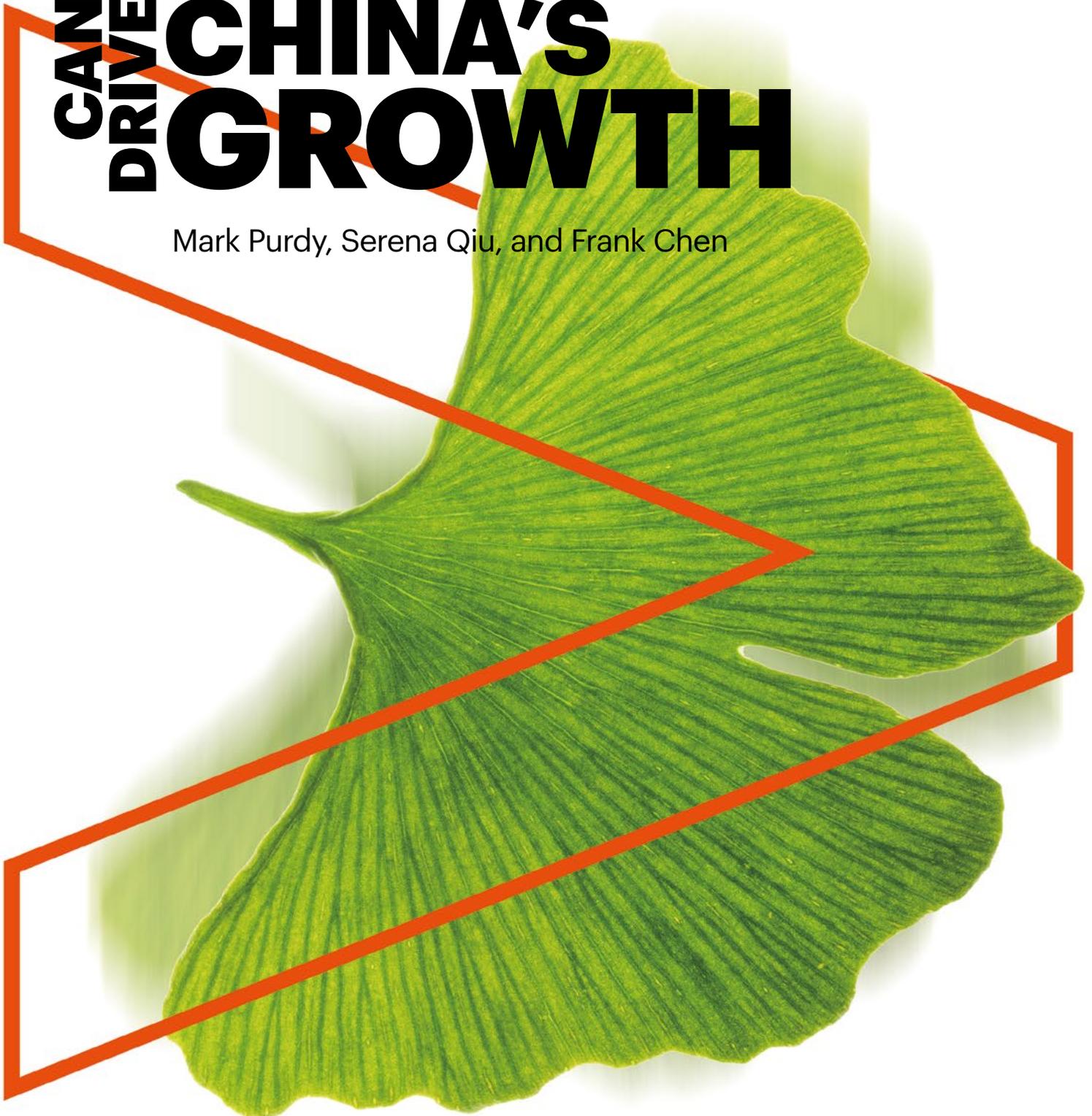


# HOW ARTIFICIAL INTELLIGENCE CAN DRIVE CHINA'S GROWTH

Mark Purdy, Serena Qiu, and Frank Chen



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# China can no longer depend on increases in capital and labor to drive desired levels of economic growth. Fortunately, a new factor of production – artificial intelligence – has emerged that promises to transform the basis of the country’s economic progress.

Globally, there has been marked decline in the ability of increases in capital investment and in labor to propel economic progress. These two levers are the traditional drivers of production, yet they are no longer able to sustain the steady march of prosperity enjoyed in previous decades in many economies.

China is no exception. The economy has slowed significantly, labor shortages and a capital crunch have disrupted the old growth model, and productivity has dwindled.

But long-term pessimism is unwarranted. With the recent convergence of a transformative set of technologies, economies are entering a new era in which artificial intelligence (AI) has the potential to overcome the physical limitations of capital and labor and open up new sources of value and growth.

Indeed, a recent analysis by Accenture revealed that AI has the potential to add as much as 1.6 percentage points to China’s economic growth rate by 2035.

This potential has not been lost on China’s policy makers. Since 2014, the government has launched a series of national economic initiatives, including the 13th Five Year Plan, Made in China 2025, the Robotics Industry Development Plan, and the Three-year Guidance for Internet Plus Artificial Intelligence Plan. AI’s place among the nation’s economic priorities is clear: The goal is to create a 100 billion yuan (US\$15 billion) AI market by 2018.<sup>1</sup>

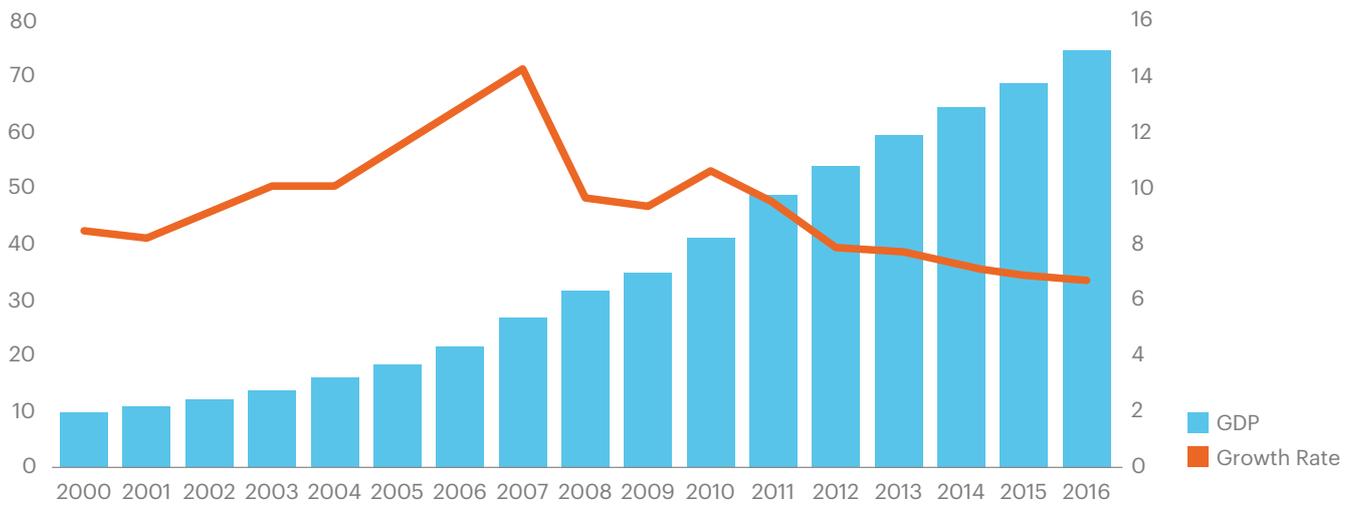
To successfully pursue this ambitious agenda, policy makers and business leaders must prepare for, and work toward, a future with artificial intelligence. To do this they must understand that AI is not simply another productivity enhancer. Rather, they must see AI as a tool that can transform our thinking about how growth is created.

# THE NEW FACTOR OF PRODUCTION

China's GDP growth has been shrinking over the last decade (Figure 1); those factors that propelled expansion in the past are clearly losing momentum. Meanwhile, the rate of improvement in economic efficiency is also declining.

FIGURE 1: CHINA'S GDP AND ITS GROWTH (RMB trillion, %)

China's GDP growth has steadily slowed.



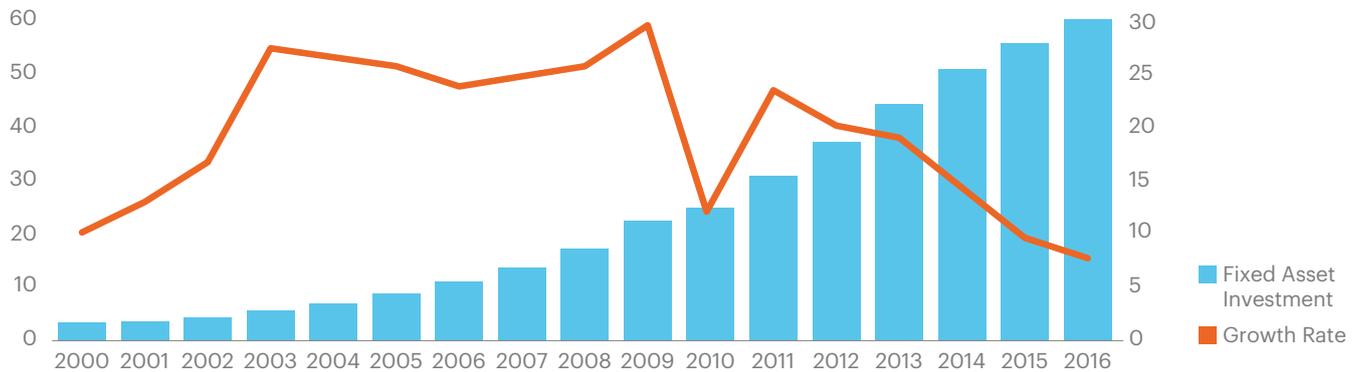
Source: National Bureau of Statistics of China

Over the last three decades, China has grown its economy by taking advantage of the country's demographic dividends and making heavy capital investment. However, as the economy has matured, this approach is no longer viable. Fixed-asset investment, the economic engine for 30 years, is now beset by overcapacity, high corporate debt and excessive real estate investment. Meanwhile, the growth of working age population is slowing rapidly (Figure 2 and 3).

China's economic slowdown highlights another area of weakness: productivity. Our previous research showed that although the period of China's rapid economic growth also saw impressive increases in productivity, it still lagged far behind developed countries.<sup>2</sup> More recently, growth of productivity has weakened significantly (Figure 4).

**FIGURE 2: CHINA'S FIXED ASSET INVESTMENT, 2000-2016 (RMB trillion, %)**

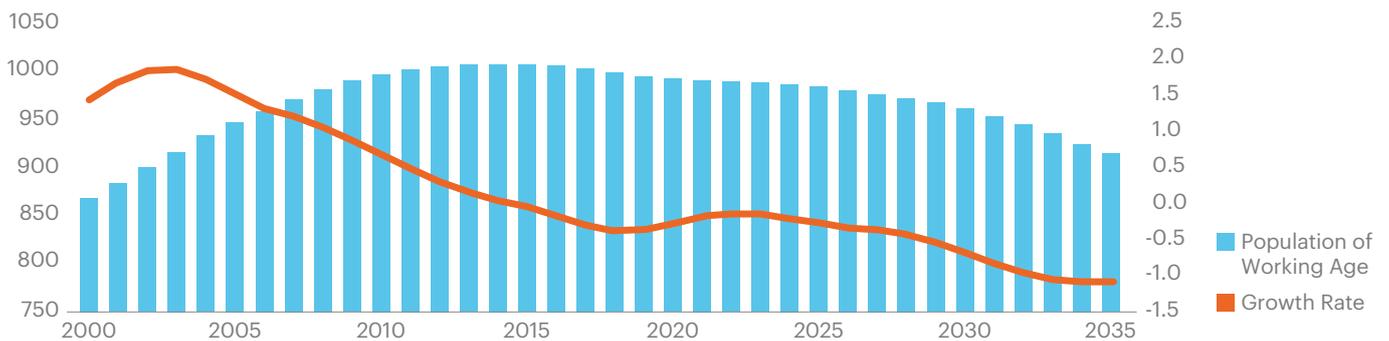
Growth of capital investment in China has begun to slow down.



Source: National Bureau of Statistics of China

**FIGURE 3: CHINA'S WORKING-AGE POPULATION, 2000-2035 (million, %)**

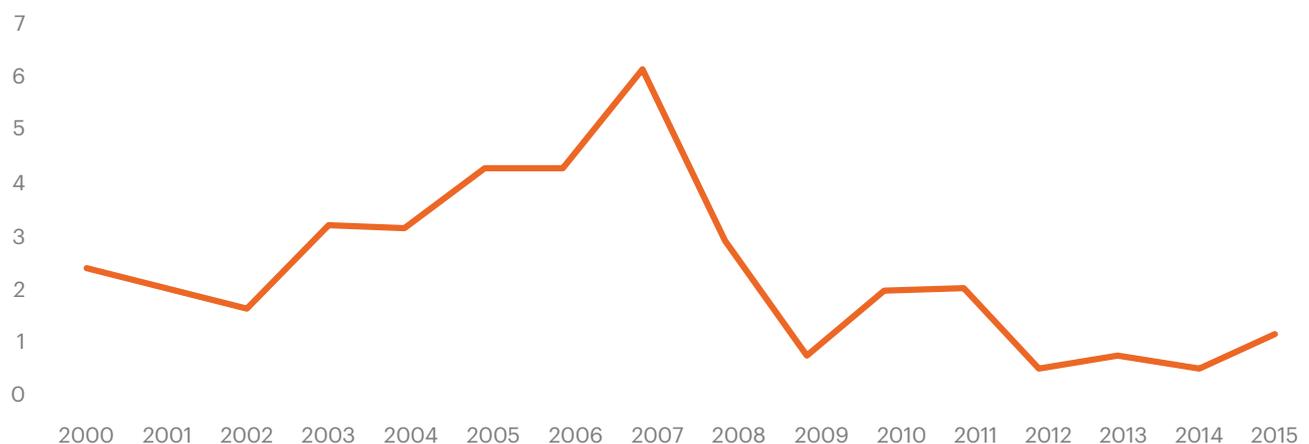
Fewer people are available to pick up the slack in the workforce.



Source: Oxford Economics

**FIGURE 4: CHINA'S TOTAL FACTOR PRODUCTIVITY GROWTH, 2000-2015 (%)**

A key measure of how well an economy uses its existing capital and people is "total factor productivity" (TFP). Data show China's TFP growth is shrinking in the past decade.



Source: The Conference Board, Total Economic Database

Yet as challenging as much of the economic data for China undoubtedly is, it only tells part the story.

The key missing element: the impact of new technologies on economic growth.

Traditionally, the “factors of production” that drive economic expansion are capital and labor (Figure 5). Growth occurs when the stock of capital or labor increases, or when they are used more efficiently. The growth that comes from innovation and technological change in the economy is captured in total factor productivity (TFP).

Economists have always thought of new technologies as driving growth through their ability to enhance TFP. This made sense for the great technological breakthroughs of the last century — electricity, railways and IT. However, these dramatic boosts to productivity did not create entirely new workforces.

Today, we are witnessing the emergence of another set of new technologies, commonly referred to as artificial intelligence (see “What is artificial intelligence?”). Many see AI as similar to past technological breakthroughs. If that is true, then it is reasonable to expect some growth as a result, but nothing transformational.

But what if AI has the potential to be not just another driver of total factor productivity, but an entirely new factor of production?

To understand the transformational nature of AI, it must be seen as a physical capital-labor hybrid. AI can replicate labor activities at much greater scale and speed, and even perform some tasks beyond the capabilities of humans. Moreover, in some areas it has the ability to learn faster than humans, if not yet as deeply. For example, by using virtual assistants, 1,000 legal documents can be reviewed in a matter of days, a task that would require three people six months to complete.<sup>3</sup>

### FIGURE 5: THE AI GROWTH MODEL

Our model adapts the traditional growth model by including AI as a factor of production.



NB: ▲ indicates the change in that factor.

Source: Accenture analysis

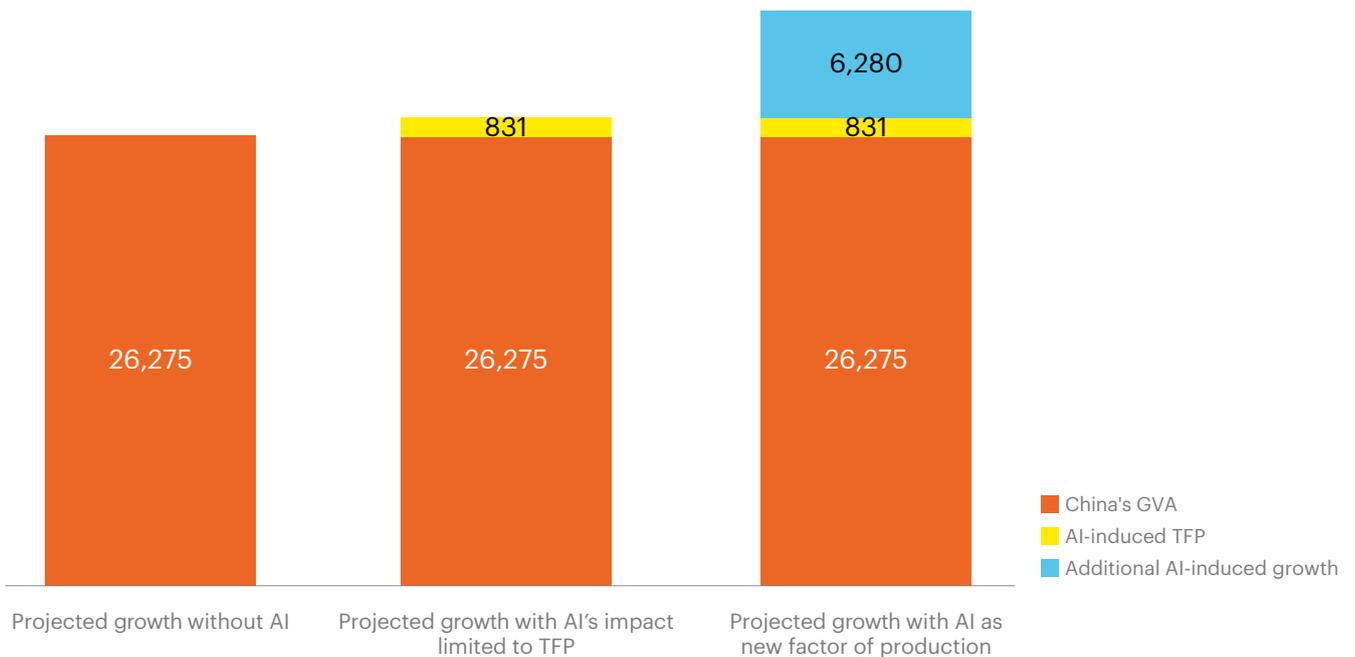
But AI can also take the form of physical capital such as robots and intelligent machines. And unlike conventional capital, such as machines and buildings, it can actually perform better over time, thanks to its self-learning capabilities.

Based on our analysis and modeling, we can illustrate what happens when AI is seen as a new factor of production rather than just a productivity enhancer. In China’s case, this translates into a significant increase in projected growth.

As Figure 6 shows, the first scenario is business-as-usual, assuming no AI effect. The second represents the traditional view of AI as a TFP enhancer where it has a limited impact on growth. The third scenario shows a transformative effect on growth when AI acts as a new factor of production. This ability of AI to complement and enhance traditional factors of production is where its true potential lies.

**FIGURE 6: THREE GROWTH SCENARIOS FOR CHINA’S ECONOMY**

AI as a new factor of production can lead to significant growth opportunities for China’s economy.



**China’s GVA in 2035 (US\$ billion)**

Source: Accenture and Frontier Economics



China is facing diminishing demographic dividends. But with AI's augmentation effect, China will again benefit significantly from its large population.<sup>4</sup>



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## WHAT IS ARTIFICIAL INTELLIGENCE?

AI is not a new field; much of its theoretical and technological underpinning was developed over the past 70 years by computer scientists such as Alan Turing, Marvin Minsky and John McCarthy. Today, the term refers to multiple technologies that can be combined in different ways to:



### Sense

Computer vision and audio processing, for example, are able to actively perceive the world around them by acquiring and processing images, sounds and speech. The use of facial recognition at border control kiosks is one practical example of how it can improve productivity.



### Comprehend

Natural language processing and inference engines can enable AI systems to analyze and understand the information collected. This technology is used to power the language translation feature of search engine results.



### Act

An AI system can take action through technologies such as expert systems and inference engines, or undertake actions in the physical world. Auto-pilot features and assisted-braking capabilities in cars are examples of this.

All three capabilities are underpinned by the ability to learn from experience and adapt over time. AI already exists to some degree in many industries but

the extent to which it is becoming part of our daily lives is set to grow fast.

**Two key factors are enabling AI growth:**

**1. Unlimited access to computing power.**

Public cloud computing was estimated to reach almost US\$70 billion in 2015 worldwide. Data storage has also become abundant.

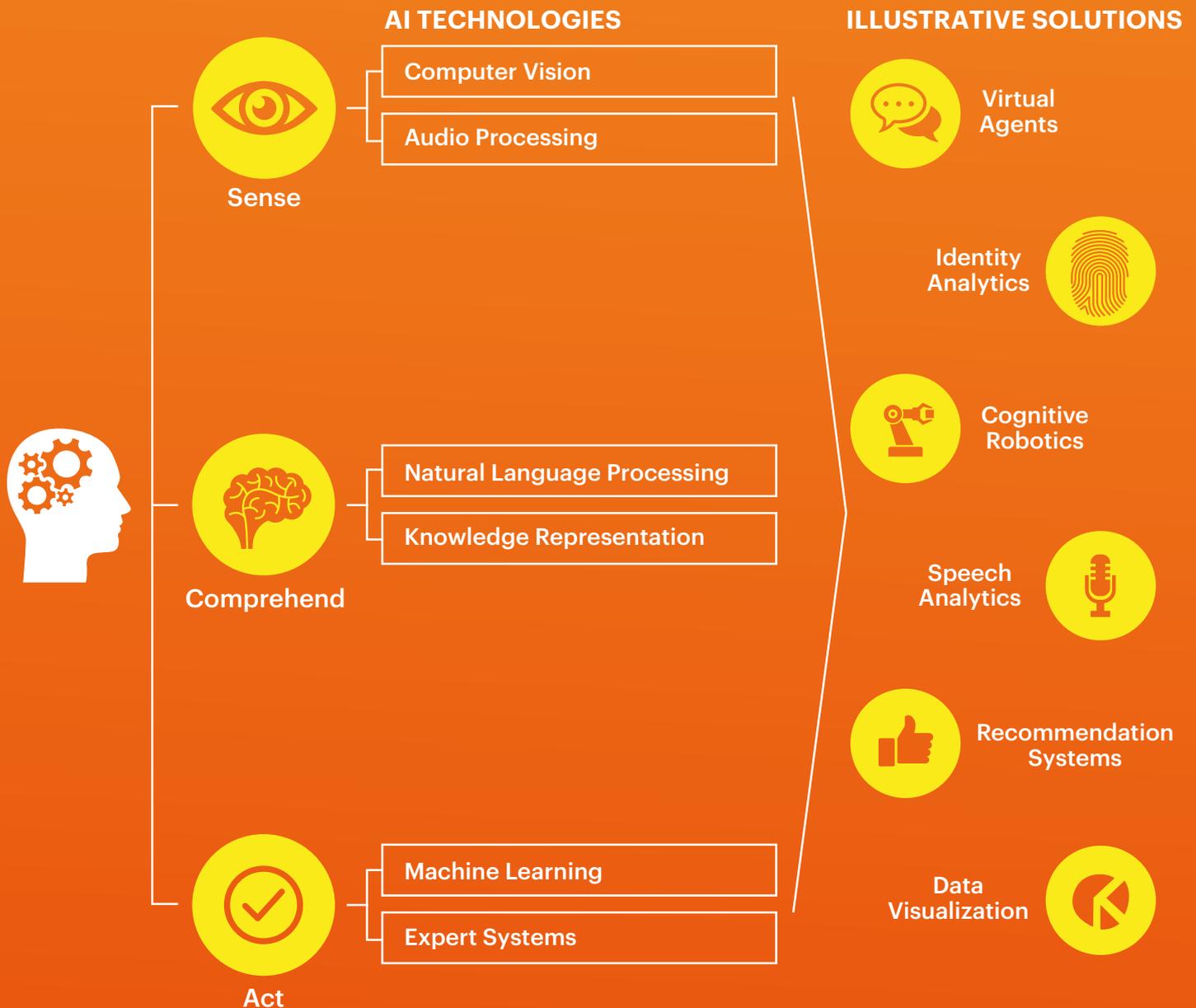
**2. Growth in big data.**

Global data has seen a compound annual growth rate (CAGR) of more than 50 percent since 2010 as more

of the devices around us have become connected. As Barry Smyth, professor of computer science at University College Dublin, told us: “Data is to AI what food is to humans.”

So in a more digital world, the exponential growth of data is constantly feeding AI improvements.

**FIGURE 7: EMERGING AI TECHNOLOGIES**



Source: Accenture analysis

# THREE CHANNELS OF AI-LED GROWTH

**As a new factor of production, AI can drive growth in at least three important ways. First, it can create a new virtual workforce — we call this effect “intelligent automation.” Second, AI can complement and enhance the skills and ability of existing workforces and physical capital. Third, like other previous technologies, AI can drive innovation in the economy. Over time, as economies use AI not only to do things differently but also to do different things, it becomes a catalyst for broad structural transformation.**

## Intelligent automation

The new AI-powered wave of intelligent automation is already creating growth through a set of features unlike those of traditional automation solutions.

The first feature is its ability to automate complex physical world tasks that require agility and adaptability. Consider the work of retrieving items in a warehouse, where companies have relied on people’s ability to maneuver in crowded spaces and avoid moving obstacles. Now, robots from California-based Fetch Robotics use lasers and 3D depth-sensors to navigate safely and work alongside warehouse workers. Used in tandem with people, the robots can handle the vast majority of items in a typical warehouse.<sup>5</sup>

A Chinese delivery company is using robots for package-sorting in its warehouses. The robots identify the destination of each package by scanning a bar code, thus minimizing sorting mistakes, and then take the packages to different areas around the sorting center. The machines can sort up to 200,000 packages a day and are self-charging, enabling them to operate around the clock. They have also improved efficiency by around 30 percent and maximized sorting accuracy.

Whereas traditional automation technology is task specific, the second distinct feature of AI-powered intelligent automation is its ability to solve problems across industries and job titles.

For instance, Amelia — an AI platform with natural language processing capabilities developed by the US firm IPsoft — can support maintenance engineers in remote locations. Having read all the manuals, Amelia can diagnose a problem and suggest a solution.<sup>6</sup>

This platform has also learned the answers to the 120 questions most frequently asked by mortgage brokers; one bank uses the platform to handle such financial queries, traditionally a labor-intensive task.<sup>7</sup>

The third and most powerful feature of intelligent automation is self-learning, enabled by repeatability at scale.

The wide adoption of “chatbots” — a computer program that conducts a conversation via auditory or textual methods — is a good example. A recent Accenture survey found that 68 percent of business leaders surveyed in China are currently using intelligent virtual assistant to create better customer interactions.<sup>8</sup> Like a conscientious employee, these chatbots recognize the gaps in their own knowledge and take steps to close them. If chatbots are presented with a question that they cannot answer, they escalate it to a human colleague, then observes how the person solves the problem.

The self-learning aspect of AI represents a fundamental change in the way work is done. Whereas traditional automation capital degrades over time, intelligent automation assets constantly improve.

## Labor and capital augmentation

A significant part of the economic growth from AI will come not from replacing existing labor and capital, but in enabling them to be used much more effectively.

Consider one challenge that hotel staff everywhere face. They spend a lot of time making routine room deliveries. AI-based robots can help. One type of robot, developed by California-based Savioke and called Relay, made more than 11,000 guest deliveries in the five large hotel chains where it is deployed. As Steve Cousins, CEO of Savioke, told us: “Relay enables staff to redirect their time toward increasing customer satisfaction.”

Moreover, AI augments labor by complementing human capabilities, offering employees new tools to enhance their natural intelligence.

For example, Praedicat, an American company providing risk modeling services to property and casualty insurers, is using machine learning and big data processing technologies to improve underwriters’ risk-pricing abilities. Its AI platform reads more than 22 million peer-reviewed scientific papers to identify serious emerging risks. As a result, underwriters can not only price risk more accurately, but also create new insurance products.

An AI start-up in China has launched a legal semantic case search service, which can quickly retrieve relevant legal cases. According to the input case description and key word, it draws out the most similar historical cases with their full written judgments, which include participants, proceedings, legal demand, investigation and defense. This service will be able to save lawyers from the redundant time-consuming case search process.

AI can also improve capital efficiency — a crucial factor in industries where it represents a large sunk cost. For instance, in manufacturing, Japanese industrial robotics company Fanuc has teamed up with Cisco and other firms to create a platform to reduce factory downtime — estimated at one automotive manufacturer to cost US\$20,000 per minute.<sup>9</sup> The Fanuc Intelligent Edge Link and Drive (FIELD) system is an analytics platform powered by advanced machine learning. It captures and analyzes data from disparate parts of the manufacturing process to improve manufacturing production. Already FIELD has been deployed in an 18-month “zero downtime” trial at one manufacturer, where it realized significant cost savings.<sup>10</sup> In China, a large utility company is leveraging AI to analyze large amounts of data generated throughout the grid and making real-time control decisions. AI helps solve the problems of heavy workload and poor security in the old insulator detection technology.

“AI could enable people to focus on more innovative work. From a macroeconomic perspective, that means AI will significantly drive industrial upgrading in China.”<sup>11</sup>

**ZHIGUO WANG,  
CO-FOUNDER, IFLYTEK**

### **Innovation diffusion**

One of the least-discussed benefits of artificial intelligence is its ability to stimulate innovation as it diffuses through the economy.

Take driverless vehicles for example. A combination of lasers, global positioning systems, radar, cameras, computer vision and machine learning algorithms can enable a driverless vehicle to sense its surroundings and act accordingly. Not only are Silicon Valley technology companies entering the market, but traditional companies are also building new partnerships to stay relevant. For instance, Ford is working with Massachusetts Institute of Technology and Stanford University.<sup>12</sup>

As innovation begets innovation, the potential impact of driverless vehicles on economies could eventually extend well beyond the automotive industry.

Mobile service providers could see even more demand from subscribers as drivers, now free to enjoy leisure activities while traveling, spend more time on the Internet, which, in turn, could create new advertising opportunities for the service providers and selling opportunities for their retailer partners. The insurance industry could create new revenue streams from the

masses of data that self-driving vehicles generate. By combining vehicle data with other streams such as smart phones and public transport systems, they could not only build up a more complete picture of their customers, but they could also create new policies that insure total customer mobility, not just driving.

Real-time, accurate road and traffic data generated by driverless vehicles could supplement other sources of information to enable local authorities to change the way they charge for road usage. Standard vehicle registration could be replaced with more equitable and convenient pay-per-use road tolls, with instantly updated prices to help reduce congestion.

There could even be significant social benefits. Driverless vehicles are expected to reduce the number of road accidents and traffic fatalities dramatically, making the technology potentially one of the most transformative public health initiatives in human history. They could also give back independence to people who cannot drive due to disability, enabling them to take up jobs from which they were previously excluded. And, even among those who can drive, driverless cars will make traveling far more convenient, freeing up time that people can dedicate to work or leisure.

# FACTORING IN AI

To understand the value of AI as a new factor of production in China, Accenture, in association with Frontier Economics, modeled its potential impact on the country's economy and its industries.

Our results reveal unprecedented opportunities for value creation. We find that AI has the potential to add up to 1.6 percentage points to China's annual economic growth rate — a powerful remedy for slowing rates of the recent years.

## Boosting national economic growth

To estimate the economic potential of AI we compared two scenarios for China. The first is the baseline, which shows the expected annual economic growth rate under current assumptions about the future. The second is the AI scenario, which shows expected economic growth once the impact of AI has been absorbed into the economy. As it takes time for the impact of a new technology to feed through, we used 2035 as the year of comparison. (see "Appendix: Modeling the GVA impact of AI").

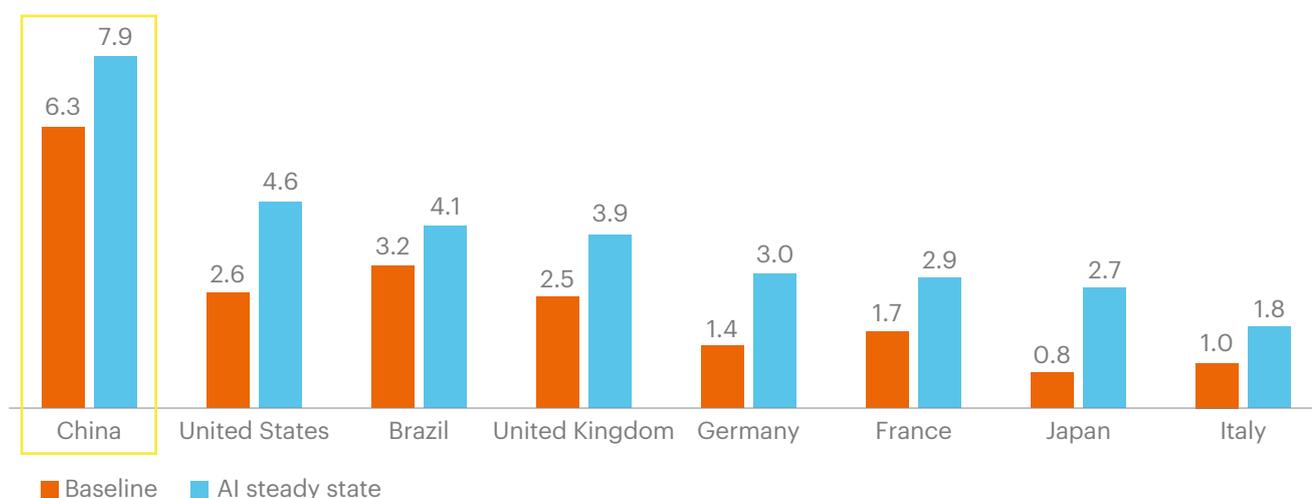
According to our research, AI will add 1.6 percentage points to China's expected growth in 2035 – or annual growth of nearly 8% under the AI scenario vs 6.3% under the baseline scenario. This translates to an additional US\$ 7.1 trillion gross value added (GVA) in 2035.

## Labor productivity revival

AI has the potential to boost China's labor productivity by 27 percent in 2035. This rise in labor productivity will not be driven by longer hours but by innovative technologies enabling people to make more efficient use of their time.

### FIGURE 8: THE ECONOMIC IMPACT OF AI

AI has the potential to increase China's annual growth rate by 1.6 percentage points by 2035 in terms of gross value added (a close approximation of GDP).

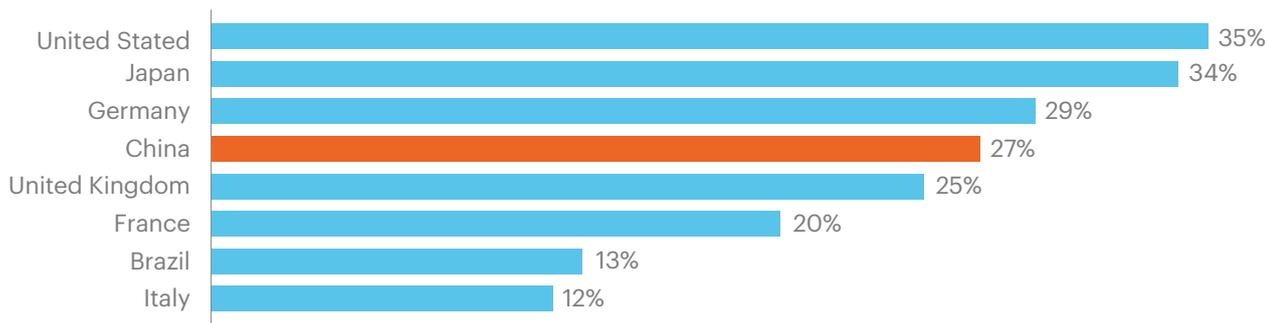


### Real gross value added by 2035 (%)

Source: Accenture and Frontier Economics

## FIGURE 9: INCREASE IN LABOR PRODUCTIVITY IN AN AI WORLD

AI promises to boost China’s labor productivity by 27% in 2035.



Source: Accenture and Frontier Economics

### Revitalizing China’s industries

Our economic modeling shows how AI could provide significant benefits for China at the national level. But what about among industries?

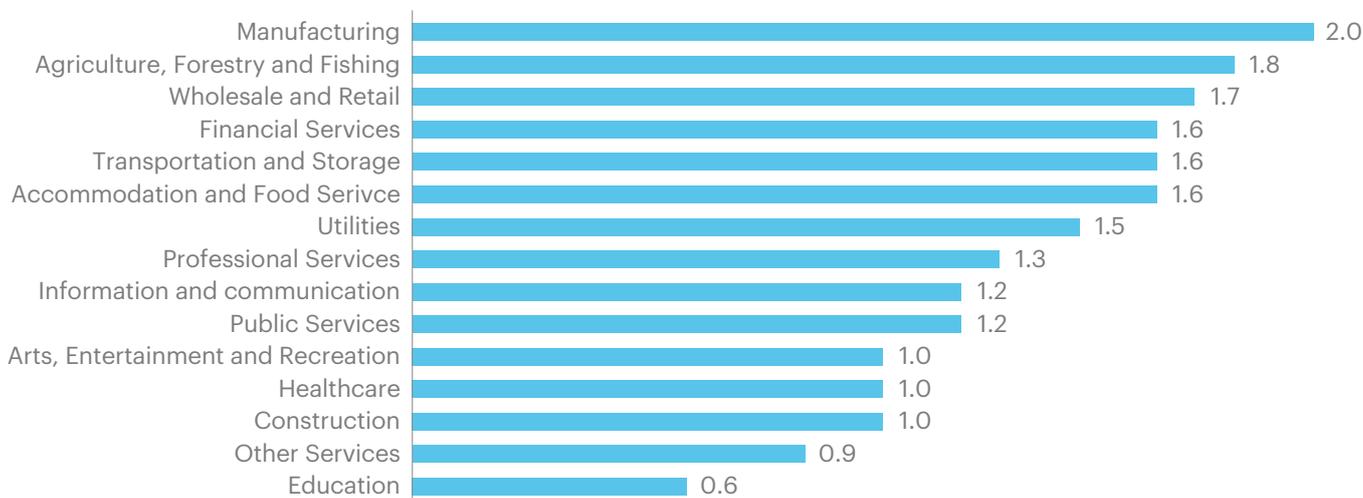
To understand its sector-specific economic potential for the country, we combined the results of our macro AI modelling with industry size data to illustrate the potential economic impact of AI on 15 diverse industries in China. Our analysis reveals that Manufacturing; Agriculture, Forestry and Fishing; and Wholesale and Retail are the three sectors that will benefit most from the application of AI, with boosts in their annual GVA growth rates by 2 percentage points, 1.8 percentage

points and 1.7 percentage points respectively by 2035.

With labor-intensive sectors — Wholesale and Retail; Arts, Entertainment and Recreation; and Healthcare — AI augments the human workforce, enabling people to become more productive over time and redirecting their focus to more critical tasks. For traditionally capital-intensive industries, the AI impact can be equally dramatic. In Manufacturing, for example, faulty machines and idle equipment will become a thing of the past as AI-powered systems deliver constantly rising rates of return due to their ability to learn, adapt and evolve over time. Things like rapid prototyping or dynamic resource allocation can significantly reduce time-to-market and cut costs in the process.

## FIGURE 10: AI’S IMPACT ON CHINA’S INDUSTRIES

Percentage difference of annual GVA growth rates between baseline and AI steady state by 2035.



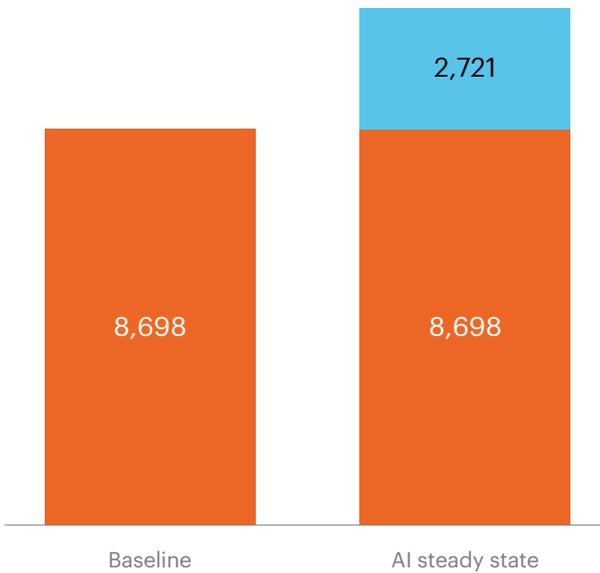
Source: Accenture analysis

# INDUSTRY SPOTLIGHTS

## Manufacturing

In Manufacturing, precursors like the Internet of Things (IoT) have created favorable conditions for the seamless integration of intelligent systems. Today's IoT technologies enable physical assets such as assembly lines to connect and communicate with digital systems. Moreover, AI can bridge the gap between current and more advanced forms of automation and learning. Our research shows that AI could add an additional US\$2.7 trillion GVA in 2035 to this sector — an increase of almost 31 percent compared with business-as-usual.

**FIGURE 11: CHINA'S MANUFACTURING GVA IN 2035 (US\$ billion)**

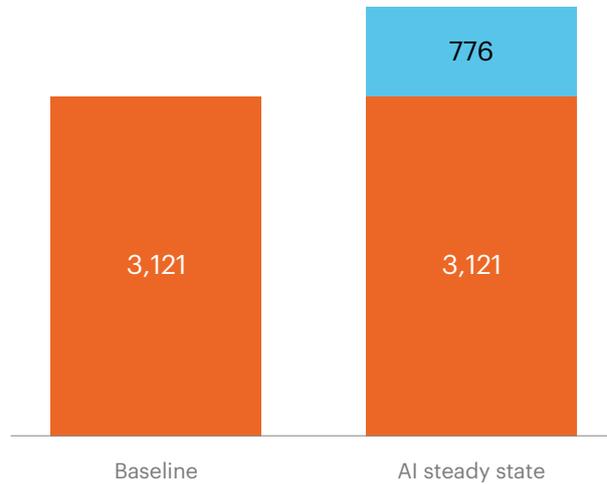


Source: Accenture analysis

## Wholesale and Retail

AI can create more than US\$0.7 trillion in additional GVA in 2035 for China's Wholesale and Retail sector — an increase of 25 percent compared with the baseline scenario. Retailers can draw on AI's intelligent automation capabilities to streamline inventory and warehouse management, while augmented reality technologies can enable immersive shopping experiences for customers. Among the sectors that Accenture studied, this industry is expected to benefit considerably from additional innovation effects spurred by AI — for instance, helping to uncover pockets of latent demand.

**FIGURE 12: CHINA'S WHOLESALE AND RETAIL GVA IN 2035 (US\$ billion)**



Source: Accenture analysis

# NEXT STEPS FOR POLICY MAKERS AND BUSINESS LEADERS

To fully exploit AI's potential for reigniting China's economic growth and the revitalization of its industries, policymakers must be thoroughly prepared to address the challenges — intellectual, technological, political, ethical and social — that will inevitably arise as artificial intelligence becomes more embedded in our lives. Business leaders will need to integrate AI into their strategies and create a new AI playbook that empowers people to do what they do best — imagine, innovate and create.

## For policymakers: Clearing the path to an AI future

### Prepare the next generation for the AI future

Seamlessly integrating human intelligence with machine intelligence, so that they coexist in a two-way learning relationship, will become more critical than ever. As the division of labor between man and machine changes, policy makers need to reevaluate the type of knowledge and skills imparted to future generations.

Currently, technological education goes in one direction: people learn how to use machines. Increasingly, this will change as machines learn from humans, and humans learn from machines.

For example, customer services representatives of the future will need to act as “role models” to their digital colleagues, and potentially vice versa.

Technical skills will also be required to design and implement AI systems, drawing on expertise in many specialties, including robotics, vision, audio and pattern recognition. But interpersonal skills, creativity and emotional intelligence will also become even more important than they are today.

### Advocate a code of ethics for AI

Intelligent systems are rapidly moving into social environments that were once occupied only by humans.

This is opening up ethical and societal issues that can

slow down the progress of AI. These range from how to respond to racially biased algorithms to whether autonomous cars should give preference to their driver's life over those of others in the case of an accident. Given how prevalent intelligent systems will be in the future, policy makers need to ensure the development of a code of ethics for the AI ecosystem. Also, ethical debates must produce more tangible standards and best practices in the development of intelligent machines.

### Address the redistribution effects

Many commentators are concerned that AI will eliminate jobs, worsen inequality and erode incomes. This explains the rise in protests around the world and discussions taking place in countries, such as Switzerland, on the introduction of a universal basic income. Policy makers must recognize that these apprehensions are valid.

Their response should be twofold. First, policy makers should emphasize the tangible benefits of AI. For instance, AI promises to alleviate some of the world's greatest problems, such as climate change (through more efficient transportation) and poor access to healthcare (by reducing the strain on overloaded systems). Benefits like these should be clearly articulated to encourage a more positive outlook on AI's potential.

Second, policy makers need to actively address and preempt the downsides of AI. Some groups will be affected disproportionately by these changes. To

prevent a backlash, policy makers should identify the groups at high risk of displacement and create strategies that focus on reintegrating them into the economy.

## **For business leaders: Creating a new playbook for an AI world**

### **Step beyond automation, and towards new innovations**

AI could be a game changer for China's industries. A recent Accenture survey pointed out that almost three-quarters of Chinese business leaders surveyed believe that AI will transform their industries over the next three years.<sup>13</sup> Regardless of industry, business leaders should actively embrace these AI-driven disruptions and integrate AI into their own business strategies.

Automation has been a critical element of business strategy in the past. Yet, with recent strides in AI, companies need to take the next step and harness the intelligence of dynamic, self-learning and self-governing machines, which will be able to generate new business opportunities for companies. Business leaders should seek more AI-powered innovations in both operations and business models, changing their mindset from "doing things differently" to "doing different things."

### **Take a strategic approach to data management**

The performance of AI will directly depend on the quality and amount of data that are available. Accenture research shows that the majority of executives are unsure about the business outcomes they derive from their data analytics programs, which can mean that enterprise data remains vastly underutilized.<sup>14</sup>

While many large companies already have added a chief data officer (CDO) to the C-suite (Gartner estimates that 90 percent of large organizations will have a CDO by 2019<sup>15</sup>), a key focus for these executives is on data security, regulations and governance. Instead, they should see themselves as stewards who construct and maintain an integrated, end-to-end data supply chain. These AI-savvy CDOs will concern themselves with issues such as: What is the balance between internal and external data sources? What is the company's data churn and cost per day? Where are the data silos? How can our company simplify data access?

## **Invent new business capabilities for an AI-powered organization**

To achieve the full potential of AI, human and machine intelligence must be tightly interwoven. There will be a need for new skills in the workforce that go beyond technical expertise to embrace a new emphasis on human abilities — judgment, communication, creative thinking — that complement technologies.

AI will transform not only what people learn, but also how they learn.

Traditionally, career paths followed a linear progression from entry-level to experienced senior. But with AI taking over mundane and low-value-added tasks, a skills gap will open up between young professionals and older workers, favoring those workers with experience. To adapt their businesses to the changing nature of learning and employee training, business leaders can strengthen focus on the needs of their workforces, particularly in the area of agile skills development.

Adoption of AI also presents new challenges to HR. Since AI is a form of virtual labor, it will interact with the workforce, contributing and adding value in the same way a human co-worker would. Hence, the role of the Chief HR Officer will not only be about managing human employees, but also the supervision of AI workers — Human AI Resources. This will raise questions, such as: How do companies remodel performance metrics? How do they optimize workforce requirements between human and AI labor? As a result, the CHRO will play a much bigger role in business strategy and innovation, as well as accumulate a greater technical understanding of AI technologies and how these will shape the future of work.

For Chinese businesses, creating a culture of inclusion and diversity should also be high on the agenda. As they drive these programs forward, leaders must consider the pervasive impact of AI. Concerns over job security, wages and privacy can affect the attitudes of employees and how they embrace and harness AI in their work. For leaders, their key will be to integrate AI into the corporate culture.

# APPENDIX: MODELING THE GVA IMPACT OF AI

AI has the potential to have a broad-based disruptive impact on society, creating a variety of economic benefits. While some of these benefits can be measured, others, such as consumer convenience and time savings, are far more intangible in nature. Our analysis focuses on measuring the GVA impact of AI.

We began with a modified growth model developed by Robin Hanson, professor of economics at George Mason University, Virginia, United States. We looked at the additional increase in growth that would occur as a result of AI by contrasting it with the baseline growth rate.

In our model, we defined labor as a continuum of tasks that can either be performed by a human or artificial intelligence — not work solely done by humans. The intent was to introduce intelligent systems as an additional workforce capable of handling activities that require an advanced level of cognitive agility.

To estimate the shares of workers' tasks that could be performed by intelligent machines (AI absorption rates), we drew on research by Frey and Osborne who take a task-based approach to identifying roles and occupations that are affected by AI.<sup>15</sup> The estimates are aggregated at country and industry-level, taking into account the different mix of occupations and industries within each country. These figures were adjusted to reflect:

- **Assumption about long-run employment:** We assume that employment will be constant in the long term.

- **Differences between AI's technological potential and actual potential achieved:** We considered the uptake of AI — from zero to the maximum technological potential. We assumed that a 50 percent uptake would be reasonable in the time frame analyzed, that is, AI substitution is assumed to achieve 50 percent of its technological potential.

- **Capacity of countries to absorb AI technologies:** A key driver of the impact of AI on growth is how well each country is positioned to benefit from the emergence of new technologies and how ready it is to integrate them into its economy — measured by what we refer to as a country's "national absorptive capacity" (NAC). This includes factors such as access to a sophisticated information and communication technology infrastructure, a reliable regulatory framework, and considerable public and private investments in the digital economy. All economies that derive a significant AI dividend rank high on this index. This is a relative measure where countries are compared to the top performer, the United States. (For further details on the importance of national absorptive capacity, see "The Growth Game-Changer: How the Industrial Internet of Things can drive progress and prosperity"<sup>16</sup>).

With these calculations and adjustments, we arrived at our final estimates of AI absorption rates used in our macro model. Along with the quantitative model, we supplemented our research by conducting interviews with experts from a range of different disciplines and secondary research to give insight into the capacity of AI to generate economic growth.

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