide all residents of India with high-assurance, unique, digitally verifiable means to prove who they are. An important beneficial impact has been the potential to reduce loss, fraud, and theft in government benefits programs by enabling the direct transfer of benefits to bank accounts. This use has helped spur consumer adoption of digital services. Almost 870 million bank accounts were linked to Aadhaar by February 2018, compared with 399 million in April 2017 and 56 million in January 2014.<sup>3</sup> A recent survey shows that 85 percent of people who opened a bank account between 2014 and

2017 used Aadhaar as their identification. In all, 82 percent of public benefits disbursement accounts are now linked to Aadhaar, which has reduced fraud and leakage.<sup>4</sup>

A suite of open application program interfaces (APIs) is linked to Aadhaar. For example, the Unified Payments Interface platform integrates other payment platforms in a single mobile app that enables quick, easy, and inexpensive payments among individuals, businesses, and government agencies. DigiLocker permits users to issue and verify digital documents, obviating the need for paper.

Digital ID systems globally are not without controversy: some worry about their ability to track personal information that could be misused in the hands of malicious entities, and the risk of systematic exclusion is also a concern.<sup>5</sup> Aadhaar's design follows a data minimisation policy that allows collection and storage of basic demographic data only. Thereafter, whenever any ID-requesting party asks for verification, the Aadhaar system issues only a yes or no based on the biometric match. It does not store or share the reason for the verification or details of any transaction. The risk arises when other databases not belonging to Aadhaar are seeded with Aadhaar numbers. For example, an individual's bank account details can be pieced together, and the availability of that information can give rise to fraudulent practices.

India's Supreme Court ruled in September 2018 that Aadhaar does not violate the right to privacy and may legally be required to obtain government services.<sup>6</sup> However, in its 1,400-page ruling, the court also struck down a section of the Aadhaar law stipulating that private companies could require potential customers to provide an Aadhaar ID for services such as opening a bank account, obtaining mobile phone SIM cards, or enrolling children in school.<sup>7</sup> To make such uses permissible on a voluntary basis, the government would need to amend the relevant laws or modify authentication processes.

<sup>1</sup> Unique Identification Authority of India, April 2018.

<sup>2</sup> *About Aadhaar*, Unique Identification Authority of India, uidai.gov.in.

<sup>3</sup> UIDAI; IDinsight.

<sup>4</sup> Ronald Abraham et al., *State of Aadhaar report 2017–18*, IDinsight, May 2018.

<sup>5</sup> For a discussion of the potential economic impact, along with challenges and risks, of digital ID globally, see *Digital identification: A key to inclusive growth*, McKinsey Global Institute, January 2019.

<sup>6</sup> *What is Aadhaar? India's controversial billion-strong biometric database*, SBS News, September 27, 2018.

<sup>7</sup> Manveena Suri, “Aadhaar: India Supreme Court upholds controversial biometric database”, CNN.com, September 26, 2018.

Global and local digital businesses are creating services tailored to India's consumers and unique operating conditions. For example, Alibaba-backed Paytm, India's largest mobile payments and commerce platform, has more than 300 million registered mobile wallet users and six million merchants.<sup>8</sup>

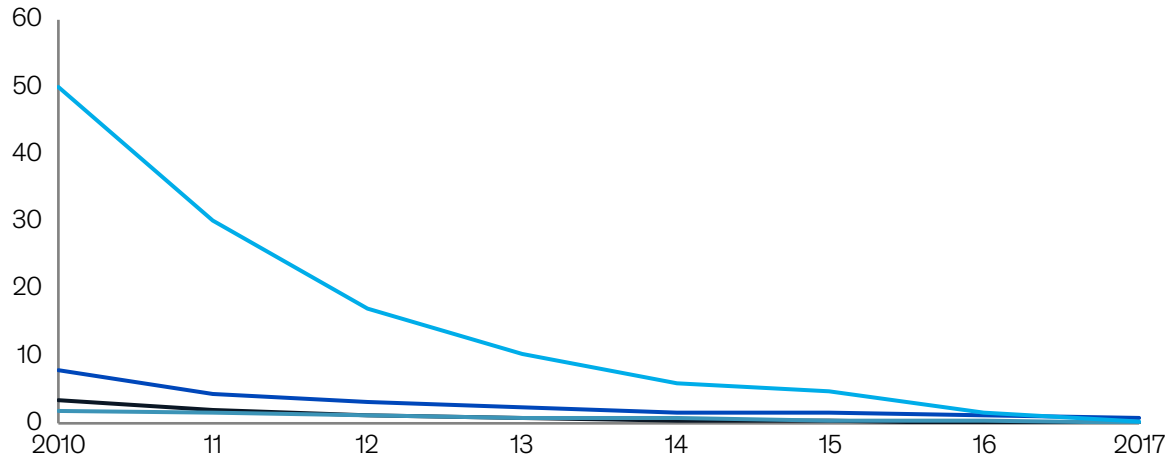
<sup>8</sup> Harichandan Arakali, “Paytm reloaded: It's no longer just a mobile wallet”, Forbes, March 15, 2018.

## India's data usage quadrupled in one year as prices fell.

United States Brazil China India<sup>1</sup>

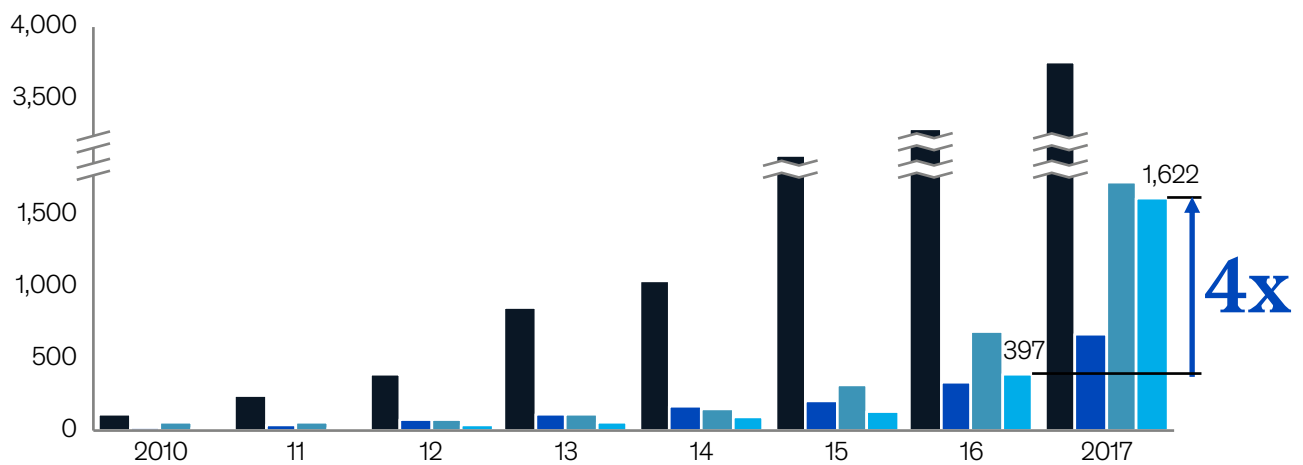
### Data price

Per GB of data (% of monthly GDP per capita)



### Data consumption

Per connection, per month (MB)



<sup>1</sup> In data published by the Telecom Regulatory Authority of India for September 2018, consumption per unique subscriber is shown to have increased to 8,320 MB, putting India on pace to more than quadruple its average consumption again from 2017 to 2018.

SOURCE: Analysys Mason, January 9, 2019; UN Database; McKinsey Global Institute analysis

## India's digital divide is narrowing, and all states have much room to grow

With both private- and public-sector action promoting digital usage, India's states have started bridging the digital divide. Lower-income states are showing the fastest growth in internet infrastructure, such as base tower stations and the penetration of internet services to new customers. While low- and moderate-income states as a group accounted for 43 percent of all base tower stations in India in 2013, they accounted for 52 percent of the incremental towers installed between 2013 and 2017.<sup>9</sup> Low-income states like Uttar Pradesh, Madhya Pradesh, and Jharkhand were among the five fastest-growing states in internet penetration between 2014 and 2018; Uttar Pradesh alone added more than 36 million internet subscribers in that period. Ordinary Indians in many parts of the country—including small towns and rural areas—can read the news online, order food delivery via a phone app, video chat with a friend (Indians log 50 million video-calling minutes a day on WhatsApp), shop at a virtual retailer, send money to a family member through their phone, or watch a movie streamed to a handheld device.

Even after these advances, India still has plenty of room to grow in digital terms. Just over 40 percent of the populace has an internet subscription.<sup>10</sup> Despite the growth of digital financial services, close to 90 percent of all retail transactions, by number, are still in cash.<sup>11</sup> Only 5 percent of trade is transacted online, compared with 15 percent in China in 2015.<sup>12</sup> Looking ahead, India's digital consumers are poised for robust growth. By our estimates, India could add as many as 350 million smartphones by 2023.

## Indian businesses are digitising rapidly but not evenly

Against this backdrop of rapid consumer internet adoption, India's businesses have a relatively uneven pattern of digitisation. We surveyed more than 600 firms to determine the level of digitisation as well as the underlying traits, activities, and mind-sets that drive digitisation at the firm level. We used each company's answers to score its level of digitisation on a scale of 0 to 100 and created the MGI India Firm Digitisation Index. Companies in the top quartile, which we characterise as digital leaders, had an average score of 58.2, while those in the bottom quartile, the digital laggards, averaged 33.2. The median score was 46.2.

A higher score indicates a company uses digital more extensively in day-to-day operations (such as implementing customer relationship management systems or accepting digital payments) and in a more organised manner (for example, by having a separate analytics team or centralised digital organisation) than companies with lower scores. Our survey found that, on average, digital leader firms outscored other firms by 70 percent on strategy dimensions (for example, responsiveness to disruption and investment in digital technologies), by 40 percent on organisation dimensions (such as level of executive support and use of key performance indicators), and by 31 percent on capability dimensions (including use of technologies such as CRM and enterprise resource planning solutions, and adoption of digital payments).

Differences in digital adoption within sectors are greater than those across sectors. While some sectors have more digitally sophisticated companies than others, top-quartile companies can be found in all sectors—even those sometimes considered resistant to technology, such as transportation and construction. Conversely, sectors such as information and communications technology (ICT), professional services, and education and healthcare, which have more digitised firms on average, are represented in the bottom quartile of adoption (Exhibit E4).

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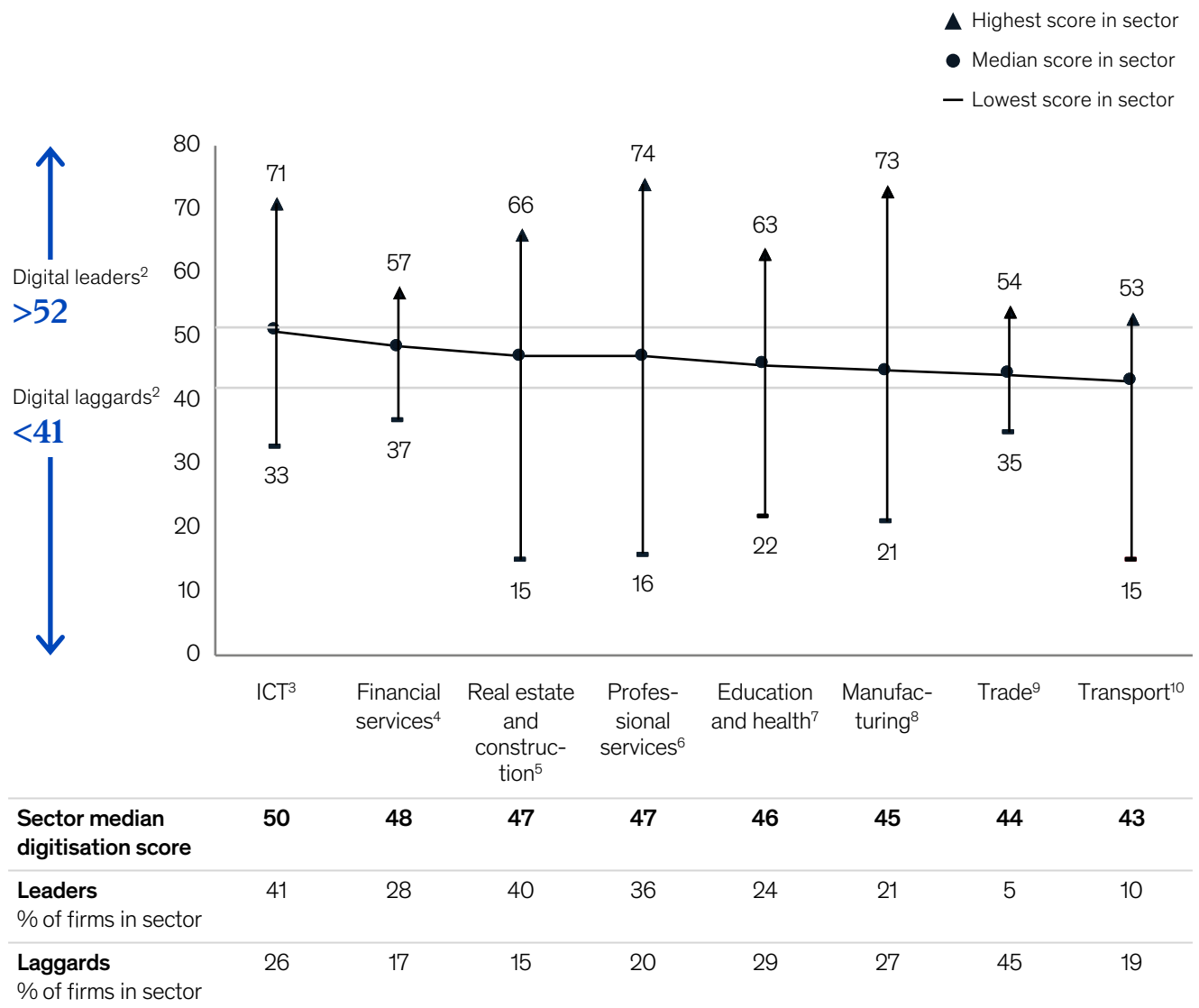
<sup>9</sup> States are categorised based on their per capita GDP relative to the country's: "very high income" states have per capita GDP more than twice India's average; "high income", 1.2 to 2 times; "moderate income", 0.7 to 1.2 times; and "low income", less than 0.7 times.

<sup>10</sup> *Indian telecom services performance indicator report*, June–September 2018, Telecom Regulatory Authority of India.

<sup>11</sup> "Digital payments in India to reach \$1 trillion by 2023: Credit Suisse", *Economic Times*, February 15, 2018.

<sup>12</sup> Euromonitor International Retailing Edition 2019.

## Digitisation levels vary more within sectors than across sectors among large Indian firms.

India Firm Digitisation Index<sup>1</sup>

<sup>1</sup> Based on 50-question survey of 220 large companies (5 billion rupees or \$70 million annual revenue). The survey seeks to determine level of digitisation as well as the underlying traits, activities, and mindsets that drive it. Firms are scored based on their responses on dimensions related to digital strategy (eg, responsiveness to disruption, investment in digital technologies); digital organisation (eg, level of executive support, use of key performance indicators); and digital capabilities (eg, use of technologies like CRM and ERP, or adoption of digital payments).

<sup>2</sup> Leaders are top quartile firms in terms of firm digitisation index, while laggards are in the bottom quartile.

<sup>3</sup> ICT comprises telecom services providers, media and information technology companies.

<sup>4</sup> Financial services comprises banks, finance, and insurance companies.

<sup>5</sup> Real estate and construction comprises construction companies, real estate developers, and real estate brokerage firms.

<sup>6</sup> Professional services comprises companies in the fields of consulting, architecture, and stock trading, among others.

<sup>7</sup> Education and health comprises firms in the fields of health services, pharmaceuticals, and education services.

<sup>8</sup> Manufacturing comprises firms in manufacturing of textiles, food processing, metal and metal products, petroleum and related products, and others.

<sup>9</sup> Trade comprises companies trading, both wholesale and retail, commodities (eg, automobiles, sanitary wares).

<sup>10</sup> Transport comprises firms in logistics and passenger transport.

SOURCE: McKinsey India firm digitisation survey, May 2017; McKinsey Global Institute analysis

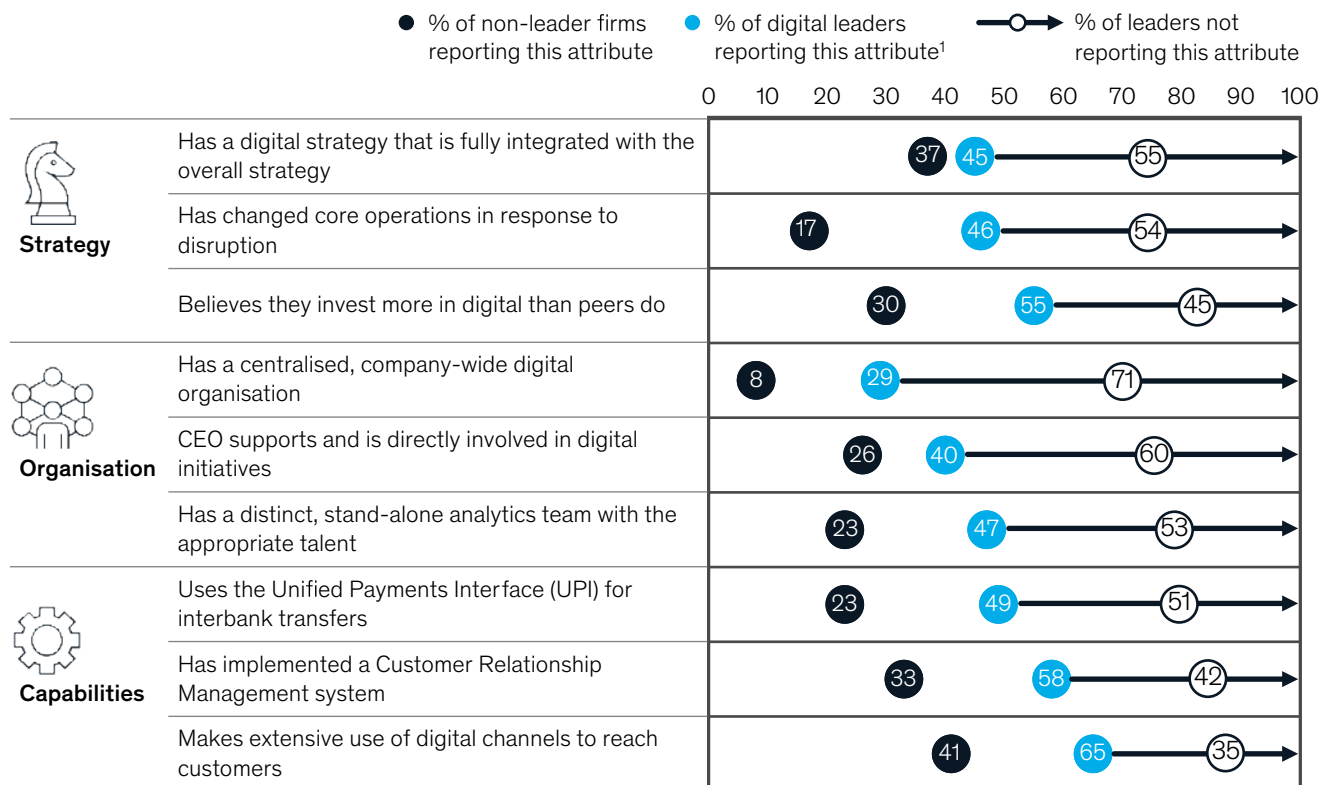
## Digital leaders share common traits that digital laggards can emulate

India's digital leaders share common traits in digital strategy, organisation, and capabilities, but they still have room to improve across all three areas, from CEO support for digital initiatives to use of customer relationship management systems and other digital capabilities (Exhibit E5).

Exhibit E5

### India's digital leaders still have ample room for improvement in many areas.

% of firms responding



<sup>1</sup> "Leaders" are firms scoring within the top quartile of MGI's India Firm Digitisation Index.

<sup>2</sup> Results of a survey conducted across 220 large firms in India with revenue of 5 billion rupees, or \$70 million.

SOURCE: McKinsey India firm digitisation survey, May 2017; McKinsey Global Institute analysis

- **Digital strategy:** Leading digital companies in India adopt strategies that make them stand out from their peers in several ways. They centre their strategies on digital, let digital technologies shape how they engage with customers, and invest more heavily in digital than their peers. These firms are 30 percent more likely than bottom-quartile firms to say they fully integrate their digital and overall strategies, and 2.3 times more likely to sell their products through e-commerce platforms. Top-quartile firms are 3.5 times more likely than bottom-quartile firms to say that digital disruptions led them to change their core operations. Digital leaders also make digital investment a priority. Top-quartile firms are 5.5 times more likely than bottom-quartile firms to outspend their peers on digital initiatives and 40 percent more likely to consider digital a top priority for investment.

- **Digital organisation:** Many more digital leaders than laggards have a single business unit that manages and coordinates digital initiatives for the entire company. Top-quartile firms are 14.5 times more likely than bottom-quartile firms to centralise digital management, and five times more likely to have a stand-alone, properly staffed analytics team. Top-quartile firms are also 70 percent more likely than bottom-quartile firms to say their CEO is “supportive and directly engaged” in digital initiatives.
- **Digital capabilities:** Top-quartile firms are 2.6 times more likely than bottom-quartile firms to use customer relationship management software, for example, and 2.5 times more likely to coordinate the management of their core business operations by using an enterprise resource planning system. Digital leaders also optimise their digital marketing. Our survey shows that top-quartile companies are 2.3 times more likely than bottom-quartile firms to use search engine optimisation, and 2.7 times more likely to use social media for marketing.

The gap between digital leaders and other firms is not insurmountable. In some cases, even when the difference is large, companies may be able to begin closing it by digitising in small, relatively simple ways. Social media marketing is a good example. Bottom-quartile firms are 70 percent less likely than top-quartile businesses to use social media to attract and serve new customers, and less than half as likely to use e-commerce or listing platforms. However, these sales channels are cheap and easily accessible, and a business owner with a smartphone and a high-speed internet connection will encounter few barriers to taking advantage of them.

# 94%

Percentage of small businesses that accept debit or credit card payments

## Small businesses are closing the digital gap with larger firms and are ahead of them in accepting digital payments

Large companies (defined in our survey as having revenue greater than 5 billion rupees, or about \$70 million) have the financial resources and expertise to invest in some advanced technologies, such as artificial intelligence and the Internet of Things, but growing high-speed internet connectivity and shrinking data costs are opening digital opportunities for many small-business owners and sole proprietors.

Indeed, our survey found that small businesses are ahead of large companies in accepting digital payments. Among small firms, 94 percent said they accept payment by debit or credit card, compared with only 79 percent of big firms; for digital wallets, the figures were 78 percent versus 49 percent. Small companies also are more willing to use digital technologies such as video conferencing and chat to support their customers.

Our survey found that 70 percent of small firms have built their own websites to reach clients, compared with 82 percent of large firms, and are just about as likely as those big companies to have optimised their websites for mobile devices. Small firms are less likely than big firms to buy display ads on the web (37 percent versus 66 percent), but they are ahead of big companies in connecting with customers via social media and are more likely to use search engine optimisation. More than 60 percent of the small firms surveyed use LinkedIn to hire talent, and about half say most of their employees need to have basic digital skills. While only 51 percent of smaller firms said they “extensively” sell goods and services via their websites (compared with 73 percent of big businesses), small businesses use e-commerce platforms and other digital sales channels just as much as large firms and are equally likely to receive orders through digital channels such as WhatsApp.

# 700m

Estimated number of smartphones in India by 2023

## Digital applications have potential to create significant economic value for India but will require new skills and labour redeployment

Firms in India that innovate and digitise rapidly will be better placed to tap into a large connected market of up to 700 million smartphones and about 800 million internet users by 2023. In the context of rapidly improving technology capabilities and declining data costs, technology-enabled business models could become omnipresent across sectors and activities in India over the next decade. That will likely create significant economic value in each of these sectors. At the same time, the nature of work will change and require new skills.

## **Core digital sectors could more than double in size by 2025, and each of several newly digitising sectors could contribute \$10 billion to \$150 billion of economic value**

We consider economic impact across three types of sectors. First are core digital sectors, such as IT-BPM; digital communication services, including telecom services; and electronics manufacturing. Second are newly digitising sectors that are not traditionally considered part of India's digital economy but have the potential to innovate and adopt digital rapidly, such as financial services, agriculture, healthcare, logistics, and retailing. Third are activities related to government services and labour markets, which can be intermediated using digital technologies in new ways.

India's core digital sectors accounted for about \$170 billion—or 7 percent—of GDP in 2017–18.<sup>13</sup> This comprises value added from sectors that already provide digital products and services at scale, such as IT-BPM (\$115 billion), digital communication services (\$45 billion), and electronics manufacturing (\$10 billion). We estimate that these sectors could grow significantly faster than GDP, and their value-added contribution could range from \$205 billion to \$250 billion for IT-BPM, \$100 billion to \$130 billion for electronics manufacturing, and \$50 billion to \$55 billion for digital communication services, totalling between \$355 billion and \$435 billion and accounting for 8 to 10 percent of India's GDP in 2025.

Alongside these already digitised sectors and activities, India stands to create more value if it succeeds in nurturing new and emerging digital ecosystems in sectors such as agriculture, education, energy, financial services, healthcare, and logistics. The benefits of digital applications to productivity and efficiency in each of these newly digitising sectors are already visible. For example, in logistics, tracking vehicles in real time has enabled shippers to reduce fleet turnaround time by 50 to 70 percent.<sup>14</sup> Similarly, digitising supply chains allows companies to reduce their inventory by up to 20 percent. Farmers can cut the cost of growing rice by 15 to 20 percent using data on soil conditions that enables them to minimise the use of fertilisers and other inputs.<sup>15</sup>

In cross-cutting areas such as government services and the markets for jobs and skills, digital technologies can also create significant value. For example, shifting government transactions, including subsidy transfers and procurement, online can enhance public-sector efficiency and productivity, and creating online marketplaces that bring together workers and employers could considerably improve the performance of India's fragmented and largely informal job market.

Unlocking this value will require widespread adoption and implementation. The economic value will be proportionate to the extent that digital processes permeate organisations and their marketing and service delivery channels, shop floors, and supply chains. Our estimates of potential economic value for each sector vary depending on adoption rates by 2025; for example, in areas where the readiness of India's firms and government agencies is low and considerable effort will be required to catalyse broad digitisation, adoption may be as low as 20 percent. Where private-sector readiness is relatively high and government policy is already supportive of large-scale digitisation, adoption could be as high as 80 percent.

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<sup>13</sup> Estimates based on industry revenue and cost structures and growth trends.

<sup>14</sup> *Who we are*, Rivigo, rivigo.com.

<sup>15</sup> Pinaki Mondal and Manisha Basu, "Adoption of precision agriculture technologies in India and in some developing countries: Scope, present status and strategies", *Progress in Natural Science: Materials International*, June 2009, Volume 19, Issue 6.

In all, we estimate that India has the potential to create considerable economic value by 2025: \$130 billion to \$170 billion in financial services (including digital payments); \$50 billion to \$65 billion in agriculture; \$25 billion to \$35 billion in retail and e-commerce (including supply chain); \$25 billion to \$30 billion in logistics and transportation; and roughly \$10 billion in areas such as energy and healthcare (Exhibit E6). Greater digitisation of government services and benefits transfers could yield economic value of \$20 billion to \$40 billion combined and up to \$70 billion from more efficient skill training and job market matching using digital platforms. The economic value is estimated as a range (see Box E2, “Our methodology for sizing economic value”). While these estimates underscore large potential value, realisation of this value is not guaranteed: losing momentum on the government policies that enable the digital economy would mean India could realise less than half of the potential value by 2025.

Box E2.

### **Our methodology for sizing economic value**

Our research seeks to analyse and quantify the potential economic impact of digital technology and applications in India over the coming years.

The core digital sectors we describe (IT-BPM, digital communication services, and electronics manufacturing) are already considered part of India’s digital economy, and their GDP contribution is measured based on conventional revenue, expense, and value-added metrics.

Economic data are not available for technology-based business models and applications in newly digitising sectors—such as agriculture, education, energy, financial services, manufacturing, healthcare, logistics, and retail—because national income accounts do not yet track them separately. For these areas, we create broad estimates of potential economic value in the future. We use a value-impact approach to understand and estimate the potential effect of digital adoption on productivity based on micro evidence from sectors and firms. We identify discrete use cases and estimate their potential impact by quantifying the productivity gains possible if they were to scale up and achieve moderate to high levels of adoption. Productivity gains are estimated by measures such as greater output using the same resources, cost savings, time savings, and new sources of capital and labour that could become available with the implementation of digital technologies.

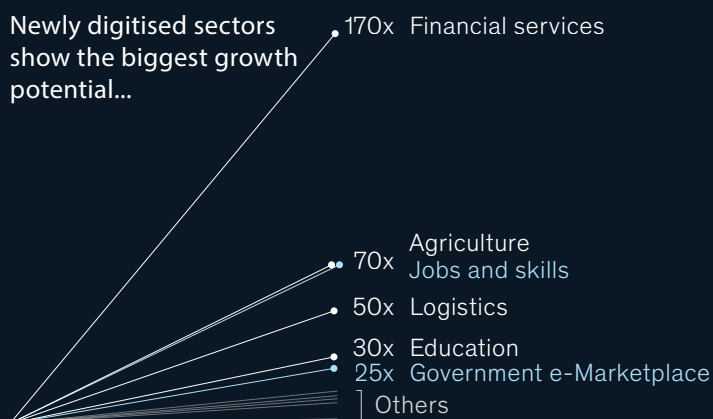
We do not estimate potential GDP impact because the accounting and marketisation of productivity gains remain uncertain and hard to predict. For example, it is unclear whether time saved will convert into productive and paying jobs, and whether new digital services will generate consumer surplus accruing to users of technologies or paid products that yield revenue to producers. Nevertheless, we believe these estimates provide a sense of the order of magnitude of the impact that digitisation represents for an economy of the scale and breadth of India’s.

All our estimates are in nominal dollars in 2025 and represent scope for economic value creation in that year. They do not represent market revenue or profit pools for individual players; rather, they are estimates of end-to-end value to the whole system.

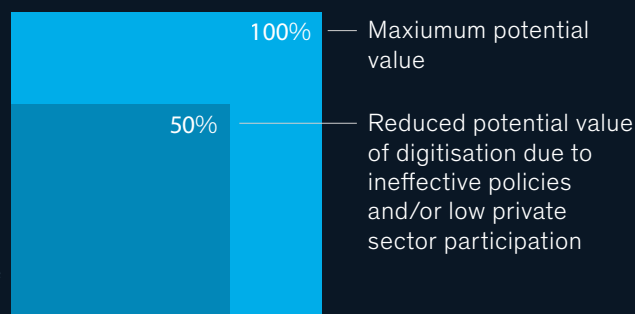
Our estimates of economic value in 2025 represent potential; they are not a prediction. The pace of India’s progress will depend on government policies and private-sector action. Realising the economic value estimated would necessitate investment in digital infrastructure and ecosystems, complementary investment in physical infrastructure and productive capacities, and education and training of the workforce.

## Digital technologies can create significant economic value in India in 2025.

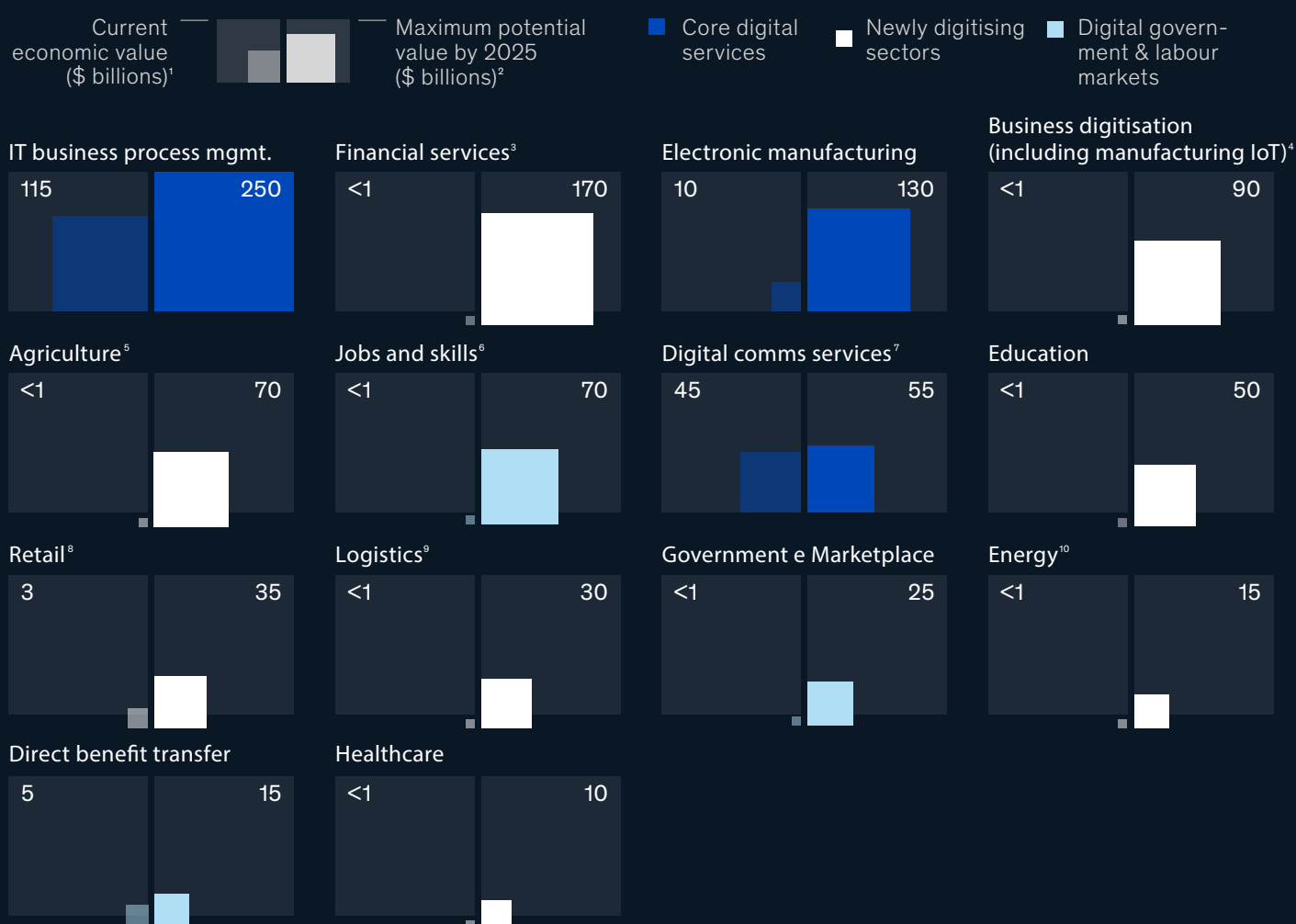
Newly digitised sectors show the biggest growth potential...



...but India will need to seize the opportunity.



Sector value potential ranked from highest (IT) to lowest (healthcare)



¹ McKinsey Global Institute value estimates in each category are based on the "value-impact approach" and focus on the potential effect of adoption of the considered digital applications on productivity. Discrete use cases were identified with their potential impact, in terms of greater output, time, or cost saved; these estimates were multiplied by their adoption rates to create a macro picture of potential economic gains for each application, scaled up for each sector.

² All of our estimates are in nominal US dollars in 2025 and represent scope for economic value creation in that year. They do not represent market revenue, or profit pools for individual players; rather they are estimates of end-to-end value to the system as a whole. Some of the economic value we size may or may not materialise as GDP or on market-based exchanges.

³ Potential estimate of economic value from flow-based lending, plus economic value created through digital payments.

⁴ Excluding effects of business digitisation in financial services, agriculture, education, retail, logistics, energy, and healthcare, which are listed separately.

⁵ Potential estimate of economic value from precision agriculture, digital farmer financing and universal agricultural marketplace.

⁶ Potential estimate of economic value from online talent platforms.

⁷ Estimation for 2025 includes value addition from visual broadband services, plus digital media and entertainment.

⁸ Potential estimate of economic value from e-commerce and digital supply chain. For estimation purposes in the report, e-commerce is considered for e-commerce. If broader definition of e-commerce is used (etail + etravel), current value becomes \$5 billion and future potential becomes \$28 billion to \$40 billion. This assumes that etravel becomes 25 percent of broader e-commerce by 2025, consistent with trend observed in China.

⁹ Potential estimate of economic value from efficient logistics and shared transport.

¹⁰ Potential estimate of economic value from digitally enabled power distribution and smart grid with distributed generation.

Source: McKinsey Global Institute analysis

## **Productivity unlocked by digital applications could create up to 65 million jobs for Indians by 2025, but up to 45 million workers will need retraining and redeployment**

Prior MGI research on the effects of automation and other technologies on work has found that while some jobs will be displaced, and others created, most occupations will change as machines complement humans in the workplace.<sup>16</sup> That in turn will require a new focus on retraining. For India, we estimate that the new digital economy may render obsolete all or parts of 40 million to 45 million existing jobs by 2025, particularly those in highly predictable, nonphysical activities, such as the work of data-entry operators, bank tellers, clerks, and insurance claims- and policy-processing staff. Consequently, many millions who currently hold these jobs will need to be retrained and redeployed.

At the same time, heightened productivity and increased demand generated by digital technology applications may create enough new jobs to offset that substitution and employ more workers if the requisite training and investments are made. We estimate that 60 million to 65 million new jobs could be created through the direct impact of productivity-boosting digital applications.

## **New skills will be needed for jobs of the future**

Jobs of the future will be more skill-intensive. The need for functional digital literacy will increase across the board. For example, many more delivery workers will need to use apps to navigate their way around the city, shop floor workers will need to understand and respond to the output of precision control systems, farm advisory agents will need to read intelligent apps on their tablets and discuss implications with farmers, and health workers will need to learn how to extract and upload data into intelligent health management information systems. Routine tasks like data processing will be increasingly automated.

Along with rising demand for skills in emerging digital technologies (such as the Internet of Things, artificial intelligence, and 3-D printing), demand for higher cognitive, social, and emotional skills, such as creativity, unstructured problem solving, teamwork, and communication, will also increase. These are skills that machines, for now, are unable to master. As the technology evolves and develops, individuals will need to constantly learn and relearn marketable skills throughout their lifetime. India will need to create affordable and effective education and training programs at scale, not just for new job market entrants but also for midcareer workers.

## **Four sectors in which digital forces can have a transformative effect**

To capture the potential economic value that we size at a macro level, businesses will need to deliver digital technologies at a micro level: that is, use digital technologies to fundamentally change the way individuals and businesses interact and perform day-to-day activities. We examine the potential shifts in interactions between individuals and institutions (predominantly businesses, although government agencies also play important roles in many value chains). These interactions will shift because of three digital forces: those that allow people to connect or collaborate, transact, and share information; those that enable organisations to automate routine tasks to increase productivity; and those that provide the tools for organisations to analyse data to make insights and improve decision making. The interplay of these three forces will lead to the emergence of new data ecosystems in virtually every business sector or domain, spurring new products, services, and channels, and creating economic value for consumers as well as components of the ecosystem that best adapt their business models.

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<sup>16</sup> See *Jobs lost, jobs gained: Workforce transitions in a time of automation*, McKinsey Global Institute, December 2017. For this report, we used similar analysis with different time frames.

# 40%

The percentage of India's labour force that works in agriculture

To highlight the kinds of business model changes that companies should envisage and prepare for, we examine how the connect-automate-analyse trio can play out across four sectors: agriculture, healthcare, retail, and logistics.

**Digital agriculture:** More than 40 percent of India's labour force works in agriculture, which contributes about 18 percent of the country's GDP.<sup>17</sup> Farms are small, averaging a little more than one hectare, and inefficient, with crop yields ranging from 50 to 90 percent of those in Brazil, China, Russia, and other developing economies.<sup>18</sup> Many factors contribute to this. Indian farmers have a dearth of machinery and relatively little data on soil health, weather, and other variables; according to the government's online farmer advisory portal, about 50 percent of farmers' queries pertain to weather-related information.<sup>19</sup> Because of poor logistics and warehousing, about \$15 billion worth of agricultural produce went to waste before reaching consumers in 2013.<sup>20</sup>

Digital technology can transform India's agriculture ecosystem in several ways (Exhibit E7). Online bank accounts can provide the income and spending data that farmers need to qualify for cheaper credit from banks. Digital land-registry records could make crop insurance available to more farmers. Precision agriculture—delivering real-time data to farmers' mobile phones to help them optimise fertiliser, pesticide, and other inputs—can increase yields by 15 percent or more.<sup>21</sup> After harvest, farmers could use variants of online marketplaces for agricultural produce to transact with a larger pool of potential buyers. One such platform, the government's electronic National Agriculture Market, or eNAM, is available in 585 locations in 16 states and shows potential to increase prices realised by farmers by 15 percent.<sup>22</sup> Combined, these and other digital technologies can help food production better keep pace with population growth and add \$50 billion to \$65 billion of economic value in 2025.<sup>23</sup>

<sup>17</sup> Our estimates based on official data sources including *Report on fifth annual employment-unemployment survey (2015–16)*, Ministry of Labour and Employment, Government of India; *First advance estimates of national income 2018–19*, Ministry of Statistics and Programme Implementation press release, January 7, 2019.

<sup>18</sup> *India's technology opportunity: Transforming work, empowering people*, McKinsey Global Institute, December 2014.

<sup>19</sup> Kisan Call Centre dashboard, mKisan, Government of India.

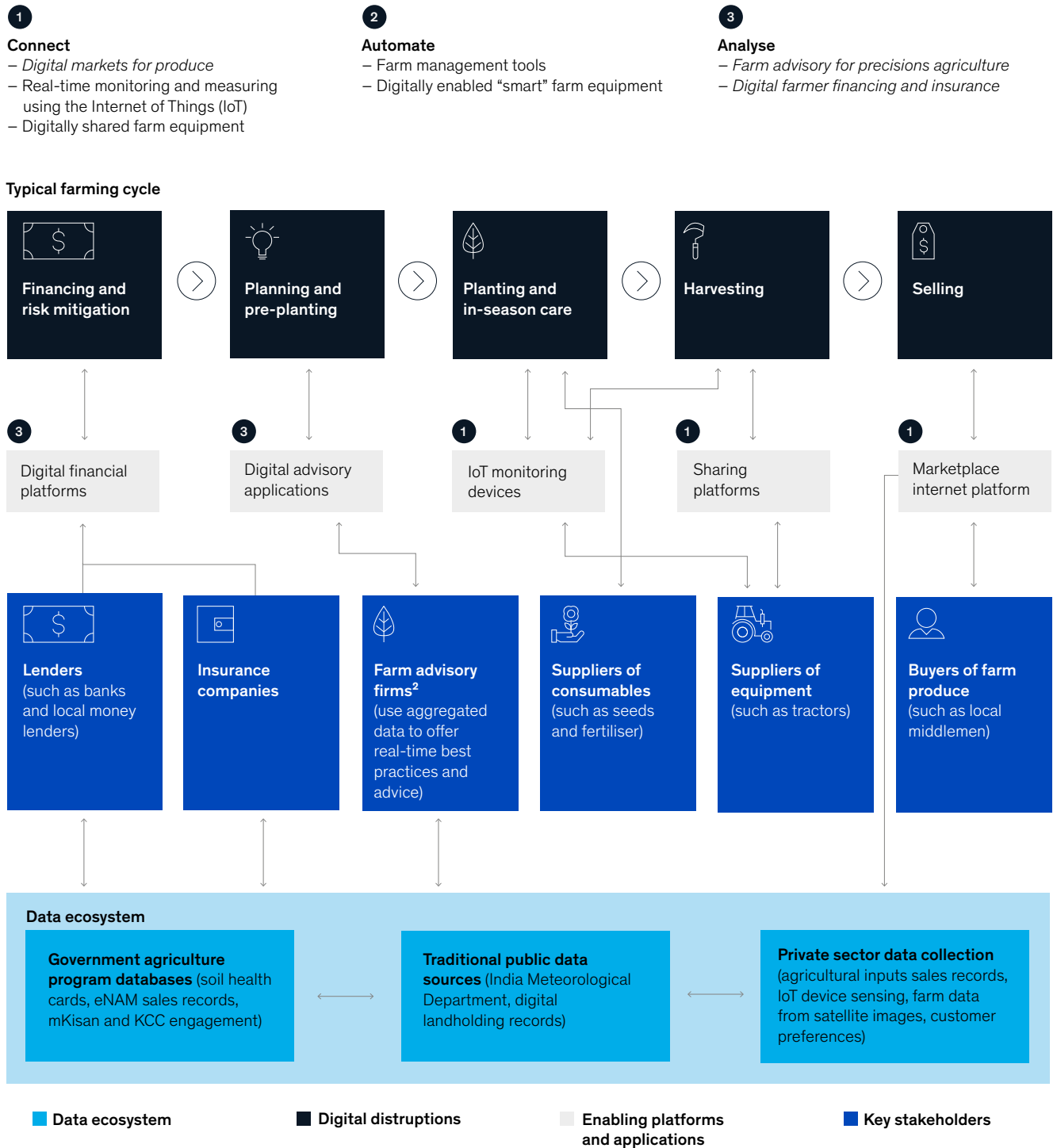
<sup>20</sup> *Wastage of agricultural produce*, Ministry of Food Processing Industries press release, August 9, 2016.

<sup>21</sup> *Digital transformation initiative: Unlocking \$100 trillion for business and society from digital transformation*, World Economic Forum, January 2017; *Rapid introduction and market development for urea deep placement technology for lowland transplanted rice*, International Fertilizer Development Centre, 2017.

<sup>22</sup> Ramesh Chand, *Doubling farmers' income: Rationale, strategy, prospects and action plan*, National Institution for Transforming India policy paper number 1/2017, March 2017; eNAM, Ministry of Agriculture and Farmers Welfare, Government of India, May 2018.

<sup>23</sup> Ramesh Chand, *Doubling farmers' income: Rationale, strategy, prospects and action plan*, National Institution for Transforming India policy paper number 1/2017, March 2017.

## Farms of the future: making data-driven decisions from seeding to selling.<sup>1</sup>



<sup>1</sup> This schema imagines how the Indian agricultural landscape could look in five to ten years if digital applications were to be widely adopted. This would require an open and interoperable data ecosystem, clear guidelines about data ownership and usage, wide availability of broadband connectivity in rural areas, and digital literacy among farmers.

<sup>2</sup> This role in the ecosystem could be taken on by a new player (a startup) or an existing player (such as suppliers of consumables or equipment).

NOTE: Applications in italic type are explored in depth in this report.

SOURCE: McKinsey Global Institute analysis

**Digital healthcare:** India has too few doctors, not enough hospital beds, and a declining share of state spending on healthcare relative to GDP.<sup>24</sup> While life expectancy has risen to 68.3 years from 37 in 1951, the country still ranks 125th globally.<sup>25</sup> Indian women are three times as likely to die in childbirth as women in Brazil, Russia, China, and South Africa—and ten times as likely as women in the United States.<sup>26</sup> India also trails other big emerging economies in infant mortality, childhood nutrition, and other public health markers. India has the world's highest incidence of tuberculosis, the most cases of HIV/AIDS outside of Africa, and three-fourths of all malaria cases in South and Southeast Asia. Indians are less likely to survive breast cancer than people in China or the United States, and more likely to succumb to heart attacks at an earlier age.

Digital solutions can help, not just in alleviating the demand-supply mismatch by freeing up 15 percent of the time of scarce healthcare professionals, but also in improving quality and trust (Exhibit E8). Telemedicine lets doctors consult with patients over a digital voice or video link rather than in person; this could enable them to see more patients, thereby easing the doctor shortage in rural areas. In trials and pilots, telemedicine cuts consultation costs by about 30 percent. If telemedicine replaced 30 to 40 percent of in-person outpatient consultations, India could save up to \$10 billion and improve care for the poor and those living in remote areas. Consolidating individual patients' lifelong medical history into an electronic health record (EHR) can help healthcare providers make more accurate diagnoses and lower the risk of medical errors. Once stripped of information that could identify patients, EHRs also could reduce administrative costs and provide data for medical research. Some hospitals in India already practice evidence-based care, using digital platforms to give doctors and nurses access to the best recent research to supplement their clinical expertise. The Manipal Hospitals chain of medical centres uses IBM Watson for Oncology, a cognitive computing platform, to analyse cancer patients' records and present oncologists with a range of potential diagnoses and personalised treatment options.<sup>27</sup>

**Digital retail:** More than 80 percent of all retail outlets in India—most of them sole proprietorships or mom-and-pop shops—operate in the cash-driven informal economy. That compares with 55 percent of retailers in China and 35 percent in Brazil.<sup>28</sup> Because a large part of their trade happens in cash, owners of these businesses do not generate the financial records needed to apply for a bank loan. That limits their growth potential and their opportunity to acquire productivity-enhancing digital tools. Large retailers have their own troubles. Their business models, based on manual store operations and high inventory levels, are capital heavy. They tend to give little thought to customers' in-store experiences or long-term loyalty. In many cases, retailers' marketing practices are outdated and ineffective, and their prices are static regardless of inventory or demand.

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<sup>24</sup> *Current health expenditure (percent of GDP)*, World Bank, 2015.

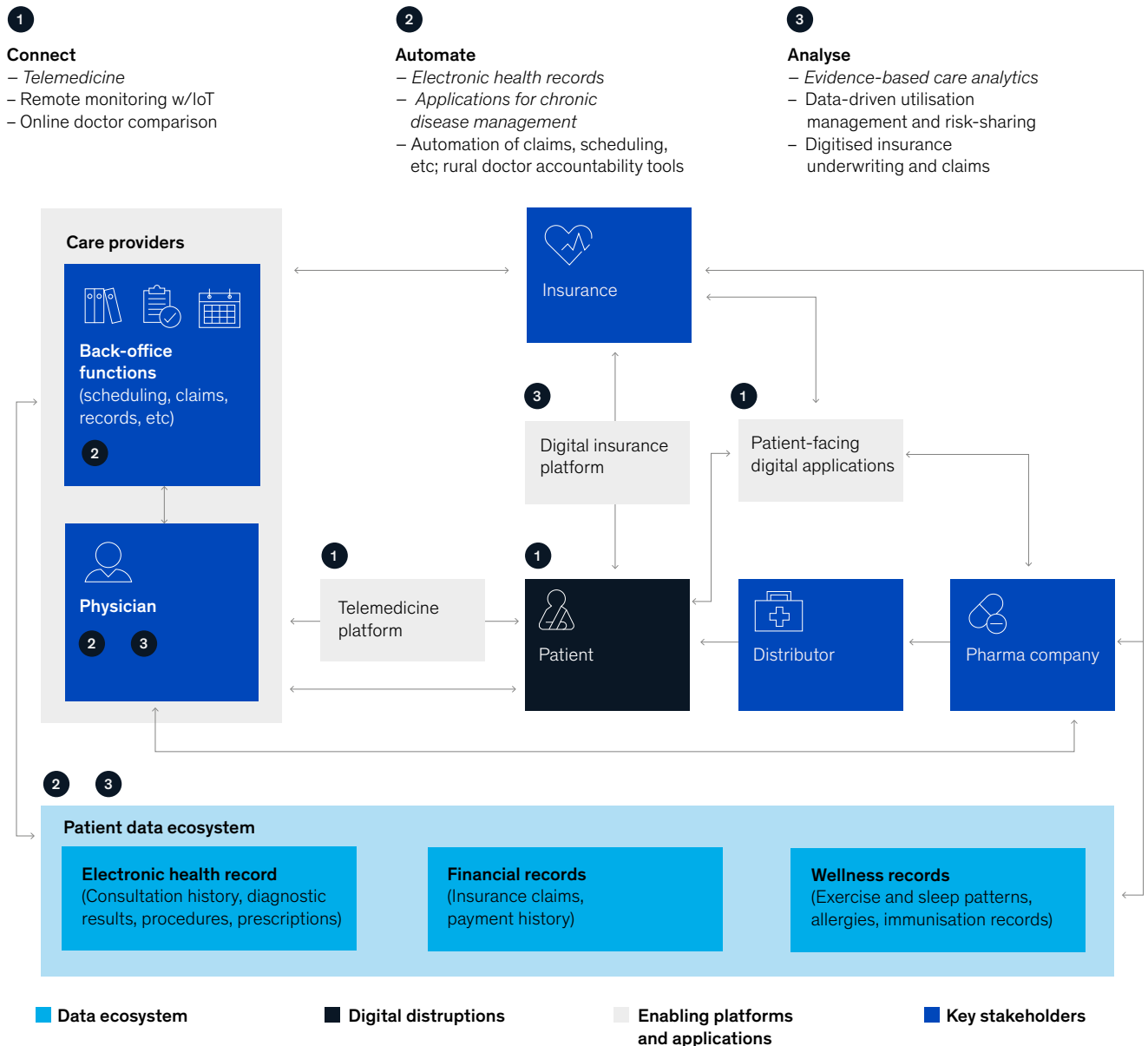
<sup>25</sup> *World health statistics 2018*, World Health Organization.

<sup>26</sup> *Healthcare in India: New milestones, new frontiers*, Organisation of Pharmaceutical Producers of India, December 2016.

<sup>27</sup> "Manipal Hospitals announces national launch of IBM Watson for Oncology: Evidence-based cancer care now available pan-India for Manipal and non-Manipal patients", IBM press release, July 29, 2016, [ibm.com/press](http://ibm.com/press).

<sup>28</sup> "Traditional grocery stores" category in Euromonitor International Retailing Edition 2019; we refer to traditional grocery stores as mom-and-pop stores.

## Healthcare in the future: digital technologies enable seamless care centered on patients.<sup>1</sup>



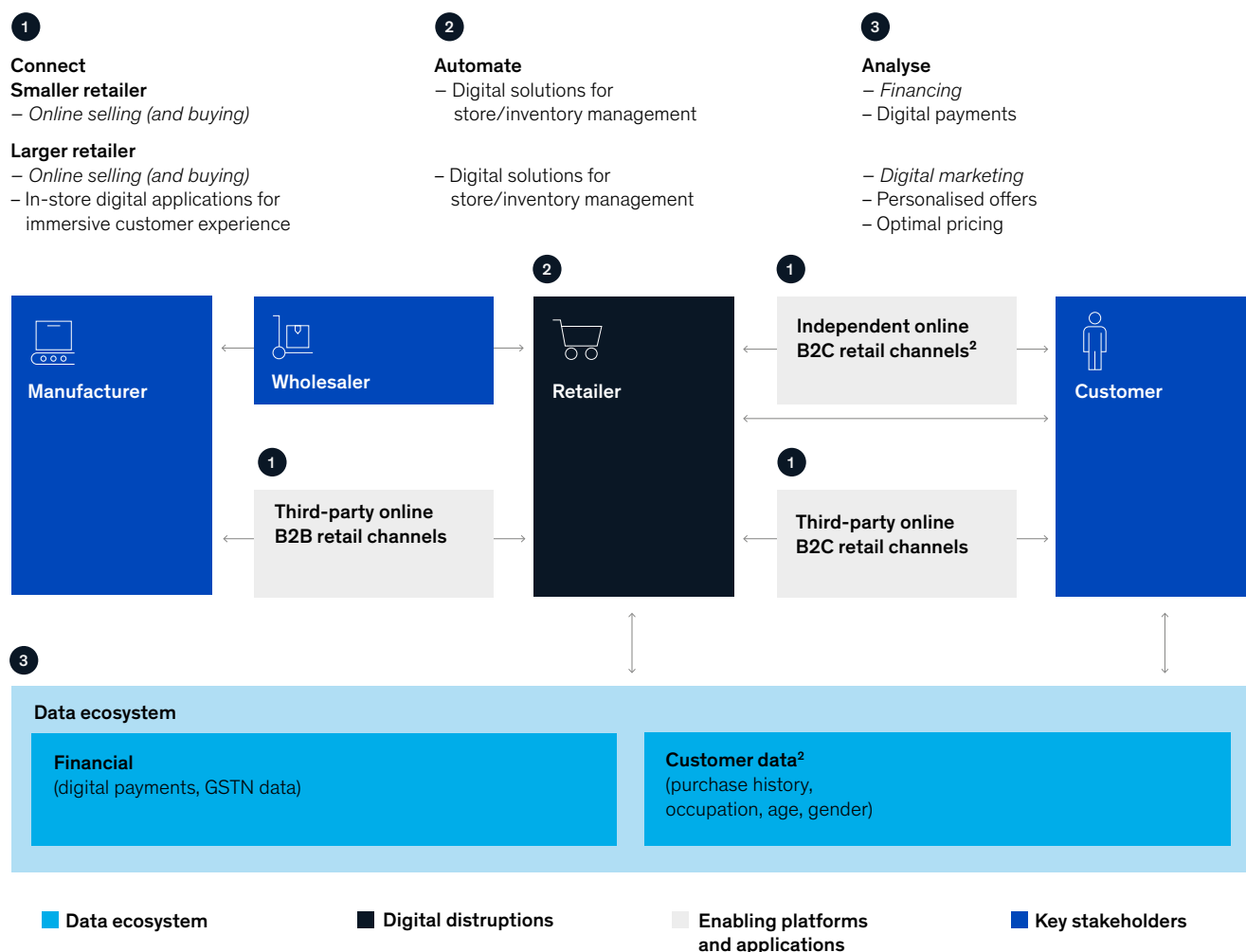
<sup>1</sup> This schema imagines how the Indian healthcare landscape could look in five to ten years if digital applications were widely adopted. This would require an open and interoperable electronic health record ecosystem, clear guidelines about data ownership and privacy, the wide availability of broadband connectivity in rural areas, and rules about who can see records.

NOTE: Applications in italic type are explored in depth in this report.

SOURCE: McKinsey Global Institute analysis

Digital solutions could reshape interactions among players in the value chain (Exhibit E9). E-commerce can enable retailers to expand without resorting to the capital-intensive brick-and-mortar model. Some do not even bother with their own website, instead relying on third-party sites like Amazon, which offer large, ready pools of shoppers along with logistics, inventory, and payment services as well as customer data analytics. Likewise, digital payments automatically create financial records to establish the creditworthiness of both the store and its customers, making access to formal finance easier. Digital marketing, through social media or other means, can engage customers and build brand loyalty. We estimate that e-commerce sales in India would grow faster than sales at brick-and-mortar outlets, allowing digital retail to increase its share of trade from 5 percent currently to about 15 percent by 2025.

## Retail in the future: data-enriched client experiences, online and in stores.<sup>1</sup>



<sup>1</sup> This schema imagines how the Indian retail landscape could look in five to ten years if digital applications were widely adopted. This would require clear rules about permissible e-commerce practices, significant growth in consumer banking and digital payments, wide availability of broadband connectivity in rural areas, continued growth in internet subscribers and smartphone owners, and widespread digital literacy among consumers.

<sup>2</sup> This is relevant primarily for large retailers.

NOTE: Applications in italic type are explored in depth in this report.

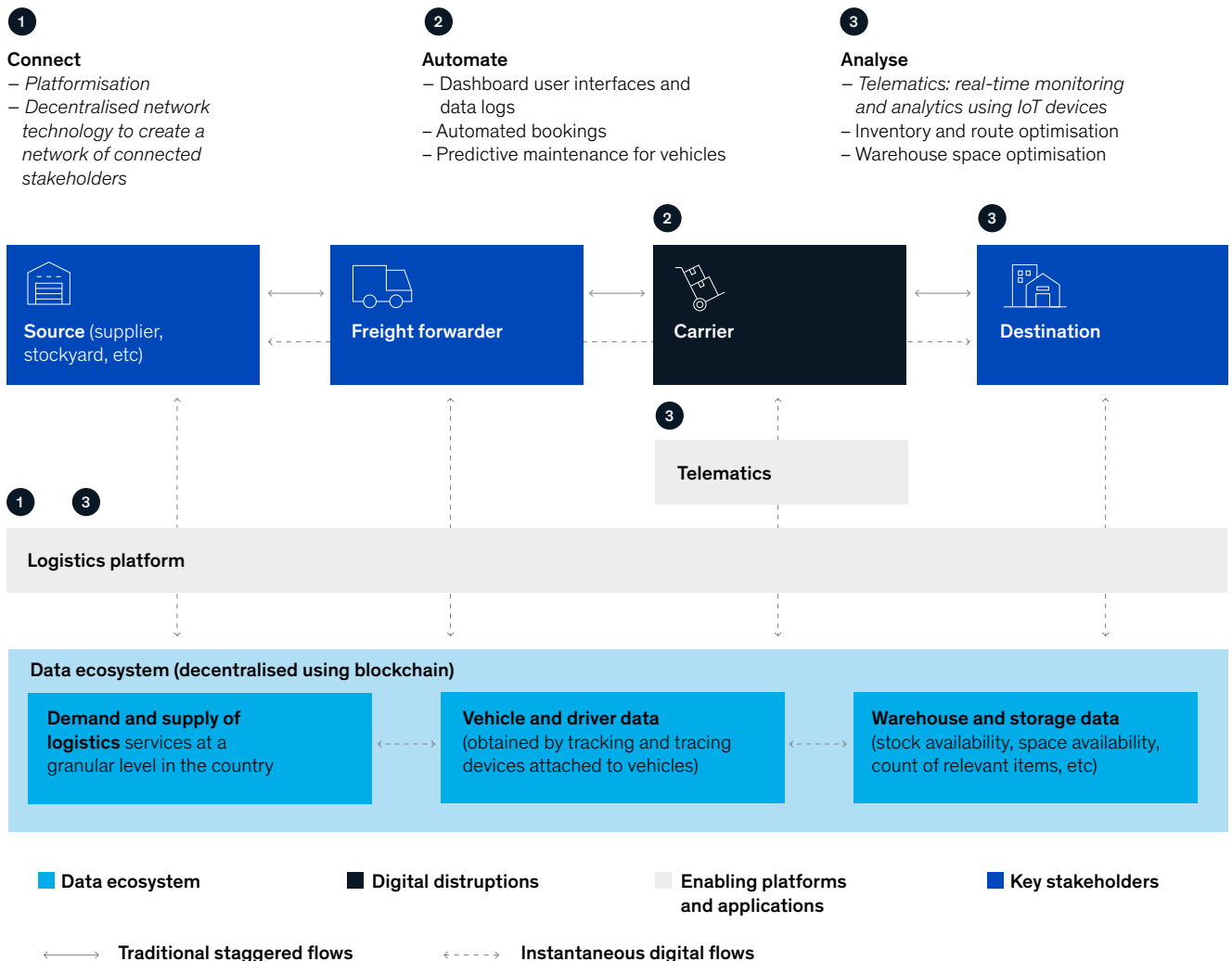
SOURCE: McKinsey Global Institute analysis

**Digital logistics (including transportation):** Economists forecast that India will add more than \$1 trillion of incremental GDP by 2022, one of only five economies globally to achieve this feat.<sup>29</sup> That would challenge the overburdened logistics network, which already suffers from a fragmented trucking industry, inadequate railways infrastructure, and a shortage of warehousing. India spends about 14 percent of GDP on logistics, compared with 12 percent in South America, 9 percent in Europe, and 8 percent in the United States, according to McKinsey estimates. High costs and low performance assume greater importance in light of the government's "Make in India" programme, which seeks to increase manufacturing's share of GDP from about 16 percent to 25 percent by 2022.

Digital transformation is likely even in this traditional, physical sector (Exhibit E10). To prevent logistics from getting in the way, the government is creating a transactional e-marketplace,

<sup>29</sup> The \$1 trillion incremental GDP estimate assumes that India continues growing at its current rate. GDP per capita growth has exceeded 5 percent annually since 1995. See *Outperformers: High-growth emerging economies and the companies that propel them*, McKinsey Global Institute, September 2018, and *Global Outlook*, Economist Intelligence Unit, January 2019.

## Logistics in the future: digital technologies allow supply-chain consolidation and analysis.<sup>1</sup>



<sup>1</sup> This schema imagines how the Indian logistics landscape could look in five to ten years if digital applications were widely adopted. This would require robust roads, railways, ports, and other infrastructure; standards for logistics data sharing; and rules on ownership and liability.

NOTE: Applications in italic type are explored in depth in this report.

SOURCE: McKinsey Global Institute analysis

the National Logistics Platform, to connect shipping agencies, logistics services, inland container depots, container freight stations, banks, and insurance agencies with customs authorities, seaport and airport officials, and railways managers.<sup>30</sup> By creating a place where stakeholders can share information and coordinate plans, the platform is intended to speed deliveries, reduce inventory requirements, and smooth order processing.

Private logistics firms also are enlisting digital solutions to streamline operations. These include moving freight booking online, automating customer service, installing tracking devices to monitor truck and cargo movements and increase productivity, leveraging real-time weather and traffic data to map the most efficient routes, and equipping trucks with internet-linked sensors that alert dispatchers when a vehicle needs maintenance. According to McKinsey estimates, digital interventions that result in higher system efficiency and better asset utilisation can reduce logistics costs by 15 to 25 percent.

<sup>30</sup> "Department of Commerce developing national logistics portal", Ministry of Commerce & Industry press release, August 23, 2018, pib.nic.in.

## Implications for business, government, and individuals

For India to reap the full benefits of digitisation—and minimise the pain of transitioning to a digital economy—business leaders, government officials, and individual citizens must play distinct roles and work together.

**Business leaders** will need to assess how and where digital could disrupt their company and industry and set priorities for how to adapt to the changing environment. Potential disruptions and benefits may be particularly large in India because of its scale, the rapid pace of digitisation, and its relatively low current productivity in many sectors. For firms to seize the benefits of these digital changes, leaders will need to act quickly and decisively to adapt their companies' existing business models and to digitise internal operations. In this context, four imperatives stand out.

First, companies will need to take smart risks in adapting current business models and adopting new, disruptive ones. Only 46 percent of Indian firms in our survey reported having a coordinated plan to change their long-term operations to react to large-scale disruption.

Second, digital should be front of mind as executives strategise. Customers are becoming more digitally literate and have come to expect the convenience and speed of digital, whether they are shopping online or questioning a billing irregularity, but many companies do not meet their expectations. In our survey, 80 percent of firms cite digital as a “top priority”, but only 41 percent say their digital strategy is fully integrated with the company's overall strategy.

Third, firms will need to invest in building digital capabilities quickly, especially hiring talent needed to implement and accelerate digital transformation. That is especially challenging in India because many of its most talented workers emigrate and rarely return. Companies could partner with universities to recruit and develop talent, beginning with digital natives who are currently enrolled or have recently finished their studies. Skills and capabilities that need to be developed in this cohort include nonlinear and lateral thinking to go beyond well-defined processes and methodologies, a strong technology-first bias when solving business problems, and an “open source mentality” that helps students stitch together multiple sources of knowledge to solve problems. Companies will also need to build deeper understanding of technology and capabilities at all levels of their organisations, including in the C-suite. Senior executives will need to champion digital and advanced analytics initiatives across their firms.

Finally, firms will need to encourage agile, digital-first organisation. This may require a new attitude that puts digital first, starting with a “test and learn” mind-set that encourages rapid iteration and a high tolerance for failure and redeployment.

**India's government** has done much to encourage digital progress, from clarifying regulations to improving infrastructure to launching the Digital India initiative, an ambitious plan to double the size of the country's digital economy. However, much work remains to be done for India to capture its full digital potential. Government can help by partnering with the private sector to drive digitisation.

Most directly, national and state governments can foster digital growth by continuing to invest in digital infrastructure and the digitisation of government operations. This helps by providing a market for digital solutions, which generates revenue for providers and encourages startups, by expanding access to high-speed internet connectivity, and by giving people more reasons to sign on—whether to receive a cooking-gas subsidy or register the purchase of property.

Government can help further in at least three ways: by creating and administering public data sources that public and private organisations can leverage to improve products and services and even create new ones; by fostering a regulatory environment that supports digital adoption while also protecting citizens' privacy; and by facilitating the evolution of labour markets in industries disrupted by automation.

**Individual Indians** are already reaping the benefits of digitisation as consumers, but they will need to be cognisant that its disruptive powers can affect their lives and work in other fundamental ways, too. As workers in an environment impacted by digital technologies, individuals will need to be aware of how their work may change and what skills they will need to thrive in the future, as well as looking for opportunities to capture the benefits of a new digital-led economy and workplace. Individuals will also need to become stewards of their personal data and sceptical consumers of information.

Preparation can start with awareness of industry innovations and disruptive technologies and with learning how they might affect competing firms and the people who work for them. Preparing for change may involve becoming comfortable with basic digital tools such as mobile phones and the internet, acquiring additional skills in a worker's current industry, or training for a new line of work.

Workers can also get ahead by building an online presence: as employers increasingly post and fill positions online, it is essential for job hunters to create a personal profile on one or more platform. Thousands of Indians are already using digital technologies to become their own boss; India accounts for 21.5 percent of workers signed up to online outsourcing sites worldwide, second only to the United States. When they are engaged full time, these online outsourcing workers frequently earn as much as or more than Indians in conventional employment.

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India's digital advances over the past few years have gained momentum as both the public and private sectors have propelled the country into the forefront of the world's consumers of internet and digital applications. Indian business, too, has embraced digital, albeit unevenly, with adoption varying widely among companies and sectors. Navigating the emerging digital landscape is not easy, but it is one of the golden keys to India's future growth and prosperity. Unlocking the opportunities will be a challenge for the government, for businesses large and small, and for individual Indians across the subcontinent, and some pain will accompany the gains. But if India can continue its digital growth trajectory and accelerate further, the rewards will be palpable to millions of businesses and hundreds of millions of citizens.

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