McKinsey Global Institute

Executive summary

Reskilling China

Transforming the world's largest workforce into lifelong learners

January 2021

McKinsey Global Institute

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MGI is led by three McKinsey & Company senior partners: co-chairs James Manyika and Sven Smit and director Jonathan Woetzel. Michael Chui, Susan Lund, Anu Madgavkar, Jan Mischke, Sree Ramaswamy, Jaana Remes, Jeongmin Seong, and Tilman Tacke are MGI partners. Mekala Krishnan is an MGI senior fellow, and Sundiatu Dixon-Fyle is a visiting senior fellow. Project teams are led by the MGI partners and a group of senior fellows and include consultants from McKinsey offices around the world. These teams draw on McKinsey's global network of partners and industry and management experts.

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Authors
Jonathan Woetzel, Shanghai
Jeongmin Seong, Shanghai
Nick Leung, Hong Kong
Joe Ngai, Hong Kong
Li-Kai Chen, Kuala Lumpur
Vera Tang, Shenzhen
Bo Wang, Beijing
Shivin Agarwal, Hong Kong

Preface

China has the largest workforce in the world, and the economy in which citizens live and work is in the throes of dynamic change. China is modernizing and digitizing, and is now turning its attention to how to ensure that workers have the skills they need for the next phase of the country's economic journey. After three decades of educational reform, the new focus is on reskilling and embedding an ethos of lifelong learning in China's workplaces and society.

This report focuses on ways to reform China's talent-development systems. It builds on MGI's extensive research on China's economy and global analysis on the future of work. Educational reform is a broad topic that includes philosophy, culture, history, and society, and requires in-depth expertise from academics, policy makers, educational institutions, parents, and students. In this research, however, we take an economic lens, focusing in particular on the development of skills.

The research was led by Jonathan Woetzel, McKinsey senior partner and a director of MGI in Shanghai; Jeongmin Seong, MGI partner in Shanghai; Nick Leung, McKinsey senior partner and chairman of McKinsey Greater China in Hong Kong; Joe Ngai, McKinsey senior partner and managing partner of McKinsey Greater China in Hong Kong; Li-Kai Chen, McKinsey senior partner in Kuala Lumpur; and Vera Tang, a McKinsey partner in Shenzhen. The work was also guided by James Manyika, McKinsey senior partner and co-chair and director of MGI in San Francisco; Jaana Remes, MGI partner in San Francisco; and Susan Lund, MGI partner in Washington, DC. Shivin Agarwal and Bo Wang led the research team, which comprised Gang Chen, Ke Dong, Ashley Li, Yifei Liu, Julia Ni, Erik Rong, Yining Xu, Athena Yan, and Chang Zhao. We thank Gurneet Singh Dandona and Alok Singh for their input on future of work analytics.

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While we are grateful for all the input we have received, the report and views expressed here are ours alone. We welcome your comments on this research at MGI@mckinsey.com.

James Manyika

Director and Co-chair, McKinsey Global Institute
Senior Partner, McKinsey & Company
San Francisco

Sven Smit

Director and Co-chair, McKinsey Global Institute
Senior Partner, McKinsey & Company
Amsterdam

Jonathan Woetzel

Director, McKinsey Global Institute
Senior Partner, McKinsey & Company
Shanghai

January 2021

In brief

Reskilling China

Three decades of Chinese educational reform have created a workforce oriented toward an industrial economy. Now the challenge is to transform China's talent-development model to develop the skills needed in an innovative, digitized, postindustrial economy. Key findings include the following:

A talent revolution in China can enable continuous improvement in living standards for all. Over the past three decades, China has achieved significant progress in incomes, labor productivity, and GDP growth. To continue to improve living standards, sustaining wage growth and productivity gains will be critical. For China to achieve 70 percent of the average per capita GDP of high-income economies by 2050, a long-term goal as interpreted by Chinese think tanks, necessary per capita GDP growth of 4.7 percent and wage growth of 4.9 percent is implied. This requires a skills revolution in China's workforce.

Up to one-third of global occupational and skills transitions may occur in China. By 2030, up to 220 million Chinese workers, or 30 percent of the workforce, may need to transition between occupations due to automation. That's about 36 percent of all global transitions simulated by MGI's future of work model. In a midpoint automaton scenario, about 516 billion hours of work—an average of 87 days per worker—need to be redeployed by 2030 as the mix of skills in demand changes. China needs to support the adaptation of migrant workers, who have limited resources and access to training and, often, low skills, given that 22 to 40 percent of their work is susceptible to automation.

These transitions will require transforming China's education and skills development system. Three elements stand out. First, learning will need to be extended beyond schools to cover China's working adults (everyone); this implies tripling the scope of skills development. Second, content needs to evolve from basic to a broad range of skills (everything). The high cognitive, social and emotional, and technical skills that will be in demand could account for an additional 236 billion hours by 2030, or an average of about 40 days per worker. Third, education and skills development should be available to all throughout their lives (everywhere) to support all workers who need to undertake some reskilling every year.

Based on an extensive survey of best practices in China and around the world, pilot projects based on four levers could kick-start the transformation:

— **Adoption of digital technologies.** China's economy is already significantly digitized, with increasing investment in educational technologies. More than two million people could deliver microcurricula through digital platforms while various tools such as artificial intelligence and virtual reality can improve the efficiency of delivery. More than 900 million internet users can benefit from digital technology and enjoy enhanced quality through hybrid online-offline learning.

— **Collaborative ecosystem.** Expanded use of public-private partnerships can help plug the gap between skills developed and what the market needs. Educators and employers can partner to design joint programs and drive innovative research. A coalition of school–industry partnerships, potentially with commitment from 300,000 companies, could be developed. Industry-specific partnerships can help address talent shortages of 30 million people in ten key manufacturing sectors identified by the government.

— **Enhanced vocational tracks.** China can make the vocational track attractive to students by expanding flexible pathways such as a "3+4" secondary-undergraduate model that enables them to go directly to application-oriented universities. Vocational pathways also need to be flexible to support midcareer transitions. China can develop vocational educators with industry experience—more than 80 percent of the total—to improve the quality of teaching staff.

— **Mindsets and incentives.** Individuals can shape their lifelong learning journey by using information platforms and acquiring required skills through microcredential programs. Employers can enhance competitiveness by strengthening their provision of training. The government can provide incentives to further investment in human capital.

Implementing the transformation requires an integrated delivery unit approach. A national leading group with ministry representatives and subject-matter experts can steer the overall direction together with local delivery units of governments, employers, educators, and social institutions to drive implementation. Deeper participation by private-sector players as educators in their own organizations and investors in training and skills is needed. Executives can consider a checklist of priorities such as identifying skill gaps, devoting more resources to training workers, and expanding partnerships with other stakeholders.

Reskilling China for a postindustrial economy

China faces skills and jobs shifts on an unprecedented scale

Three transitions to 2030

Occupations

Workforce shifting occupation, %

~36

Chinese workers — Global

Up to 220 million workers may shift occupational categories (early automation scenario)

Skills

Hours of work, 2018–30

516B Displaced by automation

~87 days per average worker could be automated, and need to be redeployed

Equity

Migrant worker activities, %

22–40

Automation risk

22-40% of work activities of 331 million migrant workers at risk of automation

Transforming China into a nation of lifelong learners

Everyone

3x

expansion of skills development system to cover all students and workers

Everything

236B

hours by 2030 (40 days per worker) subject to rising demand for higher cognitive, social and emotional, and tech skills, requiring new content and delivery

Everywhere

24/7

access to skills development to overcome time, place, and money constraints

Pilots based on four levers could start the skills transformation

Potential goals by 2030

Digital technologies

Engaging, multi-channel hybrid model

>900m reached through tech-enabled learning platforms and more than 2m people deliver microcurricula

Collaborative ecosystem

Partnerships among educators, employers, and government

300,000 school-industry partnerships

Enhanced vocational track

Competitive and flexible pathways for students and adults, higher quality teachers

>80% of teachers have industry experience

Shift in mindset and incentives

Culture of lifelong learning for individuals and employers

All eligible for skills development subsidy

Implementing a new system needs a national leading group, local delivery units, and deeper engagement from employers, including those in the private sector

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Executive summary

China has changed beyond recognition since its opening in the late 1970s and is now undergoing another significant evolution from an export-, manufacturing-, and investment-led economy to one driven by domestic consumption, services, and innovation—arguably a postindustrial economy. After decades of reform, China today has an education system that is oriented toward an industrial economy. Gaps in access, quality, and relevance in education still need to be plugged, but there is now potentially an even larger challenge to meet: developing the skills needed for a modern, digital, and innovative economy, instilling a new national ethos of lifelong learning, and ensuring that the system is equitable. Nothing less than a transformation of China's education and talent-development systems appears necessary. China has undertaken transformative reform before; it now needs to do so again.

Around the world, work is changing as digitization and automation spread, and many millions of people will need to become more skilled, refresh their skills, and continually reinvent themselves—and some to change occupations. Because of the country's sheer scale, as many as one-third of the global occupational transitions needed for the future of work may be in China. If it gets this right, best practices and models could offer a helpful reference point for other economies, particularly emerging ones.

In this report, the McKinsey Global Institute (MGI) assesses the country's education system today and, based on an extensive survey of best practices in China and around the world, describes pilot projects using four levers that could kick-start a transformation of China's talent-development system designed to have sufficient breadth and ambition to enable continuous rising in living standards in the period to 2030. We do not attempt to tackle the full breadth of the issues relating to educational reform, which, we acknowledge, includes much broader dimensions such as philosophy, culture, history, and society, and which requires the in-depth expertise of academics, policy makers, educational institutions, parents, and students. Rather, we focus on the economic dimension of talent development and, in particular, on the development of skills. We hope that this analysis can provide helpful input and facilitate discussion among key stakeholders.

China needs a skills revolution to enable continuous rises in living standards for all in a postindustrial economy

A skills revolution is vital if the quality of life of the average Chinese person is to continue improving even as the nature of the economy changes. Over the past 30 years, incomes and labor productivity have grown tenfold, and GDP has increased by 13 times. However, some key drivers are waning. The mass migration from agriculture to urban employment helped fuel rapid growth, but the pace of urbanization is slowing down. China is aging, and the working-age population is shrinking. Debt levels and costs are rising.

To sustain continuing increases in per capita GDP and wages will require rising productivity enabled by improved skills and innovation.[1] Chinese think tanks have simulated scenarios in which the country achieves the aspirations of 70 percent of the per capita GDP of high-income economies by 2050, compared with 27 percent today.[2] The scenarios suggest that China needs to achieve annual growth in per capita GDP of 4.7 percent and wage growth of 4.9 percent by 2050 (Exhibit E1).

Exhibit E1

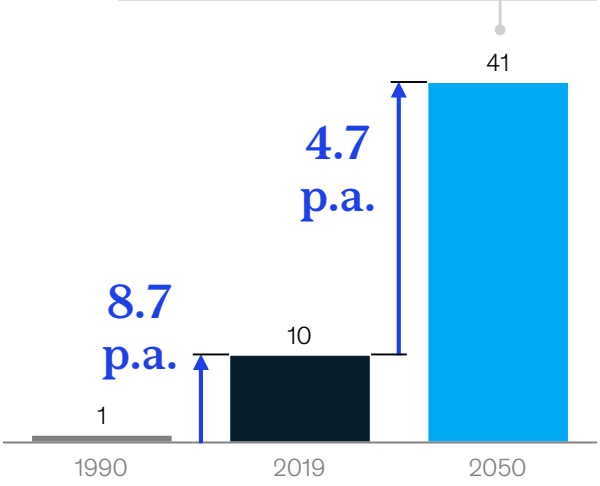
Sustaining per capita GDP and wage growth is important for continuous improvement of living standards.

Simulation

$ thousand, 2015 real terms

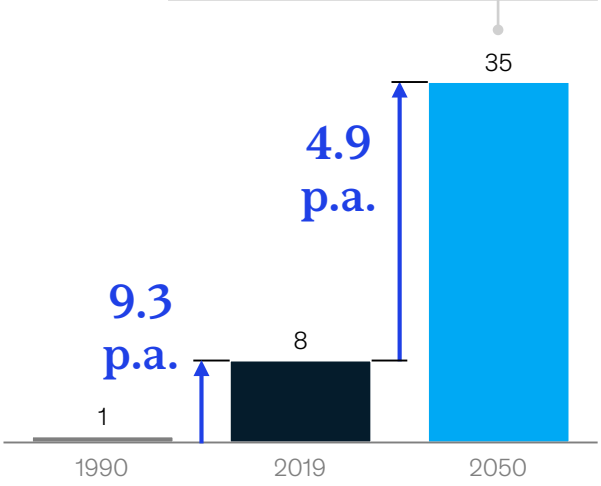
China per capita GDP

Scenario: Chinese think tanks' interpretation of long-term goal to achieve 70% of average per capita GDP of high-income economies[1]



Average annual wage per employee

Scenario: Implied wage growth for China to 70% of average per capita GDP of high-income economies[2]



1. Some Chinese think tanks defined a long-term scenario in which China achieves 70% of the average of high-income economies' per capita GDP by 2050. The World Bank defines a high-income country as one with gross per capita national income of $12,536 or more in 2019.
2. Assuming labor share of income remains constant.

Source: World Bank; McKinsey Global Institute analysis

[1] *The China effect on global innovation*, McKinsey Global Institute, October 2015.
[2] A high-income country is defined by the World Bank as having gross per capita national income of $12,536 or more in 2019; China did not belong to this category in that year. Several Chinese think tanks interpret China's goal of becoming a fully modernized economy by 2050 to achieve between 50 percent and 80 percent of high-income economies by 2050.

China's economy is undergoing rapid changes in pursuit of these goals. The economy is transitioning away from being led by investment and manufacturing to being driven by consumption, services, and innovation.[3] This changes the mix of skills and talent needed. At the same time, a global spread of digitization and automation is reducing demand for manufacturing jobs characterized by repetitive physical activity, as well as service jobs requiring basic cognitive skills such as data entry and validation. Demand is rising for social and emotional skills as well as technological skills. If anything, digitization and automation have accelerated in response to the COVID-19 pandemic, and therefore the need to be mobile and reskill may have become even more urgent.[4]

China could make three transitions that in combination amount to a transformation of its labor market on an unprecedented scale (Exhibit E2).

30%

of Chinese workers may need to transition between occupations by 2030

— **Occupations.** By 2030, up to 220 million Chinese workers, or 30 percent of the workforce, may need to transition between occupations. That's about one-third of all global transitions forecast by MGI's future of work model. We segmented China's workforce into six occupational categories to analyze in some detail shifts in labor-market demand and changes in the occupational mix that those shifts necessitate. The six occupational categories are frontier innovators, skilled professionals, administrative white-collar workers, frontline services labor, manufacturing workers, and construction and agriculture workers. Our simulation found that demand for frontier innovators could rise by 46 percent, for skilled professionals by 28 percent, and for frontline services labor by 23 percent, while demand declines for manufacturing workers by 27 percent and for construction and agriculture workers by 28 percent.

— **Skills.** In a midpoint automation scenario, about 516 billion hours of work, or an average of 87 days per worker, may be displaced and need to be redeployed by 2030.[5] Overall, demand for physical and manual skills and basic cognitive skills could fall by 18 percent and 11 percent, respectively. However, demand for social and emotional skills and technological skills could rise by 18 percent and 51 percent, respectively.

— **Equity.** Labor-market and skills transitions are likely to be particularly challenging for China's rural-urban migrants. By 2019, the number of those workers stood at 291 million. The country is continuing to urbanize, and if the historical rate were to hold, the number of rural-urban migrant workers could reach 331 million by 2030. Because of the hukou household registration system, many migrants lack access to services including healthcare and education, and cannot access quality training programs; moreover, many of these workers are low skill and low paid and do not have sufficient financial resources for those programs.[6] Automation may compound the challenges migrant workers face. About 22 to 40 percent of the work of China's migrant workers is susceptible to automation—about 151 billion to 277 billion hours, or 57 to 105 days per person. Particular attention needs to be given to helping migrant workers make necessary transitions.

An effective transformation in China to manage these transitions could generate valuable know-how that could be a helpful reference point for other parts of the world.

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3 *China's choice: Capturing the productivity opportunity*, McKinsey Global Institute, June 2016.

4 Sapana Agrawal, Aaron De Smet, Sébastien Lacroix, and Angelika Reich, *To emerge stronger from the COVID-19 crisis, companies should start reskilling their workforces now*, McKinsey & Company, May 7, 2020; Oliver Tonby, Jonathan Woetzel, Noshir Kaka, Wonsik Choi, Jeongmin Seong, Brant Carson, and Lily Ma, *How technology is safeguarding health and livelihoods in Asia*, McKinsey & Company, May 12, 2020; and Aamer Baig, Bryce Hall, Paul Jenkins, Eric Lamarre, and Brian McCarthy, *The COVID-19 recovery will be digital: A plan for the first 90 days*, McKinsey & Company, May 14, 2020.

5 Our midpoint scenario already includes the impact of COVID-19.

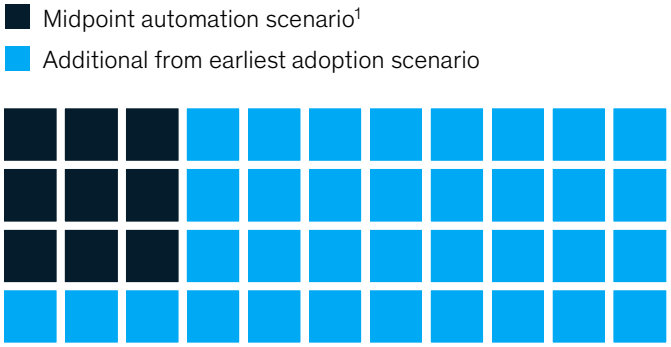
6 L. Rachel Ngai, Christopher A. Pissarides, and Jin Wang, "China's mobility barriers and employment allocations," *Journal of the European Economic Association*, 2019, Volume 17, Number 5; Zhenxiang Chen and Kayuet Liu, "Assimilation of China's rural-to-urban migrants: A multidimensional process," *Chinese Journal of Sociology*, April 2018; Russell King and Ronald Skeldon, "'Mind the gap!' Integrating approaches to internal and international migration," *Journal of Ethnic and Migration Studies*, 2010, Volume 36, Number 10; and Wenfei Winnie Fang and C. Cindy Fan, "Migrant workers' integration in urban China: Experiences in employment, social adaptation, and self-identity," *Eurasian Geography and Economics*, 2012, Volume 53, Number 6.

Exhibit E2

China needs to achieve three labor force transitions in the next decade.

Occupational transition

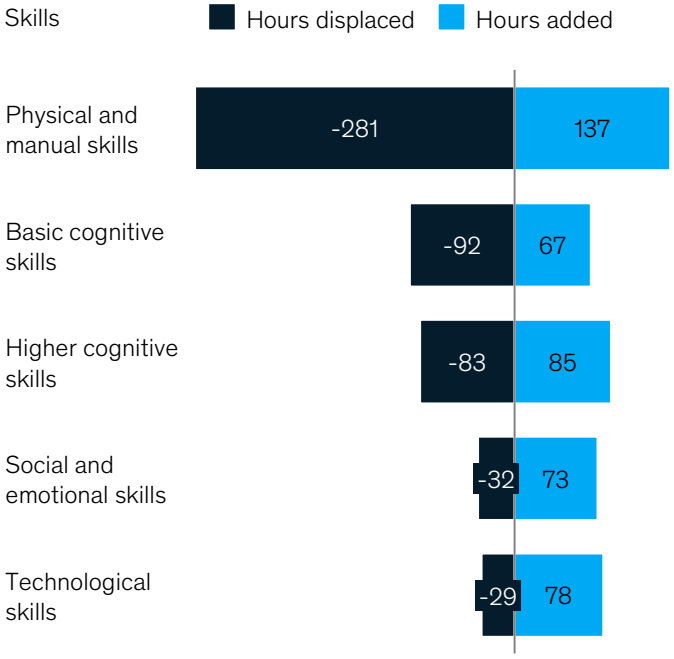
Number of workers in China needing to move out of current occupational categories to find work, 2018–30, million (1 block ≈ 5 million)



Up to **220M workers** (~36% of global workforce) may need to switch occupations

Skills transition

Change in hours worked by 2030, midpoint automation scenario, %



~516B hours displaced due to automation (average ~87 days per worker) and need to be redeployed across different skills

Equity transition[2]

Number of migrant workers, million

~330M migrant workers at risk of 22–40% of work activities automated

1. Includes changes expected due to COVID-19.
2. 2030 estimate based on historical compound annual growth rate of migrant worker population, 2014–19. Calculation takes effect of hukou reform into account.

Source: ILO; National Bureau of Statistics of China; O*NET; Oxford Economics; McKinsey Global Institute analysis

China's education and skills development system needs to be transformed

Over the past 30 years, China has achieved transformative change in its education system. The system served the industrial economy well, but the economy is changing. The country once again needs to reinvent education and skills development in the broadest sense, to enable people to develop the capabilities they need to thrive in life and at work—to equip its people for a postindustrial society.

To achieve this transformation, three elements stand out, which we can summarize as the "three Es": everyone, everything, and everywhere. First, education, training, and learning should be available not only to school-age people but to working adults. Second, the content of education and skills development needs to change to reflect an economy that is moving far away from the industrial model of the past 30 years. Third, education and training should be ubiquitous, available to all throughout their lives, anywhere and anytime (Exhibit E3).

Exhibit E3

China's skills development system needs to be transformed in order to sustain economic growth and improve living standards.

	Current state	Potential direction
Everyone	Primary focus on **formal education system** accommodating ~243 million students[1]	**3x expansion of scope** to support entire population including 775 million workers
Everything	**Strong academic performance** (PISA reading, math scores) yet **gaps in some metrics** including growth mindset and critical thinking	**Broad capability building** to equip 236 billion hours of work requiring higher cognitive, social and emotional, and technical skills by 2030 through a new content and delivery model[2]
Everywhere	**Rural-urban gaps** (30 pp lower enrollment in higher education) and **limited migrant worker support**	**Ubiquitous access** to training to support reskilling of almost all workers every year on 24/7 basis

1. All students enrolled in K–12 and higher education in 2019, according to official statistics.
2. On average, 40 days per person by 2030 due to the impact of automation.

Source: Chinese General Social Survey; Ministry of Education; National Bureau of Statistics; McKinsey Global Institute analys is

Everyone: Education and skills development needs to expand beyond students to China's workforce

Over the past 30 years, China has continuously reformed education. Public investment in education soared 50-fold between 1992 and 2018, from 2.7 percent of GDP to 4.1 percent. In 1978, only 66 percent of children were covered by compulsory education; today that share is 100 percent. Gross enrollment in secondary education more than doubled from 41 to 95 percent over the same period. The number of college admissions increased from 3.7 million in 2000 to 9.1 million in 2019. 91 percent of teachers in secondary education now hold a bachelor's degree and above, compared with only 24 percent in 2000.

China now needs to focus on reskilling the current workforce to match the needs of a changing economy. By 2030, we find that 75 percent or 543 million workers is likely to be people who are already in the labor force today. This implies that workforce reskilling and vocational training systems can be the major drivers of impact by 2030. The number of students currently enrolled in K–12 and higher education is about 243 million; total employment today is about 775 million. As China expands workforce training and lifelong learning, the scope of education and skills development system needs to triple by 2030. According to official statistics, the number of students (including adults) undertaking non-diploma programs declined from 44 million to 37 million between 2015 and 2019.[7] Not all training needs to be offered in formal school programs. In the future, the skills development system can encourage the development of new platforms and flexible training venues outside the school system to meet a variety of learning goals. Private institutions and employers can play a role in filling gaps and expanding the access to all.

3x

expansion of education and skills development system needed by 2030

Workforce training is facing challenges today from low investment, limited relevance to the world of work, and a lack of a sense of urgency about the importance of skills among Chinese people, leading to low participation in programs. China could act to develop competitive vocational schools to offer high-quality training, expand the number and capabilities of industry experts, and overcome social bias. Singapore did this from the 1980s onward through public-relations campaigns and substantial investment in technical schools. Low investment in training appears to reflect the fact that many Chinese companies tend to experience high turnover of workers. One study found that average time spent in the first job for the generation born in the 1990s in China was only 19 months, but for the generation born in the 1970s and 1980 it was 51 and 43 months, respectively.[8] The incentive to devote substantial resources to training is weak. Many Chinese workers do not appear to regard participation in training programs as important. In one survey, 79 percent of respondents said training was necessary, but the survey also found that many of them do not consider vocational skills training to be urgent.[9] This may reflect time and financial constraints on workers.

In parallel, the long-term task of tackling remaining structural issues in China's education system should get under way. About 288 million students may enter the workforce after 2030, and about 400 million new Chinese are expected to be born between 2020 and 2050. The work of changing the education system for these future students arguably needs to begin now to ensure that reforms in education and talent development continually support a rising standard of living.

[7] This includes graduates from technical-vocational programs (three million in 2019), technical training for peasants (24 million), and other training (11 million).
[8] *First job insights*, LinkedIn, August 2018, linkedin.com.
[9] *White paper on China's education and training industry*, iResearch, 2017, report.iresearch.cn.

Everything: The content of education and skills development needs to offer broad capabilities that equip people for a fast-evolving economy

The content of both education and any expanded worker training needs to better match what society needs. In an industrial society, basic literacy and the ability to follow predefined instructions were often sufficient. Now, in China's changing economy, boundaries between sectors are blurred and the nature of work is continuously being reinvented. More than ever, therefore, people need to deal with ambiguous and complex situations where there are no clear instructions to follow. Knowledge and skills can become outdated quickly, and skills development content needs to equip students and workers with broader and flexible capabilities—continuously refreshed—if they are to meet changing demand. Demand for higher cognitive (such as critical thinking and decision making), social and emotional (such as interpersonal skills and leadership), and technical skills (such as advanced data analysis) will increase. Our simulation of a midpoint automation scenario suggests that 236 billion hours of work related to these three skill sets—about 40 days per person on average—needs to be added by 2030. This requires investment in developing different content beyond traditional textbooks, such as case studies and hands-on projects as well as new delivery approaches such as participatory learning and experiential training.

~40

days per average worker needs to be added to higher cognitive, social and emotional, and tech-skilled work by 2030

In academia, PISA statistics suggest that although China scores above the Organisation for Economic Co-operation and Development (OECD) average on reading and mathematics, it scores below the OECD average on growth mindset and students' well-being.[10] China was in the bottom 20 countries in the world on PISA scores for students' "ability to think like a scientist," an attribute relevant to creativity and entrepreneurship.[11] In universities, there appears to be an unmet appetite among students for more exposure to practical skills. In one 2018 survey of graduates, 62 percent of respondents said they had insufficient practical lessons including, for instance, field studies and internship opportunities.[12] The same survey found that 63 percent of students who responded said that they didn't have enough information when choosing a major.

In the case of vocational training, content is often outdated, and some instructors lack expertise. Vocational curricula have not been updated to keep pace with the changing economy. In a TÜV Rheinland survey of vocational schools and firms, respondents from about 36 percent of schools said that instructors lack practical industry experience, 50 percent said that instructors' fields of expertise were not fully consistent with their teaching, and 30 percent of 115 corporate representatives surveyed said that vocational school instructors lack hands-on industry experience.[13] A survey by Zhaopin in 2019 found that among white-collar workers not satisfied with their training, nearly 40 percent of respondents said that training outcomes were below their expectations.[14]

[10] We note that the score for Chinese students is based on relatively prosperous cities of Beijing, Jiangsu, Shanghai, and Zhejiang. The Organisation for Economic Co-operation and Development (OECD) defines growth mindset as the belief that someone's ability and intelligence can develop over time. For an overview of OECD findings on PISA scores for Asia, see Li-Kai Chen, Emma Dorn, Marc Krawitz, Cheryl SH Lim, and Mona Mourshed, *Drivers of student performance: Asia insights*, January 2018, McKinsey.com.

[11] Li-Kai Chen, Emma Dorn, Marc Krawitz, Cheryl SH Lim, and Mona Mourshed, *Drivers of student performance: Insights from Asia*, 2017, McKinsey.com.

[12] Boqing Wang and Yonghong Chen, *Chinese 4-year college graduates' employment annual report (2019)*, Social Science Literature Press, June 2019, pishu.com.

[13] *Welcoming Industry 4.0 white paper on the development of Chinese vocational education*, TüV Rheinland, September 2018

[14] *Demand and satisfaction of vocational training by Chinese workers*, Zhaopin, September 2019, marketwatch.hroot.com.

Everywhere: Provision of education and skills development needs to be ubiquitous
Geography, time, and money currently constrain the ability to learn. Yet to reskill China effectively, access to education and skills development needs to be ubiquitous. In the new system, more than 80 percent of the workforce could take reskilling programs of various kinds. The system can also make competitive vocational tracks more widely available and can reduce gaps between those who live in cities and those who live in rural areas. China could take an ambitious view, seeking to craft a system that is available 24/7 through expanded use of digital technologies and that could even be mandatory for workers—in other words, "opt out" rather than "opt in." Employers could enable this by vastly increasing the training of their own workers, partly supported by policy incentives.

Public expenditure on education in tier-one cities is

3.3x

higher than in tier-three and tier-four cities

In today's system, where people live still to an extent determines whether they can access educational and training resources. On the whole, these resources are more available and of higher quality in urban than in rural areas. According to official statistics, only three million migrant workers—about two percent of the total 291 million—took part in a vocational or technical program in 2019. Many migrant workers do not have sufficient time to study or financial resources to pay for courses. The compulsory education budget per student each year in rural areas is about 60 percent of that of central urban areas; in those areas, more than 90 percent of teachers have university degrees and above, compared with 72 percent in rural areas according to China Education Panel Survey data. And although gaps between cities are narrowing, public expenditure on education in tier-one cities is 3.3 times higher than in tier-three and tier-four cities.

In China, as in many other countries, vocational training is less highly prized than academic education, and it is perceived as not offering a good return on investment of time and money. The number of secondary vocational schools, students, and teachers is falling rather than rising. Pathways from vocational courses to employment are uncertain, and student satisfaction tends to be low. Within three years of job placement, half of vocational graduates change career paths, compared with 30 percent of traditional academic graduates.[15]

Digital technologies, public-private partnerships, vocational education, and a shift in mindsets and incentives could be levers

A survey of best practices in China and around the world highlights four levers that could be used as the core of various pilot projects. China could use them to kick-start a broader transformation of the environment for learning and teaching—powered by digital technologies; characterized by close collaboration between the public and private sectors and among educators and companies; flexible and competitive vocational tracks; and available throughout people's lifetimes.

On all four levers, China has strengths that suggest it can achieve large impact and significantly beneficial outcomes that are needed to meet an aspiration to develop the skills needed to support continuous rises in living standards in the period to 2030 (Exhibit E4). Managing a transformation on the scale needed is a huge challenge that involves all of Chinese society, and it arguably makes sense to avoid major disruption and unintended consequences by establishing best practices in relatively small-scale pilots before scaling up to the national level. In many cases, China already has examples of best practices in different locations.

[15] *Chinese 3-year vocational college graduates' employment annual report*, MyCOS, June 2017, pishu.com.

Exhibit E4

Four levers could lead to significant impact on education and skills development by 2030.

Digital technologies	**900M+** individuals reached through tech-enabled learning platforms	**2M+** individuals deliver microcurricula through digital platforms
Collaborative ecosystem	**300K+** school-enterprise partnerships, covering **11K** vocational schools and **27M** students	
Enhanced vocational tracks	**All** application-oriented universities open to flexible paths (eg, "3+4" program) for vocational students	**>80%** of vocational educators with industry experience
Mindset and incentives	**220M** people benefiting from information platforms to navigate occupation transition[1]	**All** eligible for subsidized training programs[2]

1. Early adoption automation scenario.
2. Singapore's Skills Future program typically offers SGD$500–SGD1,000 over a 5-year period to all aged between 25 and 60.

Source: McKinsey Global Institute analysis

Digital technologies: Traditional textbook-based learning can be transformed into a more engaging, multichannel hybrid model

Today, education and training are largely delivered using traditional methods. According to one survey on corporate training, only 20 percent of respondents were taught online and 10 percent on microlearning platforms.[16] The adoption of digital technologies can transform traditional textbook-based teaching and learning methods into more engaging, multichannel, and hybrid models.[17]

Digital technologies can empower content creators to deliver microcurricula and make content delivery more engaging and personalized by using tools such as artificial intelligence (AI) technologies and gamification. Lizhiweike, an online education platform in China, offers a solution that helps people create video clips and open classes for anyone who has a smartphone. Boost, a provider of leadership training, offers a mobile app enabling users to interact with 3-D characters in real-life role-playing to learn and practice leadership skills while providing personalized feedback. A hybrid model that combines online and offline and a redefinition of the role of teachers can broaden access to rural students. In rural areas, hardware is gradually improving. Today, 99 percent of rural villages have installed networking broadband. QingXiYuanShan is dedicated to improving rural students' English-language capabilities, with content as good as that of urban schools, streamed from the certified teacher's office; local teachers then are responsible for after-class coaching. Digital platforms can also help rural students establish pathways to urban jobs by offering training and an opportunity to explore potential careers. It is important that digital is fully

[16] "China training industry report 2016–2017," *Training Magazine* and OnDemand Consulting, June 2020, trainingmag.com.cn.

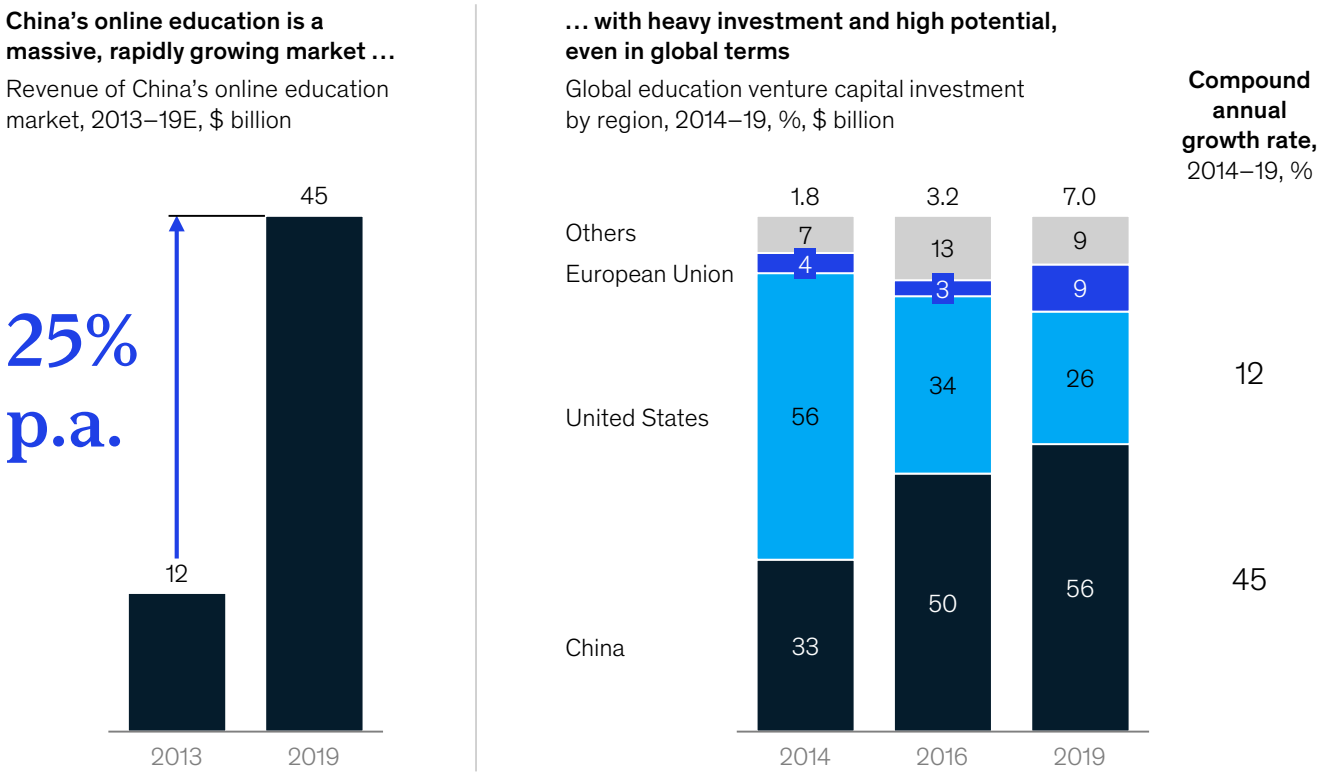
[17] Jake Bryant, Christine Heitz, Saurabh Sanghvi, and Dilip Wagle, *How artificial intelligence will impact K–12 teachers*, January 2020, McKinsey.com; Jake Bryant, Felipe Child, Emma Dorn, and Stephen Hall, *New global data reveal education technology's impact on learning*, June 2020, McKinsey.com; and Jake Bryant, Emma Dorn, Stephen Hall, and Frederic Panier, *Reimagining a more equitable and resilient K–12 education system*, September 2020, McKinsey.com.

understood by teachers and students—providing every child with a laptop or education app will not be sufficient. Without effective implementation, technology alone may not help to improve outcomes.[18]

China is in a good position to expand the use of digital in education and training. It has a large, young market that enables rapid, large-scale commercialization of digital business models. For example, penetration of e-commerce and mobile payments is two to three times higher than in many other countries. In China, more than 95 percent of users access the internet via mobile.[19] Adoption of innovations such as online to offline, social commerce, and livestreaming has been rapid, and the COVID-19 pandemic accelerated their use even further. For instance, the number of monthly active users of Zuoyebang, an online education startup that provides tutoring, increased from 106 million in January 2020 to 157 million in March 2020 according to QuestMobile. China is building a solid position in educational technology investment (Exhibit E5). In 2019, it accounted for 56 percent of global venture capital investment in education. From 2014 to 2019, venture capital going into China's education technology sector grew at a compound annual rate of 45 percent to total $3.9 billion.

Exhibit E5

Educational technology is already a huge, rapidly growing market in China, with high potential.



Source: HolonIQ; iResearch Global Group; McKinsey Global Institute analysis

[18] Li-Kai Chen, Emma Dorn, Marc Krawitz, Cheryl SH Lim, and Mona Mourshed, *Drivers of student performance: Asia insights*, January 2018, McKinsey.com.
[19] *Digital China: Powering the economy to global competitiveness*, McKinsey Global Institute, December 2017.

The potential is large. More than 900 million people—that is, virtually everyone with internet access—could obtain high-quality digital content to meet the needs of their skills transitions. More than two million people could deliver microcurricula through digital platforms that are not usually covered by traditional textbook-oriented curricula. That's double today's number assuming the number of users on education and training platforms follow the typical growth pattern of other technology platforms, and the ratio to content providers remains constant. A large share of education and training hours can be enhanced by advanced technologies in a hybrid online-offline model.

Collaborative ecosystem: Expanded public-private skills development partnership can help address the gap between workforce skills and what employers need

Today, there is a gap between the capabilities and skills China's education and skills development systems enable people to develop and what employers need. Expanded collaboration between education and training providers and employers could help bridge this gap. Stronger collaboration can create benefits for all stakeholders. For instance, employers can access qualified talent, educators can achieve improved outcomes in job placement, and government can benefit from a more productive labor force.

Collaboration between academia and industry can lead to opportunities in designing joint programs, driving innovative research, and improving job placement for students. There are emerging examples in China. DJI, a commercial drones maker, launched a joint innovation laboratory with the Hong Kong University of Science and Technology to drive further advances in unmanned aerial vehicle technology. Tencent and Beijing University of Posts and Telecommunications codeveloped a course on social media. Alibaba Group and Hangzhou Normal University co-founded the Alibaba Business School, which offers four bachelor's degrees.

Enterprises can play a more significant role in vocational education, committing themselves to playing a part in the design of curricula, training, and recruiting, while government can facilitate collaboration among different stakeholders. A subsidiary of China Metallurgical Group, the China MCC5 technical school has good access to experienced professionals—70 percent of the school's 2,300 educators have both academic knowledge and mid- to senior-level industry credentials. Over the past five years, 98 percent of students have gone on to jobs. The DAWT training center, which employs the dual vocational training system used in Germany, was developed with co-owners Taicang secondary vocational school, the Taicang government, and leading auto engineering companies Kern-Liebers and Mubea. The co-owners share training costs, and 95 percent of students get jobs in their chosen profession. It is also important to expand the pool of high-quality teachers by facilitating more exchange with companies through rotational programs.

China is well positioned to develop more collaboration through public-private partnerships with its dynamic corporate ecosystem. The country has about 120 Chinese companies in the Fortune 500, and some 4,000 listed companies on the Shanghai and Shenzhen stock exchanges. Leading vocational schools have developed partnerships with about 200 corporate partners and demonstrate successful development of skill set and placement programs. China needs to scale up similar partnerships across the nation.

We see potential for a coalition of vocational school-industry partnerships, potentially with commitment from 300,000 companies (that is, 40 percent of companies the China Statistics Bureau classifies as above scale). This coalition, which could work on improving the design of curricula, the quality of training, and job placement, could cover about 11,000 secondary and higher vocational schools with 27 million students. If industry-specific public-private partnerships can strengthen the provision of training, China may be able to address a combined shortage of more than 30 million skilled workers in key manufacturing sectors identified by governments by 2025. Pilot programs can potentially be initiated in 30 cities where manufacturing accounts for a large share of GDP and local governments have strategies to drive structural upgrade.

300,000

companies could take part in vocational school-industry partnerships

Vocational tracks: Competitive and flexible educational pathways and making educators with industry experience the norm could more effectively develop and reskill talent

The pathway to training could have multiple entry points, giving workers flexibility in returning to school, receiving retraining, and pursuing higher-skill jobs. Chinese workers considering enrolling in training programs have many constraints on their time and mobility, and flexibility is vital. As an example of an approach in the United States that China might consider, the entire curriculum of the University of Phoenix is designed for adult learners. Courses tend to be five to six weeks in duration and largely conducted online.

China could also make the vocational track more attractive to students, for instance by offering a "3+4" secondary-undergraduate model that enables them to go directly to higher vocational or application-oriented universities without taking the national gaokao college entrance exam. This model is already being pioneered in China by Shandong and Zhejiang provinces, where secondary vocational schools are partnering with local universities to create 3+4 programs. To provide more options to vocational students, this approach could be expanded to all application-oriented universities in China, including ones that the government is expecting to convert from traditional universities.[20]

Vocational training programs could offer improved teaching if they were to collaborate more with companies to gain up-to-date knowledge and invite company representatives to teach at vocational colleges. Finland's Telkkä program, for instance, provides on-the-job training and coaching programs in a company environment.[21] Company instructors develop their skills by tapping into the knowledge of faculty members, and teachers benefit from the instructors' practical knowledge of recent technologies and working practices. Skilled workers can also be deployed to teach at vocational schools, as in the Teach Too program in the United Kingdom.[22] In 2020, vocational schools in Zhangjiagang organized an internship program for more than 300 professional teachers, covering fields such as accounting, electrical engineering, logistics, finance, and computer engineering.

>80%

of specialized vocational teachers could be required to have industry experience by 2030

China could also develop more dual vocational educators with industry experience. By 2030, more than 80 percent of teachers of specialized courses at vocational schools could be required to have industry experience in related areas, up from today's actual proportion of 32 percent for secondary and 40 percent for higher vocational schools. Industry experience is a prerequisite in German vocational schools.

Mindset shifts and incentive schemes: Individuals and employers need to be prepared for a lifelong learning journey

The importance of skills needs to be elevated, and a culture of lifelong learning should be developed and nurtured to help motivate a broad-based increase in skills. This will require a major mindset shift among individuals and companies. The 18th National Congress emphasized the importance of the "learning society" to promote an inclusive, prosperous society. This is a significant shift, but China's companies and people have successfully adapted to radical change in the past.[23] A number of initiatives could be considered to enable the change. For instance, information platforms could help people to develop necessary capabilities and manage skills and occupational transitions throughout their lives (see Exhibit E6 for an illustration of the choices that a tour guide, for instance, may have, which could lead to a tripling of salary, according to our simulation). The impact and reach of information platforms would be significant, benefiting 220 million people who would need to make an occupational transition by 2030 in our early automation adoption scenario.

[20] There are currently about 1,200 universities in China and the government plans to transform existing higher vocational schools or ordinary universities into about 600 "application-oriented" universities. The purpose is to equip students with both theoretical knowledge and practical experience.

[21] Pia Cort, Auli Härkönen, and Kristiina Volmari, *PROFF – Professionalisation of VET teachers for the future*, Panorama series number 104, European Centre for the Development of Vocational Training (Cedefop), 2004.

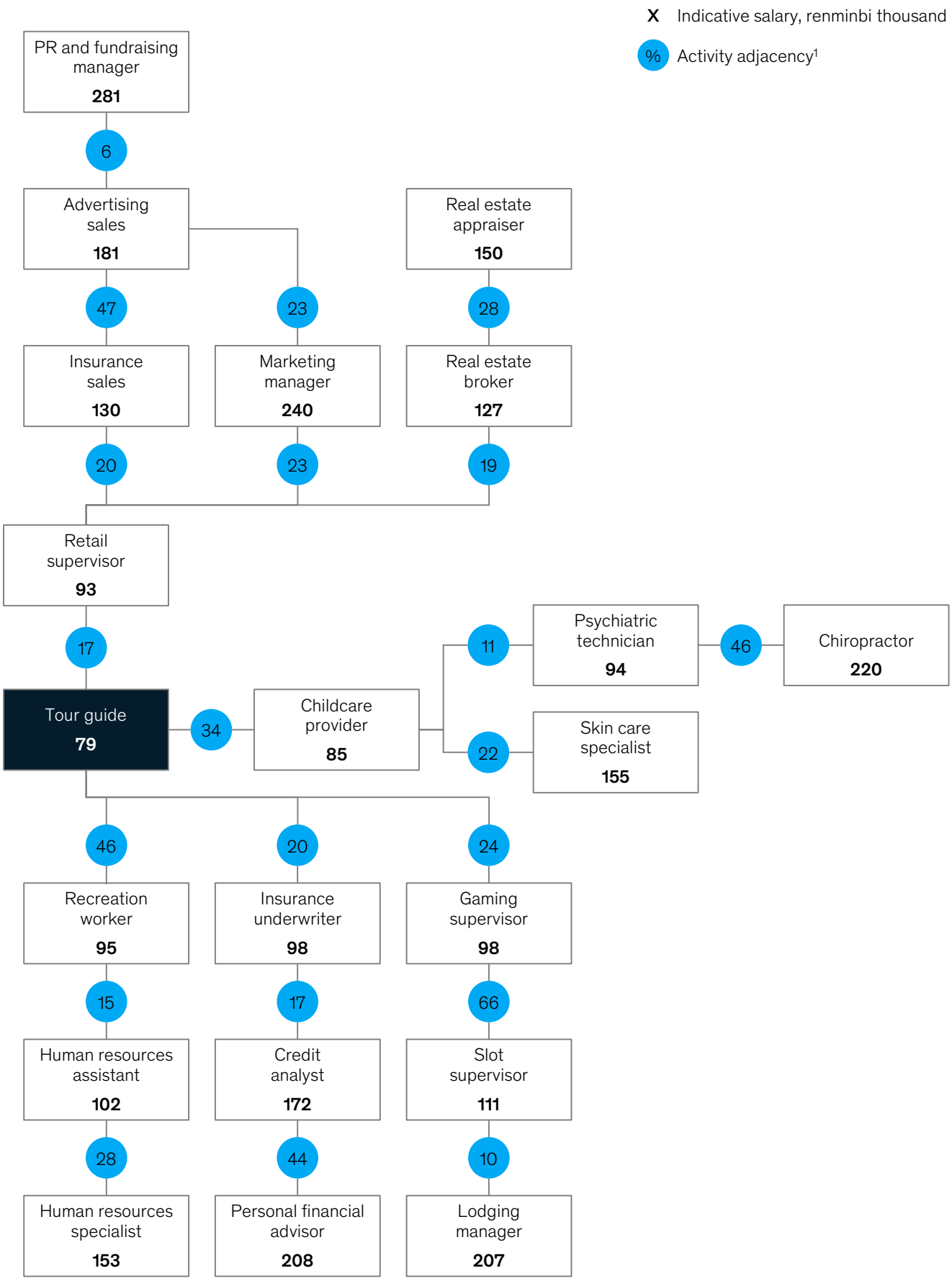
[22] *Teach Too: Carshalton college with Mirabot*, YouTube, March 2, 2016, youtube.com.

[23] Consider, for instance, the fact that in three decades China shifted from being a largely agrarian economy to an industrial one. From employing 75 percent of workers in 1977, today agriculture employs only 25 percent. Since 1978, more than 600 million people are estimated to have moved from rural to urban areas. Another example of change is China's rapid embrace of the private sector. In 1995, the private sector accounted for only 18 percent of urban employment; today, the share is 87 percent.

Exhibit E6

Information platforms can guide pathways for job seekers.

Illustrative



1. Minimum time worker in each occupation spends doing activities performed by its adjacent occupation.

Source: O*Net; McKinsey Global Institute analysis

A microcredential system beyond the awarding of degrees would ideally be in place to promote a continuous learning culture. Governments can also play a role in offering incentives to facilitate the transition. MySkillsFuture, a government-sponsored program in Singapore, offers courses, career information, and employment services, and allows content providers to post certified courses online. An important element of the program is that the government offers citizens a training account with funds that individuals can choose how to spend, giving them ownership of their learning journey.[24]

Employers can embrace the lifelong learning system, too. By investing sufficiently in learning opportunities for their employees, companies may become more competitive in the job market and be more attractive to individuals with the skills they may need, creating a virtuous cycle of productivity growth in the medium term. Reflecting this reality, the number of "corporate universities" is on the rise as companies judge that this route enables them to design courses that suit their skills needs; for students, this is an attractive option because they are more or less assured of a job.

A major issue to overcome is inertia among companies when it comes to training their workforces. In theory, an overarching incentive for companies is that investing sufficiently in learning opportunities for their employees should mean that they have the skills they need to be competitive and productive. However, market failures do exist in the provision of workforce training. One study, for instance, highlighted a "poaching externality" that reduces the incentive among employers to train their employees, because they bear the cost but another firm may reap the benefits.[25] Another study argues that when firms do not appropriate all the gains from the on-the-job training they provide, training subsidies or training levels may be required.[26] In China, government may need to step in as governments around the world do. A number of tools could be used to provide effective incentives. One is government subsidies. Many countries have been experimenting with systems such as co-funding through grants or vouchers, and financial incentives through the tax system. China has been moving in this direction, for instance increasing the tax-free employee training expense cap, and related subsidies.[27]

Moving China forward could require a systemic approach with the private sector playing an integral role

To transform the Chinese education and training system in the ways that we describe in this report, such as incorporating digital solutions and offering lifelong learning to the entire workforce, would require substantial investment. The returns are potentially very large, but China needs to incorporate an investment requirement into its planning and consider carefully what investment mix may be most effective, how much the public and private sectors and even individuals could contribute to the effort, and how to design a system of workable incentives to achieve a new era of workforce training and lifelong learning.

The transformation will require comprehensive strategic thinking with input from all relevant stakeholders—notably, with the private sector playing a greatly expanded and more integral role. The challenge is how to coordinate the many players in a fragmented system characterized by a lack of collaboration especially between the public and private sectors, but also between educational providers and companies.

[24] The program typically offers 500 Singapore dollars to 1,000 Singapore dollars over a five-year period to all aged between 25 and 60.

[25] Giorgio Brunello and Maria De Paola, *Market failures and the under-provision of training*, prepared for EC-OECD Seminar on Human Capital and Labour Market Performance in Brussels, Belgium, December 8, 2004.

[26] Alison L. Booth and Dennis J. Snower, eds., *Acquiring skills: Market failures, their symptoms and policy responses*, Cambridge University Press, 1996.

[27] *Notice on the tax refund for enterprise employee training budget*, State Taxation Administration, May 2018, chinatax.gov.cn.

At the national level, in other spheres, China has made use of a "leading group" and other cross-functional organizational approaches to tackle complex and cross-departmental agendas. Examples of such approaches include the framework of five-year plans for economic reform, innovation, and urbanization, for instance. Following this approach would mean setting up a national leading group focused on the future of work with a broad membership of officials from multiple ministries. This group would in turn seek input from representatives of educational and vocational institutions, employers, and a range of subject-matter experts.

Crucially, any national plan needs effective implementation at the local level, where conditions and characteristics vary widely, from the structure of industry and its likely evolution to the number of employers and education providers to fiscal health. For important items on the national agenda—including, for instance, New Style Urbanization and poverty eradication—local governments have similarly used a small leading group model or delivery units. For education and skills development, China could consider setting up local delivery units that can be dedicated to the detailed implementation of the national strategy, tailored to local contexts, defining specific milestones, continuously monitoring progress, and holding performance dialogues. The group can encompass stakeholders including private-, social-, and education-sector institutions. It can also ensure broad and inclusive access, especially for underprivileged workers.

Educators can likewise contribute to the transformation. They can be more open to collaboration with employers in order to better understand changing patterns in demand for skills, working with companies to improve the design of curricula and strengthening pathways from education and training to employment. Teachers need to be reskilled if they are to be effective in their use of digital technologies and adopting a hybrid online-offline model. China can further embrace incentives for educators to encourage them to experiment with new approaches to developing educational content and new delivery models. The final priority is to expand training capacity to support the development of lifelong learning, especially for workers who will continually need to refresh their skills.

Employers, particularly those in the private sector, can also play a crucial role as educators and trainers as well as investors. Much of the reskilling can be carried out through corporate mechanisms, including, for instance, corporate universities for both internal and external audiences. Training programs by cohort and collaboration with external educators can also be considered. Companies can put in place incentives for workers to train by, for instance, making pay raises and promotion contingent on completing courses. These investments could pay off if managed well. One study found that companies that have a corporate university delivered 9 percent higher shareholder returns than an equity index of 3,000 firms over a ten-year period.[28] Investment opportunities are emerging, too. Chinese tech players have been offering programs to produce next-generation entrepreneurs and teach the skills that the market demands. China's education and training market has been growing rapidly—at 16 percent a year since 2014—to reach a value of three trillion renminbi (about $435 billion) in 2019.[29] However, the share of vocation-related training is estimated to be only 14 percent.[30] As China shifts its focus toward workforce development, significant growth may come from the services related to lifelong learning that could provide long-term investment opportunities.

16%

annual growth in China's education and training market since 2014

[28] Peter McAteer and Mike Pino, *The business case for creating a corporate university*, Corporate University Xchange, September 2011.
[29] We used an exchange rate of 6.9 renminbi per $1 (the 2019 average).
[30] iResearch.

To kick off the journey, business executives can consider a checklist of priorities to keep in mind, from identifying skill gaps and devoting more management time to the broad issue of training workers, to developing partnerships with educators and ensuring that training is an integral part of companies' government relations effort (Exhibit E7).

Exhibit E7

To kick off the skills development journey, business executives can consider a checklist of priorities.

Key actions	Potential approach
Prioritize worker skills. Identify skills gaps and devote management time and budget to closing them	• Skills and competency mapping • Competitive benchmarking
Expand skills training. Provide training needed to cover all workers, preferably with tailored content	• Digital platform • Cohort-based programs
Ensure incentives to train are in place. Introduce training "opt out" system and link with performance evaluation system	• Corporate credit banks • Revised evaluation metrics to reflect learning
Adjust training content. Offer a mix of "forum, field, and feedback" to improve the effectiveness of learning	• Digital technologies (eg, gamification) • Field trips and on-the-job training
Track impact. Ensure that effective evaluation systems are in place to track effectiveness of training and value for money	• Pre- and post-training assessment • Peer observations, self-reflection
Develop partnerships. Explore partnerships with educators to offer competitive, up-to-date programs and content	• Corporate universities • Public-private partnerships
Integrate training into government affairs efforts. Ensure that training provision is integral to government relations	• Policy monitoring • Public program application

Source: McKinsey Global Institute analysis

China has transformed education over the past three decades, creating a workforce oriented toward an industrialized economy. But the country is now arguably entering a postindustrial phase, and education and skills development systems need to adapt. Our future of work simulation suggests that occupational and skill shifts will need to be achieved on an unprecedented scale. Indeed, those transitions could be up to one-third of all such shifts globally. If China gets this right, its experience could be shared in other parts of the world, especially in emerging economies in Asia and beyond.

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