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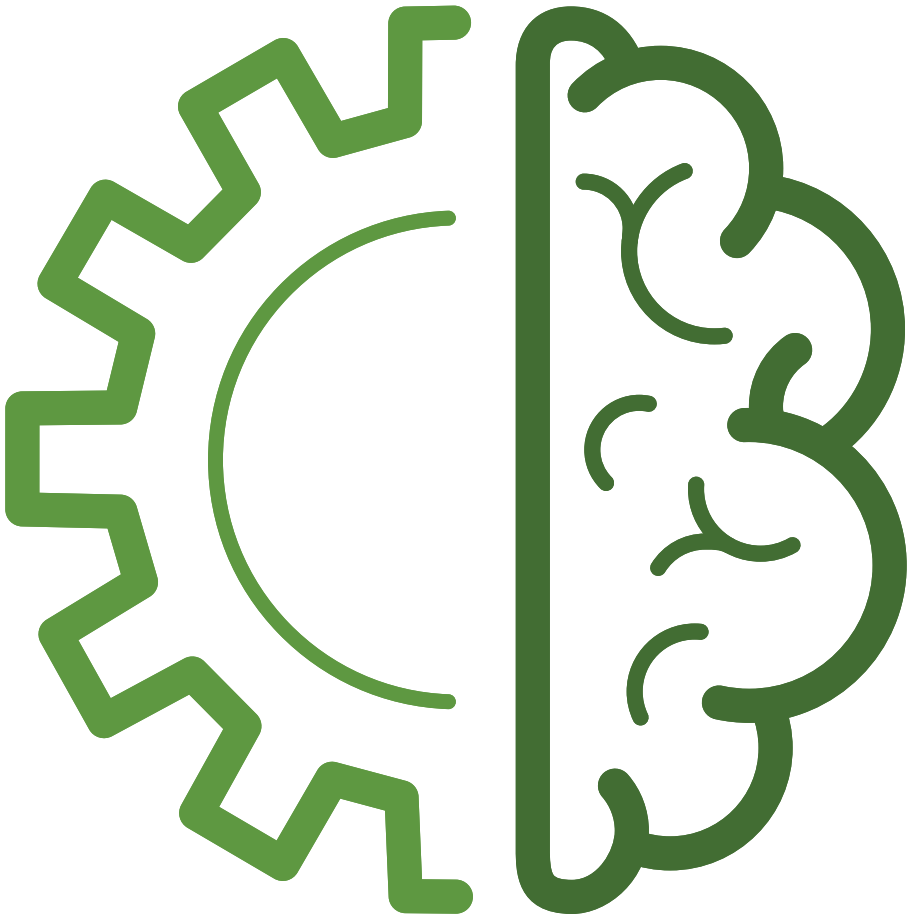


Automation

and its impact on employment

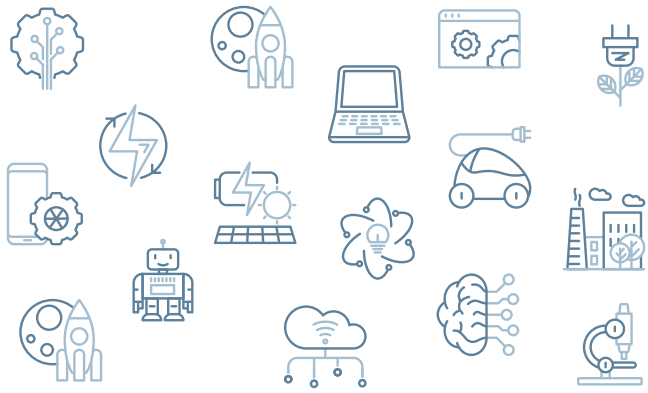
Introduction

Automation will increasingly impact the world of work during the next few years. This is already felt in some industries, and different countries are experiencing the effects more so than others. Discussions of how automation will alter working life, however, are always loaded with 'maybe' statements.

Studies highlight varying degrees of job losses or job creation, yet scenarios are dependent on factors that will facilitate positive or negative change. It's not a simple case of the 'jobs we have now' experiencing gains or decreases either. Yes, automation could create demand for existing goods and services, but it may also lead to new industries and new jobs. Job 'designs' too could evolve once new technologies are embedded, and, if progress is positive, there may even be more work to go around – or not, depending on what action is taken to offset disruption.

Predicting the future is not a science. Differences of opinion vary. So we've reviewed research on automation and its potential impact on employment. We summarise our findings below, including the steps required by governments and employers to ensure positive rather than negative disruption. But first...

Different Types of Automation

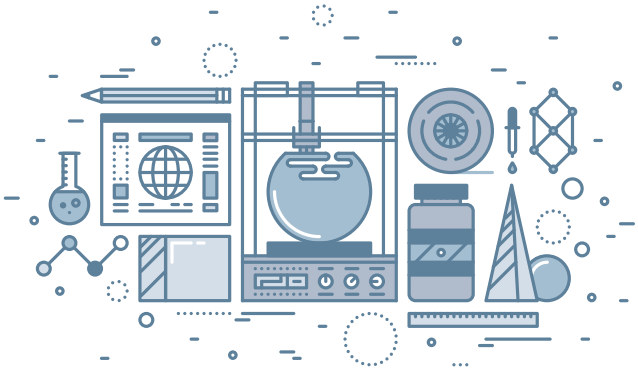


When people think about automation and work, they often imagine robots operating within a manufacturing environment. A key factor to understand, however, is that automation and robotics are two distinctly different things. Yes, crossovers exist between the two, but to appreciate the nuances of the technology, it's a good idea to keep them separate in your mind.

Automation is the term used when describing a process or task performed by software or a machine, usually undertaken by a human. It can be mechanical or virtual; simple or complicated. Robotics, on the other hand, is a branch of engineering focused on designing and building robots. While robots may automate some tasks, in the main, they have **little to do with automation** outside of industrial settings. And even within manufacturing facilities, other types of machines are used which don't come under the robotics banner.

Industrial Automation (IA)

There's various uses for robots and other automated machines in industrial settings. 3D printing is an



obvious example, as are autonomous vehicles for logistics. But also, specific machines are used in hazardous environments including **'cobots' which work alongside humans**, assisting with heavy lifting and other potentially dangerous tasks.

Software automation also plays an increasingly critical role in the working lives of humans and there are variations worth considering.

Business Process Automation (BPA)

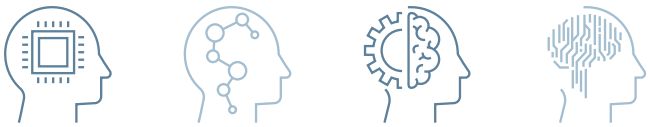
This involves an organisation taking all its basic non-manufacturing processes and seeking ways to improve efficiency by automatising them. Various software tools are used across areas such as **HR, accounts and contract management** – essentially creating a back-office function but without people.

Robotic Process Automation (RPA)

Unrelated to (mechanical) robotics, RPA is the term given to higher level automation, where software is used in certain circumstances to **augment process performance** and perform complex tasks. Rather than being an aspect of a BPA solution, it fulfils a primary function in one critical area such as customer order processing. A one off investment, rather than business overhaul.

Intelligent Process Automation (IPA)

Whereas RPA is adherent to pre-set rules, IPA software uses artificial intelligence (AI) to learn how to mimic human computer interactions and deliver intelligent outcomes. Another component of IPS is machine learning, a type of AI that enables computers to **adapt, change and even test different approaches** based on data retrieval.



What the impact studies tell us

As the **MIT Technology Review** discovered when it analysed several reports published between 2013 and 2017, little consistency or agreement exists on how many jobs will be lost or created due to automation, worldwide, during the next few years.

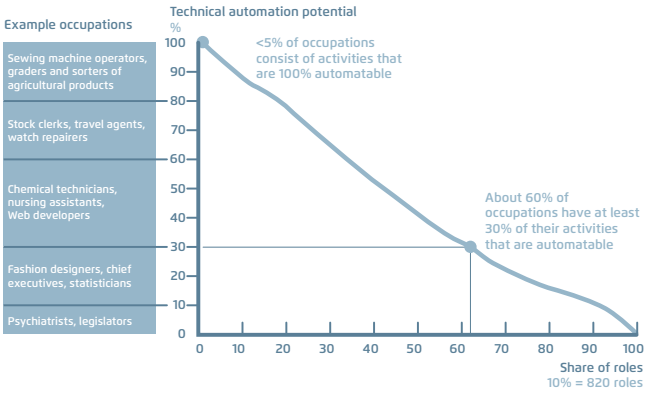
Report	Pub.	Lost (million)	Gained (million)	By when
Gartner	2017	1.8	2.3	2020
Metra Martech	2013	-	1.0 – 2.0	2020
International Federation of Robotics	2013	1.9	3.5	2021
McKinsey	2017	0.4 – 0.8	0.6 – 0.9	2030
Thomas Frey* *Writer & Futurist	2012	2.0	-	2030

Although some of the studies in the table are close when it comes to predictions up to 2020-2021, jumping ahead a decade the numbers become incomprehensibly bigger. To think that only 1.8 million jobs will go within the next two years, and ten years later that figure increases by half a million or more, is difficult to accept. But, change is coming, and as the technology described in the previous section becomes more prevalent and embedded within different sectors of the economy – **the UK Government** discusses decreasing cost of AI licensing models and sensors, as well as rising labour costs as propelling development of and investment in automaton – it could be far reaching and rapid.

What's more useful are the studies that take a nuanced view of the components of jobs and

how they may be affected. **A new report by OECD** published in March 2018, considers the impact across 32 countries. While it claims one in two jobs will be influenced by automation, the risk of replacement varies, with only 14% of jobs (66 million workers) being highly (70%+) automatable. 32%, on the other hand, have a 50%-70% risk of changing due to automation. The median job within the study has a 48% chance of being partly automated.

The 2017 McKinsey study also assesses degrees of automation and revealed a now well documented statistic. 60% of occupations have at least 30% of constituent work activities that can be automated.



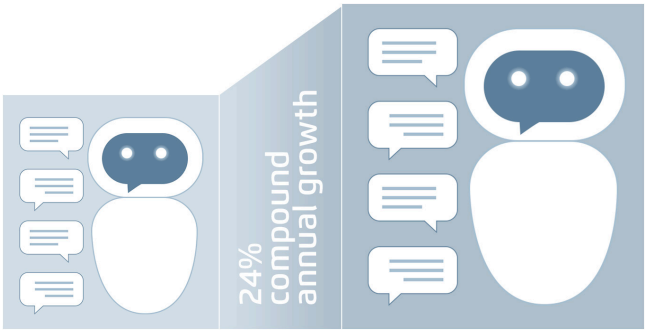
It further states that although half of all jobs have the technical potential to become automated based on currently available technologies, due to social, economic and technical factors, the rate of adoption will be varied and slow. However, over 200 million global workers will need to switch occupational categories by 2030 and most likely re-train because of role changes.

Different countries, too, will feel the impact more than others. According **to the OECD** jobs in Anglo-Saxon, Nordic countries and the Netherlands are less at risk than jobs in Eastern and Southern European countries. In a European context, when analysing McKinsey's research across Spain, Netherlands, France, Norway, UK, Germany, Switzerland and Sweden, between 20%-26% of workers will be displaced. The UK is lowest, and Germany is highest on that scale.

Jobs under threat

Jobs in the manufacturing industry and agriculture, as well as various low-level service sector roles are the most automatable. A **UK Government briefing document** provides several examples of developments in this area including German manufacturers using robotic arms for loading and lifting, as well as automated factories and warehouses such as those used by adidas and Ocado, where goods are moved and packed by machines. Amazon, too, has **doubled the number** of packing robots in its factories in recent years. Within agricultural settings, machines can harvest and sow crops as well as perform more delicate roles like fruit picking.

Outside of manufacturing, low-level administrative functions will most likely decline in the short term. Data entry, analysis and office support occupations in addition to some customer interaction, will be the first to go. In its briefing paper, the UK Government highlight how technology could help businesses manage increased workloads and deliver faster and more accurate services. Chatbots – an example



of IPA technology – are a tool already entering mainstream business practice. The compound annual **growth rate of chatbots is 24%,** with some studies indicating **over 50%** of online shoppers prefer accessing apps rather than using email, phone or contact forms when making enquiries.

Other software automation is helping law firms conduct document searches, assist publishers such as the Associated Press to write earnings reports, process mortgage applications for lenders, and

even offer short-term market predictions for traders. All experience better and faster outcomes than if humans had done the work, according to the UK Government. Areas where technology is available but falls short of human expertise includes text and speech translation and sales. Outside of the office, **McKinsey also reveal** developments in software that could replace workers within the travel and leisure industry, banking, food service and cleaning. Transport too will see widespread changes when autonomous vehicles are good enough to replace people.

A useful table in **the OECD report** highlights the mean probability of automation for different sectors of the economy. While it is lower-level and skilled roles which score most highly, it's interesting that industries and professions such as teaching, medicine, accounting and ICT are also at risk of changing and evolving due to technological advances. Innovation in automation software capable of social and cognitive intelligence, perception and manipulation, is moving at a rapid pace, according to the report.

Gains to be made

As we saw in the table above, all impact reports, whether making short or long term predications, agree that a net gain in jobs is likely thanks to automation. Most refer to past technological progress as proof of how employment will adapt. Using the personal computer as a basis for its estimations, **McKinsey's study shows** how 15+ million new jobs were created in the US since 1980, despite the PC replacing certain functions. It also discusses how previous technological revolutions have led to increased leisure time, facilitating the rise of new industries such as entertainment, sport and DIY and the jobs within them.

The process is twofold, however, with a demand for existing jobs also expected to rise. **OECD use a similar example** explaining how US bank teller numbers increased thanks to ATMs. Fewer tellers meant branch operation costs went down, but urban bank branches have subsequently increased by 43% during the last 30 years, meaning more tellers exist now than before ATMs.

As the **UK Government briefings** on the impact of automation on jobs claim, technological innovation never leads to long-term unemployment, but rather types of employment within professions change as specific tasks evolve and new tasks emerge. **Research also indicates** that roles tend to become more intensive. Bank tellers, for example, now deliver several of what McKinsey calls 'value added services' which never existed before. Other occupations where analytical and social skills are required have also grown in line with a greater intensity in performing critical tasks associated with those roles. According to **the OECD**, scientists across different disciplines are more numerous and more productive now thanks to computer software taking on time consuming data work, enabling experts to engage is theory and methodology development, interpretation, writing and communication.

With regards to completely new jobs, McKinsey say by 2030 **8%-9% of roles** won't be familiar to us today. It's certain sectors, too, that will experience increases coinciding with automation, as well as

other social and economic trends driving growth and changes in employment.

First, the obvious area where new occupations will emerge will be within automation and robotics itself. This industry alone could be worth **up to $11 trillion** globally by 2025.

Sub sectors such as autonomous vehicles could account for **£51 billion in the UK alone**. Other industries expected to become hives for new types of employment include the wider **service sector**, such as financial and management services as well as **healthcare and education.**

For healthcare, McKinsey offer the most in-depth insight into how that sector will evolve. The primary driver they see behind imminent healthcare worker demand is our aging populations. By 2030, an estimated 300 million more people aged over 65 years means a greater need for caring services. Automation won't necessarily replace workers in this sector because the inherent skills required are difficult to automate, while lower wages means the industry remains a low priority for innovation. Employment at the top will rise too, however, in occupations like doctors, nurses and health technicians whose specialist skills are in demand.

Another facilitator for job growth is consumption. Driven by an emerging middle class in previously undeveloped regions of the world, by 2030 consumer spending will have **increased by $23 trillion** during the previous decade and a half. McKinsey estimates 300+ million new jobs will emerge in occupations producing goods and services, as well as across the whole supporting infrastructure of the consumer industry. Difficult to automate jobs include everything from engineering, building and plumbing to accountants, analysts, IT professionals and other technology specialists.

Generic functions such as management, and skills and competencies like **digital, creativity, entrepreneurship, empathy, persuasion, negotiation and perception** will also be in demand and integral to new occupations that emerge.

In a London Business School backed study in 2016 which revealed **100 jobs of the future**, it's interesting to note how climate change, energy efficiency and space exploration are other areas facilitating the creation of new and previously unheard of jobs. Some stand-out titles from the list include: Vertical Farmer, Insect-based Food Developer, Drowned City Specialist, Solar Flight Specialist and Spaceport Designer.

Underlying concerns

In 2018, several indicators show that employment is moving in the right direction, despite the march of automation. The **OECD confirms** that US employment has risen 6% in the last 10 years, and a recent report by the European Commission showed similar trends in Europe. An additional **3.5 million people** were working across the region between 2016 and 2017, while incomes also went up and levels of poverty decreased. Current momentum in the jobs market suggests the EU will reach its target of a 75% employment rate by 2020.

Regardless, worries that things are on the cusp of turning bad endure. **A recent UK survey**, for example, revealed 37% (circa 10 million workers) fear employment circumstances will change for the worse over the next decade due to automation.

While some fearmongering can be attributed to

dramatic media coverage, some genuine concerns of how things may pan out exist. One is that the transition period will be protracted, leading to a conflagration of inequality. European income inequality **rises still**, and as most new jobs require specialist knowledge and higher education, those at the top of the wage tree could experience pay increases, while demand for low-paid, easily automatable labour declines.

Furthermore, significant employment increases in the past have relied on productivity gains driven by automation and other technological advances. While the Eurozone is **making gains in productivity**, figures are only reaching pre-recession levels now, and only in some, but not all, states. All the while the trend globally **suggests productivity has been in decline** for several years and is unlikely to ever reach levels recorded in the past. So much so, only 50% of **experts surveyed in 2014** believed automation would continue to create jobs at a similar or faster rate than it displaces them. And if 'not enough jobs' is one side of the coin, McKinsey take another track suggesting it's a **dearth of workers** due to several demographical factors such as aging, that will cause major problems. Other concerns flagged in UK Government research include over-regulation stifling innovation, as well as automation encouraging re-shoring of manufacturing to Europe. The latter posing potential negative effects on the global economy.

Solutions: Education and training

The general agreement within impact research is the overwhelming need for employers and Governments to invest in training and developing key skills. This will both offset disruption, as well as facilitate the transition into an automated future.

Research points to three interrelated strands to upskilling requirements:

1. Training specialist skills

Training specialist skills, particularly those within the STEM (science, technology, engineering and mathematics) family, is essential. These skills will enable people to gain employment within the burgeoning automation sector, but also help people transition into roles where they're working more closely with, and being assisted by, automated software and devices. It's part of what McKinsey call a mass **redeployment of labour**, training people to become adaptable so they can fulfil roles where the task or purpose changes due to automation. Careers, too, will become more varied as employment evolves.

2. Boosting levels of education

A 2016 OECD study confirmed that those with higher degrees such as a Masters or PhD, were least likely to lose their job to automation. Less than 1% of highly educated workers were at risk versus 15% of workers whose highest qualification was up to secondary school level. Higher educational attainment, whether that's professional training or some form of tertiary education, is critical.

3. Skills and attributes

A third strand is the types of skills and attributes gained through this upskilling process. Yes, STEM is one aspect, but not everyone has an aptitude in those areas. Instead, training in activities that require **social and emotional skills**, higher cognitive capabilities and creativity will take precedence. Academics at the Massachusetts Institute of Technology (MIT) Center for Digital Business indicate **writing, NPD and even art** may be useful skills to have. The Pew Research Center further states that developing any 'uniquely human' and therefore **difficult to automate adroitness**, should be encouraged.

The need for training differs between countries. McKinsey highlight how the percentage of workers that would need to learn new skills or upgrade their education was **considerably higher in Japan**, than it was in the USA and Germany. Access to education and training is also better in some countries. Across OECD countries, however, a widespread issue is **poor participation** in training schemes, and education in general, by workers most at risk of automation. It recommends boosting adult learning initiatives outside of the workplace as a key policy for Governments over the next few years.

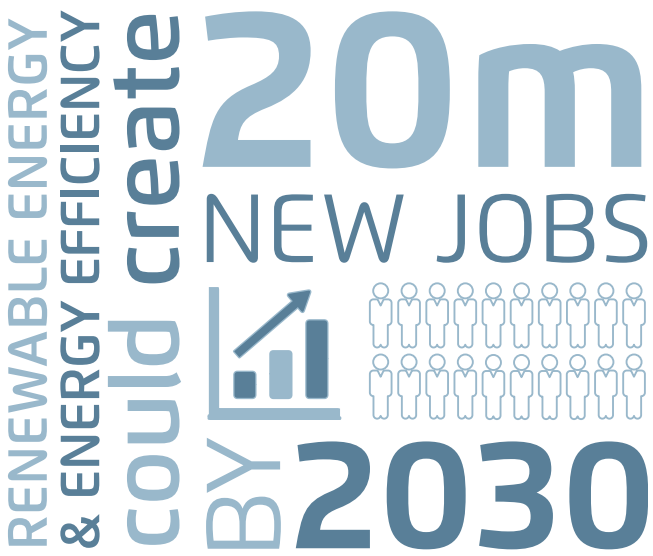
European Commission documents point to **'Skills Agenda for Europe'** and EU funding, as providing a strong foundation for equipping people in Europe with better skills at all levels. It also notes facilitating better cooperation between member states, training providers and companies as a key component of its strategy. Similarly, the UK Government is expanding training funding in automation technology, as well as seeking ways to leverage training programmes that enable humans to **'retain an advantage'** over automation technologies.

Solutions: Beyond skills and education

There are other initiatives which could help offset the disruption caused by automation. Some of these are being pursued while others remain at the conceptual stage as policy makers and investors work out how to deliver outcomes. On the policy side, they include **promoting work sharing**, as well as various tax reforms aimed at increasing capital, business or consumption taxes while reducing taxes on labour. Another more contentious solution is for countries to introduce a universal basic income. This was already **trialled in Finland** in 2017, and is widely debated by European policy makers.

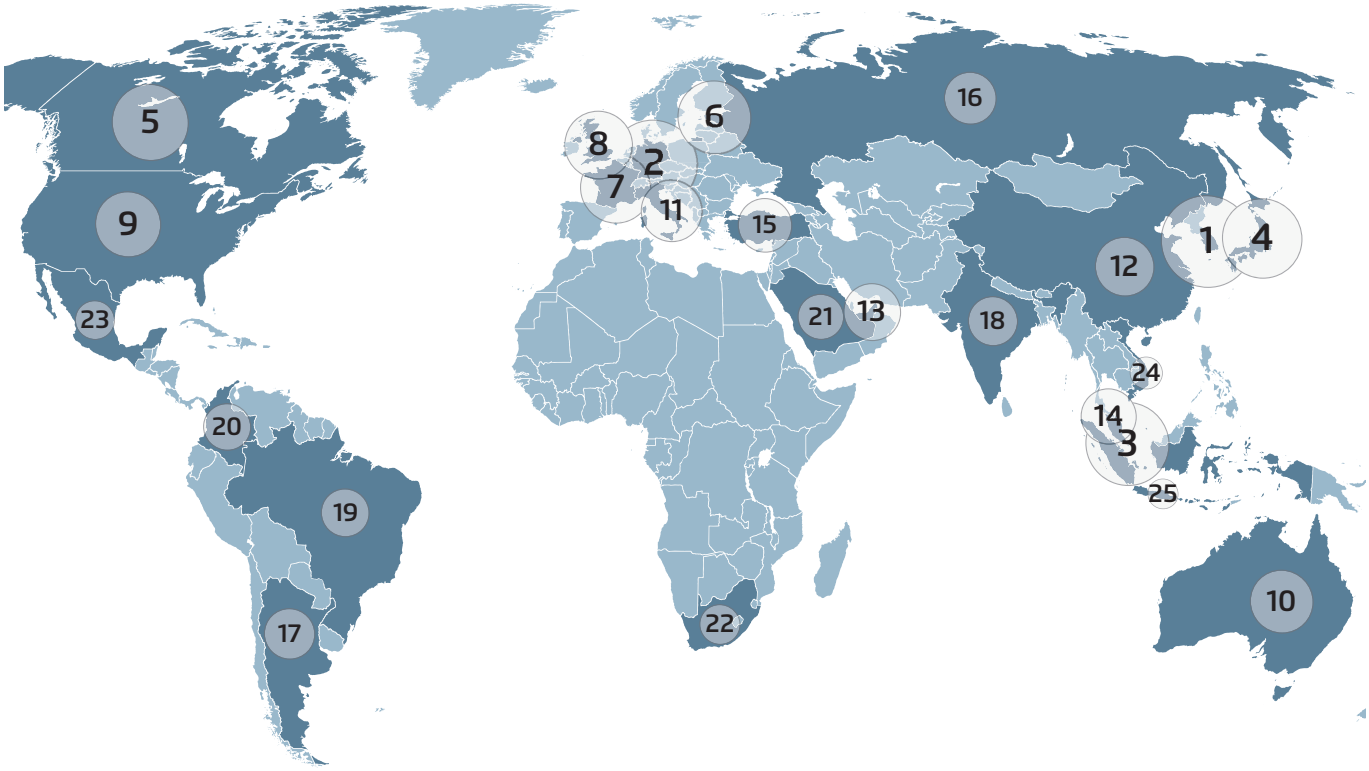
With regards to investment, **McKinsey identify three areas** where they believe heightened investment will create a demand for work. The first is infrastructure and specifically construction. 80 million to 200 million jobs could be created according to estimations, helping offset the displacement of workers in other sectors. Housing shortages is one main driver for investment and the range of jobs the sector supports are broad and includes architects and engineers, skilled trades people, construction workers, machinery operators and other lower skilled positions.

Energy is another sector where investment is needed and where the positive knock-on effect for employment would be welcomed amidst rising automation. Climate change is an obvious catalyst for innovation and, according to McKinsey, giving a boost to industries supporting renewable energy and energy efficiency could create up to 20 million jobs by 2030. Finally, another contentious solution is the marketisation of previously unpaid domestic work including childcare, early childhood education, cleaning, cooking and gardening. Up to 90 million new jobs could be created in this scenario, according to the report.



WHO'S PREPARED?

In conclusion, we found a recent Economist backed study helpful in assessing which countries were most prepared for the imminent automation revolution. Going beyond skills and training, the study also considers various other factors such as a country's innovation environment, as well as education and labour market policies. Out of the 25 countries assessed, it's encouraging that Germany, France and the UK make the top ten, while perhaps surprising that the USA is only ninth on the list. To find out more, visit **http://www.automationreadiness.eiu.com**.



Overall Index: ranks and scores

1 South Korea	91.3	7 France	78.9	13 UAE	64.3	19 Brazil	46.4
2 Germany	89.6	8 UK	73.1	14 Malaysia	57.7	20 Colombia	44.7
3 Singapore	87.3	9 US	72.0	15 Turkey	53.7	21 Saudi Arabia	42.0
4 Japan	82.6	10 Australia	70.4	16 Russia	52.5	22 South Africa	41.0
5 Canada	81.8	11 Italy	67.5	17 Argentina	51.7	23 Mexico	40.7
6 Estonia	79.5	12 China	67.1	18 India	47.2	24 Vietnam	37.3

Mature Developed Emerging