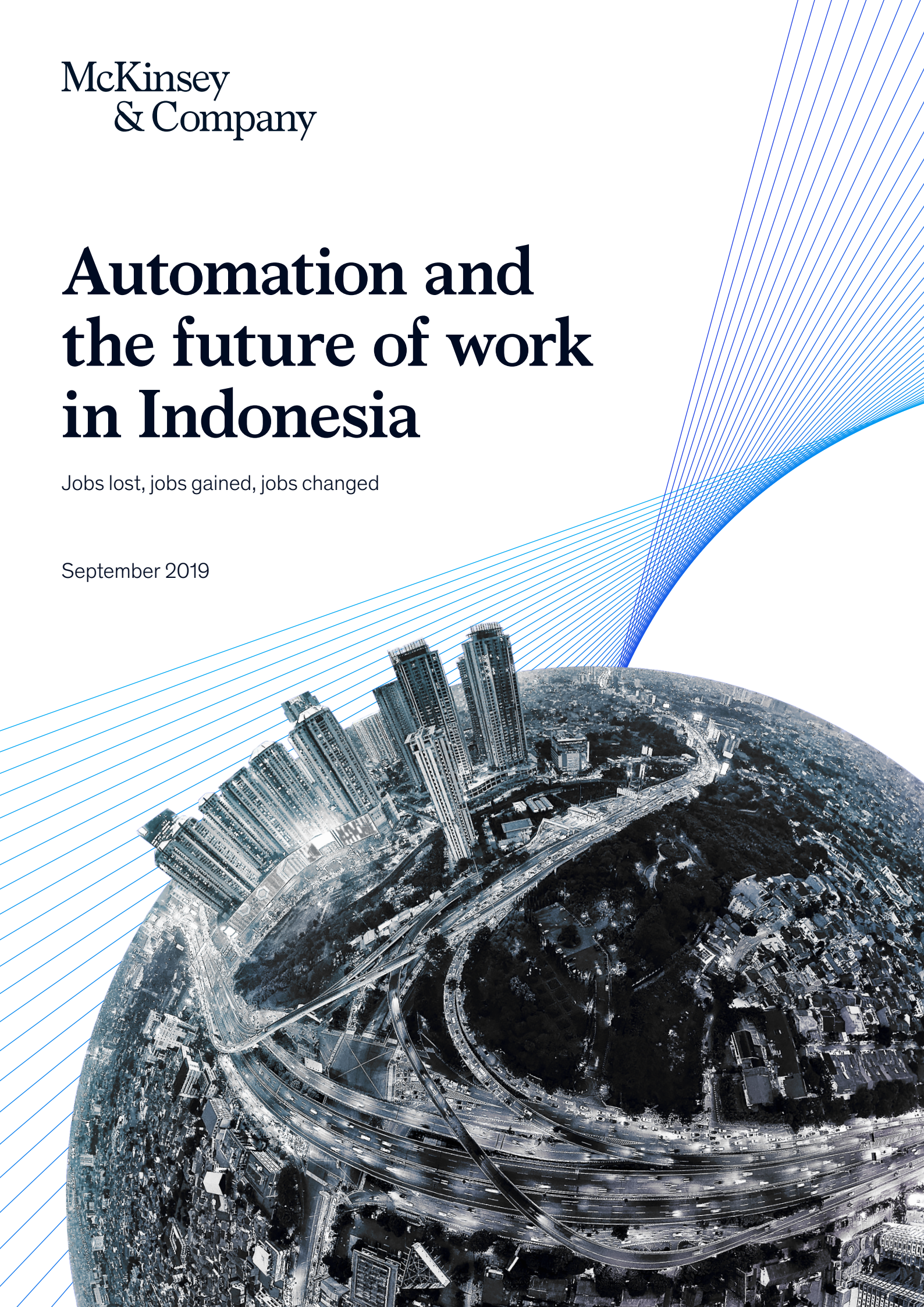


McKinsey
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Automation and the future of work in Indonesia

Jobs lost, jobs gained, jobs changed

September 2019



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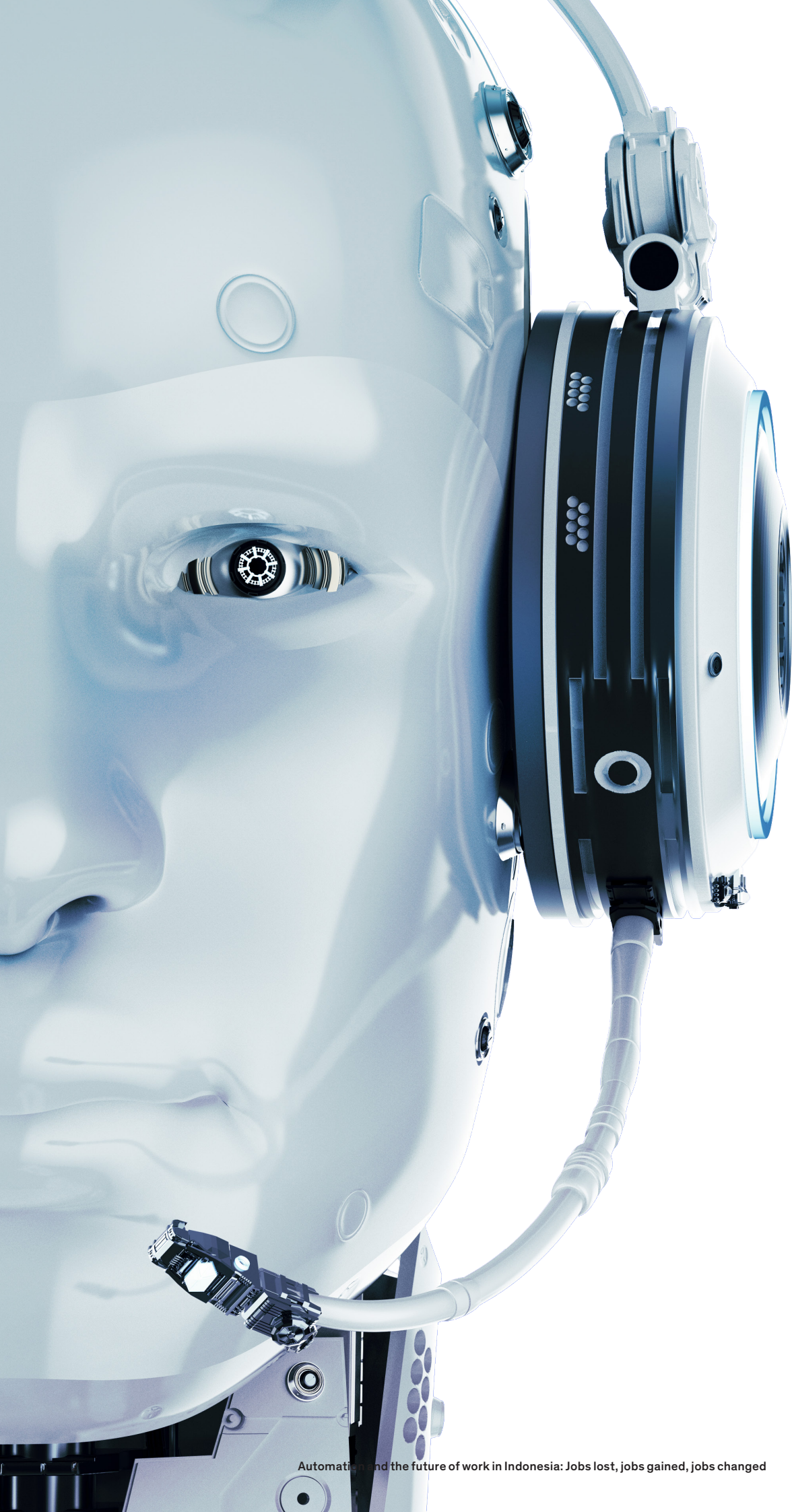
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Automation and the future of work in Indonesia: Jobs lost, jobs gained, jobs changed

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Automation and the future of work in Indonesia: Jobs lost, jobs gained, jobs changed

Automation technologies are changing the workplace, providing a significant opportunity for nations and companies to boost productivity, efficiency, and growth. At the same time, they are altering the nature of work. Successfully harnessing these technologies will create jobs, but it will also displace others and change many occupations. This report, which draws on our global research into how technology is affecting the economy, business, and society, focuses on the implications of automation adoption for Indonesia. Key findings:

- Automation has the potential to raise productivity and GDP growth in Indonesia and generate higher incomes for workers and market opportunities for companies. The positive economic impact could help Indonesia accelerate its growth trajectory, creating jobs for many of the 25 million new entrants to the country's labor force by 2030.
- While some jobs in Indonesia may be displaced by automation, many more will be added to the economy by 2030, likely leading to a net gain. About 16 percent of the total hours worked in Indonesia could be automated by adopting demonstrated technologies, according to a scenario that takes the midpoint in our range for the pace of automation adoption. These lost jobs could be more than compensated for by new labor demand, especially from rising incomes and increased spending on infrastructure and other sectors. We estimate that these factors could lead to a net gain in Indonesia of between four million and 23 million jobs by 2030. This figure includes 10 million jobs in new occupations that do not exist today, in line with past trends of innovation generating new forms of work.
- Indonesia is already successfully harnessing the digital revolution to some degree. Companies such as Go-Jek and Grab are continuing to grow, providing job opportunities to Indonesia's underemployed and unemployed population. Online commerce is another example of how new technologies are creating work. By 2022, we estimate that online commerce could directly or indirectly support up to 26 million full-time-equivalent jobs. These examples highlight Indonesia's entrepreneurial dynamism and willingness to adapt, but they are just a start: much more can be done to harness the new technologies.
- Employment growth is likely to change the mix of sectors in the Indonesian economy as a whole. Construction and manufacturing could see growing demand for labor, as could accommodation and food service, education, healthcare, and retail and wholesale trade. However, some occupations that involve routine, predictable work could be susceptible to automation, including collecting and processing data.
- New skills will be needed for the automation age. These include technological skills, but also social and emotional and higher cognitive skills such as creativity and advanced problem solving. Indonesians who complete secondary education will likely see the largest net change in employment to 2030, but in percentage terms, the greatest opportunities will be for those who have college or advanced education. This creates an important challenge for the country's education sector.
- Indonesia will need proactive strategies to adopt artificial intelligence (AI) and automation to remain competitive in the global and ASEAN marketplace. All stakeholders, including policy makers, academic institutions, NGOs, and business leaders, will need to prepare for substantial changes affecting the future of work. Companies must start planning for, and transitioning into, the future of work now, with long-term learning programs both for people affected today and those possibly affected in the future.

Automation and the future of work in Indonesia

Indonesia's positive story: many more jobs will be created to 2030 than are lost to automation.

23 million

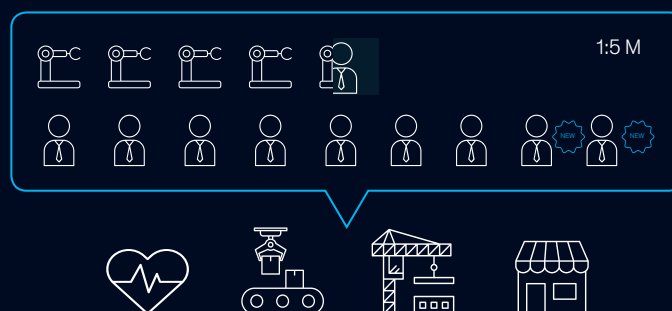
jobs could be displaced by automation

Healthcare, construction, manufacturing, and retail

will benefit from increased labor demand

27 million to 46 million

new jobs could be created in the same period



10 million

of these jobs will be new types of occupations

To capture the productivity benefits of automation, Indonesians will need to learn new skills.



Demand for work that is not easily done by machines will increase.

This includes:

- Unpredictable physical activities
- Interacting with stakeholders
- Managing and developing people

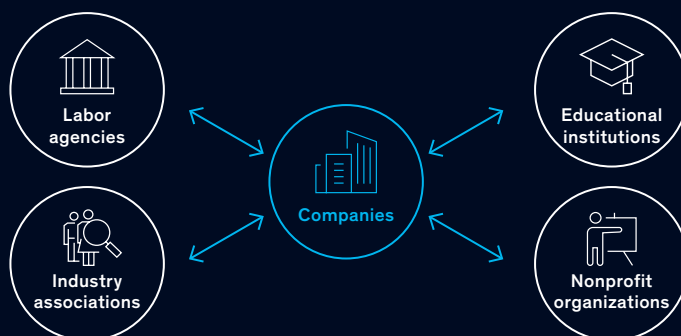


Data collection and processing along with predictable physical activities could be most affected by automation, with a decline in working hours for all three tasks.



An increasing share of jobs in Indonesia will require college and advanced degrees.

Indonesians who complete secondary education will likely see the largest net change in employment to 2030.



All stakeholders will need to prepare for substantial changes affecting the future of work. Companies will need to start planning for, and transitioning into, the future of work now, with long-term learning programs both for people affected today and those possibly affected in the future.

Source: McKinsey Global Institute analysis

Indonesia's jobs story can be a positive one. Automation has the potential to raise productivity and GDP growth, and to generate higher incomes for Indonesian workers and market opportunities for Indonesian companies. While as many as 23 million jobs could be displaced by automation in Indonesia by 2030, between 27 million and 46 million new jobs could be created in the same period.



1. Automation in the global economy

Automation and AI are not new, but recent technological progress is pushing the frontier of what machines can do. New generations of more capable systems are appearing in environments ranging from automated checkouts in grocery stores to e-payment platforms. Much of this progress has been driven by improvements in systems and components, including sensors, and in software.

AI has made especially large strides in recent years, as machine-learning algorithms have become more sophisticated and made use of huge increases in computing power and of the exponential growth in data available to train algorithms. Data and storage costs have declined sharply. Digital enables the capture and storage of huge amounts of data that existed but were not used in the past. At the same time, computing power has grown exponentially; today's smartphones that fit in the palm of the hand are more powerful than the room-sized computers that sent men to the moon.

Companies globally are using these technologies to personalize sales and marketing, offering customers “next product to buy” recommendations. They are also deploying advanced analytics and artificial intelligence to conduct preventive maintenance that identifies potential problems in machines long before they break down. Other uses are identifying fraudulent transactions and providing real-time instructions to truck drivers so that they optimize routes and fuel use. Deployment of AI and automation technologies can do much to lift the global economy and increase global prosperity at a time when aging and falling birth rates are acting as a drag on growth in many advanced economies and China. A simulation we conducted showed that AI adoption could raise global GDP by as much as \$13 trillion by 2030, or about 1.2 percent additional GDP growth per year.¹ However, even as AI and automation bring benefits to business and society, we will need to prepare for major disruptions to work.²

Globally, about half of current work activities are technically automatable

Our analysis of the impact of automation and AI on work shows that certain categories of activities are technically more easily automatable than others. They include physical activities in highly predictable and structured environments, such as repetitive factory assembly work, data collection, and data processing, which together account for roughly half of the activities that people do across all sectors. The least susceptible categories include managing others, providing expertise, and interacting with stakeholders (Exhibit 1).³ The density of highly automatable activities varies across occupations, sectors, and, to a lesser extent, countries. Our research finds that about 30 percent of the activities in 60 percent of all occupations could be technically automated—but that nearly all activities are automatable in only about 5 percent of occupations. In other words, more occupations will be partially automated than wholly automated.

Three simultaneous effects: Jobs lost, jobs gained, jobs changed

The pace at and extent to which automation will be adopted and affect jobs will depend on several factors besides technical feasibility. Among these are the cost of deployment and adoption as well as labor market dynamics, including labor supply quantity, quality, and associated wages. The labor factor leads to wide differences across developed and developing economies. The business benefits beyond labor substitution—often involving use of AI for beyond-human capabilities—which contribute to business cases for adoption are another factor. People's acceptance of these changes and various regulatory factors will also help determine the timing.

How all these factors play out across sectors and countries will vary, and for countries will largely be driven by labor market dynamics. For example, in advanced economies with relatively high wage levels, such as Japan and the United States, the share of total jobs affected by automation could be more than that in Indonesia.⁴

Given the interplay of all these factors, it is difficult to make predictions but possible to develop multiple scenarios. We begin with jobs lost. We modeled a range of scenarios

¹ *Notes from the AI frontier: Modeling the impact of AI on the world economy*, McKinsey Global Institute, September 2018.

² For a detailed discussion of automation's effect on the global economy, see *A future that works: Automation, productivity, and employment*, McKinsey Global Institute, January 2017, and *Jobs lost, job gained: Workforce transitions in a time of automation*, McKinsey Global Institute, December 2017.

³ *Jobs lost, jobs gained: Workforce transitions in a time of automation*, McKinsey Global Institute, December 2017.

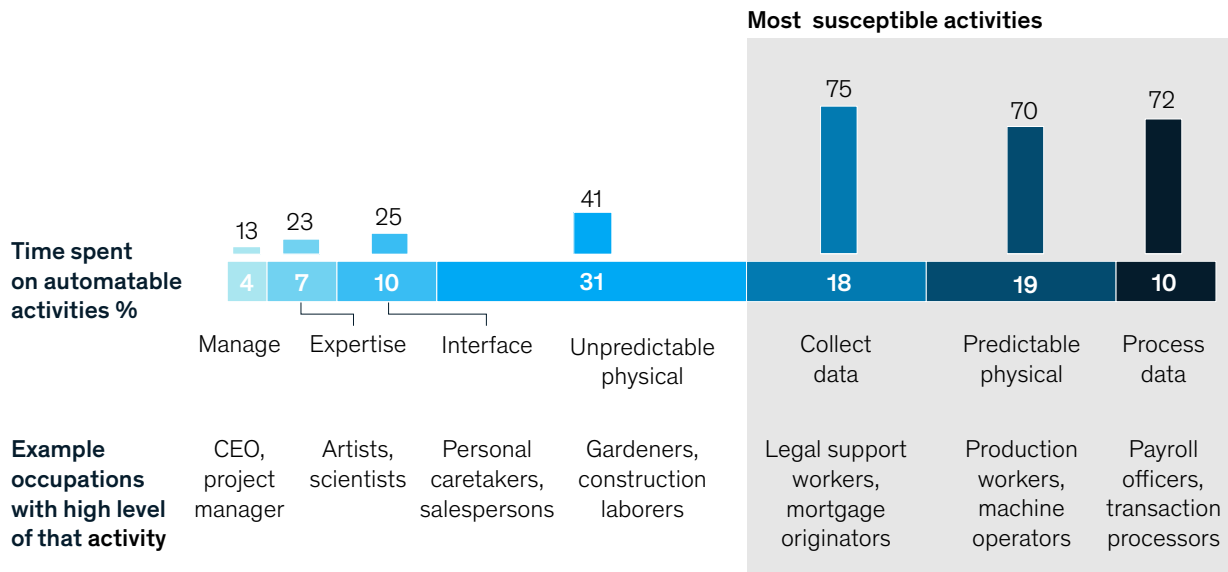
⁴ Minimum wages around the world, wageindicator.org.

Exhibit 1

Repetitive activities such as data processing, predictable physical activities, and data collection have high potential of automation.

Time spent on activities that can be automated by adopting demonstrated technologies

%



Source: McKinsey Global Institute analysis

depending on the pace of automation adoption. Our midpoint scenario for 2016 to 2030 suggests that about 15 percent of the global workforce (400 million workers) could be displaced by automation, although the full range goes from close to zero, in the slowest adoption scenario, to as many as 800 million workers, in the event that automation adoption is very rapid.

Second, jobs gained: we developed scenarios for labor demand to 2030 based on anticipated economic growth through productivity and by considering several drivers of demand for work. These included rising incomes, especially in emerging economies, as well as increased spending on healthcare for aging populations, investment in infrastructure and buildings, energy transition spending, and spending on technology development and deployment. In our midpoint adoption scenario, the number of jobs gained through these and other catalysts could amount to 555 million, or 21 percent of the global workforce. This suggests that the growth in demand for work, barring extreme scenarios, would more than offset the number of jobs lost to automation.

However, it is important to note that many emerging economies with young populations, including Indonesia, will already be experiencing an increased need to provide jobs to workers entering the workforce.

No less significant are the jobs that will change as machines increasingly complement human labor in the workplace. Jobs will change as a result of the partial automation described above, and the jobs changed will affect many more occupations than jobs lost. Skills for workers complemented by machines, as well as work design, will need to adapt to keep up with rapidly evolving and increasingly capable machines.

Four workforce transitions will be significant

Even if there will be enough work for people in 2030, as most of our scenarios suggest, the transitions that will accompany automation and AI adoption will be significant.

First, millions of workers will likely need to change occupations. Some of these shifts will happen within companies and sectors, but many may occur across sectors and

even geographies. While occupations requiring physical activities in highly structured environments and in data processing could decline, others that are difficult to automate could grow. These could include managers, teachers, nursing aides, and tech and other professionals, but also gardeners and plumbers, who work in unpredictable physical environments.

Second, workers will need different skills to thrive in the workplace of the future.

Demand for social and emotional skills such as communication will grow, as will demand for many advanced technological skills. Basic digital skills have been increasing in all jobs. Automation will also spur growth in the need for higher cognitive skills, particularly critical thinking, creativity, and complex information processing.

Third, workplaces and workflows will change as more people work alongside machines.

As self-checkout machines are introduced in stores, for example, cashiers will shift from scanning merchandise themselves to answering questions or troubleshooting the machines. Similarly, in manufacturing environments, cobots (collaborative robots) will be increasingly used. Workers and robots will labor together in close proximity.⁵

Finally, automation will likely put pressure on average wages in advanced economies—

although this is less likely to be the case in Indonesia and other emerging economies. In advanced economies, however, many of the current middle-wage jobs are dominated by highly automatable activities in fields such as manufacturing and accounting, which are likely to decline. High-wage jobs will grow significantly, especially for high-skill medical and tech or other professionals.⁶

⁵ 7 Common applications for cobots, machinedesign.com, January 2018.

⁶ AI, automation, and the future of work: Ten things to solve for, McKinsey Global Institute, June 2018.

2. The promise and challenges of automation for Indonesia

Our research suggests that increasing digitization and the adoption of automation could produce an important net benefit for Indonesia's economy over the next decade and beyond.

Many more jobs could be created by automation than displaced by it, we find—a potential net gain of four million to 23 million full-time-equivalent jobs if important investments are made (Exhibit 2)⁷. The creation of these additional jobs will be especially important for Indonesia because of its demographic situation, with the country's labor supply projected to rise by about 25 million, to almost 142 million, by 2030, from 116 million in 2014.⁸

To achieve good outcomes, policy makers and business leaders will need to embrace automation's benefits and, at the same time, address the worker transitions brought about by these technologies. Ensuring robust demand growth and economic dynamism is a priority: history shows that economies that are not expanding do not generate job growth. Midcareer job training will be essential, as will enhancing labor market dynamism and enabling worker redeployment. These changes will challenge current educational and workforce training models as well as business approaches to skill building. Another priority is rethinking and strengthening transition and income support for workers caught in the cross-currents of automation.

In this section, we lay out in detail how we arrive at these findings, by identifying areas where jobs could transition and where they could be gained. We examine ways in which work will change and what that implies for Indonesia's companies and workforce.

Jobs lost: Some work activities have a high potential for automation

To better assess the implications of automation on work, we focused on work activities rather than whole occupations as a starting point. We consider work activities to be a useful measure

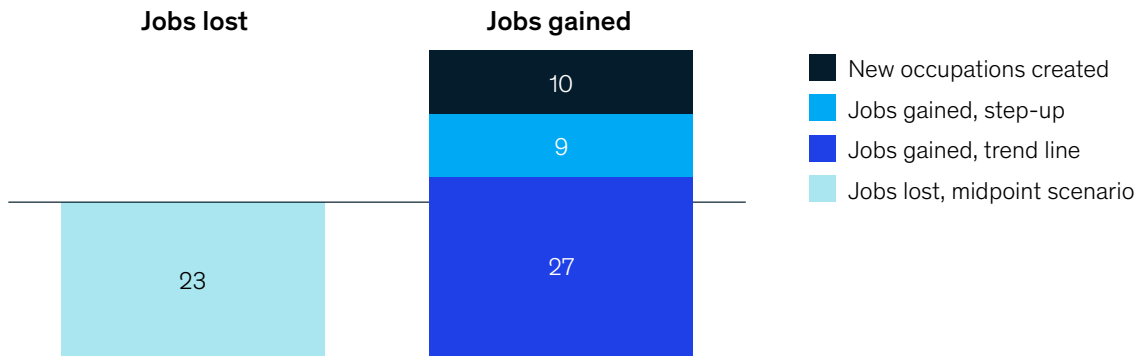
⁷ The data in this section are drawn from a global model. For full details of the methodology, see the technical appendix in *Jobs lost, jobs gained: Workforce transitions in a time of automation*, McKinsey Global Institute, December 2017.

⁸ International Labour Organization and United Nations population estimates and McKinsey Global Institute analysis.

Indonesia’s positive story: many more jobs will be created to 2030 than are lost to automation.

Automation scenarios and additional labor demand from seven catalysts, 2014–30

Million



Note: We identified seven catalysts of labor demand globally: rising incomes, healthcare spending, investment in technology, buildings, infrastructure, and energy, and the marketization of unpaid work. We compared the number of jobs to be replaced by automation with the number of jobs created by our seven catalysts as well as change in labor force, between 2014 and 2030. In addition, a study has shown that on average, 0.5 percent of the workforce has been working in “new jobs” every year (Lin, “Technological adaptation, cities, and new work,” The Review of Economics and Statistics, 2011).

Source: MGI Automation Model, March 2018; Jobs lost, jobs gained, December 2017; McKinsey Global Institute analysis

70%

of predictable tasks such as collecting and processing data and physical activities have high potential to be automated

since occupations are aggregations of different activities, and each one has a different potential for automation. For example, a retail salesperson will spend some time interacting with customers, stocking shelves, and ringing up sales. Each of these activities is distinct and requires different capabilities to perform successfully. We use the term “automation potential” to refer to activities for which the technology exists and could be adapted to automate those activities..

Our analysis of 2,000 work activities across 800 occupations shows that certain categories of activities are more easily automatable than others. They include physical activities in highly predictable and structured environments as well as data collection and data processing. The least susceptible categories include managing others, providing expertise, and interacting with stakeholders.

In Indonesia, collecting and processing data and physical activities in predictable settings all have a high potential to be automated—above 70 percent. Predictable physical activities and data collection each account for almost 20 percent of work hours in the Indonesian economy, while data processing accounts for about 10 percent.

As we note later in this section, even when some tasks are automated, employment in occupations which perform those activities may not decline. Rather, workers may perform new tasks. This will have a significant impact on the nature of activities performed by people in their current or new occupations in the future.

Automation could have a less significant effect in Indonesia on jobs that involve managing people, applying expertise, and social interactions, where machines are unable to match human performance for now.

Jobs in unpredictable environments—occupations such as forest harvesters, mining operators, gardeners, or providers of child- and eldercare—could also generally see less automation by 2030. These jobs are difficult to automate technically and often command relatively lower wages, making automation a less attractive business proposition.

In all, our analysis suggests that about 16 percent of work activities in the Indonesian economy could be automated by 2030, under a midpoint automation adoption scenario. That is the equivalent of the output of 23 million workers. Under the less likely fastest scenario for

automation adoption, that proportion would rise to 33 percent, while it would be close to zero in the event of the slowest adoption scenario (Exhibit 3). In this respect, Indonesia's expected automation adoption is midrange among emerging economies and is considerably lower than that in advanced economies.

27^M

full-time jobs in Indonesia could be created in 2030

Jobs gained: New labor demand will come from rising incomes and infrastructure spending, among other catalysts

Workers displaced by automation are easily identifiable, while new jobs created indirectly are less visible. We modeled potential sources of new labor demand globally that may spur job creation to 2030, even accounting for automation. While our list is not exhaustive, we identified seven potential catalysts of labor demand growth for our research: rising incomes; higher spending on healthcare; increased investment in buildings, infrastructure, energy transitions, and technology; and the marketization of previously unpaid work, such as childcare. Overall, these catalysts could create the equivalent of more than 27 million full-time jobs in Indonesia to 2030 in a scenario that assumes a continued trajectory of existing spending and investment trends. In the event of more focused investment to create jobs, the total could rise to the equivalent of more than 36 million jobs (Exhibit 4).

As the chart indicates, rising incomes will be a significant factor for Indonesia. Much of that growth will come from Indonesia's consuming class.

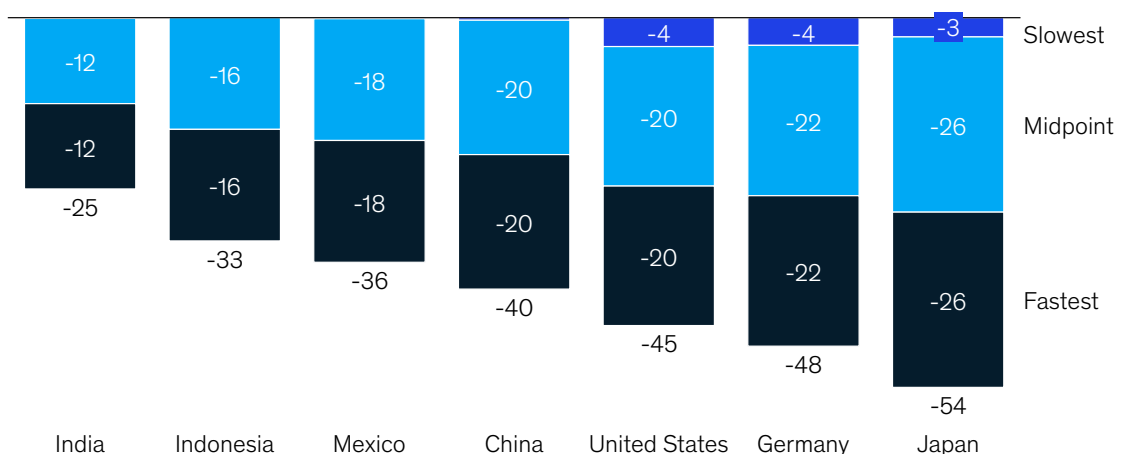
Investment in infrastructure and buildings are two areas of historic underspending that may also create significant additional labor demand in Indonesia if action is taken to bridge infrastructure gaps and overcome housing shortages. In prior research, we estimated that Indonesia spent the equivalent of about 3.4 percent of GDP on infrastructure in the period 2010 to 2015, and estimated infrastructure needs will be about 4.5 to 5 percent of GDP in the period 2017 to 2035.⁹ That spending would create large numbers of jobs in Indonesia for architects, engineers, electricians, carpenters, and other skilled tradespeople, as well

Exhibit 3

Sixteen percent of current work activities in Indonesia can be automated by 2030, replacing the output of 23 million workers.

Projected impact on total employment in midpoint automation scenario, 2016–30

% of full-time-equivalent hours expected to be automated, range of automation scenarios



Note: Figures may not sum to 100%, because of rounding.

Source: OEF; GGM; BLS; O*NET; MGI Automation Model, March 2018; Jobs lost, jobs gained, December 2017; McKinsey Global Institute analysis

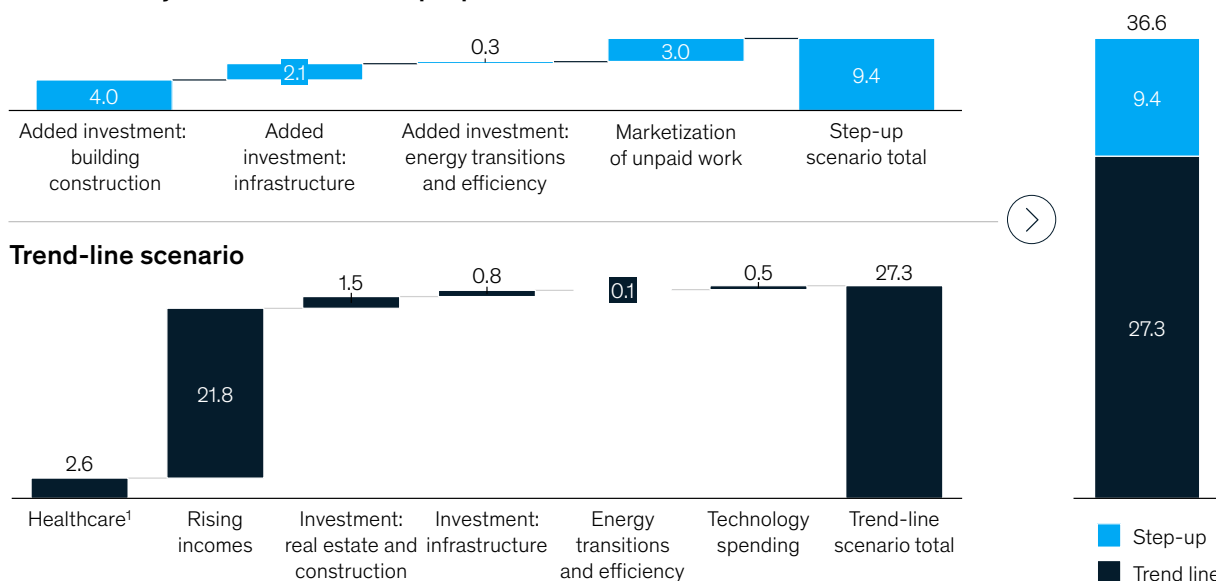
⁹ *Bridging global infrastructure gaps: Has the world made progress?*, McKinsey Global Institute, October 2017.

Rising consumer incomes and infrastructure spending are expected to be the largest sources of job creation.

Potential jobs created from seven catalysts of labor demand, midpoint automation scenario, 2014–30

Million FTEs

Incremental job creation from step-up scenario



¹ Includes increase from income increase

Note: Does not include new occupations created.

Trend-line scenario is based on continued growth in economy and step-up scenario is due to increased investment

Source: MGI Automation Model, March 2018; Jobs lost, jobs gained, December 2017; McKinsey Global Institute analysis

9M

jobs in infrastructure and real estate construction could be created in 2030

as construction workers. In our “step up” scenario, under which a particular focus would be placed on investment in infrastructure and building construction, the equivalent of more than nine million jobs could be created in Indonesia by 2030.

Other investment including in technology and in renewable energy could likewise create jobs, although to a lesser extent than rising incomes and infrastructure investment. For example, our latest research forecasts that online commerce sales in Indonesia could grow substantially, reaching up to \$65 billion by 2022—30 percent of which will be consumption that otherwise would not have occurred. We estimate that by 2022, online commerce will directly or indirectly support about 26 million jobs, compared with four million today. Direct support includes new jobs that would not have existed otherwise (for example, programmers at online commerce companies and positions at logistics companies). Indirect support includes positions that exist today and will be favorably influenced by online commerce revenue flows, such as MSME owners who shift from offline to online selling and payment providers that shift their services from physical stores to online sales. It can also facilitate increased women’s participation in the economy—for example, 35 percent of online sales are generated by women.¹⁰ Indonesia’s online commerce sector has already had a major impact on the country’s job market. For example, Tokopedia now has over four million merchants on its platform, many of them first-time entrepreneurs.¹¹ Technology has lowered the barriers to entry for innovation, spawning a generation of first-time entrepreneurs and creating jobs that did not previously exist.

¹⁰ Kaushik Das, Toshan Tamhane, Ben Vatterott, Phyllia Wibowo, and Simon Wintels, *The digital archipelago: How online commerce is driving Indonesia’s economic development*, August 2018, McKinsey.com.

¹¹ Tokopedia.com.

The last trend we consider is the potential to monetize services that substitute for currently unpaid and primarily domestic work. Research from a recent McKinsey Global Institute report indicates that Indonesia could add \$135 billion annually to its GDP by 2025 in a best-in-region scenario.¹² This represents an increase of 9 percent above the business-as-usual scenario in 2025. All three drivers of additional economic value make similar contributions: higher female labor-force participation, a higher share of women working full time rather than part time, and more women working in higher-productivity sectors such as manufacturing instead of agriculture.

Globally the magnitude of future job creation from the trends described above and the impact of automation on the workforce vary significantly by country, depending on four factors: wage levels, demand growth, demographics, and the mixture of sectors and occupations.

- Higher wages make the business case for automation adoption stronger. However, while Indonesia has relatively low wage levels on a global basis, it may be affected if companies adopt automation to boost quality, achieve tighter production control, move production closer to end consumers in high-wage countries, or derive other benefits beyond reducing labor costs (for example, solving for high labor attrition and associated costs).¹³
- Demand growth will play an important role because economies that are stagnant or growing slowly create few if any net new jobs. Countries with stronger economic and productivity growth and innovation will therefore be expected to experience more new labor demand.
- Demographics could play out in Indonesia's favor. Countries with rapidly growing workforces, such as Indonesia and India, may enjoy a "demographic dividend" that boosts GDP growth—if young people are employed.¹⁴
- Finally, the mix of economic sectors and occupations will be an important factor in determining employment growth. The automation potential for countries reflects the mix of economic sectors and the mix of jobs within each sector.

10^M

jobs in new occupations that did not exist before may be expected in 2030

Jobs changed: Net growth in jobs in services and shifting occupations will require different skills

While there is understandable concern about whether there will be enough jobs for workers given potential automation, history suggests that such fears may be unfounded: over time, labor markets adjust to changes in demand for workers from technological disruptions. Our scenarios suggest that the same trend will hold true with automation in Indonesia and more broadly. With sufficient economic growth, innovation, and investment, there can be enough new job creation globally to offset the impact of automation.

In addition, historical trends indicate that we can expect 8 to 9 percent of 2030 labor demand from new types of occupations that have not existed before.¹⁵ In Indonesia, this would mean an additional 10 million jobs.

However, a larger challenge will be ensuring that workers have the skills and support needed to transition to new jobs.

When we look at the net changes in job growth across Indonesia, we expect the mix to shift increasingly into services, including accommodation and food service, education, healthcare, and construction. Manufacturing also stands to increase employment substantially, by more than four million full-time equivalents (Exhibit 5).

¹² *The power of parity: Advancing women's equality in Asia Pacific*, McKinsey Global Institute, April 2018.

¹³ Minimum wages around the world, wageindicator.org.

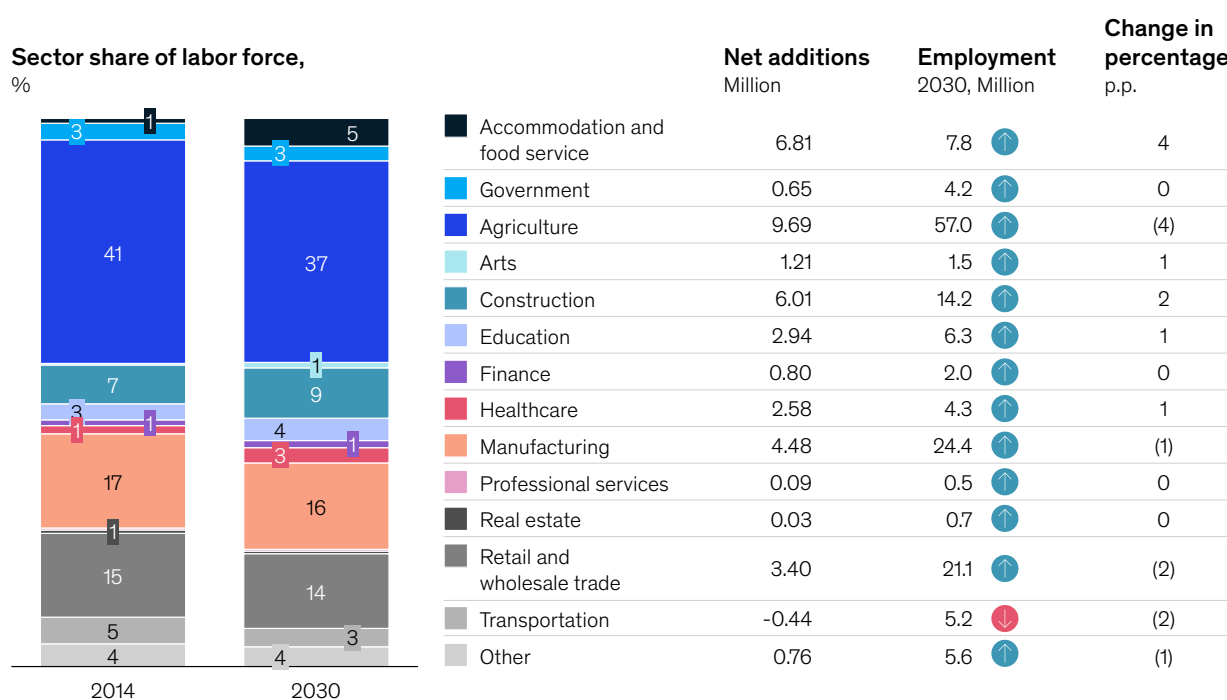
¹⁴ Total labor force, worldbank.org, September 2018.

¹⁵ Jeffrey Lin, "Technological adaptation, cities, and new work," *The Review of Economics and Statistics*, April 2011, Volume 93, Issue 2.

Jobs will be created across sectors, but the mix is expected to shift toward services and away from agriculture.

Net impact of automation and seven catalysts drivers by sector, 2014–30

Labor demand, midpoint automation scenario, step-up scenario¹



¹ Midpoint of earliest and latest automation adoption in the “step-up” scenario (ie, high job growth).
 Note: Does not include new occupations created..

Source: MGI Automation Model, March 2018; Jobs lost, jobs gained, December 2017; McKinsey Global Institute analysis

The changes in net occupational growth or decline imply that a very large number of people may need to shift occupational categories and learn new skills in the coming years. The shift could be on a scale not seen since the transition of the labor force out of agriculture in the early 1900s in the United States and Europe, and more recently in China.¹⁶ For Indonesia, we estimate that between six million and 29 million people, or as much as 20 percent of the workforce, will need to change occupational categories and thus require new training.

In general, the current educational requirements of the occupations that may grow are higher than those for the jobs displaced by automation. In Indonesia and some other emerging economies, we find higher labor demand for all education levels, with the largest number of new jobs in occupations requiring a secondary education. However, the fastest rate of job growth will be for occupations currently requiring a college or advanced degree (Exhibit 6).

Workers of the future are expected to spend more time on activities that machines are less capable of, such as managing people, applying expertise, and communicating with others, even as they spend less time on predictable physical activities and on collecting and processing data, where machines already exceed human performance. The skills and capabilities required will also shift, requiring more social and emotional skills and more advanced cognitive capabilities, such as logical reasoning and creativity.

In Indonesia, the biggest net change in hours could be for work that involves physical activities in unpredictable environments, followed by work that requires interacting with stakeholders and applying expertise (Exhibit 7).

¹⁶ *Employment in agriculture*, ourworldindata.org.

Exhibit 6

An increasing percentage of jobs will require college and advanced degrees.

Net change in total employment by education required, 2014–30

Midpoint automation¹, step-up scenario

Education level	Employment Million, 2014	Projected net change in employment Million	% change in jobs, 201-30	Employment Million, 2030 Step-up
Less than secondary	31.6	11.2	36	42.8
Secondary	56.4	15.0	27	71.4
Associate	17.1	6.8	40	24.0
College	9.3	4.9	52	14.2
Advanced	1.7	1.1	66	2.8

¹ Midpoint of earliest and latest automation adoption in the “step-up” scenario (ie, high job growth).

Note: Figures may not sum to 100%, because of rounding. Does not include new occupations created.

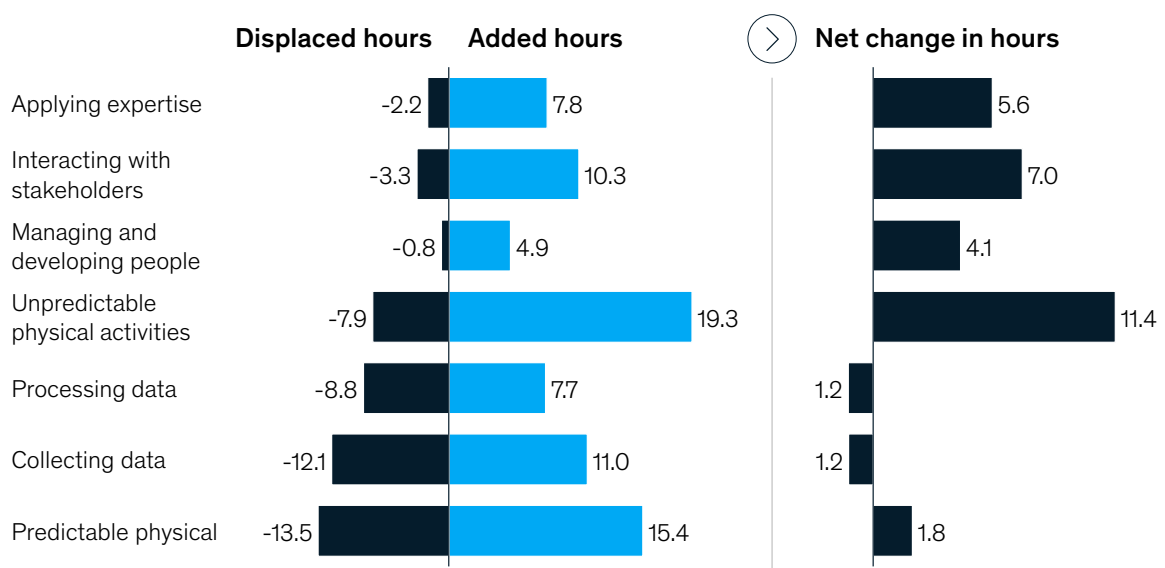
Source: O*NET skill classification; US Bureau of Labor Statistics; MGI Automation Model, March 2018; Jobs lost, jobs gained, December 2017; McKinsey Global Institute analysis

Exhibit 7

Net growth in work will involve more application of expertise, interaction, and management.

Total work hours by activity type, 2014–30 (midpoint automation¹, step-up scenario)

Billion



¹ Midpoint of earliest and latest automation adoption in the “step-up” scenario (ie, high job growth).

Note: Does not include new occupations created.

Source: O*NET skill classification; MGI Automation Model, March 2018; Jobs lost, jobs gained, December 2017; McKinsey Global Institute analysis

Many types of occupations will be affected. Middle-wage jobs that require social and emotional skills and strong interaction with stakeholders, such as retail salesforce and teachers, will grow strongly. Construction-related workers will also be in high demand, as a result of higher spending on infrastructure and buildings. One of the largest increases will be for occupations that require physical activity in unpredictable environments, for example machinery installers and firefighters (Exhibit 8).

Exhibit 8

All types of occupations requiring a wide range of skills will see a net increase to 2030 under our scenarios.

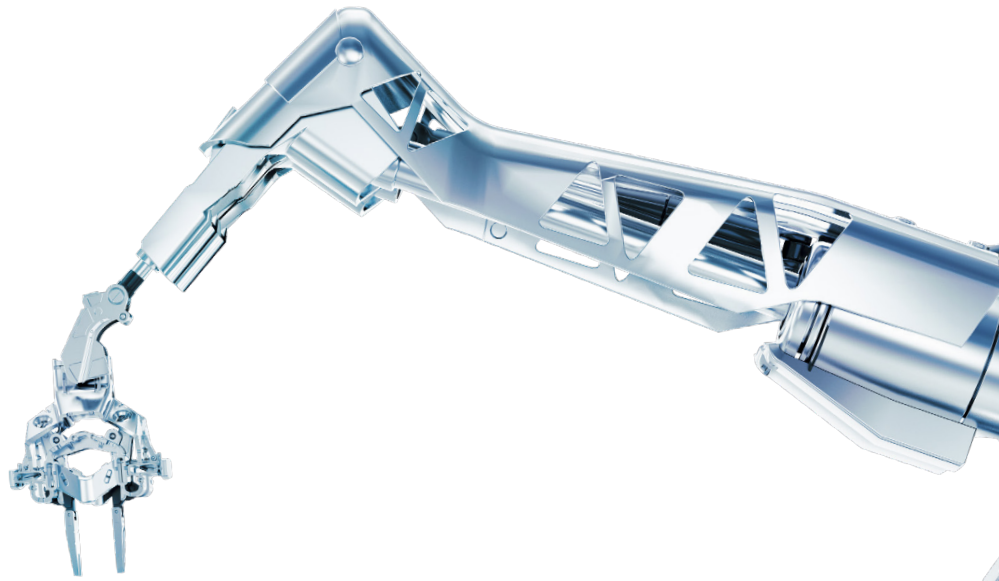
Occupation type Examples	Net change in jobs (midpoint automation, step-up scenario) ¹ 2014–30, million	% of jobs	
		2014	2030
Other jobs - unpredictable environments <i>Machinery installers and repairers, firefighters</i>	10.4	30	29
Customer interaction <i>Retail sales, food servers</i>	7.0	11	13
Other jobs - predictable environments <i>Machinists, cooks</i>	4.3	30	25
Builders <i>Construction workers, electricians</i>	4.0	7	8
Managers and executives <i>CEOs, sales managers</i>	3.2	6	6
Care providers <i>Surgeons, nurses</i>	3.2	2	4
Educators <i>Teachers, librarians</i>	2.9	1	3
Office support <i>Payroll clerks, data entry</i>	1.8	8	7
Professionals <i>Lawyers, business specialists</i>	1.5	3	4
Creatives <i>Authors, designers</i>	0.4	1	1
Technology professionals <i>Web developers, IT</i>	0.3	1	1

¹ Midpoint of earliest and latest automation adoption in the "step-up" scenario (ie, high job growth).
Note: Doesn't include new occupations created.

Source: MGI Automation Model March 2018, Jobs Lost Jobs Gained December 2017; McKinsey Global Institute analysis



Employment growth is likely to change the mix of sectors in the Indonesian economy as a whole. Construction and manufacturing could see growing demand for labor, as could accommodation and food service, education, healthcare, and retail and wholesale trade. To capture the full benefits of the automation productivity boost, an integrated effort to address skills transitions will be needed.

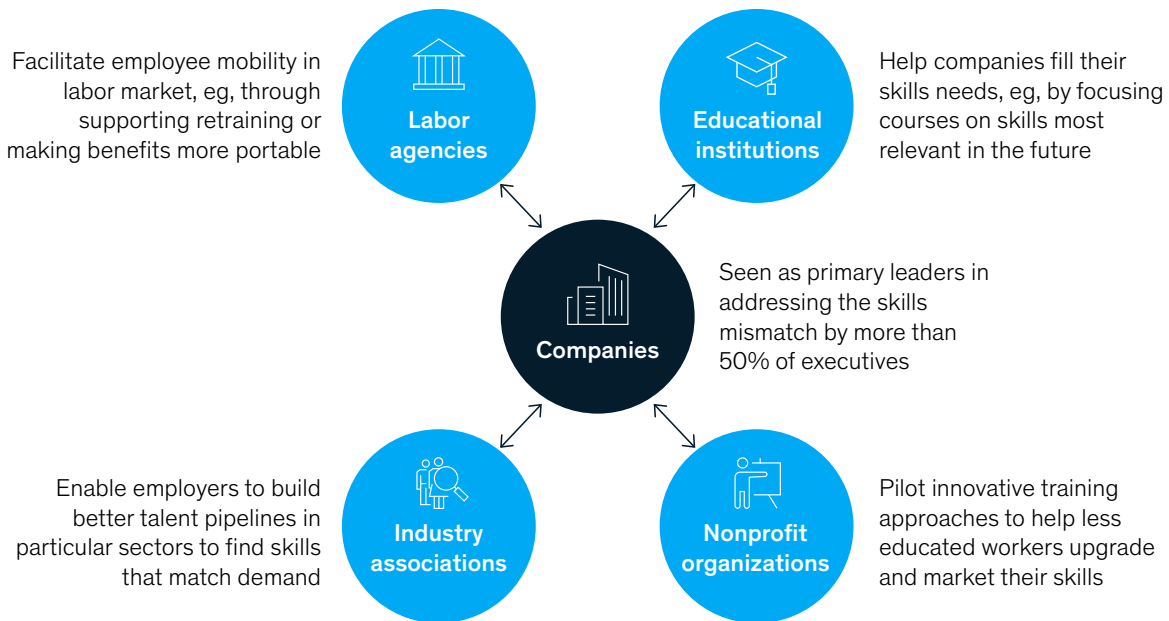


3. Transitioning Indonesia to “Making Indonesia 4.0”



The economic growth that could result from the productivity contributions of AI and automation is compelling. AI and automation will not only contribute to dynamic economies that create jobs, but also help create the economic surpluses that will enable societies to address the workforce transitions that will happen regardless.

Workforce skills development requires an ecosystem of stakeholders.



Indonesia's road map for "Making Indonesia 4.0" also involves cross-sectoral national initiatives to boost the quality of local human resources. This may require large-scale initiatives involving sustained investment, new training models, programs to ease worker transitions, income support, and collaboration between the public and private sectors.

With a young population and significant room for growth, Indonesia is well positioned to benefit from the productivity gains and new opportunities automation presents. But the country will need to set other clear priorities to help it achieve the dual objectives of sustained job creation and raising the skills of the existing labor force. We believe priorities could include:

- **Maintaining robust economic growth to support job creation.** Fiscal and monetary policies that ensure sufficient aggregate demand, as well as support for business investment and innovation, will be essential. Targeted initiatives in certain sectors could also help, including by increasing investment in infrastructure and energy transitions.
- **Scaling and reimagining job retraining and workforce skills development.** Providing job retraining and enabling individuals to learn marketable new skills throughout their lives will be a critical challenge. Midcareer retraining will become ever more important as the skill mix needed for a successful career change evolves. Business can take the lead in some areas, including with on-the-job training and providing opportunities for workers to upgrade their skills. Indonesia will need to build an ecosystem of stakeholders including academic institutions, employers, and government working together (Exhibit 9). Centers like McKinsey's Digital Capability Center (DCC) can help develop digital manufacturing and industrial expertise through experiential learning and capability-building. Each center was founded in partnership with a leading industry consortium, government organization, or research institution. The facility in Singapore is a collaboration with the Agency for Science, Technology and Research's Advanced Remanufacturing and Technology Center (ARTC)¹⁷. To date, over 200 companies in Singapore and 1000 companies globally have gone through the centers' learning module where they discover industry 4.0, learn how to implement to capture impact, and how to sustain by training their people and making the right organizational changes.

¹⁷ See a-star.edu.sg.

All stakeholders, including policy makers, academic institutions, NGOs, and business leaders will need to prepare for substantial changes related to the future of work. Companies will need to start planning for, and transitioning into, the future of work now, with long-term learning programs both for people whose jobs are changing today and those whose jobs will change in the future.

- **Improving business and labor market dynamism, including mobility.** Greater fluidity will be needed in the labor market to manage the difficult transitions we anticipate. Digital talent platforms can foster fluidity, by matching workers with companies seeking their skills and by providing a plethora of new work opportunities for those open to taking them. A global non-profit organization, Generation helps students build thriving and sustainable careers by providing capability building boot camps while engaging with employers right from the start.¹⁸ The intensive boot camp covers technical, behavioral, and mindset skills driven by the needs and demands of the industry. To date, 90 percent of young people who take the program are placed in jobs by graduation and earn two to six times as much income relative to their youth peers.
- **Providing income and transition support to workers.** Income support and other forms of transition assistance to help displaced workers find gainful employment will be essential. Beyond retraining, a range of policies can help, including unemployment insurance, public assistance in finding work, and portable benefits that follow workers between jobs. Singapore, for example, has implemented an innovative form of support aimed at upgrading skills as part of its efforts to promote growth and competitiveness in 27 sectors including environment, energy and power, healthcare, hospitality, human resource and media, and retail, among others. Through the SkillsFuture initiative, introduced by the Ministry of Education in January 2016, the government provides all Singaporeans aged 25 and older with credit to pay for approved work-skills-related courses. In 2018, more than 460,000 Singaporeans and 12,000 enterprises benefited from the training subsidies.¹⁹
- **Investing in drivers of demand for work.** Governments will need to consider stepping up investments that are beneficial in their own right and that contribute to demand for work, such as spending on infrastructure, education, healthcare, and climate change adaptation. Public-private-partnership models can be leveraged to stimulate investments in these sectors. China, for example, has invested significantly in infrastructure creation, which has resulted in additional demand for labor.²⁰
- **Promoting entrepreneurship at scale.** Entrepreneurship and more rapid new business formation will not only boost productivity, but also drive job creation. Startups and SMEs employ far more people than large enterprises. For a country like Indonesia, encouraging growth of startups and SMEs can help create jobs at scale. Online commerce has already had a major impact on Indonesia's job market. It is giving a boost to Indonesia's jewelry sector; artisans in traditional production centers such as Bali and Yogyakarta sell their products to digitally savvy local aggregators, who then resell to overseas retailers.²¹

* * *

Policy makers, business leaders, NGOs, academic institutions, and individual workers all have constructive and important roles to play in smoothing the workforce transitions ahead. History shows us that governments across the globe, when faced with monumental challenges, often rise to the occasion for the well-being of their citizens. Educational models have not fundamentally changed in 100 years. It is now critical to reverse this trend, with governments making workforce transitions and job creation a more urgent priority.

Businesses will be on the frontlines of the workplace as it changes. That will require them to both retool their business processes and reevaluate their talent strategies and workforce needs, carefully considering which individuals to retain, who can be redeployed to other jobs, and where new talent may be needed. Many companies are finding that it is in their self-

¹⁸ See generation.org

¹⁹ See skillsfuture.sg.

²⁰ *China's labor market HR trends*, China-briefing.com.

²¹ Kaushik Das, Toshan Tamhane, Ben Vatterott, Phillia Wibowo, and Simon Wintels, *The digital archipelago: How online commerce is driving Indonesia's economic development*, August 2018, McKinsey.com.

interest—as well as important for societal responsibility—to train and prepare workers for a new world of work.

Individuals, too, will need to be prepared for the rapidly evolving future of work. Acquiring new skills that are in demand and resetting intuition about the world of work will be critical for their own well-being. There will be demand for human labor, but workers everywhere will need to rethink traditional notions of where they work, how they work, and what talents and capabilities they bring to that work.

In Indonesia and around the world, we will all need creative visions for how our lives are organized and valued in the future, in a world where the role and the meaning of work are starting to shift.



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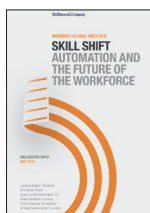
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