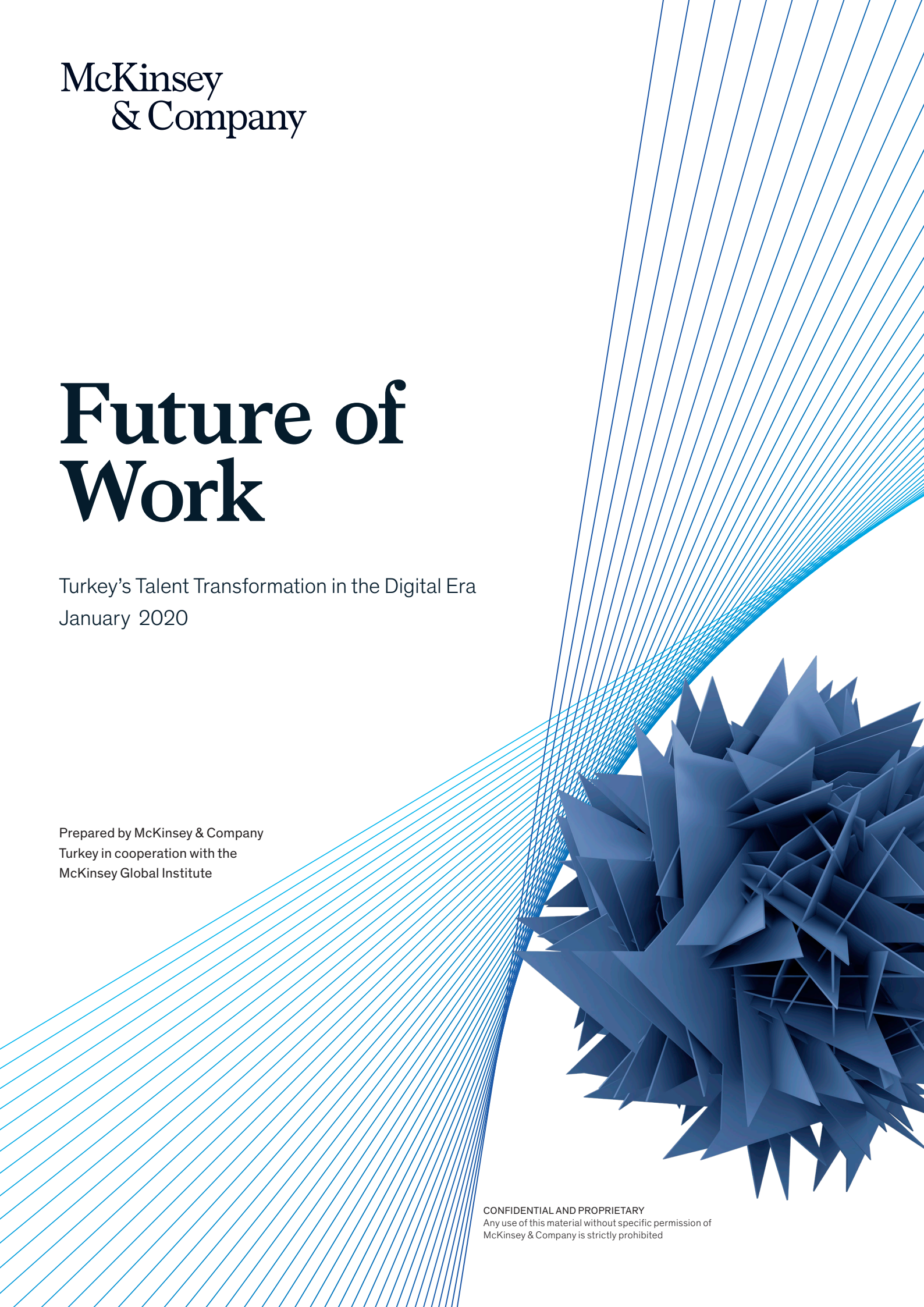
McKinsey & Company

Future of Work

Turkey's Talent Transformation in the Digital Era

January 2020



Prepared by McKinsey & Company Turkey in cooperation with the McKinsey Global Institute

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Future of Work: Turkey's Talent Transformation in the Digital Era - Report Summary

Advances in automation, artificial intelligence (AI), and digital technologies are changing the way we work, the activities we perform, and the skills we need to succeed. Catching this rapid transformation wave is of the utmost importance to ensure sustainable growth. McKinsey & Company has focused in the past decade on Future of Work research and served its clients on this topic.

In addition, the McKinsey Global Institute (MGI), the business and economics research arm of McKinsey, has studied the effects of automation on workforces and skills since 2015 and has described options that could help stakeholders benefit from potential changes in business models.

MGI considers adoption of digital technologies the most important factor in future economic growth. Research shows that adoption of digital technologies will account for about 60 percent of the potential productivity increase by 2030.[1] This holds true for Turkey: automation, AI, and digital technologies have the potential to boost the country's economy, so it is critically important to understand the opportunities and challenges regarding the future of work and to prepare the Turkish workforce for the upcoming transformation.

McKinsey & Company Turkey has worked over the past 6 months to create this report based on the experience and expertise of its 250 employees and insights from MGI. We examined the impact of productivity growth driven by automation, AI, and digital technologies on different sectors and occupations. We addressed the opportunities that will emerge to transform Turkey's talent marketplace and the challenges that must be overcome, supported by a fact base that will help stakeholders prioritize efforts to adapt the workplace to this new world. We hope that this report will shed light on the benefits that automation and increased productivity will bring to the country by 2030.

On a global scale, current technologies have the potential to help automate 50 percent of jobs. In Turkey, with the current technologies, six out of ten occupations could be automated by 30 percent. The analyses in this report are based on a scenario in which average levels of automation in Turkey are 20 to 25 percent by 2030.

The report foresees that in the next decade, automation, AI, and digital technologies, along with complementary investments, have the potential to create 3.1 million net new jobs, considering the economic impact and societal changes the technology will bring. By 2030, with the impact of automation and digitization, 7.6 million jobs could be lost, and 8.9 million new jobs could be created, a net gain of 1.3 million jobs. In addition, 1.8 million jobs that currently do not exist could be created, many of them in technology-related sectors. To enable this change, 21.1 million people in the Turkish workforce will need to improve their skills by leveraging technology while remaining employed in their current jobs. Automation and digitization are expected to affect 7.6 million employees through significant reskilling and job displacements. In addition, 7.7 million new employees who will join the workforce will need to be equipped with the latest skills required.

To ensure the success of Turkey's talent transformation, a common focal point and collective, concerted action are needed. It is critical that all stakeholders, including businesses, associations, public institutions, educational institutions and individuals, take the required actions.

[1] Solving the Productivity Puzzle: The Role of Demand and the Promise of Digitization, February 2018, McKinsey Global Institute.

Methodology

In preparing this report, we used a rich data set, including detailed country-wide occupation and wage data for each sector and Turkey-specific indicators related to education, energy, infrastructure, technology, and macroeconomics.

We employed a threefold methodology to create scenarios for jobs lost, jobs gained through automation, and impact on skill requirements.

For jobs lost through automation, we assessed 800 occupations and 2,000 work activities for 18 skills and identified each activity's time susceptible to automation as lost work time. For example, a customer service representative performs more than 20 activities. We found that activities such as product stock control and reporting of activities and sales could be automated, whereas activities such as welcoming customers and visitors and providing personalized advice regarding products and services have limited automation potential. Similarly, while a production worker's activities such as production planning and product packaging could be automated, activities such as tracking product quality control via the system and managing production teams have limited automation potential.

In addition, we modeled the impact of more than 20 global trends on labor demand in order to calculate the impact of productivity growth on economy and workforce growth. We took rising incomes, aging population, development and deployment of new technologies, infrastructure investments, energy transitions, and efficiency and creation of new markets as factors that could influence labor force demand growth by 2030.

For the implications of skill changes, we defined current and required skills for the changing nature of jobs by mapping each of 2,000 activities to 25 skills in five categories and understood the skill gap to be closed through talent transformation. We analyzed the results by comparing them with data for 46 other countries. We studied in detail how the changes will affect 15 different sectors.

We held discussions with representatives of business, academia, media, the social sector, and government to interpret the results, fine-tune implication estimations, and exchange ideas on potential actions that stakeholders could take to help us develop an assessment of Turkey's talent transformation in the digital era.

Key messages

1. Automation, AI, and digital technologies already play a prominent role in our lives and will be even more influential in the future. Their application, through increasing productivity and economic growth, can create shared prosperity and better lives for all.

We are on the cusp of a new digital age in which technologies not only do things that we thought only humans could do, but also can increasingly do them at a superhuman level of performance. Physical robots have been used for years, but we are seeing much more flexible, safer, and less expensive robots engaging in service activities in various sectors, boosting economic growth, creating jobs, and improving living standards. Our research shows that, at a global scale, adoption of current automation, AI, and digital technologies can affect 50 percent of the world economy. This is equivalent to 1.2 billion employees and $14.6 trillion in wages.[2]

In this respect, we see varying levels of impact in different sectors. For example, education technology is broadening access to courses, providing more memorable and effective instruction. The best-performing education systems offer teachers ongoing training so they can keep up with the latest digital solutions and techniques. In healthcare services, artificial intelligence can potentially diagnose some diseases better than physicians. For example, a deep learning convolutional neural network surpassed dermatologists at identifying cancerous skin lesions by visual examination alone. Similarly, in retail, consumers benefit from online platforms, which provide price transparency and ease of access and help to speed delivery. In some African countries, drones are delivering essential products anywhere in the country in 15 minutes.

With respect to infrastructure and the environment, we see smart buildings using sensors and data analytics to improve energy management. For example, AI technology used at data centers helps cut cooling bills by up to 40 percent. Beijing reduced air pollution by 20 percent after it installed air-quality sensors and regulated traffic and construction according to the pollution level.[3]

We see that automation has the potential to improve healthcare, education, traffic, emergency response, and the environment. Automation can help reduce workplace hazards, make housing more affordable, and benefit consumers in numerous ways. It can also improve job satisfaction and make labor markets more flexible. At the same time, it can increase productivity growth, which will soon be the driver of economic growth in many mature economies.

2. In Turkey, automation, AI, and digital technologies are prompting behavioral and habit shifts in an average person's daily life. This impact grows even more when combined with economic and social changes.

Societal changes driven by advances in technology and changing needs are boosting an increase in consumption in Turkey.

These changes are leading to an even more service-oriented economy than the country has today. People tend to consume food and beverage more often outside the home and to engage in cultural and sports activities and in travel. The aging population increases the demand for healthcare services and care providers. Many people want to get advisory support in areas requiring expertise, boosting service industry. At the same time, digitization and e-commerce facilitate easy access to products and services, allowing smaller companies and entrepreneurs to rapidly expand their businesses through reaching a broader customer base.

All of these changes support economic growth with increased productivity and demand for new services.

3. Although automation, AI, and digital technologies could result in some job losses, gains in productivity, increased investment, and the growth of the service economy could lead to the creation of as many as 3.1 million jobs by 2030.

Only 2 percent of occupations in Turkey are completely automatable, whereas about 60 percent of jobs have at least 30 percent automatable activities. The tasks most susceptible to automation are predictable physical activities and data collection and processing activities. Duties that require human interaction, people management, and expertise are less susceptible to automation.

Automation, AI, and digital technologies are expected to transform numerous jobs in many sectors and to create new ones. Overall, 2030 baseline employment in Turkey is estimated to be about 33.3 million. With the impact of automation and digitization, 7.6 million jobs could potentially be lost by 2030. We estimate that 8.9 million new jobs could be created by 2030 for a net gain of 1.3 million jobs. We expect impacts on productivity and economic growth as well as societal changes driven by digitization to accompany this job growth.

In addition, we estimate that 1.8 million jobs could be created in occupations that currently do not exist, particularly in technology-related sectors. For example, we expect the creation of new roles such as digital service designers, sustainable energy experts, cybersecurity specialists, and AI-assisted healthcare technicians.

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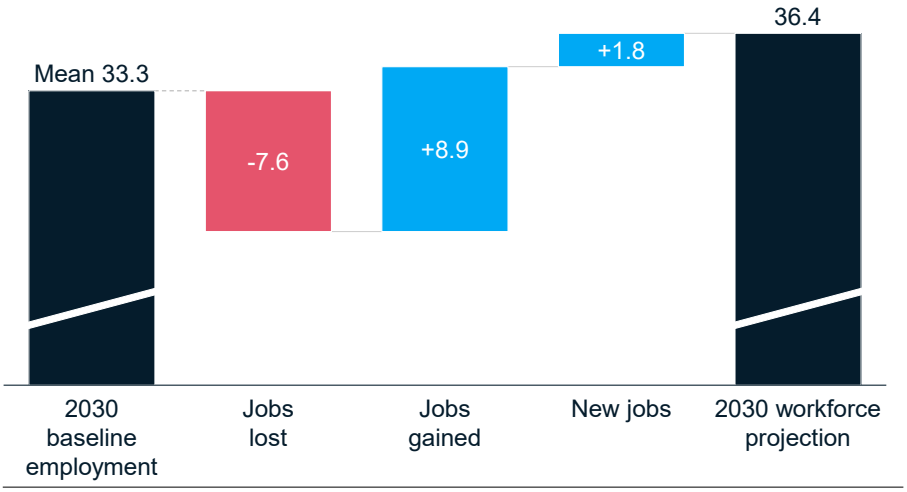
2 *Technology, jobs and the future of work,* McKinsey Global Institute, May 2017.
3 *A government blueprint to adapt the ecosystem to automation and the future of work,* McKinsey & Company, November 2019.

Automation and digitization will significantly transform jobs and create new ones

Change in labor demand in Turkey
Projection with average 20–25% automation level
Million, 2018–30



+3.1M

Job increase potential by 2030

As a result, the Turkish economy has the potential for a net job increase by of 3.1 million 2030, and expected total demand for a workforce of 36.4 million.

Taking a sectoral view, the job increases will manifest most strongly in service sectors—retail sales and service, healthcare services and care providers, food and beverage, and accommodation. Occupation groups reflect similar trends. The number of jobs that require customer interaction and the number of care providers will increase. We expect 30 percent growth in the retail sales and service industry workforce. Healthcare services and care providers are expected to grow by 40 percent, and the food and beverage and accommodation sectors are expected grow by 20 percent.

4. Upskilling and reskilling initiatives will play a key role in talent transformation.

In order to ensure Turkey's talent transformation, 21.1 million workers will need to improve their skills, leveraging technology while remaining employed in their current jobs. In addition, automation and digitization are expected to have an increased impact on 7.6 million employees who will experience significant reskilling and job displacements. Within this group, 5.6 million people are expected to change roles by upskilling and 2.0 million are expected to gain new skills to be able to work in different sectors or in different occupations. It will be critical to equip 7.7 million new employees with required skills as they join the workforce.

5. The workforce will need to acquire stronger social skills and advanced technological skills.

Workplace skills of the future fall into five categories: physical and manual, basic cognitive, higher cognitive, social and emotional, and technological. In most sectors in Turkey, the greatest increase in time spent on work activities that require certain abilities is expected to be for technological and social skills. By contrast, since activities such as data entry and equipment operation are more susceptible to automation, the demand for basic cognitive skills and physical skills could decrease in most sectors.

In 2030, if the anticipated talent transformation can be ensured, the greatest change is expected to be in technological skills, with a rate of 63 percent. While social skills are expected to increase by 22 percent and higher cognitive skills by 7 percent, basic cognitive skills and physical skills are forecast to decrease by 10 and 8 percent, respectively.

In the next 10 years, demand for workers with social and technological skills will increase

	Basic skills Basic literacy, numeracy, and communication	Physical skills Motor skills and strength General equipment repair and mechanical skills	Higher cognitive skills Creativity Complex information interpretation Project management Critical thinking and decision making	Social skills Entrepreneurship Interpersonal skills and empathy Advanced communication Adaptability and continuous learning	Technological skills Basic digital skills Scientific research Technology design and engineering Advanced data analysis
2030 baseline employment Million	5.2	15.5	5.8	4.5	2.4
2030 workforce, projected[1] Million	4.7	14.3	6.2	5.5	3.9
Change %	-10	-8	7	22	63

1. Projection with average automation level of 20–25%, does not include 1.8 million entirely new jobs

6. All relevant stakeholders should collaborate on a broad range of Future of Work initiatives to make Turkey's talent transformation happen.

All stakeholders, including businesses, associations, public institutions, educational institutions, and individuals must take required actions to benefit from the opportunities created by automation, AI, and digital technologies and to overcome the related challenges.

Following is a summary of what each party could do.

Businesses and associations:

— **Strategic workforce planning:** Leading companies should undertake efforts to conduct strategic workforce planning and prepare road maps for talent transformation. Companies should make targeted investments focused on employee reskilling and upskilling initiatives. Using sophisticated workforce planning tools and predictive analytical models to plan for talent acquisition could enhance efficiency.

— **Talent transformation programs:** Companies should set ambitious targets for automation through the latest technologies. Companies will need to add positions that require knowledge of data analytics and AI technologies and to invest in IT professionals. In addition, companies can leverage corporate academies to improve employee skills, from leadership skills to digital skills.

— **New working models:** Companies must move from traditional "waterfall" approaches to flexible and efficient working models. Agile and empowered teams should be created. Employees should also be prepared for the new working models and leadership approach.

Public institutions:

— **Geographical and sectoral strategic workforce planning:** Public institutions could engage in country-wide strategic workforce planning and establish priorities. Looking at the country's talent pool, they should analyze existing skills and plan a road map that anticipates the skills needed in the future.

— **Centers of development and technology:** Public institutions could set the priority areas for reform, establish dedicated mechanisms to enable a holistic approach, and coordinate implementation. They might also consider creating a dedicated central unit to oversee and carry out country-wide automation and retraining initiatives, with representatives from key ministries such as labor, education, and industry.

— **Accelerating mechanisms and incentives:** Public institutions could work to establish job centers to facilitate reskilling and reemployment efforts, especially for acquisition of technological skills. Special attention should be given to Technology Development Zone skills development programs and to model factories that are being established. Turkish Employment Agency (ISKUR) programs intended to mitigate the impact of automation and digital transformation on supply-demand

balance in the employment market should be revised and implemented. Furthermore, the asset-liability balance in the social security system can be closely followed considering potential disrupting effects of the technologies on the employment market. Social security and premium models aligned with the digital transformation level can be evaluated and implemented in order to balance the pace of transformation.

Educational institutions:

- **Revising the education model:** The education system should revamp school curricula to incorporate in-demand skills. Relevant classes could be made compulsory at appropriate levels. Universities and educational institutions should create programs tailored to future skills, open to adults through seminars, certificate programs, and online training.
- **Improving learning experience:** The classroom experience should be more personalized, shifting from traditional content on traditional schedules to building job skills anytime, anywhere. The new learning experience can be built through collaborating with community centers, employing experts, and using peer-to-peer or project-based instruction. Content should include problem-solving skills, rapid prototyping, and asking the right questions.
- **Lifelong learning:** The education system needs to build the mind-set of "learning to learn," emphasizing the willingness to continuously adopt new skills. This approach allows students to build the foundations of critical thinking, problem solving, and lifelong learning. Local governments can assume a key role to access a higher number of people in order to support lifelong learning.

Individuals:

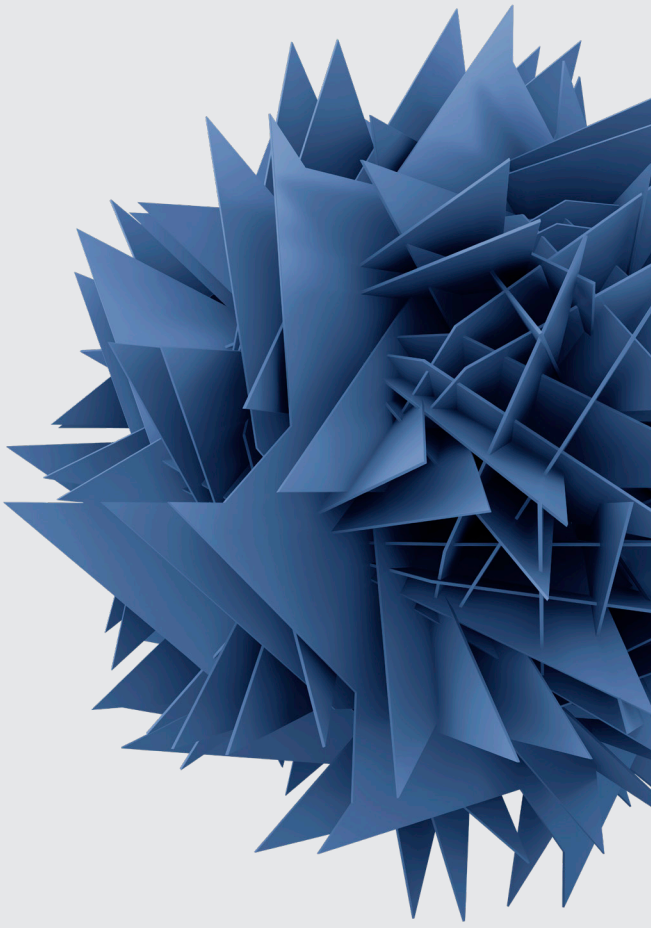
- **Continuous learning and self-development:** Individuals must own their own learning journeys by continuously updating skills throughout their careers. Leaders should understand individuals' need for capability building, both for themselves and for their organizations, and should lead the transformation.
- **Social and technological skills:** Individuals must focus on developing the key skills and attributes of the future, including social skills (such as resilience and adaptability), technological skills (such as programming and data analysis), and cognitive skills (such as critical thinking, problem solving, and creativity). Leaders should prepare their organizations for building such capabilities.
- **Lifelong flexible career paths:** Individuals will have to embrace a "startup of you" mind-set and take an entrepreneurial approach to their careers. Project-based, independent, and part-time jobs are on the rise. Individuals should prepare themselves for lifelong flexible career paths.

Automation, AI, and digital technologies offer big opportunities for Turkey to improve productivity and generate many new jobs.

To take advantage of this opportunity, Turkey should invest in talent transformation to develop the new skills required in the workplace of the future. It is critical for all stakeholders to work together to achieve this transformation. We believe that this talent transformation journey will unlock the country's strong potential.

1. Introduction

We are on the cusp of a new digital age in which technologies not only do things that we thought only humans could do, but also can increasingly do them at a superhuman level of performance. While the pace of adoption of automation, AI, and digital technologies varies by country, our research shows that at a global scale, adopting these technologies can affect 50 percent of the world economy.



Automation can be defined as the use of automatic equipment, such as machines or robots, to reduce or eliminate the need for human intervention in a process. Since the invention of the steam engine, automation has led to improved working conditions and better quality of life for many people around the world. Rapid technological developments have the potential to take this even further, given that machines can now perform big data analysis, detect criminals, and drive cars. Machines outperform humans in activities such as data collection and data sourcing, route optimization, and fraud detection.

For example, insurance companies employ pattern recognition to identify false claims, saving them millions of dollars.[4] Moreover, through techniques like machine learning and neural networks, AI can accomplish tasks that were previously thought to require human judgment. As early as 1997, IBM's Deep Blue defeated the chess grandmaster Garry Kasparov, one of the first major accomplishments of AI.[5] In 2016, AlphaGo of Google DeepMind became the first computer program to defeat a world champion in the complex game of Go.[6]

The impact of automation, AI, and digital technologies varies by country. While technological advances happen everywhere, different regions of the world are at different stages of the digitization and automation journey.

China and the United States are presumably in the lead in share of digital technology and automation in the economy. MGI estimates that the United States has captured 18 percent of its potential from digital technologies, compared to 12 percent for the European Union (EU) overall. This figure varies among other European countries, ranging from 10 percent in Germany to 17 percent in the United Kingdom.[7] Moreover, even though Europe's economy is almost the same size as that of the United States and bigger than China's, the digital and AI-based portion of its information and communications technology (ICT) sector accounts for only 1.7 percent of its GDP. This figure is less than China's 2.2 percent and half of the United States' 3.3 percent (Exhibit 1).[8] Turkey does not fare any better.

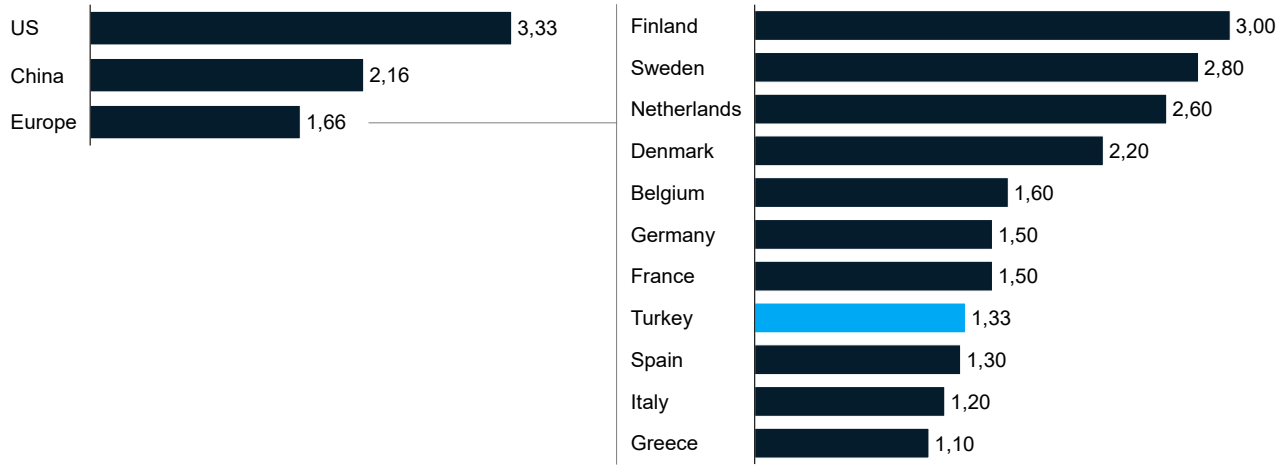
In Turkey, information technologies accounted for only 1.3 percent of GDP in 2017, a nominal figure of $11.3 billion.[9] The purely digital and AI-based portion of this figure would be even lower.

4 *A future that works: Automation, employment, and productivity,* McKinsey Global Institute, January 2017.
5 Steven Strogatz, "One giant step for a chess-playing machine", *New York Times,* December 28, 2018, nytimes.com/2018/12/26/science/chess-artificial-intelligence.html
6 *AlphaGo: The story so far,* DeepMind, deepmind.com/research/alphago
7 *Digitization, AI, and the future of work: Imperatives for Europe,* McKinsey Global Institute briefing note prepared for the EU Tallinn Digital Summit, September 2017.
8 *Notes from the AI frontier: Tackling Europe's gap in digital and AI,* McKinsey Global Institute, February 2019.
9 In 2017, GDP for Turkey was $851.6 billion, and the IT market was worth $11.3 billion. See World Development Indicators, World Bank, and ICT 2017 market data, Informatics Industry Association (TUBISAD), 2018.

Exhibit 1

Europe lags behind the United States and China on digital information and communications technologies

Digital ICT 2017[1], % of GDP, estimated



1. Digital share of information and communications technology value added is estimated by taking the share of revenue made through digital channels and by taking the portion of cost of all functions performed digitally

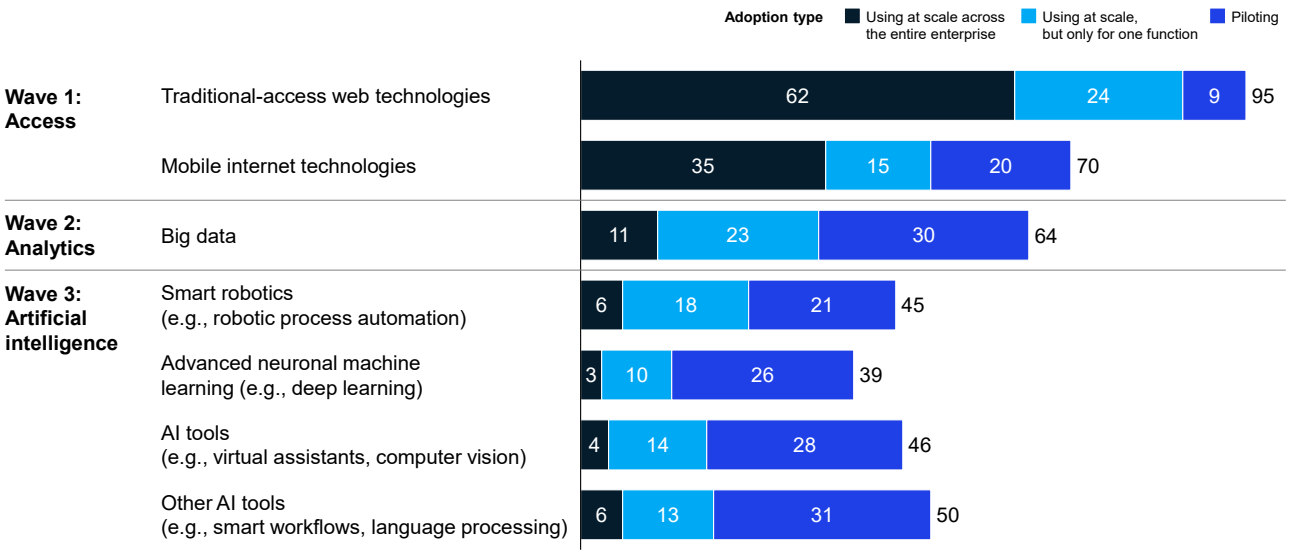
Source: Directorate-General for Research and Innovation, European Commission, 2018; McKinsey Digital Survey, 2018; World Development Indicators, World Bank; ICT 2017 market data, Informatics Industry Association (TUBISAD), 2018; McKinsey Global Institute analysis

European companies are moving to expand their use of digital technologies, but slowly. According to the European Commission, the share of fully digitized companies is increasing by less than 10 percent a year. Furthermore, a McKinsey Digital survey in 2018 found that most of the newer technological advances, such as big data and smart robotics, have remained niche solutions in Europe (Exhibit 2).[10]

Exhibit 2

Europe is in the early stages of diffusion of AI technologies

% of European large companies, 2017



Note: Figures may not sum 100% because of rounding

Source: McKinsey Digital Survey, 2018; McKinsey Global Institute analysis

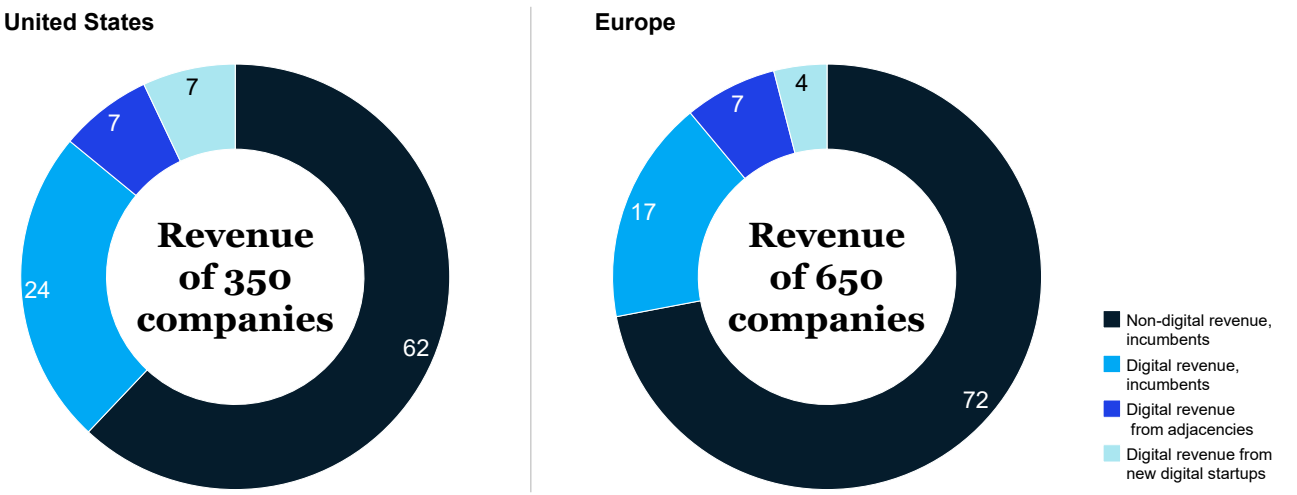
[10] *Notes from the AI frontier: Tackling Europe's gap in digital and AI,* McKinsey Global Institute, February 2019.

European public institutions have started to recognize the importance of high technology for the economy as well. The EU allocated €2.6 billion for AI and robotics development as part of its Horizon 2020 plan. French President Emmanuel Macron has announced an investment of €1.5 billion in AI research. However, other countries' efforts dwarf these numbers. For example, China is spending $2.1 billion on a single AI technology park in Beijing. China and the United States attracted 50 percent of global venture capital and corporate funding for AI in 2016, but Europe managed only 11 percent, and that share is projected to remain the same or go even lower. In addition, US companies' revenue from digitization, as a share of total revenue, is considerably higher than that of their European counterparts (Exhibit 3).[11]

Exhibit 3

Europe's digitization is less advanced than that of the United States

% of revenue



Source: McKinsey Digital Survey, 2017; McKinsey Global Institute analysis

Differences between wage levels and investment costs might help explain the differences in the pace of automation adoption in different economies. For example, higher wages and quality technology infrastructure would lead to faster automation in developed economies such as Germany, Japan, and the United States, whereas lower labor costs and the cost of capital investment in emerging economies could delay such a shift.

What holds true for any type of economy is the need for a GDP growth engine. There are two ways to achieve this: employment or productivity growth. The average age of the world population is rising, meaning relatively fewer potential workers enter the workforce each year, so increasing workforce participation to capture additional GDP growth is much harder than in years past. An important implication is that without acceleration in productivity growth, countries will not have workers to meet their GDP growth targets.

Automation is expected to unlock significant potential for increased productivity growth. Indeed, two-thirds of senior executives and labor union representatives in Turkey surveyed recently said automation will make the national economy more competitive.[12]

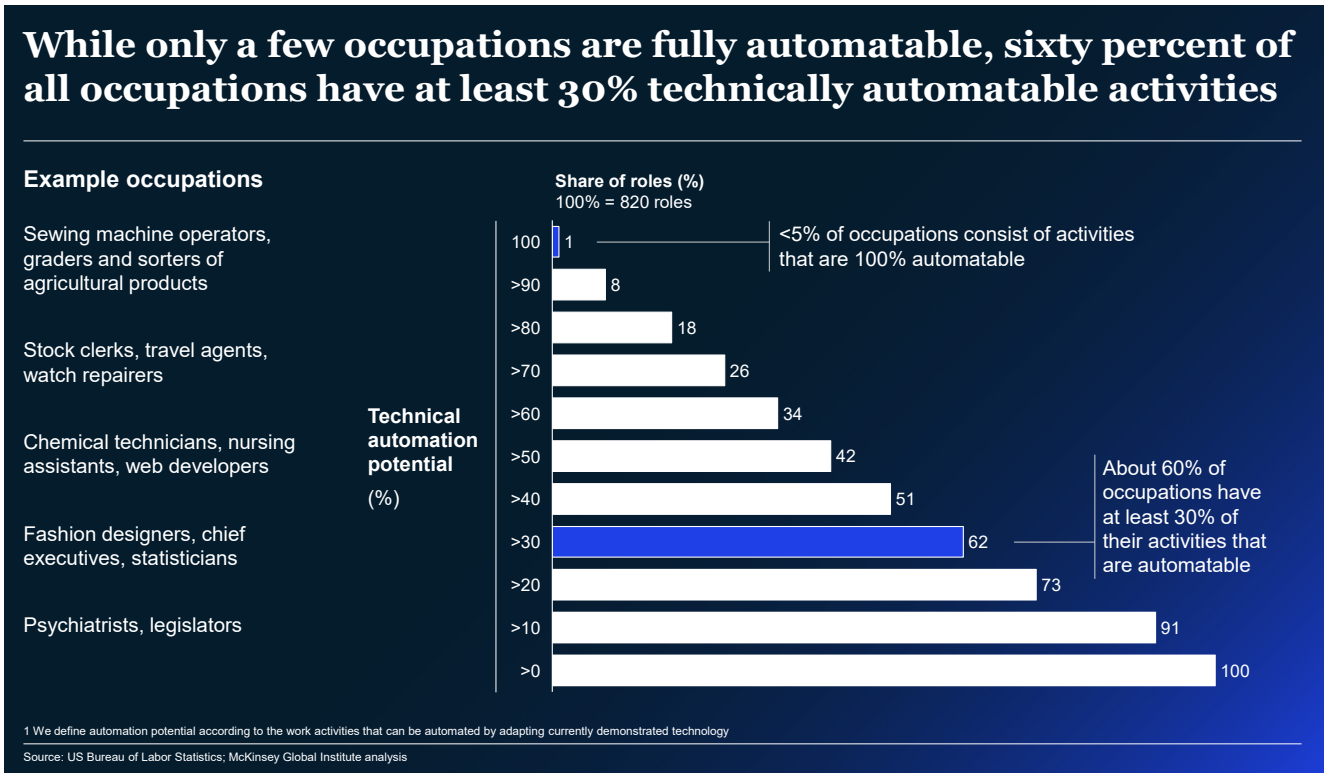
[11] Ibid.

[12] Turkish Confederation of Employer Associations (TİSK) Future of Work survey of 150 senior executives and labor union representatives, October 2019.

Focus on automation and the need for productivity growth is important for Turkey, which is already ranks low among OECD countries in labor productivity, with $38.10 of GDP output per hour worked in 2017. That figure is 21 percent lower than the OECD average, $48.10, and 42 percent below the United States, $64.20.[13]

Automation is already replacing a variety of work activities. To understand its global potential, MGI analyzed which work-related activities could be automated with the current level of technology. The results show that as much as 50 percent of current work hours can be automated by adapting currently demonstrated technologies, which corresponds roughly to the equivalent of 1.2 billion workers. This, however, does not mean that 50 percent of jobs would disappear in the short term—globally, less than 5 percent of occupations can be fully automated. Rather, the composition of work will change (Exhibit 4).[14]

Exhibit 4



Automation has two sides: it can boost productivity growth to sustain current standards of living, and it can transform certain jobs. Such changes have been common throughout history. For example, one-third of the new jobs created in the United States in the past 25 years did not even exist 25 years ago. In addition, a McKinsey study of the French economy showed that from 1996 to 2011, the internet created 2.4 jobs for every job it destroyed.[15] Humans play a crucial role in designing, building, and scaling new technologies, something that automation cannot take away.

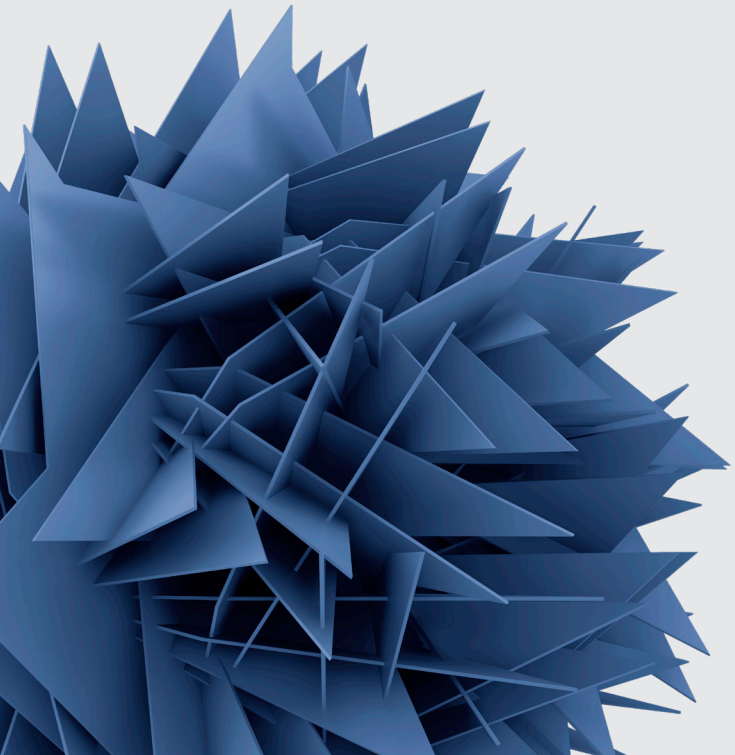
Social and higher cognitive skills will be in greater demand in the new world of work. A recent McKinsey survey found that 55 percent of respondents expect social and technological skills to be more important in the future, given the changes automation is expected to bring.[16]

Some companies and countries started to prepare for this future. The US telecommunications company AT&T, for example, has designed a transition program with external partners, including 32 universities and online education platforms, to help workers develop skills needed for their new roles. As of March 2018, more than half of AT&T's employees had completed at least one online course. The company stated that workers who have restrained are four times more likely to advance in their careers as those who have not.[17] Another US firm, the software company Bit Source, has offered training courses for laid-off coal miners in the state of Kentucky to help them change careers and learn to code.[18]

[13] Productivity statistics database, GDP per capita and productivity growth, OECD.
[14] *A future that works: Automation, employment, and productivity,* McKinsey Global Institute, January 2017.
[15] *Ibid.*
[16] Turkish Confederation of Employer Associations (TİSK) Future of Work survey of 150 senior executives and labor union representatives, October 2019.
[17] *The future of work: Switzerland's digital opportunity,* McKinsey & Company, 2018.
[18] Erica Peterson, "From coal to code: A new path for laid-off miners in Kentucky", All Tech Considered, NPR, 2016, npr.org/sections/alltechconsidered/2016/05/06/477033781/from-coal-to-code-a-new-path-for-laid-off-miners-in-kentucky

2. The impact of automation, AI, and digital technologies on occupations

On a global scale, current technologies have the potential to help automate 50 percent of jobs. In Turkey, over one-third of the activities performed in 60 percent of occupations could be automated.



Methodology

In preparing this report, we used a rich data set, including detailed country-wide occupation and wage data for each sector and Turkey-specific indicators related to education, energy, infrastructure, technology, and macroeconomics.

We employed a threefold methodology to project jobs lost, jobs gained through automation, and impact on skill requirements.

For jobs lost, we examined 800 occupations and 2,000 work activities for 18 skills and identified each activity's time susceptible to automation as lost work time (Exhibit 5). For example, a customer service representative performs more than 20 activities. We found that activities such as product stock control and reporting of activity or sales could be automated, whereas activities such as welcoming customers and visitors and providing personalized advice regarding products and services have limited automation potential. Similarly, while a production worker's activities such as production planning and product packaging could be automated, activities such as tracking product quality control via the system and managing production teams have limited automation potential.

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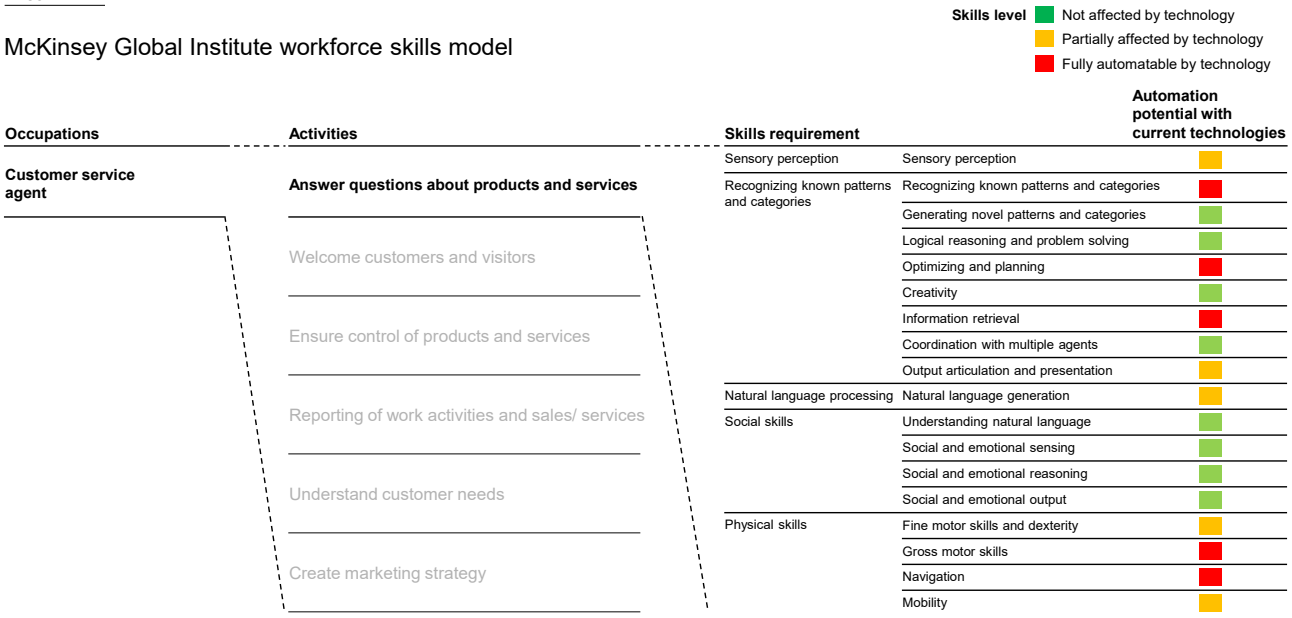
Exhibit 5

We identified automation potential for each occupation by detailed activities

ILLUSTRATIVE

McKinsey Global Institute workforce skills model

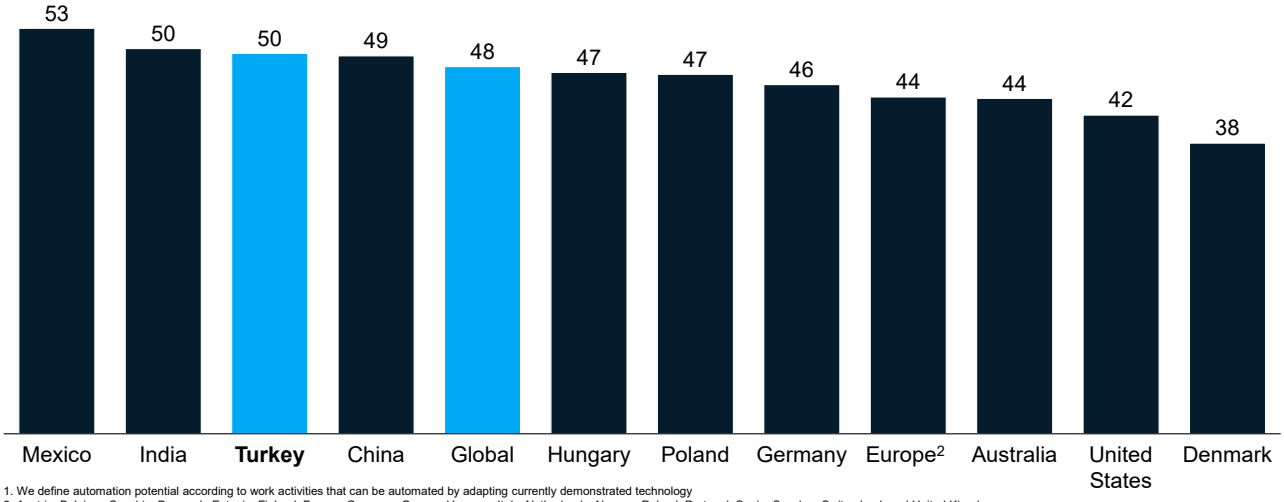


Our core finding is that 50 percent of work hours in Turkey could be automated by adapting existing technologies. This figure is equivalent to the work of a staggering 16.6 million people—out of a projected workforce of 33.3 million—in 2030. However, merely possessing automation potential does not mean that it will be realized; adoption depends on how quickly technology diffuses through all sectors of an economy and how effective companies are in reorganizing workflows. The analyses in this section illustrate the technical potential and not actual adoption, which will be discussed later in the report.

Exhibit 6

Turkey has relatively high automation potential of 50% amid high concentration of manufacturing, agriculture and trade sectors, which have high proportion of predictable work activities

Automation potential based on existing technology, %[1]



1. We define automation potential according to work activities that can be automated by adapting currently demonstrated technology
2. Austria, Belgium, Czechia, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Italy, Netherlands, Norway, Poland, Portugal, Spain, Sweden, Switzerland, and United Kingdom
NOTE: Figures may not sum to 100% because of rounding

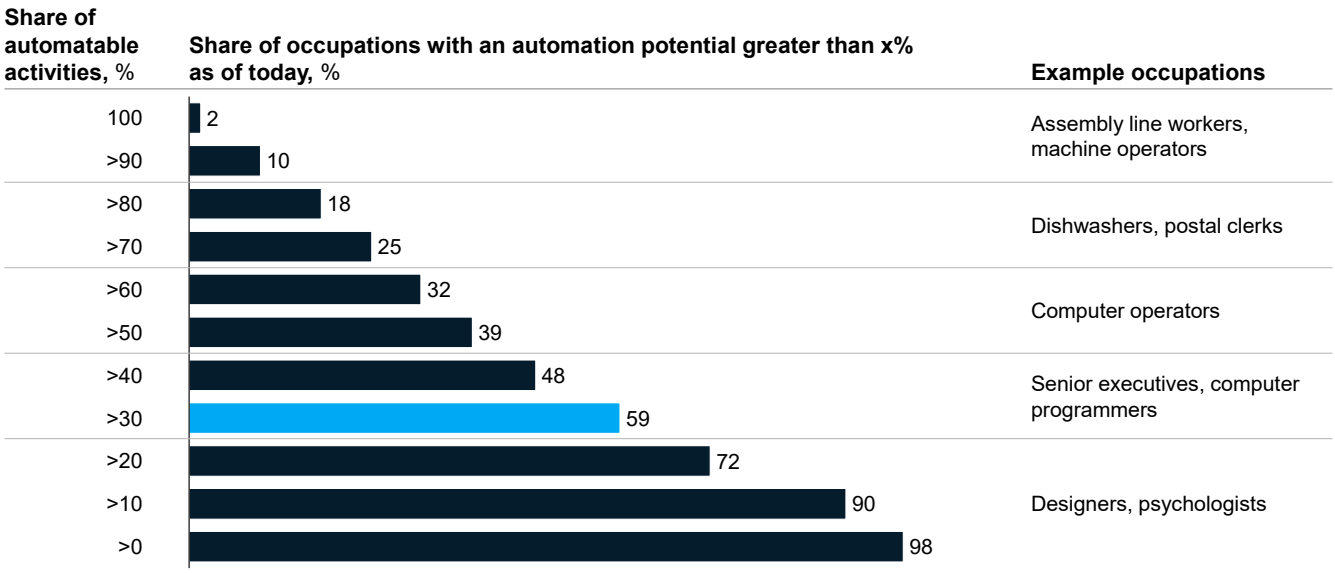
Source: O*NET; MGI Automation Model, May 2019; McKinsey Global Institute analysis

Turkey, like China and India, has higher automation potential than the global average and the average for developed countries (Exhibit 6). The economies' sectoral mix accounts for this phenomenon. Like Turkey, most developing countries have larger shares of their labor forces in highly automatable sectors, such as manufacturing and agriculture, than in other sectors. By contrast, larger shares of the labor force in developed countries are in the service, healthcare, and public sectors. Because these sectors are less prone to automation, overall automation potential is lower in developed countries. Countries such as China, India, and Indonesia have greater automation potential and large workforces that skew the average higher.

Even though automation potential for work activities is considerable, most occupations in Turkey are only partially automatable. Just 2 percent of all occupations are completely automatable, while 60 percent of jobs have at least 30 percent automatable activities. These findings are similar to MGI's global results. As expected, occupations with large percentages of repetitive work activities have a higher share of automatable activities, whereas occupations that involve more interaction, communication, and expertise have lower shares of automatable activities (Exhibit 7).

Exhibit 7

While only 2% of occupations have all their activities technically automatable, ~60% of occupations have more than 30% of their activities technically automatable



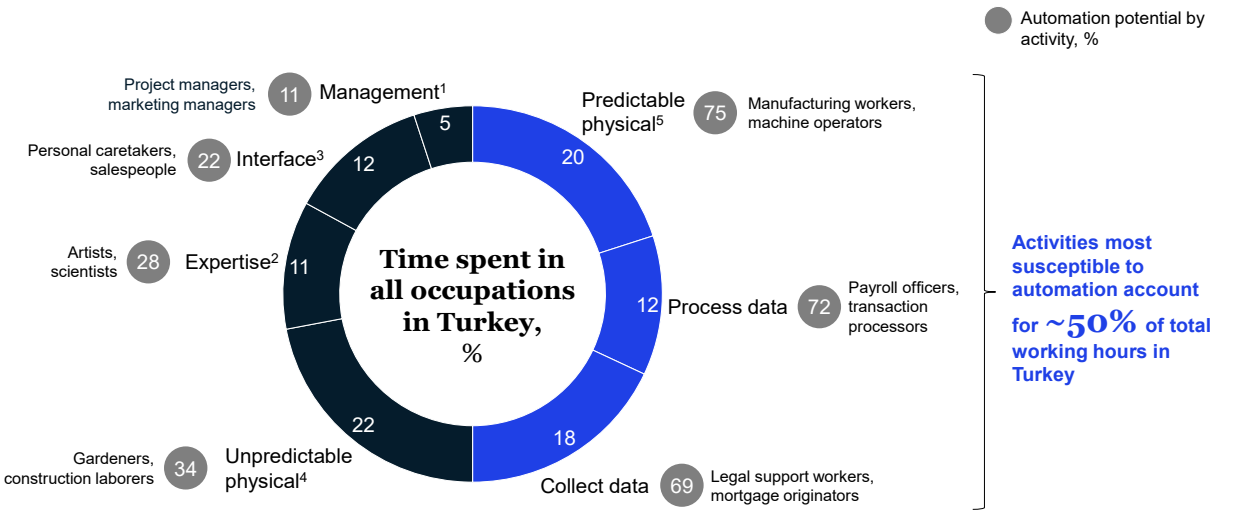
NOTE: Figures may not sum to 100% because of rounding

Source: O*NET; MGI Automation Model, May 2019; McKinsey Global Institute analysis

Looking more closely at individual occupations, we find that the activities most susceptible to automation include predictable physical activities as well as data collection and processing. These categories make up about half of all working hours in Turkey, and they all have automation potential greater than 65 percent. Activities that require human interaction and managing people are less susceptible to automation, showing automation potential of less than 25 percent (Exhibit 8).

Exhibit 8

Roughly 50% of work time in Turkey is spent on activities with high automation potential

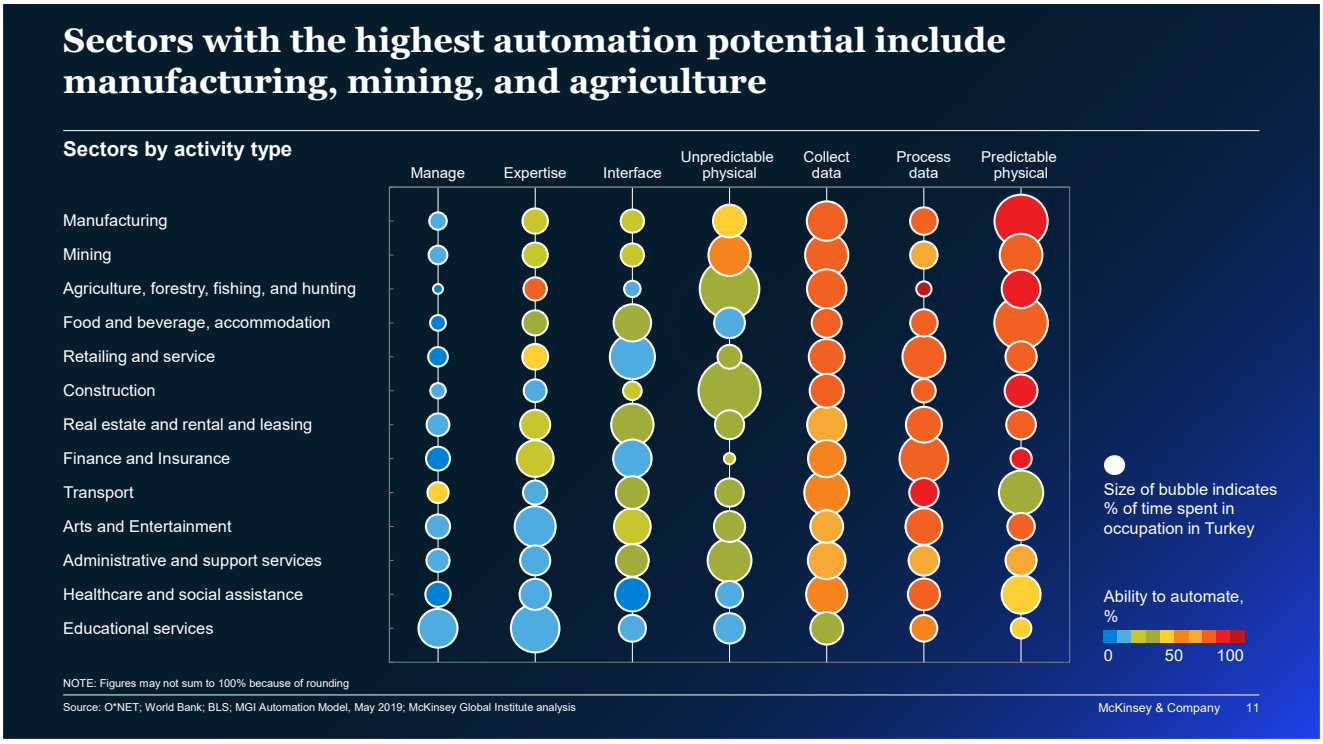


1. Managing and developing people 2. Applying expertise to decision making, planning, and creative tasks. 3. Interfacing with stakeholders
4. Performing physical activities and operating machinery in unpredictable environments
5. Performing physical activities and operating machinery in predictable environments
NOTE: Figures may not sum to 100% because of rounding

Source: O*NET; MGI Automation Model, May 2019; McKinsey Global Institute analysis

Taking a sectoral view, we see that manufacturing, mining, and agriculture have the highest automation potential, at 65 percent, 61 percent, and 56 percent, respectively. This is to be expected, since predictable physical activities dominate the occupations in these sectors. The construction sector also requires a lot of physical activities, but those activities are more unpredictable, so automation potential is lower compared with the top three sectors. Conversely, educational services and information have the lowest automation potential, at 21 percent (Exhibit 9).

Exhibit 9

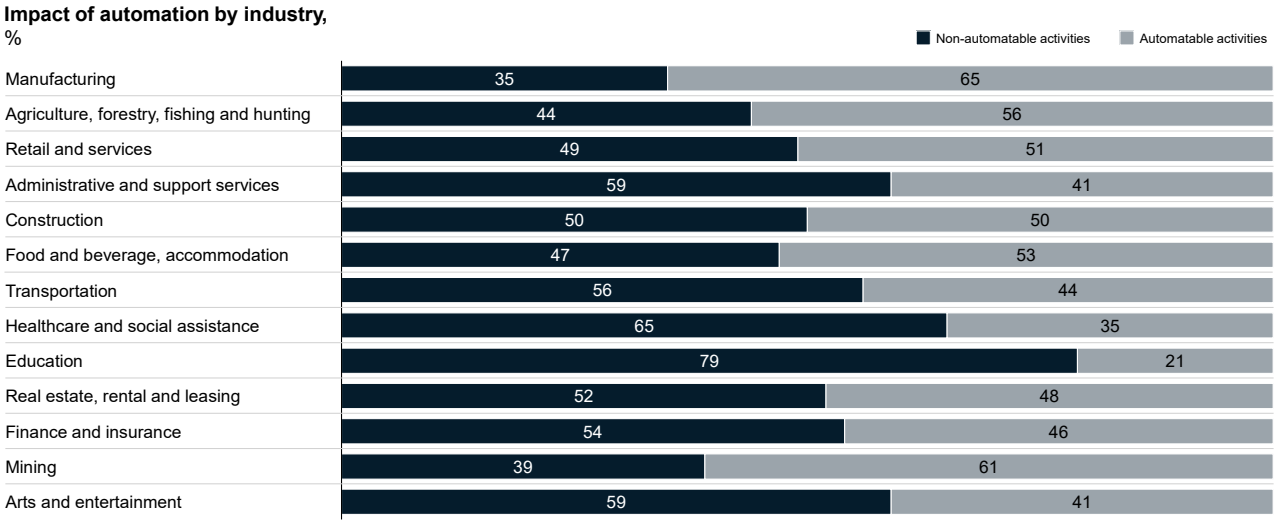


Manufacturing and agriculture head the list of sectors with the greatest automation potential in terms of full-time equivalents (FTE), followed by the retail sales and service sectors.[19] Predictable physical activities and data collection are the main reason for automation potential in manufacturing and agriculture. In retail sales and service, we expect that both predictable physical activities (such as warehousing) and interaction type are prone to automation; for example, self-checkout systems can make some cashiers obsolete. While mining also demonstrates a high potential for automatable activities, its FTE automation potential is lower because the sector employs relatively few workers. Sectors that require extensive interaction and particular expertise, such as arts and entertainment, are at the lower end of the list (Exhibit 10).

[19] The agricultural sector is the main focus of AI research in China. See *Artificial intelligence: How knowledge is created, transferred, and used: Trends in China, Europe, and the United States*, Elsevier AI Resource Center, 2018.

Exhibit 10

Manufacturing is the sector with the most automatable activities and full-time-equivalent worker automation potential



NOTE: Figures may not sum to 100% because of rounding

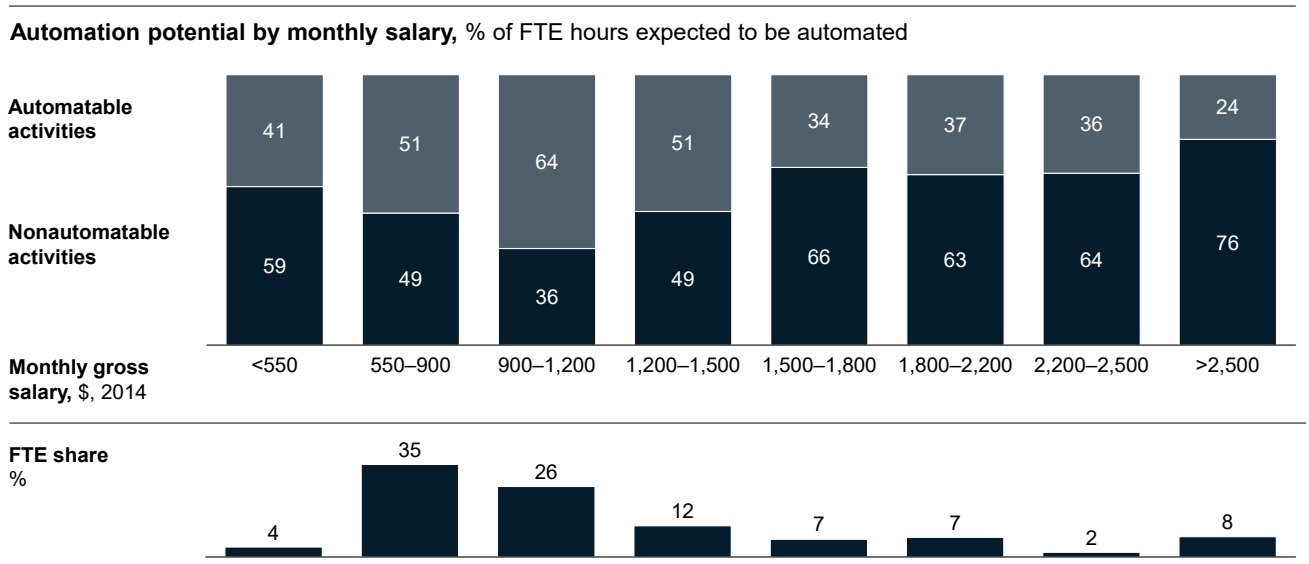
Source: MGI Automation Model, May 2019; McKinsey Global Institute analysis

An interesting finding is that salary levels are not absolute predictors of automation potential. Still, generally speaking, lower-paid occupations are more susceptible to automation. This is especially true for levels of $550 to $900 and $900 to $1,200 monthly gross salary. This corresponds to 60 percent of total employment. Automation potential for these ranges is 51 percent and 64 percent, respectively. This result is not surprising, since occupations with lower salaries are typically associated with repetitive work. However, the highest automation potential is not in the lowest salary bracket. This is mostly due to the job components at this level. For example, agricultural laborers who work for daily wages perform more unpredictable physical activities than higher-paid workers. Meanwhile, higher salary levels have lower automation potential. This is mostly because those salaries reflect jobs requiring higher cognitive skills (Exhibit 11).[20]

[20] Note that salary levels are from 2014, the latest year for which wage data are available.

Exhibit 11

Parts of occupations at all salary levels are prone to automation



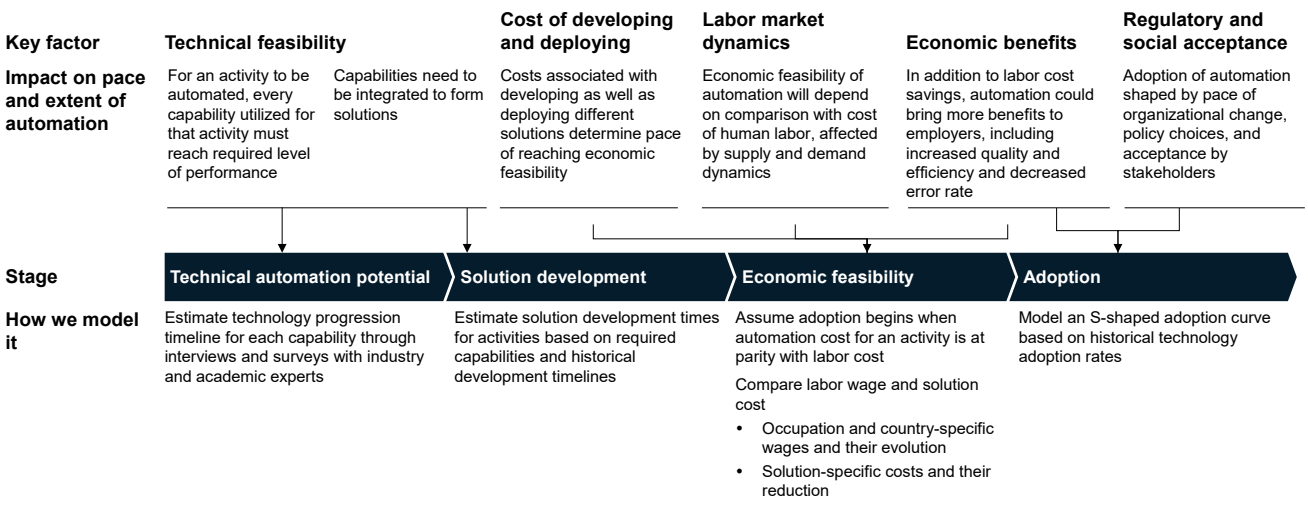
NOTE: Figures may not sum to 100% because of rounding

Source: MGI Automation Model, May 2019; McKinsey Global Institute analysis

As noted, Turkey has a technical automation potential of 50 percent, yet this does not mean that half of all work activities can be automated by 2030. Automation adoption depends on several factors. MGI examined five factors over four stages that could affect the pace and extent of automation to determine potential adoption rates (Exhibit 12).

Exhibit 12

Five factors that affect the pace and extent of automation are considered in a four-stage process



NOTE: Economic benefits affect both when adoption will begin and its pace. For determining economic feasibility, we assume that decision makers discount uncertain benefits of initial labor cost savings by roughly same amount as they believe also-uncertain nonlabor cost-related benefits will be captured

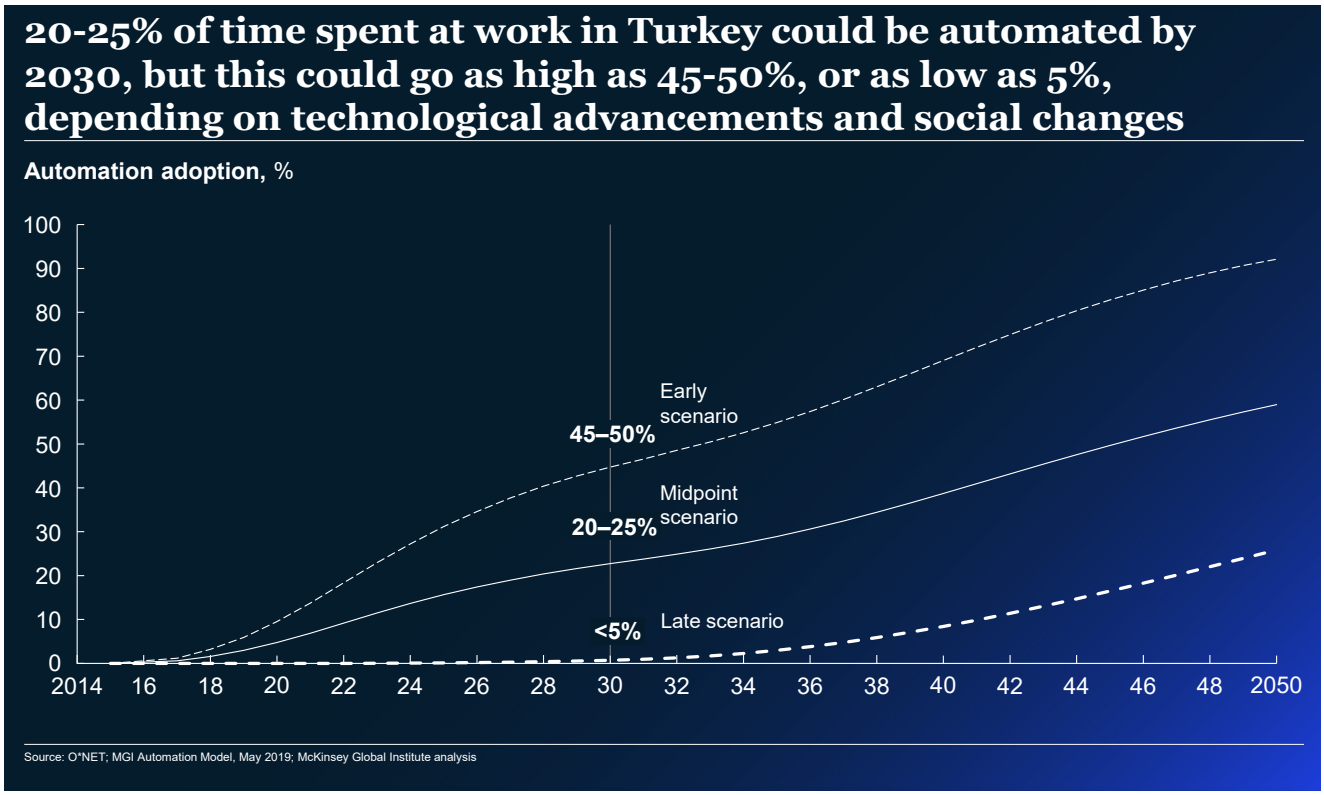
Source: McKinsey Global Institute analysis

Using this approach, we determined three scenarios for automation adoption: late (or slow), early (or fast), and midpoint, the average of the late and early scenarios. The early scenario, corresponding to the fast adoption of digital technologies, shows that 45 to 50 percent of working hours in Turkey could be automated by 2030. Such a scenario could trigger a significant productivity boost, but it would require rapid and radical changes not just in employment conditions, but also in overall society. For early adoption to happen, technologies and solutions would need to be developed more quickly. This requires both the public and private sectors to invest significantly in research and development (R&D) and in technology deployment. That would mean investment in developing the technologies domestically and in digitally enabled infrastructure to support automation. The likely barriers to adoption—social, political, and organizational—would also need to be overcome quickly. This requires considerable support and consensus across society.

The late adoption scenario, corresponding to a much slower pace of diffusion of digital technologies, shows that less than 5 percent of working hours could be automated by 2030. Although this scenario seems to be limiting job displacement originating from automation, it could also lead to a situation in which Turkish companies become less competitive globally.

Midpoint adoption will be the main scenario this report considers. This scenario shows that 20 to 25 percent of working hours could be automated by 2030. This corresponds to the displacement of about 7.6 million jobs. Exhibit 13 illustrates the possible evolution of automation adoption rates for each scenario.

Exhibit 13



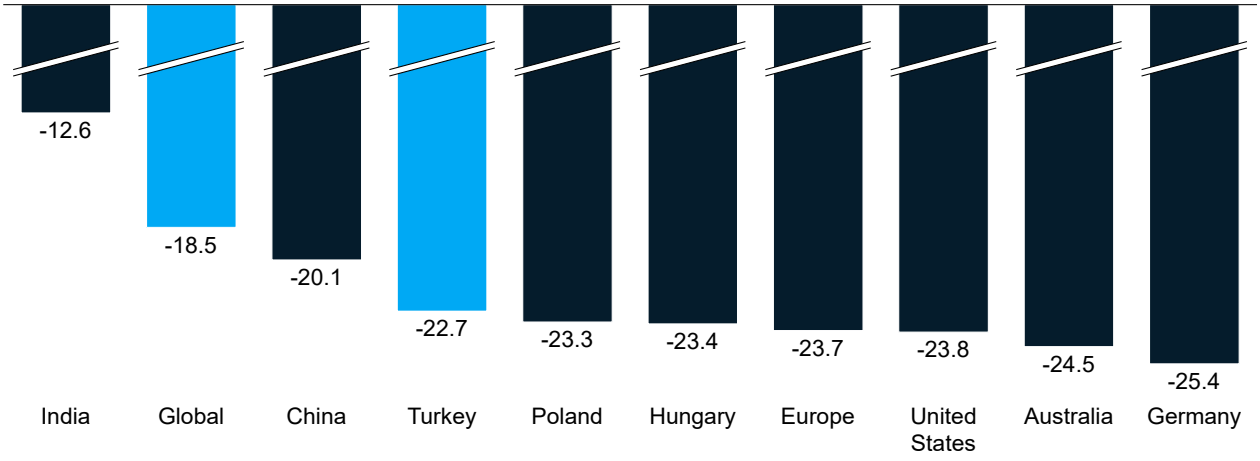
A comparison of midpoint automation adoption rates shows that Turkey scores higher than the global average and other developing countries (Exhibit 14).

This result might be expected; labor costs are higher in Turkey compared with these other countries, presenting an incentive to invest in automation. In addition, Turkish GDP per capita in terms of purchasing power parity is much higher than that of countries such as Brazil, China, India, and Indonesia. Developed economies have even higher labor costs and GDP per capita, which could spur increased adoption rates. The advanced level of technology in developed countries could also lead to higher adoption rates. This is because some portion of the technology infrastructure is already in place.

Exhibit 14

Turkey could experience automation adoption rates higher than most developing countries, as its labor costs and GDP per capita are higher

Automation adoption (midpoint scenario), % of FTE hours expected to be automated



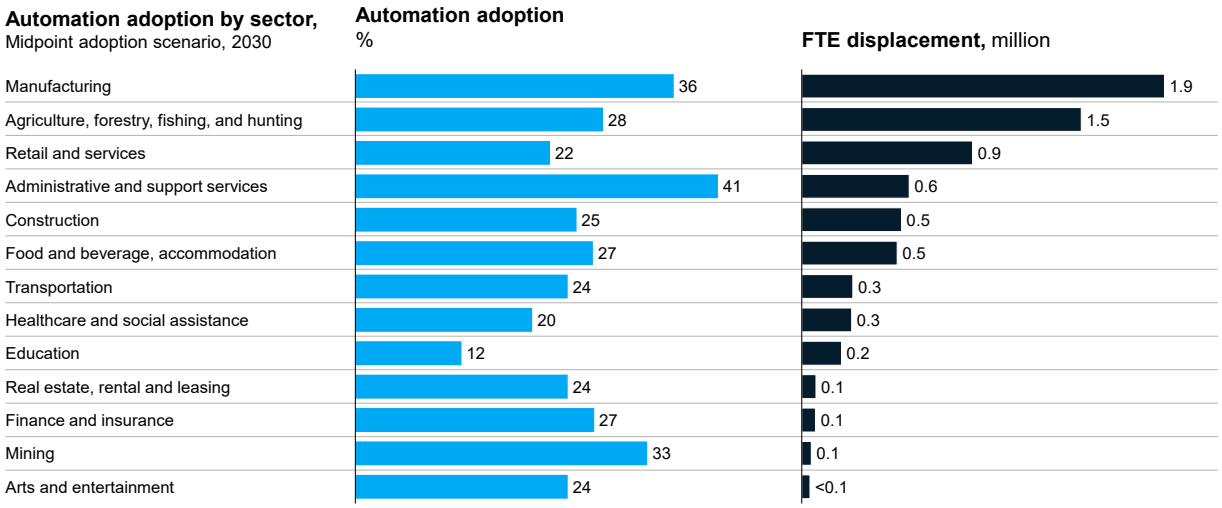
1. Population-weighted
NOTE: Figures may not sum to 100% because of rounding

Source: MGI Automation Model, May 2019; McKinsey Global Institute analysis

In automation adoption and potential job displacement, manufacturing is the segment most prone to automation. This is mainly due to the nature of jobs in the sector, which include a lot of predictable physical activities and data collection and processing activities. This result should not surprise the Turkish business community—a recent survey revealed that about half the country's executives already believe that manufacturing will be the sector most affected by automation.[21] The mining and the food and beverage and accommodation sectors have the second- and third-highest adoption rates, given the repetitive work involved in their activities. Sectors such as education, healthcare and social aid, which have smaller labor forces and lower adoption rates, are on the lower end of the list. This is, again, mostly due to the expertise required to perform these jobs (Exhibit 15).

Exhibit 15

Job displacement could vary by sector, depending on size and automation adoption rates



NOTE: Figures may not sum to 100% because of rounding

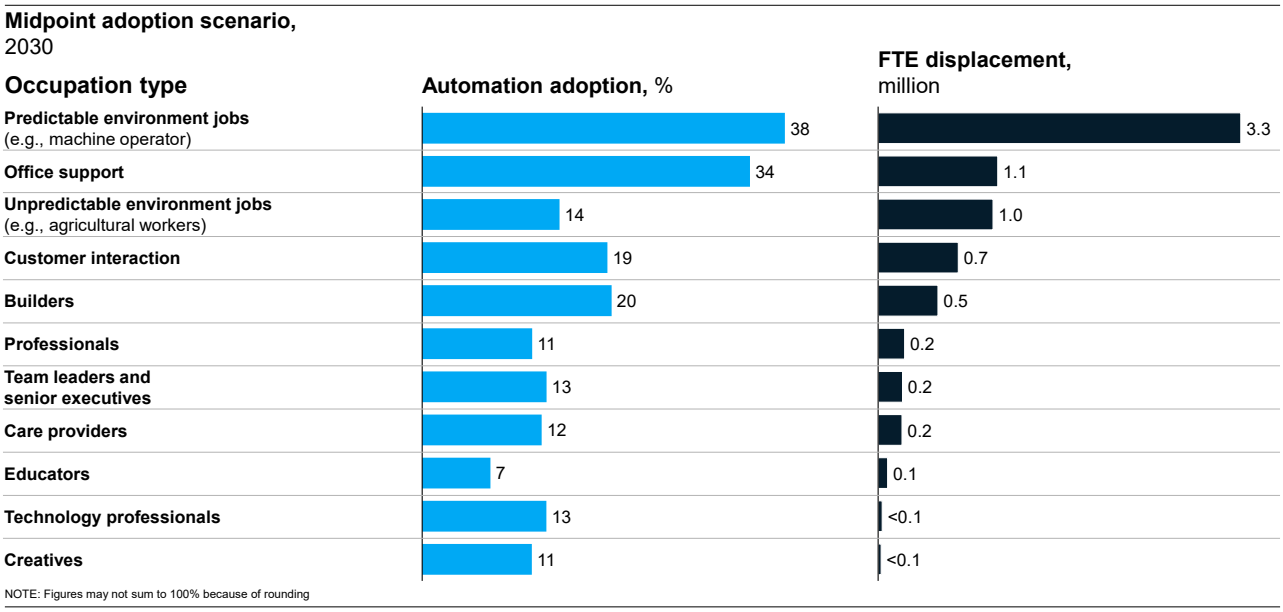
Source: O*NET; MGI Automation Model, May 2019; McKinsey Global Institute analysis

[21] Turkish Confederation of Employer Associations (TİSK) Future of Work survey of 150 senior executives and labor union representatives, October 2019.

As we have noted, the occupations that will be most affected by automation adoption include elements of repetitive work. Office support jobs, such as data clerks, come in second, as they include a lot of data collection and processing. By contrast, jobs that require expertise and creativity, such as educators and technology professionals, have lower automation rates. Exhibit 16 highlights the details of several job categories.

Exhibit 16

Among occupational categories, job losses could be highest for repetitive and physical jobs



NOTE: Figures may not sum to 100% because of rounding

Source: O*NET; MGI Automation Model, May 2019; McKinsey Global Institute analysis

As machines assume more work activity, the shift will potentially lead to job displacements. Furthermore, competition for high-paying jobs could intensify. High-skill workers could be able to spend more of their time on value-added activities, learning how to cope and coexist with automation. By contrast, relatively low-skill workers could fall into a vicious cycle of fewer work and training opportunities, which may dampen their ability to acquire the skills they need to flourish.

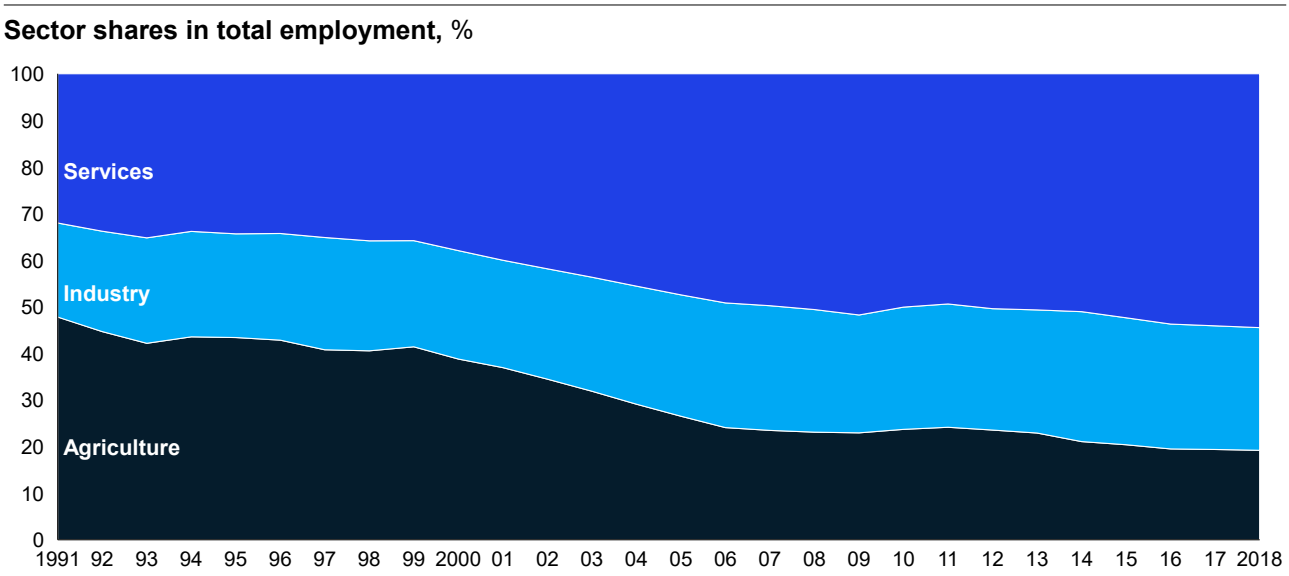
In most occupations, however, technology is more likely to complement work activities rather than totally replacing them. Radical changes in the overall employment scene are nothing new. In England during the industrial revolution, the share of workers in agriculture dropped from 56 to 19 percent.[22] Turkey has experienced a similar shift in recent decades. Since 1991, agriculture's share of total employment has dropped from 48 to 19 percent, while the service sector's share has risen from 32 to 54 percent. Despite these changes, the labor force participation rate did not experience big shifts, and total employment increased from 18 to 29 million.[23] This suggests that the Turkish labor force can successfully adapt to structural changes (Exhibits 17 and 18).

[22] Gregory Clark, *The industrial revolution as a demographic event*, UC Davis Department of Economics, n.d., faculty.econ.ucdavis.edu/faculty/gclark/210a/readings/irwash1.pdf

[23] World Bank Statistics.

Exhibit 17

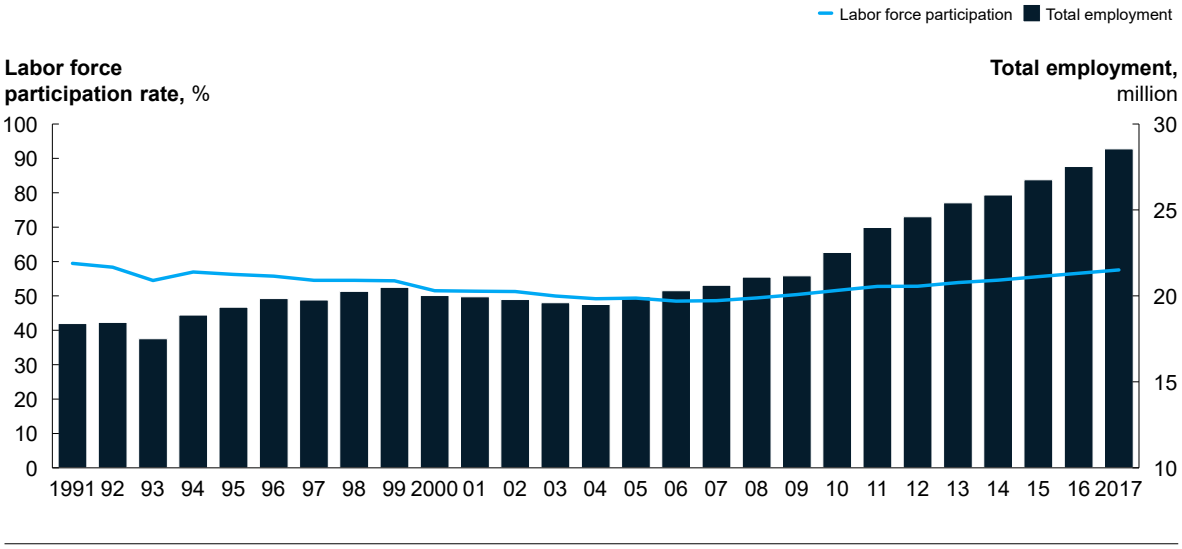
Sector shares in Turkish employment scene have changed over the years...



Source: World Bank

Exhibit 18

...and the labor force adapted to the shift

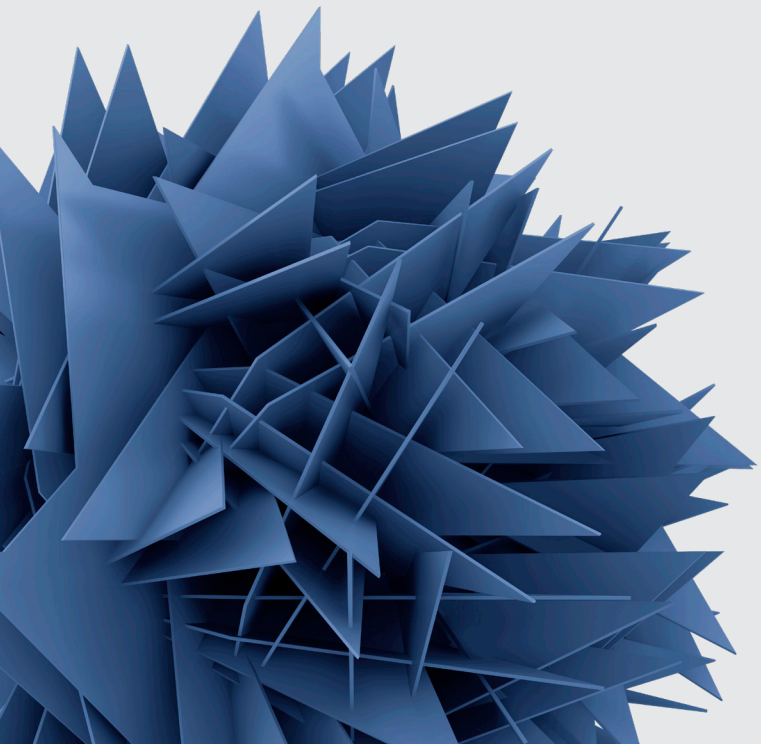


Source: World Bank

Overall, we find that automation can replace a considerable number of jobs, but it can create many jobs as well. In the next section, we will discuss the jobs automation and digitization might create and how they may affect Turkish employment.

3. Opportunities for workforce growth and new jobs

Although automation, AI, and digital technologies could result in some job losses in Turkey, gains in productivity, increased investment, and growth of the service economy could lead to the overall creation of as many as 3.1 million jobs by 2030.



Although automation and digitization could potentially result in some job losses, they are also expected to create new jobs and positively affect other economic forces. For instance, new technologies could boost the economy by raising productivity, thereby increasing demand for labor.

More economic growth could enable additional investment in areas such as infrastructure and could generate new jobs, especially in developed economies. Furthermore, greater economic growth could stimulate increased consumption and demand for newer services.

Methodology

Our work examined the impact of 20 global trends on the labor force. We identified the seven factors with the highest impact potential (Exhibit 19). We capture direct and indirect jobs that could be created from each factor and take the hours worked per person into account.

Our model offers a static view of the potential labor demand that could be created from the seven sources and does not factor in supply-demand dynamics and effects from considerations such as changes in wage levels. It estimates potential labor demand; whether this potential is captured will depend on the choices and investments made by businesses, policy makers, and workers. Beyond these seven factors, our scenarios do not account for any sources of labor demand that could play an important role in determining the future of work. We model new industries and occupations that could exist in the future, in part enabled by technology, as a certain percentage of the labor force. Studies have shown that each year, on average, 0.5 percent of the workforce is employed in entirely new jobs—that is, jobs that have not existed before. We use this figure to estimate the new jobs that may yet emerge.

Exhibit 19

We examined global trends to identify sources of potential labor demand

20 global trends

Socioeconomic and environmental trends

- Increase in income
- Aging population
- Youth labor participation
- Trade flows
- Global network and outreach to new markets
- Infrastructure development and urbanization
- Climate change
- Energy transitions and productivity

Consumer preference and behavior trends

- Increasing interest in entertainment, food and beverage, and travel
- Health and wellness
- Personal services and experience
- Education quality and lifelong learning
- Need for low-skill services
- Flexible work

Trends related to technological advancements

- Development and deployment of new technologies
- Robotics and AI
- Digital transformation of businesses
- New digital jobs
- Technology investment
- Increased mobility

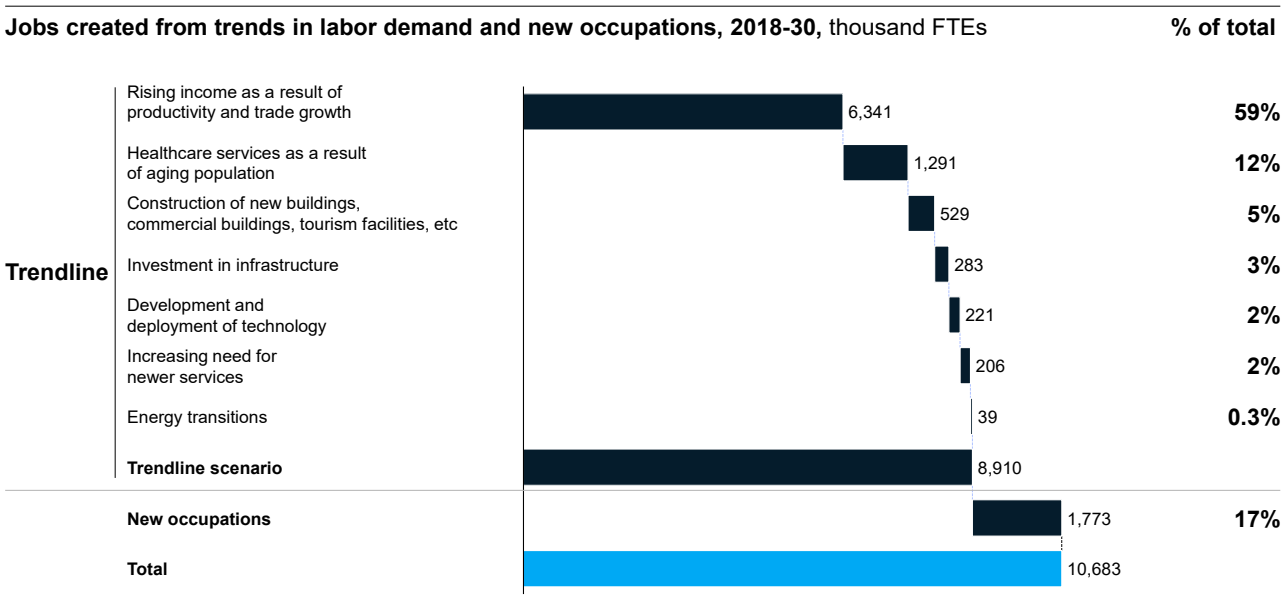
Seven top factors affecting labor demand in Turkey

- Rising income as a result of productivity and trade growth
- Healthcare services as a result of aging population
- Construction of new buildings, commercial buildings, tourism facilities, etc
- Investment in infrastructure
- Development and deployment of technology
- Increasing need for newer services
- Energy transitions

We estimate that 8.9 million to 10.7 million jobs could be created in Turkey by 2030 due to the effects of automation, AI, and digitization. This figure exceeds the estimated 7.6 million potential job displacements.

Exhibit 20

The most significant factors driving job creation are expected to be rising income levels and increasing healthcare services



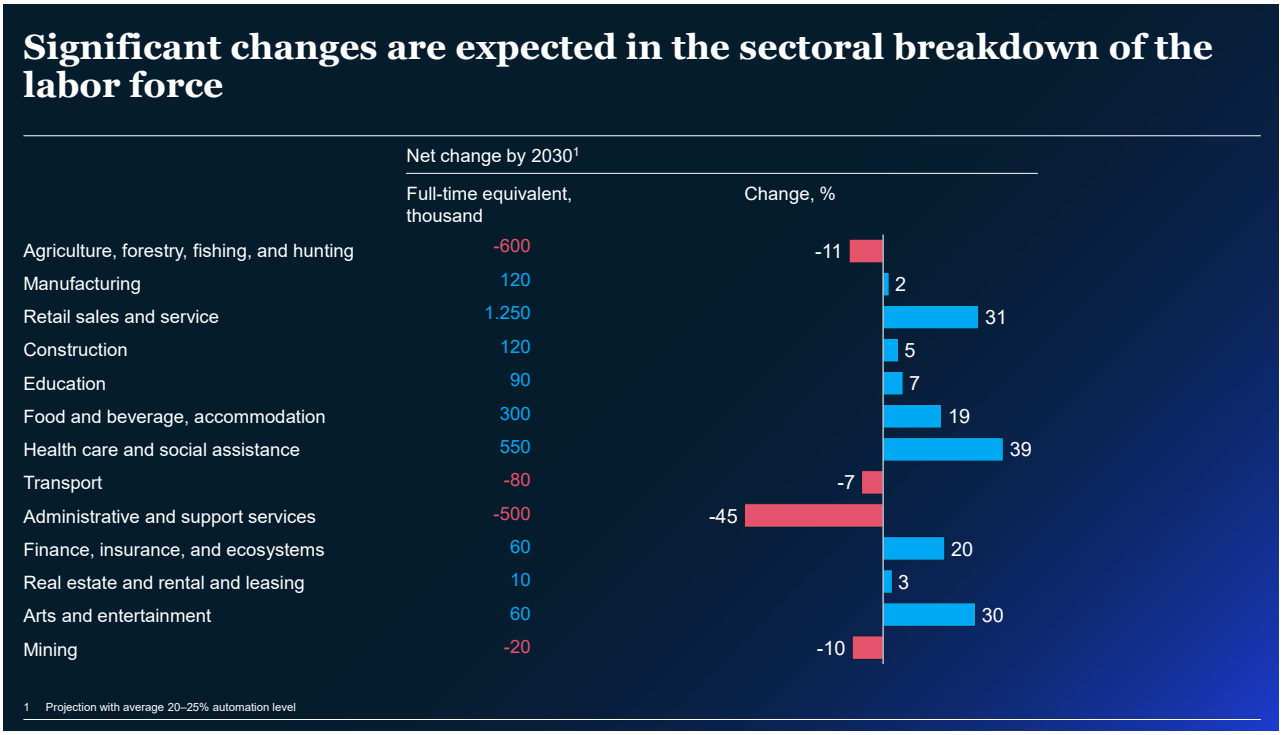
Source: O*NET; Oxford Economics; McKinsey Global Institute analysis: MGI Automation Model, March 2019; Jobs lost, jobs gained, December 2017

More than half of the new jobs created stem from just one of the seven factors of labor demand—rising incomes, which is estimated to contribute to around 6.3 million jobs. This is as expected, since GDP per capita is among the most critical factors affecting consumption and therefore job demand. It also illustrates the importance of continued economic growth for job creation. Aging population and health care are estimated to contribute about 1.3 million jobs, although their share of new job creation, at 12 percent, is lower in Turkey than in developed countries. This is because of Turkey's relatively younger population structure. Other factors contributing to demand for labor are construction of new buildings, commercial buildings, tourism facilities, and so forth (expected to contribute about 529,000 jobs), infrastructure investments (283,000), development and deployment of technologies (221,000), increase in the need for new services (206,000), and energy transitions (39,000) (Exhibit 20).

We estimate that about 1.8 million entirely new jobs could be created, in line with the 0.5 percent annual increase discussed above. We expect that these jobs could come from technology-related sectors, although it is hard to predict in detail. Potential jobs could include AI business development officer, virtual store consultant, or experience designer, although such an exercise would be guesswork.

Considering the net changes in sectors through 2030, we see that labor need is shifting toward service sectors: While we estimate an increased need for labor in sectors such as retail sales and service, food and beverage and accommodation, healthcare and social aid, we expect a decreased need for labor in sectors such as agriculture, administrative and support services, and mining (Exhibit 21).

Exhibit 21



A 30 percent increase is expected in the retail sales and service sectors. Healthcare services are expected to grow by 40 percent, and the food and beverage and accommodation sectors are expected to grow by 20 percent.

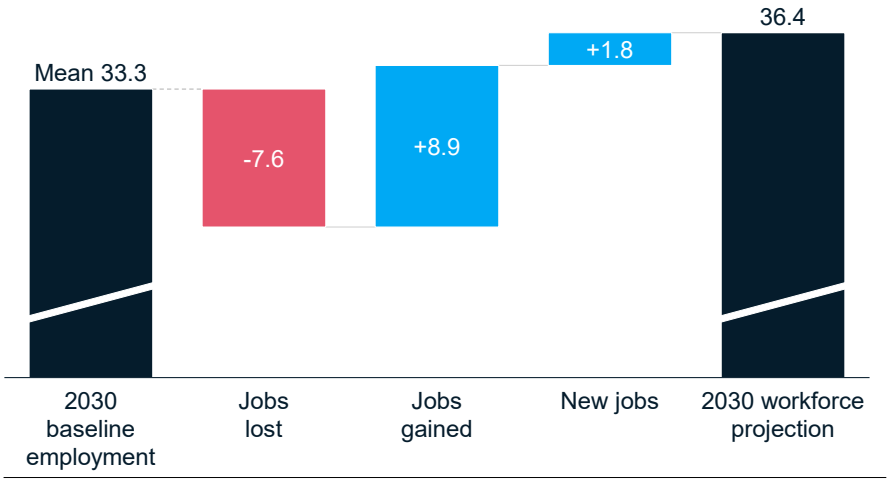
Automation, AI, and digital technologies are expected to transform numerous jobs in many sectors and to create new ones. Overall, 2030 baseline employment in Turkey is estimated to be about 33.3 million. With the impact of automation and digitization, 7.6 million jobs could potentially be lost by 2030. We estimate that 8.9 million new jobs could be created by 2030 for a net gain of 1.3 million jobs. We expect impacts on productivity and economic growth as well as societal changes driven by digitization to accompany this job growth.

In addition, we estimate that 1.8 million jobs could be created in occupations that currently do not exist, particularly in technology-related sectors. For example, we expect the creation of new roles such as digital service designers, sustainable energy experts, cybersecurity specialists, and AI-assisted healthcare technicians. As a result, the Turkish economy has the potential for a net job increase by of 3.1 million 2030, and expected total demand for a workforce of 36.4 million (Exhibit 22).

Exhibit 22

Automation and digitization will significantly transform jobs and create new ones

Change in labor demand in Turkey
Projection with average 20–25% automation level
Million, 2018–30

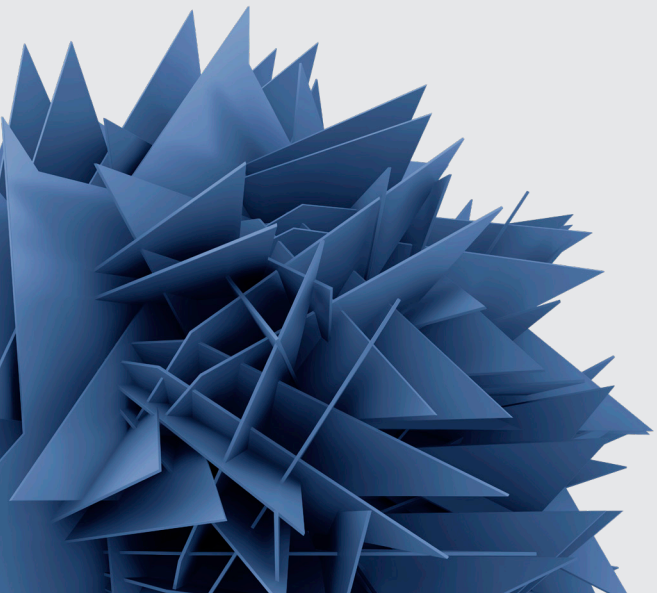


+3.1M

Job increase potential by 2030

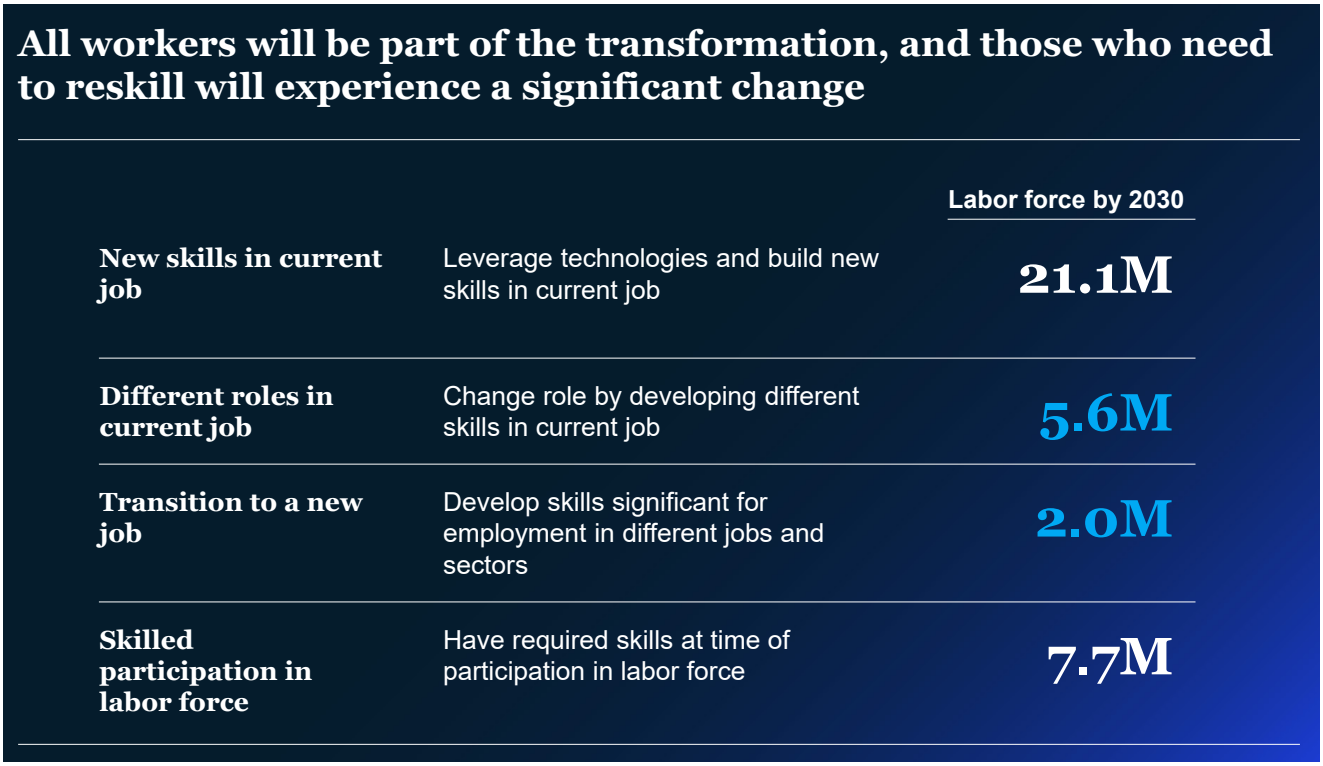
4. Skills change

Automation and digitization will certainly have an impact on the overall labor force. However, some workers will need to undertake new roles or find new occupations. The impact of the transformation will be greater on such workers.



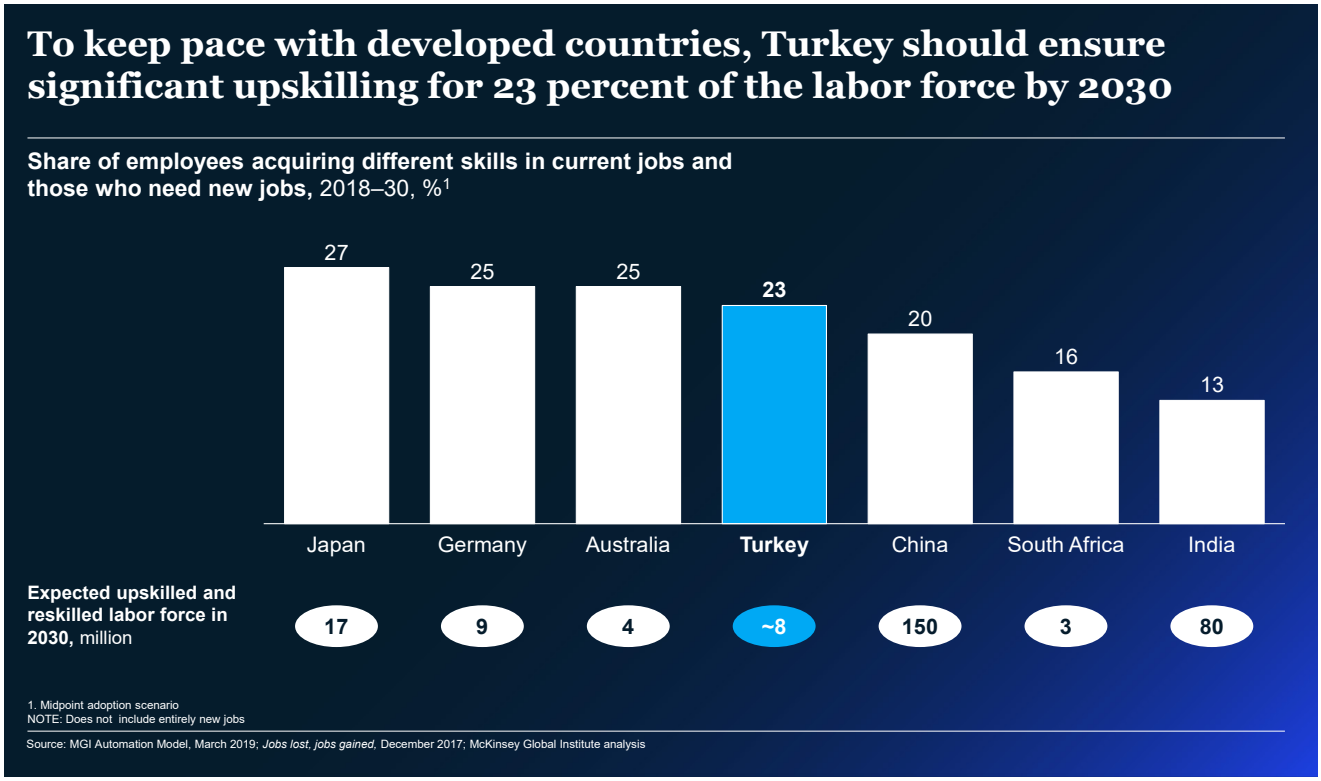
Our analysis shows that 21.1 million people in the Turkish workforce will need to improve their skills by leveraging technology while remaining employed in their current jobs. In addition, automation and digitization are expected to affect 7.6 million employees through significant reskilling and job displacements. Within this group, 5.6 million people are forecast to change roles by upskilling, and 2 million people are expected to gain new skills to be able to work in different sectors or in different occupations. It will be critical to equip the 7.7 million new employees who will join the workforce with the latest required skills (Exhibit 23).

Exhibit 23



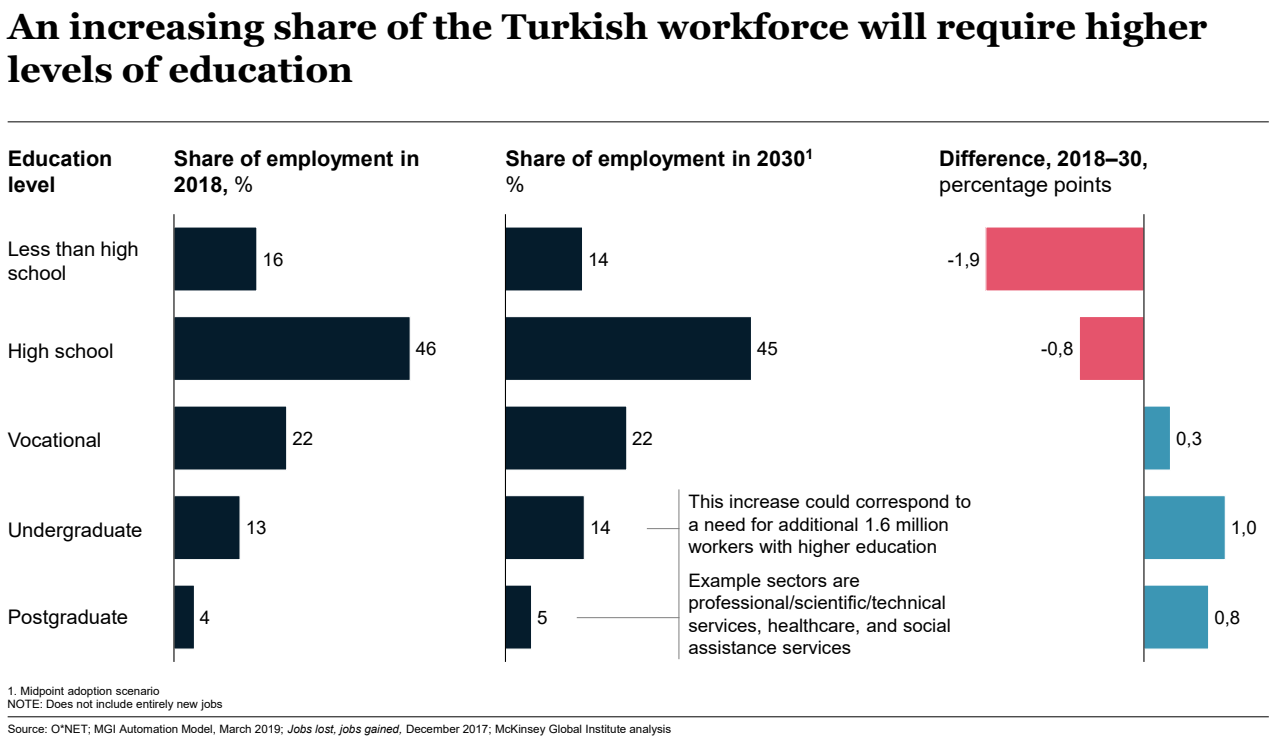
In the global context, Japan could have a higher reskilling rate than Turkey, at 27 percent. Japan is projected to have a higher automation adoption rate and a net job loss. China and India, by contrast, could have much lower reskilling and upskilling rates. They are forecast to have lower automation adoption rates and higher net job growth, meaning workers are expected to find jobs without major reskilling efforts (Exhibit 24).

Exhibit 24



Changes in occupations and work activities are also related to the level of education required to perform particular jobs. The share of occupations in Turkey that do not require a high school education is projected to drop by two percentage points by 2030, whereas the share of occupations that require at least a college degree is estimated to increase by at least one percentage point.[24] Vocational high schools will continue to be critical to ensuring a qualified labor force (Exhibit 25).

Exhibit 25



[24] O*NET Resource Center, onetcenter.org/overview.html

Methodology

We used MGI's workforce skills model, which defines a set of 25 skills in five categories: physical and manual, basic cognitive, higher cognitive, social and emotional, and technological.

We mapped these skills to individual work activities by assigning each of the 2,000 workplace activities from the US Department of Labor's O*NET database to a specific skill required to perform the activity. While in reality workers use multiple skills to perform a given task, for the purposes of our quantification, we identified the main skill used. For example, in banking and insurance, we mapped "prepare business correspondence" and "prepare legal or investigatory documentation" to the skill "advanced literacy and writing," in the category of higher cognitive skills. In retail, we classified "stocking products or parts" into gross motor skills and strength in the category of physical and manual skills, while "greeting customers or visitors" is mapped to basic communication skills in the basic cognitive category.

To quantify skills, we looked at the number of hours workers spend performing the activities mapped to that skill. To allocate a specific number of hours to each activity, we combined data on the frequency of each activity in O*NET with the overall number of hours worked in a given occupation. As the number of hours in each activity (by country and by sector) changes with automation and future job growth, so does the number of hours spent exercising different skills.

Basic cognitive skills	Basic data input and processing Basic literacy, numeracy, and communication
Higher cognitive skills	Advanced literacy and writing Complex information processing and interpretation Creativity Critical thinking and decision making Project management Quantitative and statistical skills
Physical and manual skills	Craft and technician skills Fine motor skills General equipment operation and navigation General equipment repair and mechanical skills Gross motor skills and strength Inspecting and monitoring
Social and emotional skills	Adaptability and continuous learning Advanced communication and negotiation skills Entrepreneurship and initiative taking Interpersonal skills and empathy Leadership and managing others Teaching and training others
Technological skills	Advanced data analysis and mathematical skills Advanced IT skills and programming Basic digital skills Scientific research and development Technology design, engineering and maintenance

We expect that automation and digitization will have different effects on each of the five main skill sets. Physical skills, the category with the largest share in total employment, is expected to decrease by 8 percent. Similarly, we see a 10 percent decrease in basic cognitive skills (Exhibit 26). Higher cognitive skills are expected to increase by 7 percent.

With 63 percent, the biggest increase comes from technological skills, which are projected to almost double in terms of hours worked by 2030. Social skills are expected to increase by 22 percent.

Exhibit 26

In the next 10 years, demand for workers with social and technological skills will increase

	Basic skills Basic literacy, numeracy, and communication	Physical skills Motor skills and strength General equipment repair and mechanical skills	Higher cognitive skills Creativity Complex information interpretation Project management Critical thinking and decision making	Social skills Entrepreneurship Interpersonal skills and empathy Advanced communication Adaptability and continuous learning	Technological skills Basic digital skills Scientific research Technology design and engineering Advanced data analysis
2030 baseline employment Million	5.2	15.5	5.8	4.5	2.4
2030 workforce, projected[1] Million	4.7	14.3	6.2	5.5	3.9
Change %	-10	-8	7	22	63

1. Projection with average automation level of 20-25%, does not include 1.8 million entirely new jobs

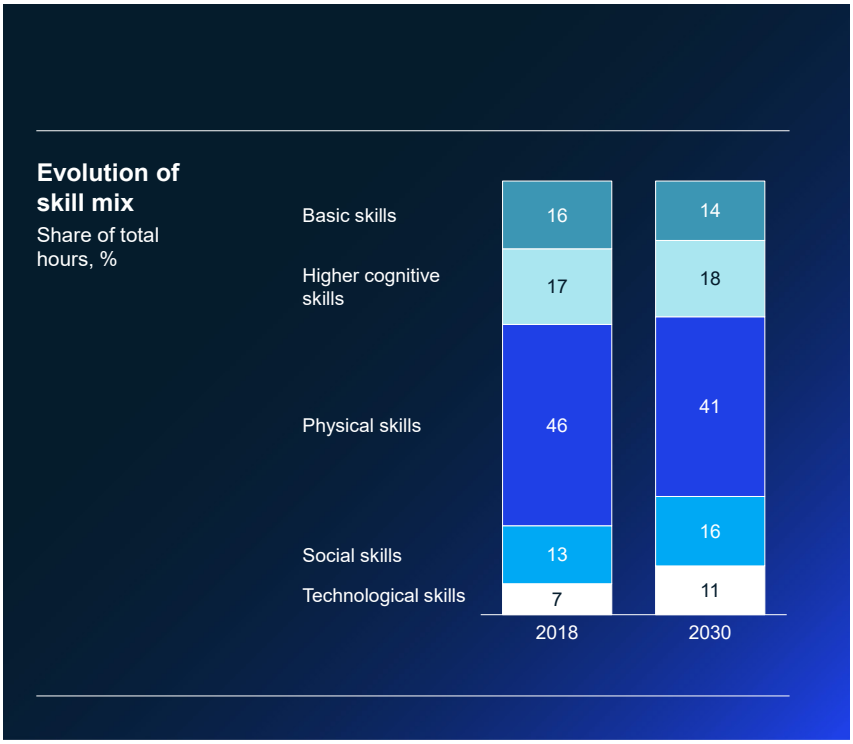
Overall sentiment in the business community appears to anticipate the coming changes in the labor market. A recent survey found that about 55 percent of respondents expected that social or technological skills will have more importance as a result of automation.[25] However, looking at total hours spent, we see that physical skills will continue to have the highest share, with 41 percent (Exhibit 27).

[25] Turkish Confederation of Employer Associations (TİSK) Future of Work survey of 150 senior executives and labor union representatives, October 2019.

Exhibit 27

Technological skills could see the biggest change in hours worked

Change in hours worked by sector and by skill category, 2018–30



NOTE: Based on difference between hours worked per skill in 2018 and modeled hours worked in 2030 in trendline scenario and midpoint automation. Figures may not sum to 100% because of rounding

Source: McKinsey Global Institute workforce skills model; McKinsey Global Institute analysis

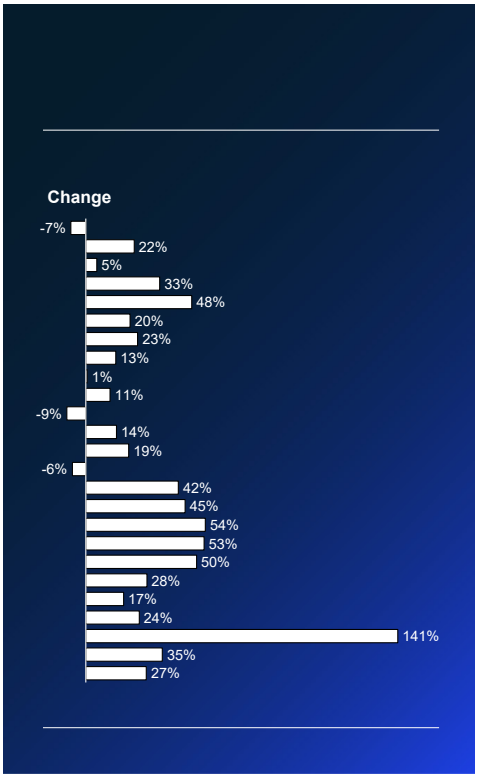
Reviewing the detailed list of skills, we see that the share of hours worked in basic digital skills could increase by nearly 1.5 times. The largest increase could come from technological skills within all categories. This shows how important it is for every Turkish worker to learn at least basic digital skills, such as daily applications of technology and computer literacy. Social skills could uniformly increase, with entrepreneurship and interpersonal skills dominating. Creativity is projected to represent a big increase in hours worked.

Basic cognitive skills, especially data input and processing, and physical and manual skills, especially equipment operation, are projected to decrease the most. This is expected. In the previous sections, we showed that predictable physical activities and data collection and processing activities are highly automatable. Exhibit 28 details the skills change.

Exhibit 28

Social skills and technological skills could see the largest increase in demand

Change in hours worked by detailed skills, 2018-30 (trend line labor demand, projection with average 20-25% automation level)



NOTE: Based on difference between hours worked per skill in 2018 and modeled hours worked in 2030 in trendline scenario and midpoint automation
Figures may not sum to 100% because of rounding

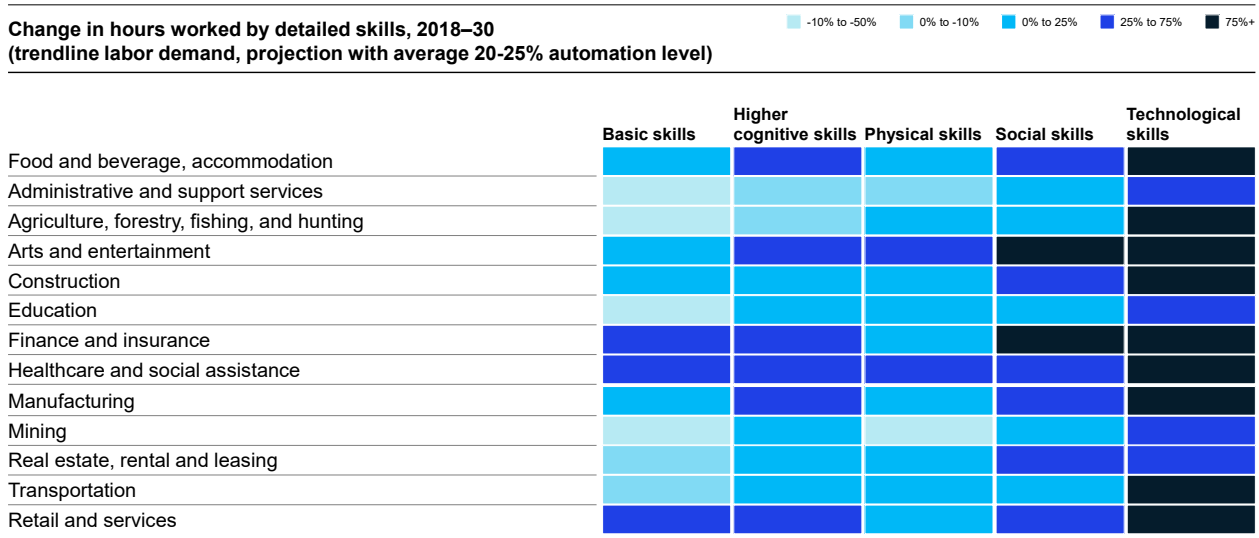
Source: McKinsey Global Institute workforce skills model; McKinsey Global Institute analysis

Taking a sectoral view, we see that the need for technological skills increases in most sectors. The same is true of social skills in most sectors, such as arts and entertainment, services, and finance, drawing attention to the importance of positive customer interactions. Basic cognitive skills and physical and manual skills, by contrast, see a decrease in most sectors, because data input, basic literacy and numeracy, and equipment operation skills are relatively easy to automate. The increased need for such skills in healthcare services and finance largely results from the rise in the number of workers in those sectors and the number of hours worked (Exhibit 29).

Exhibit 29

Skills change by sector

Change in hours worked by detailed skills, 2018–30
(trendline labor demand, projection with average 20-25% automation level)



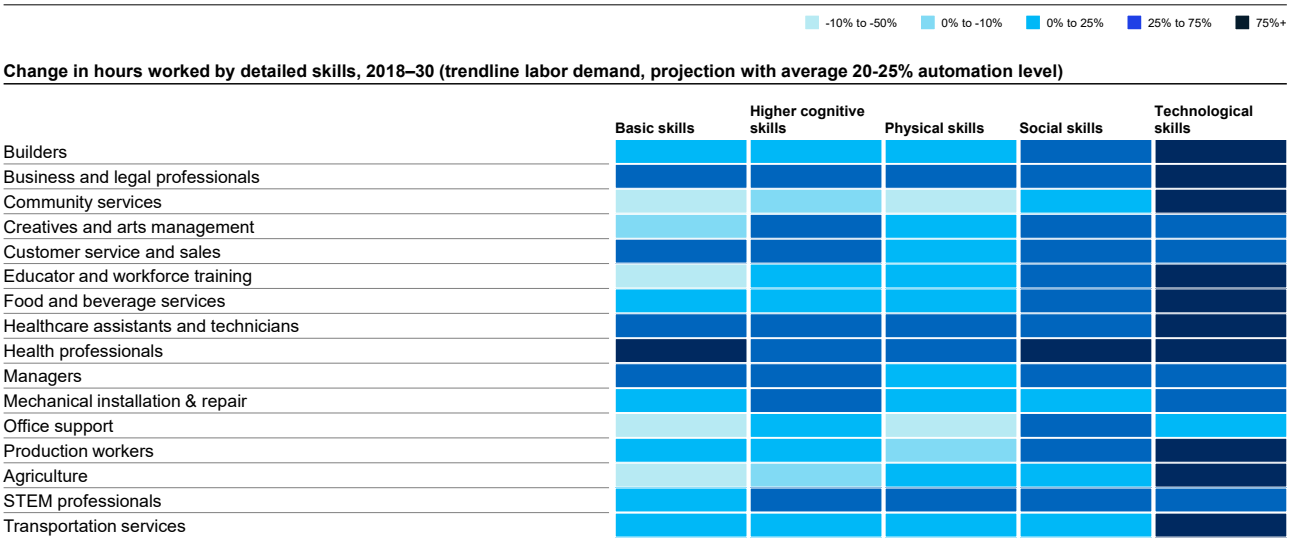
Note: Based on difference between hours worked per skill in 2018 and modeled hours worked in 2030 in trendline scenario and midpoint automation. Figures may not sum to 100% because of rounding

Source: McKinsey Global Institute workforce skills model: McKinsey Global Institute analysis

In occupation categories, we see an increase in hours spent on technological and social and emotional skills in almost all categories in Turkey. Higher cognitive skills could see the biggest increase among care providers, roles with customer interaction, and managers. The relatively greater increase for basic cognitive skills in health professionals is mostly due to the large expected increase in their numbers. For most occupation categories, basic cognitive and physical and manual skills see small increases or even decreases (Exhibit 30).

Exhibit 30

Skills evolution by occupation category



Note: Based on difference between hours worked per skill in 2018 and modeled hours worked in 2030 in trendline scenario and midpoint automation. Figures may not sum to 100% because of rounding

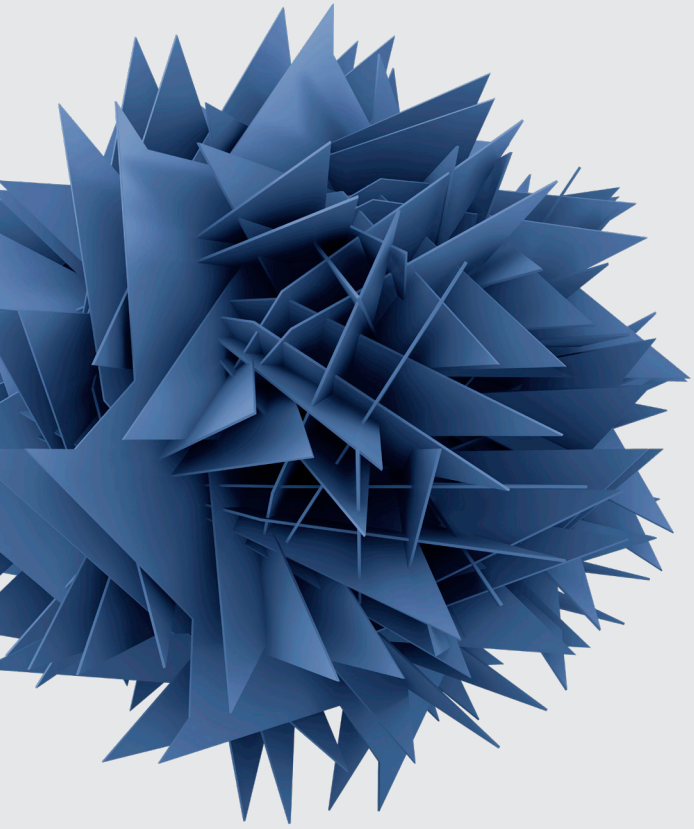
Source: McKinsey Global Institute workforce skills model: McKinsey Global Institute analysis

Overall, we conclude that the Turkish workforce's skills may need considerable improvement. Reskilling and upskilling efforts would be important areas in achieving a sustainable change in the workforce.

5. Priorities for comprehensive talent transformation

As discussed in previous sections, while automation, AI, and digital technologies and their wide-reaching effects bring many opportunities for Turkey, they also pose important challenges. Identifying these challenges and taking steps to address them is critical to ensuring sustainable productivity growth and to building a competitive workforce. Two-thirds of senior executives and labor union representatives say they believe that automation will make the Turkish economy more competitive. However, executives also believe that neither their own companies nor any other institutions are ready for automation.[26]

To reap the benefits of automation, AI, and digital technologies, stakeholders must seek to balance the pace of automation and reskilling. If automation and digitization happen too fast, the new jobs they create might go unfilled. This could potentially result in worsening income inequality and cause workers to feel that they are being left behind. If automation and digitization happen too slowly, though, Turkey's competitiveness and economic growth could suffer.[27] Striking a balance in the adoption of automation and digitization is crucial.



Businesses and associations, public institutions, educational institutions, and individuals should collaborate to achieve this key talent transformation.

In this section, we discuss what each stakeholder can do to benefit from the opportunities created by automation, AI, and digital technologies and to overcome the related challenges.

[26] Turkish Confederation of Employer Associations (TİSK) Future of Work survey of 150 senior executives and labor union representatives, October 2019.
[27] International Labour Organization and Organisation for Economic Co-operation and Development, *The labour share in OECD economies*, G20 Employment Working Group, Antalya, Turkey, February 26–27, 2015.

Businesses and associations

As one of the four pillars of the employment and work environment, companies must embrace automation, AI, and digital technologies. They should pursue full-scale transformations that would enable them to realize the totality of automation benefits.

Automation and digital technologies will bring significant changes to most occupations.[28] This would force companies to completely rethink their business models, from organization to infrastructure.

Typically, digitization has winner-takes-all dynamics.[29] It is possible for a small startup to disrupt an entire industry, as, for example, the music streaming service Spotify did. McKinsey research has found that while digital entrants generate 17 percent of global revenue, they account for 47 percent of digital revenue. This suggests that the winner-takes-all dynamic already prevails.[30] Considering that Turkish senior executives believe that neither their own companies nor any other institution is ready for automation, taking decisive action becomes even more important.[31] Furthermore, large-scale responses to digital threats or attackers are three times more likely to work than medium-scale responses.[32] In that context, companies and associations can pursue a number of approaches to get started on their transformation journeys.

Strategic workforce planning

Leading companies could undertake efforts to conduct strategic workforce planning and prepare the road map for talent transformation. Companies should make targeted investments focused on employee reskilling and upskilling initiatives. Using sophisticated workforce planning tools and predictive analytical models to plan for talent acquisition could enhance efficiency.

This approach is key to companies' change efforts. As an example, a global aerospace and defense company wanted to ensure that it was equipped with the necessary critical skills to achieve its long-term strategic business goals. However, the company had no consistent and reliable methodology to identify those skills or to forecast workforce supply and demand.

The company used predictive analytics and past employee attrition data to forecast its five-year workforce supply. It built a workforce demand model based on its long-term business goals and external data from sources such as LinkedIn. This application created a standardized approach to setting hiring plans in critical skills across business units and functions. Companies should undertake efforts in different areas of human resources management, from talent transformation programs to designing different career paths.

Talent transformation programs

Companies can acquire the skills they need through different talent programs. They can add new roles in these areas and launch training programs focused on employees in relevant positions, particularly to build new skills.

For example, in order to develop technological skills, businesses should focus on adding positions that require knowledge of data analytics and technologies and should invest in IT professionals. Companies can employ in-house training programs through "corporate academies" or partner with an external institution to improve employee capabilities through reskilling.[33] Employees' personal development areas can be identified, and customized development programs can be created using an analytical prediction model.

To help employees get used to learning in different environments and support different skills, companies can provide them with opportunities to work on and design projects in different areas, internally and externally.

For example, the enterprise software company SAP mapped comprehensive in-house learning journeys for its employees, pursuing a blend of courses and on-the-job training. AT&T developed partnerships with 32 universities and multiple online education platforms and paid training costs.[34] Likewise, when AT&T moved from a voice to a data company, it invested in reskilling of 100,000 employees, almost half of its total workforce.[35] Some Turkish companies are offering courses and learning programs to their employees, mostly focusing on technological skills and leadership and communication abilities.

This is also reflected in the views expressed by Turkish senior business executives: one-fifth of them say that creating targeted skill development programs is the most important action they can take with regard to automation.[36]

Some leading firms have launched ambitious future-of-work and skilling efforts. As part of its Upskilling 2025 initiative, Amazon announced that it would invest $700 million to train 100,000 employees for higher-skill jobs over six years.[37] The effort will allow the company to address skill gaps in areas such as data mapping, data science, security engineering,

[28] *A future that works: Automation, employment, and productivity,* McKinsey Global Institute, January 2017.
[29] *The future of work: Switzerland's digital opportunity,* McKinsey & Company, October 2018.
[30] Jacques Bughin and Nicolas van Zeebroeck, "The best response to digital disruption", *MIT Sloan Management Review,* Summer 2017, April 6, 2017.
[31] Turkish Confederation of Employer Associations (TİSK) Future of Work survey of 150 senior executives and labor union representatives, October 2019.
[32] Jacques Bughin and Nicolas van Zeebroeck, "The best response to digital disruption", *MIT Sloan Management Review,* Summer 2017, April 6, 2017.
[33] *Skill shift: Automation and the future of workforce,* McKinsey Global Institute, May 2018.
[34] Ibid.
[35] Mike Prokopeak, "Amazon goes big with $700 million reskilling pledge", *Chief Learning Officer,* July 11, 2019.
[36] Turkish Confederation of Employer Associations (TİSK) Future of Work survey of 150 senior executives and labor union representatives, October 2019.
[37] *Our Upskilling 2025 programs,* Amazon.

and business analysis through a range of internal training options. Similarly, JP Morgan Chase has announced a five-year, $350 million commitment, building on its New Skills at Work initiative, to develop and pilot innovative training programs aligned with high-demand technical skills.[38]

Finally, Walmart has invested $4 billion in upskilling initiatives over four years. Frontline hires begin with Pathways, a certificate program in basic retailing and emotional skills. They continue with tenured employees taking part in the Walmart Academy—which has more than 500,000 alumni—and the $1 a day college program, which allows employees to earn college degrees in retail management.[39]

Moreover, training and investment in the workforce have positive effects on employee engagement and loyalty, qualities that are linked to improving turnover and increasing employee support for transformations.[40]

Companies should consider training lead times and overall costs while deciding on their reskilling approaches. One additional factor specific to Turkey is the short-term skills gap, given that second language mastery and STEM focus are relatively low in the workforce. To close this gap, it is critical for companies to collaborate with different educational institutions.

New working models

Companies must move from traditional "waterfall" approaches to flexible and efficient working models. The traditional system has its virtues but can delay new product development and implementation of new processes. That mind-set can make accelerating automation or fully engaging in transformations more difficult.[41]

Adopting an agile working model could facilitate company transformation. An agile organization is a network of teams that operates through rapid learning and fast decision cycles. This approach can help companies quickly reshape strategies, products, and processes. McKinsey research has found that 70 percent of agile companies rank in the top quartile of organizational health, compared with 17 percent of bureaucratic companies. Considering that "healthier" companies create far more long-term total benefits to shareholders, the imperative to become more agile is clear.[42] Such companies achieve greater customer focus, faster time to market for products, higher revenue growth, lower costs, and a more engaged workforce. The number of Turkish companies that are pursuing agile transformations has increased rapidly over the past few years.

Agile organizations have five trademarks: strategy, structure, process, people, and technology:

— Strategy should define a shared purpose (a "north star") for the company and shift the mind-set from "capturing" value to "co-creating" it for a broader list of stakeholders (for example, employees, suppliers, and communities).

— Companies can turn their organizational structure into a leaner one, ensure that roles are clear and accountable, and facilitate governance.

— Processes should be standardized and focus on rapid iteration and experimentation, often in the form of sprints, or projects that see teams produce a single deliverable in a short time (typically one or two weeks). Processes should also be supported with transparent information flows.

— Empowering employees and giving them full authority and accountability over the tasks that they perform is an important way to ignite passion for their jobs and the company.

— Technology should be integrated into the core of the organization as a means of enabling quick reactions to business needs.

The changes automation will bring should allow companies to better recognize internal and external challenges and take appropriate actions in a timely manner, although that could require changes in corporate culture. In other words, companies should move away from the view of organizations as siloed, structured, and mechanical entities toward ones that are flexible, self-regulating, and organic.[43] Adopting a more fluid, "lively," and collaborative culture should boost productivity and increase employee engagement.

Furthermore, while it is important for an organization to adopt new ways of working, this would be hard to accomplish without a change, materially and in mind-set, in the workforce. That is where the role of human resources is critical. This function must adapt as technology changes the way organizations work. It should handle all processes leveraging technology and data analytics, and lead organizations in planning, model development, and building new skills.

[38] *Corporate responsibility report,* JP Morgan Chase, May 2017.
[39] Tom Ward, *What is a Walmart Academy? How they're building confidence and careers,* Walmart, April 2017.
[40] Ibid.
[41] *The future of work: Switzerland's digital opportunity,* McKinsey & Company, October 2018.
[42] Michael Bazigos, Aaron De Smet, and Chris Gagnon, "Why agility pays", *McKinsey Quarterly,* December 2015.
[43] Ibid.

Public institutions

The responsibility and authority for adopting automation and digitization and for managing the labor shift extend beyond employers. Public institutions must also be closely involved through smart policies to raise productivity levels and ensure sustainable, inclusive economic growth. Public institutions can support the development and deployment of automation and AI technologies through investment in basic and applied research and through building digital infrastructure. With that in mind, in this section we outline initiatives that public institutions can undertake to facilitate automation and build capabilities.

Geographical and sectoral labor force planning

Public institutions should plan the country-wide strategic workforce and draw the priorities and the vision. Looking at the talent pool in the country, public institutions could analyze the skills of the workforce and plan a road map that anticipates the abilities needed in the future.

In this context, we see that efforts led by public institutions worldwide have resulted in varying examples of policies and initiatives. In the US state of Washington, a task force composed of legislative, labor, and business members seeks to identify policies that help businesses and workers thrive in a fast-changing world.[44] The Canadian government established and finances the Future Skills Centre, a diverse consortium of experts that identifies skills newly in demand and helps citizens acquire them.[45] Finally, the government of Singapore established the Future Economy Council, chaired by the minister of finance and comprising members from industry, government, and unions. The council oversees the implementation of the recommendations of other councils covering economic growth clusters, skills development, and innovation.[46]

Centers of development and technology

Public institutions could identify priority areas for reform and support the leadership structure to rally public and political support for automation and digital transformation initiatives.

Turkey ranks 61st of 140 countries in the World Economic Forum's Global Competitiveness Index. In this index, Turkey scores even lower on some indicators such as IT adoption. This can be explained in part by the country's investment in R&D. It spent only 0.96 percent of GDP on R&D in 2017, compared with 2.37 percent for the OECD on average and 4.55 for South Korea.[47] Turkey's limited commitment to R&D makes increasing automation adoption harder, because establishing a technology infrastructure that is ready for automation requires considerable investment.

Public officials could consider establishing dedicated mechanisms to enable a holistic view and to coordinate implementation of priority areas for reform. In this context, efforts can be increased to supervise and support country-wide automation initiatives.

Public backing plays a key role in developing country-wide innovation. For example, the Chinese government has supported the creation of 17 AI technology demonstration hubs and invested in more than 1,600 tech incubators. (Of the $15.2 billion invested in AI startups in 2017, almost 90 percent came from in China and the United States.)[48] The Canadian government has invested $500 million in a Montreal AI hub and has created tax incentives to encourage investment in the training and support of foreign researchers and experts moving to Quebec. AI incubators, corporate AI labs, and a thriving AI academic research environment complete the hub's value proposition.[49] Among other countries that have achieved significant progress in this respect, the United Arab Emirates appointed a minister for AI as part of its National Program for AI.[50]

The United Arabian Emirates also established an AI Council to propose policies to build an AI-friendly ecosystem, advance AI research, and promote collaboration between the public and private sectors, including international institutions. The E-Estonia Council guided the development of the nation's digital society.[51] And the German Ministry of Interior has launched the PerDiV project, an interagency effort to address how digital technologies could transform the work processes of civil servants. As part of this project, more than 100 public agencies are upgrading their ways of working, developing training programs in skills such as digital collaboration and interaction, and reviewing their recruiting strategy to attract digital talent.[52]

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[44] *Future of work: What lies ahead?,* Washington Workforce Training & Education Coordinating Board, July 2019.
[45] "Preparing Canadians for the changing economy and future of work", Future Skills Centre, https://fsc-ccf.ca/
[46] The Future Economy Council, Singapore Ministry of Trade and Industry, https://www.mti.gov.sg/futureeconomy/TheFutureEconomyCouncil
[47] Gross domestic spending on R&D, 2000–18, OECD.
[48] Meng Jing and Amanda Lee, "Where is China's Silicon Valley?" South China Morning Post, August 12, 2017, https://www.scmp.com/tech/start-ups/article/2106494/where-chinas-silicon-valley
[49] *Government of Canada and Government of Quebec announce the creation of an international centre of expertise in Montreal for the advancement of artificial intelligence,* Government of Canada, September 2019.
[50] *Artificial intelligence in government policies,* UAE Government, government.ae/en/about-the-uae/digital-uae/artificial-intelligence-in-government-policies.
[51] *E-Estonia Council,* Republic of Estonia Government Office, riigikantselei.ee/en/supporting-government/e-estonia-council
[52] "Personal in der digitalen Verwaltung (PersDiV) - Ressortübergreifender Austausch geht 2019 weiter", Die Bundesregierung, Germany, https://www.verwaltung-innovativ.de/DE/Verwaltungsdigitalisierung/PersDiV/PersDIV_node.html

Accelerating mechanisms and incentives

With automation and digital technologies, public institutions should take steps to establish job centers for acquisition of transferable new technological skills. Particular attention should be given to Technology Development Zone skill development programs and to model factories that are being established. ISKUR (Turkish Employment Agency) programs intended to mitigate the disruptive impact of automation and digital transformation on supply-demand balance in the employment market should be revised and implemented.

Automation and digital transformation are expected to affect different aspects of employment, such as working hours and the need for flexible working conditions. The government will need to reevaluate related regulations from this perspective. Furthermore, the asset-liability balance in the social security system can be closely followed considering potential disrupting effects of the technologies on the employment market. Social security and premium models aligned with the digital transformation level can be evaluated and implemented in order to balance the pace of transformation.

Furthermore, public institutions can develop programs to identify advanced technology sectors and provide incentives to increase automation adoption. For example, affected sectors could benefit from accelerating depreciation on technology assets and R&D tax credits. These efforts could also help promote the development of advanced technologies locally, which could create even more jobs.

In South Korea, the government offers tax relief for innovative technology companies working in special R&D zones, the real estate of certain corporate research centers, the cost of research, and the employment of foreign technology experts. Italy gives tax breaks for R&D expenses and amortization of up to 250 percent for costs incurred to digitize operations; 56 percent of companies adopting Industry 4.0 technologies there have said they used at least one of the public incentives. Singapore's Productivity Solutions Grant reimburses 70 percent of the costs eligible companies incur when they adopt preapproved productivity approaches, including IT solutions, equipment, and training.

Establishing technology parks at and around universities has proven to be useful. Eighty-one technology parks in Turkey have generated 119 billion lira in sales and 3.8 billion lira in exports, and employ more than 40,000 people.[53] Providing support to these projects—building affordable housing nearby, creating improved transportation links with business centers, and providing low-cost land in collaboration with municipalities—could help to draw talent to the parks.[54]

Educational institutions

Educational institutions have a significant role to play in equipping future generations with new skills. They can improve the learning experience, update training models, and enhance opportunities for lifelong capability building.

Updating the education model

Turkey has a critical need for revamped school curricula to accommodate in-demand skills. The education system can use digital technologies to meet the demand for new skills by providing customizable learning materials for students and improving schools' technology infrastructure. The system can also identify and implement programs to address known skill gaps; relevant classes can be made compulsory at appropriate levels and provide valuable job experience to workers, postsecondary students, and youth in general.

Universities and educational institutions should create programs tailored to future skills, open to adults through seminars, certificate programs, and online training. Relevant stakeholders (public institutions, companies, and so forth) could provide financial contributions proportional to their gains through shared financing.[55]

Revamping vocational education to teach skills needed for the future could be worth exploring. Programs to support vocational schools under the leadership of companies could establish a connection between companies and students.[56] About 20 percent of Turkish senior business executives see vocational education as the most important action to prepare for automation, according to a recent survey.[57]

Improving learning experience

The classroom experience should be more personalized, shifting from traditional content on traditional schedules to building job skills anytime, anywhere. The new learning experience can be built through collaboration with community centers and experts, using project-based learning and problem-solving skills, rapid prototyping, and asking the right questions.

In an era of digitization, it is critical to conduct field research and create a predictive database of skills in order to redesign the content, method, frequency, and target audience of training programs in the most efficient and results-oriented manner. Training initiatives could be created to allow a balanced approach to the changing needs of students, youth, and employees, addressing issues related to, for example, gender equality, equality of opportunity, disadvantaged groups, geographical conditions, age, education level, employment history, and more.

[53] "Minister Varank: Technoparks have realized 3.8 billion lira worth of exports, and 119 billion lira worth of sales", *Hurriyet,* February 6, 2019, hurriyet.com.tr/ekonomi/bakan-varank-teknoparklar-3-8-milyar-lira-ihracat-119-milyar-lira-satis-gerceklestirdi-41107713

[54] *The future of work in America: People and places, today and tomorrow,* McKinsey Global Institute, July 2019.

[55] *OECD Employment Outlook 2019: The future of work,* OECD, April 2019.

[56] For details, see the project website at meslekliseisimemleketmeselesi.com/tr-TR/MLMMNedir/Amac

[57] Turkish Confederation of Employer Associations (TİSK) Future of Work survey of 150 senior executives and labor union representatives, October 2019.

Creating lifelong learning opportunities

The education system needs to build the mind-set of "learning to learn"—willingness to continuously adopt new skills and tackle new challenges. This helps promote critical thinking, problem solving, and lifelong learning, a project in which local governments can assume a key role. Local governments can assume a key role to access a higher number of people in order to support lifelong learning.

With the employment scene growing more variable, flexibility and adaptability will become the new workforce imperative, making lifelong learning increasingly important. A quarter of Turkish senior business executives consider lifelong learning the most important action to prepare for automation, according to the McKinsey survey cited above.[58] To facilitate lifelong learning, public institutions can develop, or contribute to, part-time programs specifically for workers. For example, Singapore's SkillsFuture program opens an account for every citizen over 25 years old, who can draw on the account to cover the fees for more than 25,000 courses.[59] The US Congress is considering establishing a similar program that would be funded by employee and employer contributions.[60] Public institutions might also consider a instituting a universal learning right and granting annual credits to citizens for use in learning programs.[61]

To make lifelong learning a reality, educational institutions can work collaboratively, supported by companies and public institutions, to reform the human capital development system. In the United States, Virginia Tech University is sponsoring a $1 billion Tech Campus that will focus on talent development, with specializations in software development, machine learning and artificial intelligence, and cyber security, among other subjects. The Tech Campus was central to Virginia's bid for Amazon's HQ2 relocation. The company ultimately selected Northern Virginia and said the site could lead to the creation of more than 25,000 jobs.[62]

Individuals

Companies, public institutions, and educational institutions are key players in adopting automation and digital technologies and ensuring effective workforce transition, but individuals themselves are no less important. Traditional full-time jobs are giving way to independent and agile ways of working. Moreover, the skills that will be in demand in the future, such as creativity and critical thinking, differ somewhat from what many workers bring to the table today and what the education system offers.

In many cases, personal well-being will require accepting that workplace demands have changed and embracing the necessity of learning new skills. Workers will need to reevaluate traditional notions of where they work, how they work, and what talents and capabilities they bring to that work.[63] In this section, we will examine what individuals can do in the face of the changes driven by automation, AI, and digital technologies.

Continuous learning and self-development

Individuals must own their own learning journeys by continuously updating skills throughout their careers. Leaders should understand the needs for capability building both for themselves and for their organizations and lead the transformation. A recurrent theme throughout this section has been that individuals will increasingly be in charge of their own destinies.

In this process, individuals are expected to be better off embracing a more entrepreneurial approach to managing their careers. Reid Hoffman, a co-founder of LinkedIn, calls this the "startup of you" approach.[64] Workers in many fields are becoming free agents, for better or worse. They may face more uncertainty and more frequent transitions, but they may also have greater access to new opportunities. In that sense, individuals need to become their own agents managing their profiles and careers and taking appropriate actions to develop themselves. Leaders should teach their teams to learn to be curious and own more to create the continuous learning culture.

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[58] Ibid.
[59] SkillsFuture, myskillsfuture.sg/content/portal/en/index.html
[60] Skills Investment Act of 2019, US Congress.
[61] *New Concept for Europe Initiative: Renew Europe,* World Economic Forum, January 2018.
[62] *Education dive: To help draw Amazon, Virginia Tech planned a $1B campus near DC,* November 2018, educationdive.com/news/to-help-draw-amazon-virginia-tech-planned-a-1b-campus-near-dc/542451
[63] *Jobs lost, jobs gained: Workforce transitions in a time of automation,* McKinsey Global Institute, December 2017.
[64] Reid Hoffman and Ben Casnocha, *The Start-up of You Adapt to the Future, Invest in Yourself, and Transform Your Career,* New York, NY: Crown Business, 2012.

Social and technological skills

In the era of automation, individuals must focus on developing social skills (such as resilience and adaptability), technological skills (such as programming and data analysis), and cognitive skills (such as critical thinking, problem solving, and creativity). Leaders should prepare their organizations for building such capabilities.[65] Individuals should be encouraged to enroll in courses and training that teach relevant skills. Seeking changes in curricula and asking for relevant reskilling opportunities could push other stakeholders to act, but it is ultimately up to individuals to adapt to the new environment.

Individuals cannot rely on the education they received through their 20s to last a lifetime. They will need to accept lifelong learning as a reality, especially considering that midcareer job changes are becoming increasingly common. Learning programs offered by companies, public institutions, and educational institutions can be helpful. Individuals could devote their own time and funds to other learning programs as well, keeping in mind the skills that are most in demand. It is particularly important for individuals to closely follow technological developments and maintain an innovative approach in their jobs, efficiently leveraging data and technology.

Lifelong flexible career paths

Individuals must adopt an entrepreneurial approach to their careers as part-time jobs and independent, project-based work become more common. This is part of the developing social environment in which people can connect, share information, and build a sense of community. The world is seeing a change from traditional organizational structures to dynamic networks that facilitate flexible careers.

Today, some 43 million people, corresponding to nearly 20 percent of the workers in the EU, are working on a part-time basis.[66] In Turkey, the figure is 11 percent, or about 3.1 million people. Twenty to 30 percent of the working-age population in the EU-15 and the United States earn part or most of their income from independent work such as freelancing or through gig or sharing platforms.[67] In fact, about 70 percent of independent workers say they prefer it over traditional jobs, citing flexibility, the ability to exercise creativity, and variety as sources of satisfaction.[68] About 50 percent of these workers are supplementing their salary income with nontraditional activities.[69] Individuals need to accept the rise of part-time and independent work and consider ways to take advantage of it.

Automation, artificial intelligence, and digital technologies offer big opportunities for Turkey to improve productivity and generate many new jobs.

To take advantage of this opportunity, the country should invest in talent transformation to develop the new skills required in the workplace of the future. It is critical for all stakeholders to work together to achieve this transformation. We believe that talent transformation journey will unlock the strong potential of Turkey.

[65] Ibid.
[66] "How common—and how voluntary—is part-time employment?", EuroStat News, June 8, 2018, European Commission, ec.europa.eu/eurostat/web/products-eurostat-news/-/DDN-20180608-1
[67] *Independent work: Choice, necessity, and the gig economy,* McKinsey Global Institute, October 2016.
[68] Ibid.
[69] *Jobs lost, jobs gained: Workforce transitions in a time of automation,* McKinsey Global Institute, December 2017.

Appendix: Accelerating digital transformation and capability building in manufacturing

MESS, the Turkish Employers' Association of Metal Industries, has more than 220 member companies and 185,000 employees, The association is building a digital technology center, MEXT, to support its members on their digital transformation journeys. The vision for the center is to help members adapt their business models to the changing manufacturing environment and prepare for the new digital era.

The association adopted a four-pillar framework to help guide the digital technology center: experience, assessment, learning, and ecosystem.

MEXT features a digital model factory with two production lines (discrete and continuous) that allows members to experience more than 70 state-of-the-art use cases, selected to represent best practices in digital manufacturing.

Moreover, a maturity assessment will be provided to assist members in accelerating their Industry 4.0 transformations by identifying their current status and improvement areas. An Industry 4.0 transformation road map will be developed for each member based on the assessment as well as member priorities and global benchmarks.

In addition to actions at organizational level, MEXT will also serve as a capability development center that will offer comprehensive learning programs related to Industry 4.0 and transformation skills (such as strategy development and change management).

The center is expected to provide more than 300,000 hours of training to more than 30,000 employees annually. Training content has been developed to identify the skills and processes that members will need throughout their digital transformation journey. The training program includes visits to industry pioneers in manufacturing and technology, shop-floor training sessions, and interactive workshops. Furthermore, programs have been curated to address four levels of company organizations: C-level executives, midlevel managers, engineers and experts, and shop floor employees.

In addition, an ecosystem uniting globally recognized organizations, universities, research institutes, and leading technology companies will be assembled to increase know-how about Industry 4.0.

Expected to open in the third quarter of 2020, MEXT will be a global hub for Industry 4.0 and a lighthouse future-of-work initiative.

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