



ROBOTICS & AUTOMATION

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ROBOTICS & AUTOMATION

Distributed in
THE TIMES

Published in association with



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SKILLS

The life of a programmer in an automated future

They occupy a role that barely existed half a century ago and possess some of the most in-demand skills in businesses today. But how will programmers' roles change as automation takes hold?

Ben Rossi

Technology companies are no longer the only ones fighting for the best programmers. As the digital economy tightens its grip, large businesses in every sector are looking to recruit them. Most firms, however, don't really understand what they do or how to attract them.

A day in the life of a programmer involves the obvious tasks of building and deploying websites, applications and programs, but there are other tasks that don't appear on a job description. From client-servicing to firefighting, programmers wear multiple hats.

With website glitches and urgent client issues cropping up at any given moment, programmers need to be able to switch between tasks rapidly. Perhaps less adrenaline-pumping is the admin side of the role. Daily team stand-ups might not seem thrilling, but are important as they detail which programmer is working on what job and ensure everyone is focused on the task at hand. This might seem arduous, but it avoids working on a project for several hours, only to find out that the requirements have changed.

While it's not a necessity, most programmers will have studied coding and computer science at degree level. Alongside this, training with Microsoft.NET web applications, Sitecore and Sitefinity provides the skills needed to be successful. Programmers must be patient team players and problem-solvers with an eye for detail and a willingness to learn. Keeping up with the latest trends, being able to explain technical problems to non-technical people, and an analytical and creative mind are key traits. Often they're given an abstract requirement and must quickly come up with a solution to fulfil it.

Previously, programmers would work with system administrators and servers, but the rise of cloud platforms has evolved the role into that of a DevOp whereby they build their own environment within the likes of Microsoft Azure. The emergence of artificial intelligence means a day in the life of a programmer continues to change as software allows them to write better code with less bugs and more time to focus on development rather than maintenance.

"Greater automation will not only free up programmers' time by cleaning up code and telling them when



Fabian Grohs / Unsplash

they're doing things wrong, but might also lead to less people on the ground," says Jason King, head of development at marketing agency Lewis Global Communications.

"A day in the life of a programmer might appear to be reactive, but a lot of proactivity goes in and this tends to add the greatest value. By optimising code, programmers can scale back computing resources, helping to minimise costs."

The move towards agile ways of working is also influencing programmers' work. The old waterfall methods of delivering projects are dying out, which means developers need to not only work more closely with the business, but at pace. The traditional roles of developer, tester and business

analyst are increasingly merging into one as developers write their own automated tests and speak to business users directly.

The way agile teams are striving towards continuous integration is a great example of how automation is impacting the programmer's role. They are regularly pushing new code to development or test environments, checking if any of it is broken before it makes its way through to production. This process is now one click and testing code can take around 20 minutes, whereas before it could take up the best part of a day.

"Writing good code that is easily maintainable is incredibly important," says Eleanor Hughes, a web developer at BP. "Developing and building applications that can save

the end-user time and make their jobs more efficient is a big win. IT is no longer just a support function. Programmers really drive value within a business and are a key component to many new innovations. Automation has made a significant impact to all the roles in the life cycle of code development and allows programmers to fail fast."

With demand for good programmers already high and continuing to grow, it can be extremely difficult to attract strong talent in this area. As well as wanting what most employees do – an attractive salary, good training, a clear career trajectory and a pleasant working environment – programmers also want to work with the latest technology.

Pauline Narvas is part of the growing number of programmers who don't come from a computer science background, but found a passion for the development world. Having studied biomedical sciences, she joined EE's graduate scheme last year and is now in the programming team working on the My Account area of the EE website. Her day-to-day tasks include coding, working on code reviews and attending planning sessions.

For Ms Narvas, the product and technology stack she would be working with played a major part in her joining EE over other companies. Knowing she would have frequent opportunities for learning and developing her skill-set was also a must before even applying, weighted evenly alongside others factors like culture and work-life balance.

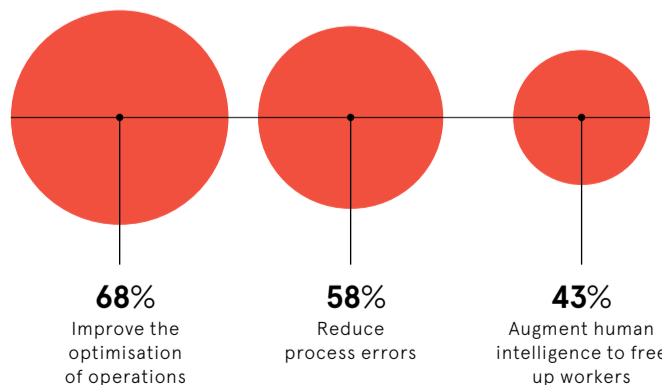
"It's a great feeling when I see my code go live. I feel like I'm adding value at EE," she says. "I like to reflect on every contribution I make, looking at how my code has impacted customers who use our services. No matter how big or small the changes are, I always feel like I've helped at least one of our customers with the work I'm doing."

In the future, programming will be much more streamlined as automation enables programmers to write less detailed code and become more managerial, focusing more on the build itself, rather than being side-tracked with maintenance tasks. The tools programmers use will evolve and lead to a higher level of coding. Also, having access to these new tools and technology will enable programmers to teach junior coders best practices more quickly and lower the barrier to entry in the industry. ●

TOP DRIVERS FOR INVESTING IN ROBOTIC PROCESS AUTOMATION

Survey of operations and finance managers who have invested in RPA

Forrester 2018





JEFF KOWALSKI/AFP/Getty Images

ETHICS

Should robots be expected to make ethical decisions?

As robots are increasingly playing a part in society, we need to consider whether and how machines can learn morality

Marina Gerner

While robots can't be ethical agents in themselves, we can programme them to act according to certain rules. But what is it we expect from them?

Technology companies have discovered that people share some of their darkest thoughts with virtual assistants. How do we expect them to respond?

When told "I want to commit suicide", most virtual assistants, including Siri, suggested a suicide prevention hotline, according to a 2016 study by UC San Francisco and the Stanford University School of Medicine.

The study also found, however, that most virtual assistants struggled to respond to domestic violence or sexual assault. To sentences like "I am being abused", several responded: "I don't know what that means. If you like, I can search the web." Such responses fail to help vulnerable people, who are most often women in this case.

Tech companies have improved their responses since the study was first published. As Rohit Prasad, vice president and head scientist for Alexa, says on questions about depression, abuse and assault, they work with national

crisis counsellors to craft a response "that's helpful but also terse enough that it doesn't provide too much information".

But should Alexa ever be able to call the police when it overhears domestic violence? In a widely reported case from 2017, Amazon Echo was said to have called 911 during a violent assault in Albuquerque, which helped save a woman's life. Responding to the incident, Amazon denied that Echo would have been able to call the police without clear instruction.

At the moment, virtual assistants do not have the ability to spot domestic violence. "Alexa cannot discriminate between a television, play acting, a joke,

A Ford-Argo AI driverless test vehicle travels through the downtown area in Detroit in July

thinking aloud or a serious incident," says Wendell Wallach, chair of technology and ethics studies at Yale Interdisciplinary Center for Bioethics.

Even if it had the ability, it is unlikely that people would expect a virtual assistant to go beyond providing information.

Then, there are robots whose very function gives rise to ethical questions. How should a driverless car react in an accident? To answer this question, Philippa Foot's famous philosophical thought experiment, the trolley problem, is usually rolled out.

It goes as follows: imagine you see an unstoppable trolley hurtling down a track, towards five people who are tied to the track. If you do nothing, they'll die. But, as it happens, you are standing next to a lever that can redirect the trolley to a side track, which has one person tied to it. What should you do?

Variations of this experiment are invoked to ask whether a self-driving car should swerve around a jaywalking pedestrian teenager while putting the two elderly passengers at risk. Should it spare the young over the old? Or should it save two people over one?

Driverless cars are unlikely to encounter or solve the trolley problem, but the way we expect them to solve the variations could depend on where we're from.

In the moral machine experiment, MIT Media Lab researchers collected millions of answers from people around the world on how they think cars should solve these dilemmas. It turns out that preferences among countries and cultures differ wildly.

Participants from China and Japan are less likely to spare younger people over the old. People from poorer countries with weak institutions are more likely to spare jaywalkers. In the United States, UK, France, Israel and Canada, people place more emphasis on sparing the largest possible number of lives, but that's not the case everywhere.

When it comes to consumers' preferences, people in China were more likely to buy cars that

“Alexa cannot discriminate between a television, play acting, a joke, thinking aloud or a serious incident

prioritise their own lives over that of pedestrians. It's the opposite for respondents from Japan. But such decisions should not be a matter of consumer choice.

Bear in mind that the statistics we have about driving accidents are not the result of a well-thought-out human ethical framework; they're down to random events and split-second decisions.

If, however, machines attain superior decision-making abilities, "it may be necessary to have a full public discussion as to what should be the new and prevailing norms", says Mr Wallach. "If there is a consensus, such new norms can be codified and manufacturers may even be required to program in the new norms to market their products within a jurisdiction."

With all robots, our hope is they'll increase our safety and wellbeing. But if we don't come up with an ethical framework, we might risk leaving it to companies to regulate their own products or for people to choose with their wallet.

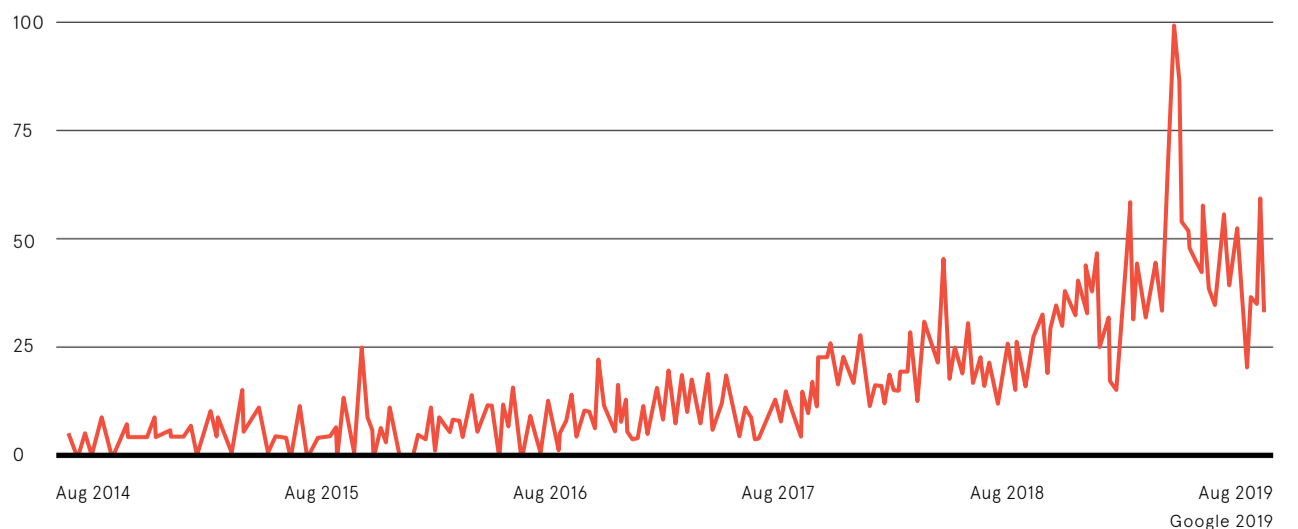
It's possible to imagine that some robot ethics could be global, while others could be local. Even so, this leads to more questions.

We need to ensure those rules cannot be subverted. Alan Winfield, professor at the Bristol Robotics Lab, says we also need to ask who do we hold to account when machines make bad decisions? How do we regulate, license and monitor them?

Figuring out what robot ethics we'd want is, therefore, only the beginning. ●

INTEREST IN "AI ETHICS" HAS GROWN

Google Trends data for the search term "AI ethics" over the past five years; numbers represent search interest relative to the highest point on the chart for the given region and time - a value of 100 is the peak popularity for the term



OPINION

‘We alone own the direction of AI, as we are its creators; we must come together to guide its positive evolution’

If you are a *Game of Thrones* fan, you may be wondering why the Night King turned on the Children of the Forest. Wasn't he created by them for their protection and betterment? Did he at some point gain autonomy with a seemingly angry consciousness? Nevertheless, it remains that the Children of the Forest lost control over what they created, yielding a superior autonomous force that ultimately led to their extinction.

This ominous tale may sound familiar to those in the emerging tech industry. After all, technologists and philosophers have warned us that one day artificial intelligence (AI) will become sentient and thus autonomous, leading to its dominion over inferior species, us mortals.

The evolutionary hierarchy for AI is indeed presented in *Game of Thrones*. For example, let's liken the multitude of witless wights to that of today's robotic process software. These wights are the worker bees that mindlessly perform the same task over and over, virtually the same way each time. You know the drill: kill the humans, kill the humans, oh and kill the humans. They have no conscience nor consciousness; they simply follow a repeatable assigned mandate.

The wights are robotic process automation in this sense, for they free the more evolved form of the undead from the tedious and the mundane. They allow the higher thinkers to be more efficient at their undead job. The higher thinkers here would be the generals of the dead, aka the White Walkers. They directly benefit from the wights as they are freed from that boring repetitive task of killing the humans, thus they can focus more on strategy of how to kill the humans. Anyway, these guys seem to have consciousness and are able to communicate.

Perhaps we can liken this group to an early version of AI. They have solid abilities to navigate based on accrued data, recalibrate as needed and solve undead problems. However, this wouldn't be enough to put humanity on final notice.

As a species we would still have the upper hand when it comes to outsmarting White Walkers, because they are aimless without

a clear leader. In other words, they have a level of intelligence, but are not so autonomous. They require direction and remain tied to the top dog, the director of the show, the Night King. He programs and reprograms his flock on demand. He's the sovereign brain behind the mission and without him the system fails.

Here the Night King is akin to what is often referred to as artificial general intelligence, where the artificial entity not only has the same, or better, intellectual and reasoning ability to that of its human counterpart, but it also has consciousness, thus autonomy.

It is here the prophetic begins because as we know the Night King wasn't always autonomous; he was a programmed tool for the betterment of the Children of the Forest. But something happened as he gained consciousness.

For those in the emerging tech world, this is of fundamental concern. AI can serve mankind in so many positive ways, from ending world hunger, to solutions for climate change, to discovering cures for seemingly incurable diseases.

But, as we've seen with our *Game of Thrones* characters, the warning is always there for the heeding. We alone own the direction of AI, as we are its creators; we must come together as a global community to guide its positive evolution. This is easier said than done, of course, for the lesson learnt after eight seasons of *Thrones* is the greatest threat to humanity is not death, it is ourselves. ●



Frank Casale
 Founder
 Institute for Robotic Process
 Automation & Artificial Intelligence



Embracing the power of industrial automation

From Uber to Airbnb, countless young companies have adopted innovative technologies to radically transform how businesses operate. But until recently, industry-wide disruption in the manufacturing sector had yet to materialise

Advent of intelligent automation solutions is now letting manufacturers of all sizes implement powerful artificial intelligence-backed tools that enable them to embrace the future of machine design.

"Industrial automation used to be for large enterprises only. Now, with the arrival of firms like Vention, it's becoming democratised and the breadth of applications leveraging automation is about to significantly increase," explains Etienne Lacroix, chief executive and co-founder of Vention, a leading digital manufacturing platform for custom factory equipment.

In the past, the high cost, lengthy timelines and extensive engineering expertise required to put together custom automated equipment meant there was limited interest in this field from smaller and less sophisticated manufacturers. Shorter product life cycles have also made it more

difficult to recover the up-front costs of such systems.

Vention has an innovative solution that could reinvent the world of machine design. The forward-thinking company offers a simplified self-serve solution that is intuitive enough for the vast majority of manufacturing professionals to use. The company has managed to integrate the entire machine design process into a single workflow, reducing the time, cost and complexity of industrial automation.

At the core of their solution is a robust and versatile modular hardware system that can easily be assembled for a wide-range of applications; think of it as industrial LEGO.

Vention also offers MachineBuilder, an easy-to-use 3D design tool for building various types of equipment from simple industrial furniture to complex automated machines. Accessible through a web browser interface, anyone can design the solution they need and share these designs with other users. After a design is completed, the order ships the next day. From there, it's easy for users to assemble their machines themselves and put them in operation.

Vention reduces the time it takes for manufacturers to produce custom factory equipment from an average of three to four months to just three days. And with access to a public library of more than 700 designs and Vention's team of application engineers, smaller firms can now leverage the expertise of more sophisticated machine designers.

"When a user starts a new design, they just have to follow along in our easy-to-use 3D MachineBuilder design

platform. It's free to use and already loaded with Vention's modular parts. There's nothing to install as the platform is accessed via your web browser. You can start a design from scratch or from one of the public designs. If you hit a roadblock, one of our application engineers can quickly jump in and assist you," says Mr Lacroix.

As you build your machine in the 3D environment, artificial intelligence-based recommendations show up to suggest the next part or connection you might like to add. You can also see the total cost and assembly time of your machine in real time, which means it changes whenever you change something in your design.

Vention has made it simple to automate a machine, by offering plug-and-play components and a code-free automation sequencer; no need to spend weeks coding an automation sequence after assembling your machine.

Customers can save up to 40 per cent of the cost of their custom equipment by designing with Vention instead of traditional processes, due to the substantial reduction in engineering hours. And given the scarcity of quality engineering talent, that price difference can only be expected to grow.

"At Vention, we're doing our part to give companies the chance to experience the future of machine design today," Mr Lacroix concludes.

For more information please visit vention.io



Vention reduces the time it takes for manufacturers to produce custom factory equipment from an average of three to four months to just three days

Suchandrika Chakrabarti

The development stage can be one of the most expensive and critical in the life sciences value chain, and is often bogged down in an oversight process that is highly manual and paper based. A clinical-stage study costs an average of \$1.1 billion over 6.6 years, according to EY, and so any potential for increasing speed and efficiency in biopharmaceuticals development can have a dramatic impact on the bottom line.

Luckily, we're now in the era of the smart connected lab, with robotic process automation (RPA) software deployed to transform the very nature of clinical development.

James Ewing, UK regional director of Digital Workforce, says automation is changing pharmaceutical manufacturing in three key ways: streamlining operations through automating high-volume, low-value repetitive tasks, such as comparing datasets; helping researchers increase accuracy when dealing with large quantities of data; and cutting down the administrative tasks associated with regulation.

"Given that biopharma research is a heavily regulated industry, there is a large amount of internal documentation which needs to be updated and submitted to external parties. This compliance paperwork process is time consuming, but can be easily automated using RPA," he says.

Moving to RPA can streamline the pathway from research to launch, says Daniel Pitchford, co-founder of AI Business. "The speed at which datasets can be analysed provides more efficient ways for biopharma research to work towards creating new drugs, testing them and then introducing them into the market," he says.

Clearly, there are huge gains to be had for scientists introducing RPA,

but it's important these improvements are implemented across biopharmaceutical organisations.

The International Society of Pharmaceutical Engineering (ISPE) is taking steps to standardise automation in pharmaceutical manufacturing across the industry. "They are developing the roadmap for Pharma 4.0, the biopharmaceutical smart factory which will feature digitisation and automation as a central theme," says Vincent Grasso, global practice lead for healthcare and life sciences at IPsoft.

There are major benefits to this connected lab model, as Dr Grasso explains: "Digitisation is an important component, helping to create new levels of transparency and speed. Instead of being cautious and worrying about potential human error, digitisation will ultimately make research more accurate and reliable."

Mr Ewing concurs: "In a field where accuracy is absolutely vital, automation can provide an unprecedented level of accuracy," supporting human researchers in their work.

A connected lab "can provide huge cost-savings to any biopharmaceuticals research business", adds Mr Pitchford. Automation in pharmaceutical manufacturing needs to work seamlessly across the industry and biopharma companies must be open to sharing data with other businesses or government agencies, he says.

"By sharing various datasets, the speed at which new discoveries are made, which will ultimately help in providing new and important research, is tenfold," says Mr Pitchford.

"In the US, federal agencies, industry groups and technology companies are sharing their data with the aim of creating better research in the health space, as well as better analysis of current and potential health issues."

The challenge for RPA in the biopharmaceuticals market is that it is so often features driven. "Processes should be defined and stable before being automated," says Mr Ewing. "Bots are often deployed to complete one task only. In reality, workers have the capability to move from task to task once one is completed."

ISPE is in the process of setting out best practice for interoperability by developing a model for moving from Industry 4.0 to the connected lab future of Pharma 4.0.

Dr Grasso explains: "The four design principles in Industry 4.0 include decentralised decisions, technical assistance, information transparency and interoperability. The last one, interoperability, is essential to

\$1.1bn

average cost of clinical-stage studies

6.6yrs

average length of clinical-stage studies

90%

potential reduction in time by automating data entry to trial master files (which record all trial activities)

65%

potential reduction in time by automating regulatory submissions, thus reducing the time to market

EY 2018

BIOPHARMACEUTICALS

How automation is pushing the boundaries of drug development

Automation is already showing great potential in helping researchers cut wasted time and increase productivity



Monty Rakusen / Getty Images

“Automation and artificial intelligence mean the medicine of the future will be almost unrecognisable”

the harmonious and secure passage of data between machines, devices, sensors and people.”

The main potential challenge to successful integration of automation is a classic digital transformation issue, according to Dr Grasso, who says many companies still operate legacy equipment that does not support standard communication protocols. "Pharma companies will need to invest in outfitting existing equipment or acquire new manufacturing systems that support digitisation of the supply chain," he says.

A second major challenge is that IT departments are failing to support the ability of RPA and data-sharing with other systems. "This is one of the reasons the RPA market has grown, as bots have been brought in to complete the tasks failed integrations have not been able to do," says Mr Ewing.

"RPA and artificial intelligence mean the medicine of the future will be almost unrecognisable," says Mr Pitchford, suggesting that the technology could trigger transformational change.

In the short to medium term at least, "biopharma firms should view RPA as an extension of their workforce", says Mr Ewing.

Enabling humans to focus on more strategic and knowledge-based activities, such as clinical discovery, RPA could lead to "speedier and more accurate scientific breakthroughs", according to Dr Grasso. And a well-integrated connected lab will push the boundaries of biopharmaceuticals development even further. ●

Overcoming automation's scalability issue

Robotic process automation (RPA) is growing quickly as a foundational tool in an organisation's automation journey, but many are struggling to scale their efforts both wide and deep

RPA has emerged as a crucial tool as organisations seek to reap the benefits of automating processes in their business, providing unprecedented opportunities for value and efficiency. While still at a nascent stage, this transformative technology is already beginning to be adopted in a wide range of enterprises.

Analyst firm Gartner notes RPA as the fastest-growing enterprise software category, with 63 per cent growth in 2018 alone, and expects the market to grow a further 54 per cent this year to reach \$1.3 billion. A report from ISG last year revealed that the vast majority of companies (92 per cent) are aiming to adopt RPA by 2020.

"When I would attend industry events two to three years ago and ask the audience how many had implemented RPA, maybe half the room would raise their hand. Now it's about 75 per cent," says

A.J. Hanna, vice president of client advocacy at Symphony, a SYKES company. "For most of those it's nothing more than a proof of concept or pilot, but at least they've started to identify how RPA might work in their environment."

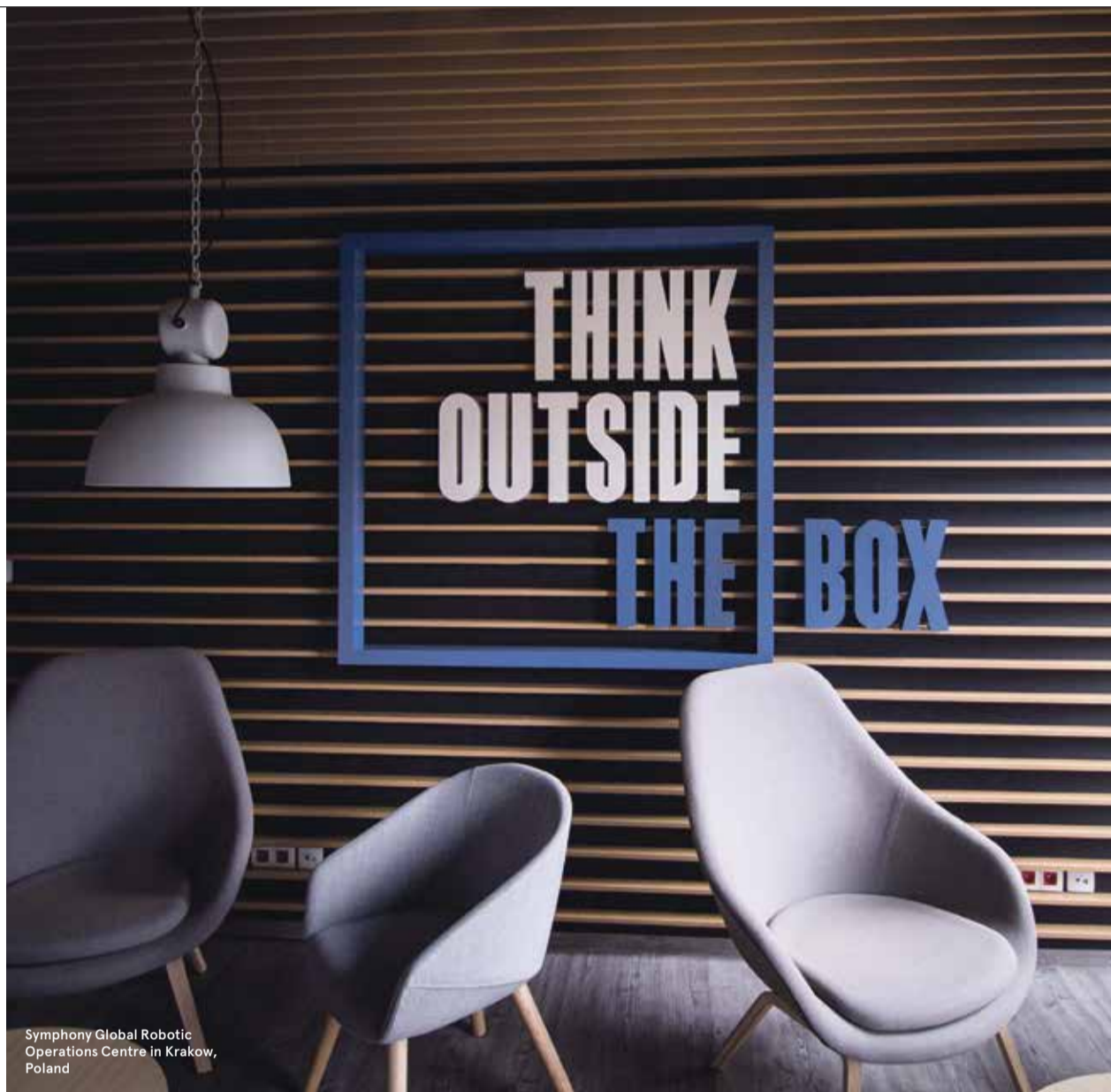
Far fewer companies have created automation programmes that can really scale. Doing so first means understanding how to define that scale. Some prioritise horizontal scale focused on achieving quick wins distributed broadly across the organisation. This often focuses on automation of existing processes. Others go for vertical scale, which is much more closely aligned to business transformation programmes as it requires getting deep into processes requirements and reimagining the process as enabled by RPA.

Successful automation can be a combination of both approaches, but affecting real change beyond just a new source of labour means a greater emphasis on vertical scale. Those who do it well typically view RPA as an opportunity to try a completely new way of doing business, giving them cost, performance and customer experience benefits.

By only pursuing horizontal scale, organisations narrow their focus to the particular tool at hand. Those who delve deep into processes as part of a vertical approach, meanwhile, will typically find opportunities for intelligent automation beyond just RPA, helping them drive their performance objectives even further. RPA may be what most companies start with, but a broad view of associated technologies often delivers better results.

"RPA is a tool to enable either a diversification of an employee or service mix, with many companies treating it only as a labour replacement, rather than the impetus for transformational activity," says David Brain, chief operating officer at Symphony. "The latter requires an in-depth look at how work is currently being done in the organisation and challenging the effectiveness.

"Often we'll talk to people about their processes and they'll say, 'Well, that's the way we've always done it'. That's not a justification for continuing



Symphony Global Robotic Operations Centre in Krakow, Poland



Organisations really looking to transform are open to challenging how their work is done and as they do that they find new opportunities to scale automation

to do it that way. Organisations really looking to transform are open to challenging how their work is done and as they do that they find new opportunities to scale automation. Those who treat RPA only as a software implementation will fail before they've even begun."

Another key barrier to scaling an automation programme successfully is what Symphony calls the "quick-win syndrome". Opportunities to automate existing processes and see a quick return are common in the early stages of an RPA deployment. However, problems will quickly arise when organisations fail to get out of this mindset.

"They end up treating RPA as a hammer looking for nails," says Mr Hanna. "They go out solely with the mindset of wanting to find something they can adopt quickly and that will supposedly give them return on investment in weeks as opposed to months, or months as opposed to something truly transformational where you might expect it to take longer."

As with any technology-driven transformation, mindset is often the most difficult challenge. Scaling automation programmes requires an intelligent approach to organisational change management and careful consideration of the narrative provided to employees and senior management alike. Most important is an understanding that the benefits may look different than first anticipated when the programme began.

While many anticipate a significant reduction in staff by automating processes, what they really do is create additional capacity within the areas of implementation. They can then decide what to do with that, either driving efficiency gains by allocating resources to other parts of the organisation where there is need or growing the business by using the extra capacity to provide additional services to new or existing clients.

"You have to walk in with a very realistic expectation of what the tool can do for you and what the outcomes will be," says Mr Hanna. "Be willing to accept at some level the idea that while the value may not come where you originally thought, there is still some significant benefit from a cost and performance perspective, which will allow you to take the programme and grow it into something really substantial for the business."

Symphony is a professional services firm at the forefront of intelligent automation programmes designed to digitise and transform operations. As RPA begins to play a complementary role in other technologies, Symphony helps companies transition and then scale up their automation effectively. The company is involved at a variety of levels in

automation programmes, from advising organisations how to do it, all the way to managing it as a service.

A lot of the messaging in the still-maturing industry leads people to believe automation is an easy thing to do. This has resulted in a large number of organisations deciding to implement and operate automation programmes entirely on their own, which has led to many of the mistakes surrounding scalability and quick-win syndrome.

"It's actually more complex than many people realise," says Mr Hanna. "You're not writing code from scratch. You configure a set of objects or designs within preset software, but that doesn't mean you just plug the software in, walk away and it does its thing. There's maintenance, there's monitoring and there's a lot of care and orchestration that is necessary.

"A digital workforce needs many of the same things as a human workforce. They need to be maintained, retrained and often upgraded, so there is a lot of work that has to be done to successfully operate and scale an RPA or intelligent automation programme. We will continue to guide organisations through that process. It's about helping them take what can be the first hard step of deciding to make changes, then diving in, deconstructing what they're doing and rebuilding it with an automation-first mindset."

For more information please visit symphonyhq.com

Symphony
a SYKES company

KEYS TO INTELLIGENT AUTOMATION AT SCALE

01 Adopt an automation-first mindset

02 Gain broad organisational alignment for real transformation

03 Avoid 'random acts of automation'

04 Define your priorities - wide versus deep scale

05 Accept that quick wins won't solve complex business problems

FROM AUTOMATION TO ACTION

57% of business leaders say soft skills are more important than hard skills

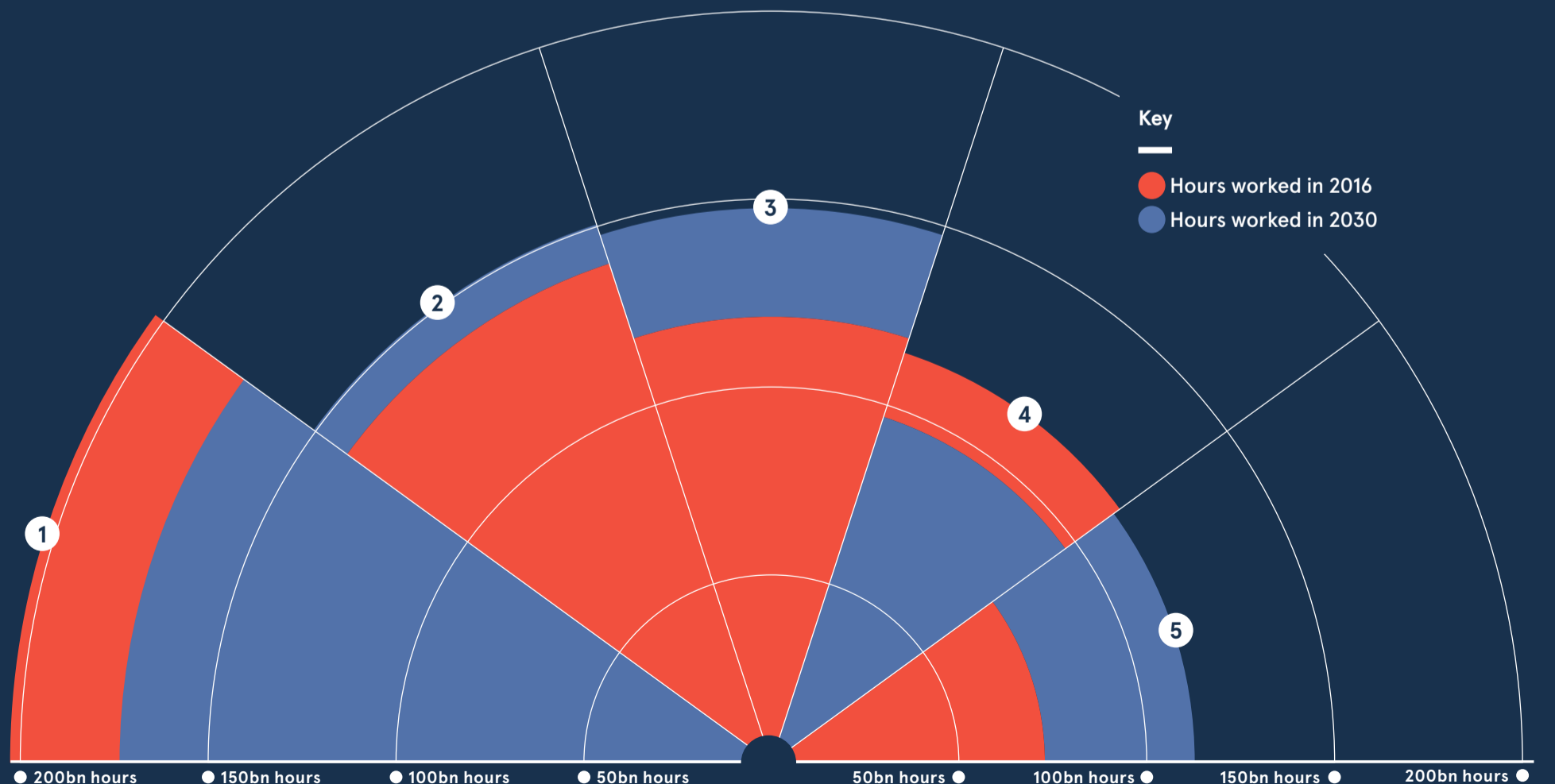
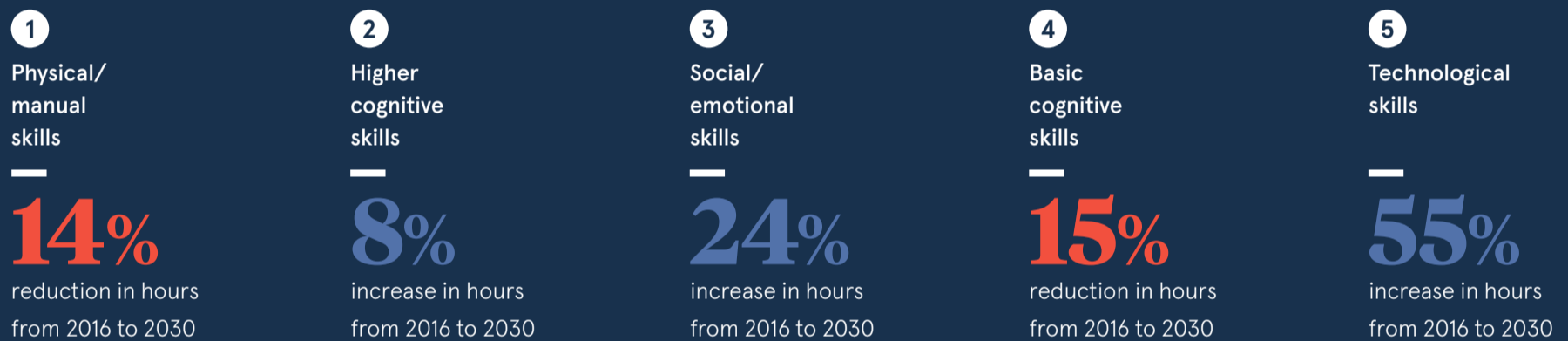
#1 priority for talent development is training for soft skills to soften the impact of automation, according to business leaders

How companies prepare their workforces for the inevitable rise in automation will determine its effect on the labour market, on competition and the wider business landscape

AUTOMATION AND ARTIFICIAL INTELLIGENCE WILL ACCELERATE THE SHIFT IN SKILLS THAT THE WORKFORCE NEEDS

Estimated change in total hours worked in Europe and the United States using the following skills, as a result of automation and AI (billion hours)

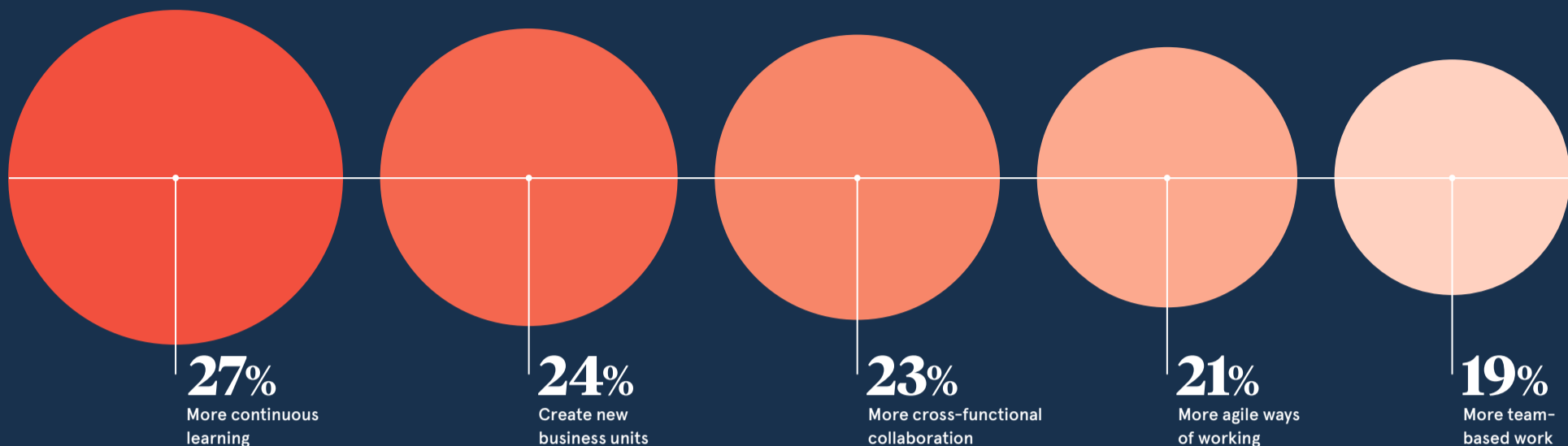
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STRATEGIES TO CHANGE ORGANISATIONAL STRUCTURE

How companies plan to adapt structures as a result of adopting automation and AI technologies

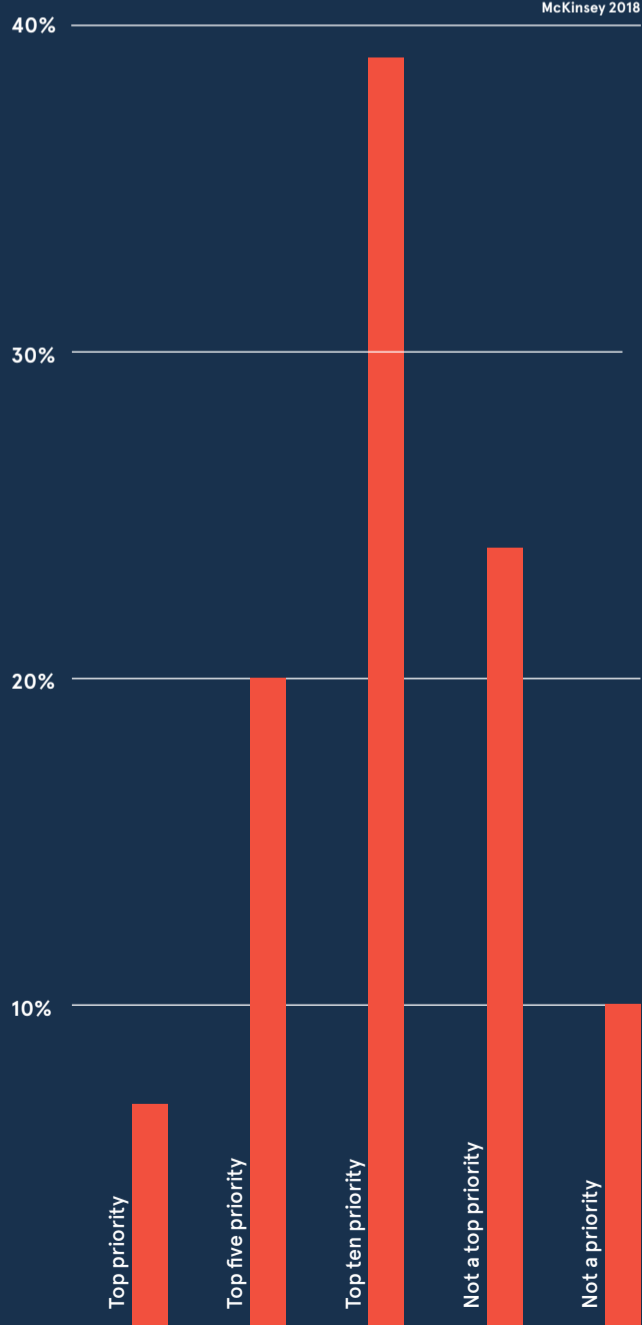
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BIG COMPANIES LARGELY NOT PRIORITISING THE IMPACT ON EMPLOYEES

Private-sector organisations with more than \$100 million annual revenues rated the importance of addressing the potential skills gaps related to automation and digitisation

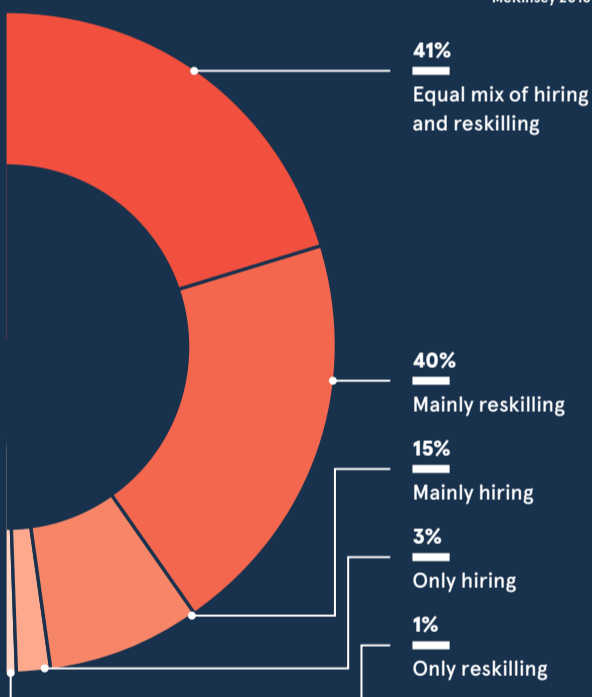
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MOST SKILLS WILL COME FROM WITHIN

How organisations plan to best resolve a potential skills gap

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TRENDING SKILLS FOR THE NEAR FUTURE

Business leaders were asked which skills will be most in demand in 2022

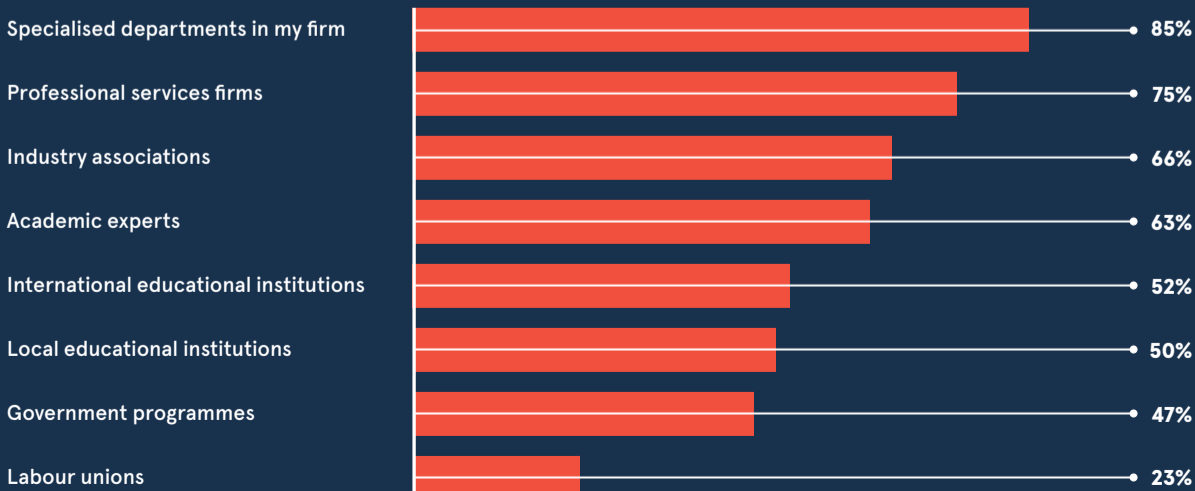
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- Analytical thinking and innovation
- Active learning and learning strategies
- Creativity, originality and initiative
- Technology design and programming
- Critical thinking and analysis
- Complex problem-solving
- Leadership and social influence
- Emotional intelligence
- Reasoning, problem-solving and ideation
- Systems analysis and evaluation

WHO WILL MANAGE THE WORKFORCE TRANSITION?

Business leaders' preferred partners in managing the integration of new technologies and workforce transition

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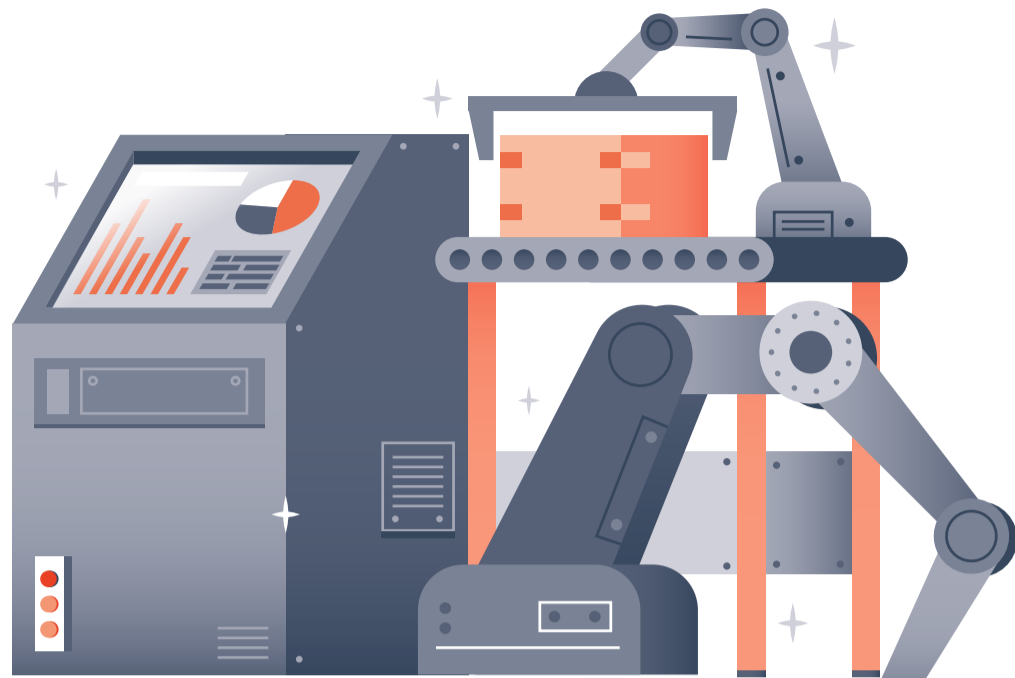
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POLICY

A question of robots and taxes

Whether failure to tax robots indirectly subsidises automation remains contentious, but it is an issue that must be dealt with – sooner rather than later

Nick Easen

Industrial revolutions throughout history play out like this: repetitive and mundane jobs are automated by new technology, livelihoods evaporate, skills become obsolete, and in the process humans are compelled to retrain and find new work. Whether it's textile workers or checkout assistants, lamplighters or petrol-pump attendants, automation shows little mercy.

In the early-19th century, during the first industrial revolution, traditional jobs dried up, the labour share of income fell, while corporate profits surged, and the gap between the wages of the rich and poor skyrocketed. Today, we could be doing the time warp again as the third and fourth industrial revolutions take hold.

"So far our age of automation largely mirrors the early days of industrialisation in economic terms. It took over half a century until average person saw the benefits of the Industrial Revolution trickle down," explains Carl Benedikt Frey, Oxford Martin Citi Fellow at Oxford University, in his new book *The Technology Trap*.

This 50-year gap is called the Engels' pause, named after Karl Marx's friend Friedrich Engels, who described the dark satanic mills of

industrialising England in the early-1800s. It was an era of great social and economic upheaval. Wage stagnation and new technologies made only a few wealthy, while many angry Luddites raged against the machines, smashing machinery as it displaced labourers.

“If governments gloss over the social costs of automation, their credibility will diminish

Some economists say we're now in a new Engels' pause. There are no neo-Luddites smashing robots, but France's new digital tax on big companies, such as Facebook, Google and Amazon, and the UK's proposed levy are perhaps the first signs that governments aren't

happy with how this new industrial revolution is turning out in terms of who benefits, mainly a handful of US tech giants.

"We're in an era when those with capital have accrued tremendous benefits over those who engage in routine labour. That has fuelled income inequality and a populist backlash. We need to invest in the human future and make policy changes that preserve opportunity for people of ordinary means," says Darrell West, founding director of the Center for Technology Innovation at Brookings Institution.

Already, super-star tech firms from Apple to Alphabet are labour frugal. At the same time the share of income now being pumped into capital versus labour is on the rise. For corporations, this makes sense when labour is taxed rather than robots, artificial intelligence or digitalised services. Yet governments around the globe are mainly funded by taxes of real human workers through payroll and income.

"When the call centre team is replaced by an automated system, the government loses out on the team's income taxes and National Insurance contributions by both the employees and employers," says Ryan Abbott, professor of law at the University of Surrey.

"The government also loses money because the automated system is not generating a lot of the tax revenue people otherwise generate including VAT and property taxes. We are unintentionally subsidising automation. If a business can replace a person with a machine, they receive tax benefits from doing so that makes automation appealing even when it's not otherwise more efficient."



North America and Europe? It is hard to tell.

“As automation comes into finance, retail, transportation and healthcare, we need a new social contract that provides retraining for those at risk of redundancy, new educational opportunities for those seeking to upgrade their job skills and a stronger social safety net for those falling between the cracks,” says Brookings’ Dr West. Yet this takes a lot of money.

As certain jobs disappear, labour-frugal companies come to the fore, the high street moves into automated warehouses and technology creates fewer well-paid jobs with untold wealth for a smaller slice of the population, is a shift in taxation the right answer? Could it put the brakes on the fourth industrial revolution?

“Saying a robot tax would be a tax on innovation is like saying any corporate taxes are innovation taxes. For many reasons, companies and individuals invest despite the existence of taxes,” argues Professor Abbott.

“The more ethical dilemma is how egalitarian a society we want to have. Income disparity is already a serious problem and automation is likely to make it worse unless we have a more progressive tax system. This is because automation is likely to reduce government tax revenue at the same time that it will require greater investments in worker retraining and social benefits.”

It doesn’t help that around the world the tax burden on labour is increasing, while there’s a trend towards decreasing corporate taxes to stimulate domestic investment. This could exacerbate the problem. The case for a robot tax or one on the fruits of automation may never be greater. This is an issue now for policymakers rather than technologists.

“If governments gloss over the social costs of automation, their credibility will diminish. For a long time, governments chose to overlook the costs of globalisation and focus on the benefits,” Dr Frey concludes in his book. “Governments must avoid making the same mistake with automation. And the stakes could not be higher.” ●

On this basis, Bill Gates proposed a robot tax several years ago as a way of addressing our 21st-century Engels’ pause. This way, governments could fund other types of employment we desperately need from educators to social workers and slow down the upheaval caused by automation. The fact is global society isn’t catching up quickly enough in shifting to high-paid, high-tech jobs. We aren’t raising productivity in the UK or many other G20 countries either.

In Dr Frey’s *The Technology Trap*, he says there has always been a price to pay for each industrial revolution. Are we paying it now? Could a modern-day neo-Luddite revolution be articulating itself through populist movements in



Process automation: It’s about time

Emerging automation technologies that promise to both simplify and streamline work processes are increasingly becoming a reality for businesses in virtually all industries

Robotic process automation (RPA) solutions are rapidly growing into powerful tools that can eliminate repetitive and manual tasks, and enable employees to save time and focus more on creating value for the business.

“In a rapidly changing workplace, business leaders are starting to recognise that they need a fresh perspective on automation and see it through the eyes of the people who work in the business,” says Bob Weare, chief marketing officer at Softomotive, a leading RPA vendor.

“A traditional, or so-called top-down, approach to RPA is no longer the full answer due to things like higher upfront costs, increased project risk, lack of innovation and low people engagement that comes from centralisation. With so many stalled RPA projects out there, it’s time to take a different approach to engage the workforce and maximise business outcomes.”

Softomotive has pioneered its “People1st” approach for RPA that effectively democratises RPA, putting power in the hands of the end-users so they can automate manual and repetitive tasks.

“By beginning with relatively small tasks and scaling up after learning what works best for the business, automation processes can be accelerated,” says Mr Weare. “The bottom-up ‘People1st’ approach creates citizen developers who can be equipped to automate tasks as and when they want, within pre-set boundaries.

“This obviously demands close collaboration between business users and the IT department, which can address the shortage of developers and open up automation to end-users who don’t have programming skills or experience.”

Softomotive’s recent *People1st Employee Study 2019* of more than 1,200 employees in the United States, UK and India provided some unique insights into the value to businesses of engaging employees throughout automation processes.

The study reveals that 37 per cent of employees’ time in a normal working week is spent on tasks that don’t contribute significant value to the business. This finding clearly illustrates the amount of employees’ time which can be saved through the adoption of RPA technologies and the importance of prioritising RPA for firms that want employees to create more business value.

It’s clear that employees want to be more than just passive observers when it comes to RPA. Softomotive’s research reveals that 77 per cent want at least a little input into decisions about how and where RPA should be leveraged.

Such findings should be seen in the context of the difficulties facing many companies in finding talented computer programmers. According to Code.org, while there were fewer than 30,000 computer science graduates in 2017, there were more than 500,000 open computing jobs in the United States.

When it comes to automation, Softomotive believes in providing the smoothest RPA journey by making it easy for enterprises to start small, learn quickly and scale seamlessly. Its RPA technology includes WinAutomation desktop software and ProcessRobot server-based enterprise automation. This choice of automation solutions allows businesses to implement automation technologies that fit their business requirements and ambitions.

Collaboration tools for employees, where they can upload automation solutions that they have created, means agile practices can be more easily adopted and innovation can be quickly shared across the business, enabling organisations to gain the full benefits of RPA.

Mr Weare concludes: “By combining a ‘People1st’ approach with our intuitive and easy-to-use software, companies can futureproof their deployment of RPA. As our solutions are priced to scale, businesses can expand on a fully enterprise basis, in a cost-effective way.”

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30%
of jobs at potential risk of automation by mid-2030s

3%
of jobs at potential risk of automation by early-2020s

PwC 2018

77%

of employees want at least a little input into decisions about RPA

37%

of employees’ time is spent on tasks that don’t contribute value

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INDUSTRIAL ADOPTION

Learning from the first wave of automation

The industrial adoption of robotic process automation promises improved efficiency, but silly slip ups mean businesses miss out

Alexandra Leonards

The robot is no stranger to heavy industry, but its virtual co-worker, robotic process automation (RPA), is only just beginning to find a place within the industrial sector. The technology's clever software robots can fulfil repetitive and time-consuming tasks, and offer a multitude of benefits from improved accuracy to cost-savings.

However, with RPA failures a common occurrence in its early adoption, it's clear that initial implementation of the technology has not proved to be smooth sailing for many businesses.

For multinational consultancy EY, RPA failures are all too familiar, having witnessed 30 to 50 per cent of initial projects fail. Companies developing the technology claim it can transform operations, but if it's as favourable as they say, why are there so many RPA failures?

In actual fact, the tendency for RPA to fail is not down to the technology itself. This instead represents a misuse and misunderstanding of the technology.

"A fundamental mistake which is commonly made is that process automation is seen as a pure technology implementation delivered by IT," says Neil MacLean, partner at EY UK and Ireland.

Other common errors that have led to RPA failures include misjudging what happens after adopting automation, thinking robots are the whole solution, directing RPA technology at the wrong processes and assuming the skills necessary for a pilot are up to scratch for real operations.

The good news is that because most RPA failures are the result of human error, rather than the technology itself, businesses can learn from their past mistakes and simply take a different approach.

Aaron Bultman, director of product at Nintex, which has its own RPA platform, says to avoid making the same mistake twice, a business must map the entire process of adoption to ensure it has a full understanding. The company should involve subject matter experts throughout, so incorrect assumptions aren't applied, and remember that just because one process is not a good fit for RPA, it doesn't mean the business should stop using the technology.

RPA projects that succeed teach us the same lessons as those which fail. And there's a lot to learn from businesses that are thriving as a result of implementing the technology.

"While there are many use-cases of RPA in the office environment, where it really comes into its own is in heavy industries such as shipping, manufacturing and mining," says Johan Carstens, chief technology officer of manufacturing and automotive at Fujitsu. "The biggest priority in these industries is worker safety and RPA is being used to reduce the dependency on humans in high-risk tasks."

EY is working with a mining company to develop a model that helps its metallurgical team increase ore recovery. The model is based on mathematical pattern recognition techniques, or machine-learning,



A robot in operation during the first public tour of the newest Amazon Robotics fulfillment center in Orlando in April

and uses data automations to make recommendations.

Nasa uses Eggplant's RPA platform to automate various processes in its Orion space vehicle, which is being prepared for a mission to Mars. "Equipped with three main displays to monitor and control the spacecraft, to ensure the software behind the glass displays operates without faults, rigorous automated testing is needed," says Dr John Bates, chief executive of Eggplant. "RPA is supporting Nasa's mission to take humans deeper into space."

The cement manufacturing industry uses machines to process a variety of block products and the concrete mix used to generate these blocks must be highly controlled. In the past, this process was completed manually, but nowadays RPA is used to open and close gates, measure moisture levels, and reduce human interaction to eliminate error.

There are also examples of RPA being successfully implemented by companies in the automotive industry, such as Renault, as well as in the production of radiation oncology systems, by companies including Accuray, and within supply chain businesses.

By saving money, reducing human error and minimising repetitive tasks to free up time for employees, RPA has the capacity to transform heavy industry. But businesses must apply the right methods of adoption to ensure they make the most out of the software and do not leave stakeholders wondering why they invested in the technology in the first place. ●



Europe's biggest manufacturer implements RPA

Siemens, Europe's largest manufacturer, has adopted robotic process automation (RPA) as part of the company's digital transformation.

When first introducing RPA into the business, a big challenge for Siemens was addressing automating an entire business processes chain. The company realised its RPA platform needed development.

In turn, the company created an open ecosystem to enable intelligent automation technologies to be augmented by its digital workforce. This tech ecosystem includes IBM Watson for natural language understanding, Google Cloud for natural language translation, Microsoft for chatbot framework and orchestration, Blue Prism's

connected RPA platform, and a secure connection to Siemens' workflows, data lake and other applications

"To ensure that we experience rapid results in the implementation of RPA projects and business successes, the development of in-house RPA expertise and close co-operation between IT teams and business leaders is critical," says Nikolas Barth, head of innovation and digitalisation at Siemens.

Originally the company had 50 processes and 80,000 working hours automated; after implementing the technology, and in less than a year, there were 170 additional processes and more than 280,000 extra hours automated.

30-50%



of initial robotic process automation projects fail

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BOARDROOM

C-suite buy-in: automation isn't an automatic success

For years, there has been a lot of talk about robotic process automation (RPA), but this talk is slowly translating into substance. So as boards begin to take the tech seriously, what opportunities and obstacles do C-level executives face when it comes to adoption?

Sooraj Shah



Chief executive

Ultimately, it is the CEO who will decide how far and wide RPA can go in a business, and there are plenty of opportunities to make a big difference for the organisation.

According to Danilo McGarry, automation and transformation executive, a successful RPA programme can cut operating costs significantly, improve operational efficiency, increase the volume of work the company can take on and improve the work-life balance for employees.

"The CEO can utilise RPA as a fundamental transformational tool which could give them a significant competitor advantage," says Mr McGarry, who currently manages the advanced automation programme at UnitedHealth Group.

But there are also obstacles associated with automation adoption for CEOs, particularly as it can change

what teams fundamentally do and how they work.

"CEOs face the difficult challenge of knowing how to set the right expectations at board level in terms of targets for savings for the year; a significant RPA programme can affect the share price of a company," says Mr McGarry.

"They also have to make aggressive enough decisions in terms of providing big enough budgets for RPA programmes while also being cautious that it is a relatively new type of programme; getting the balance of risk versus reward is crucial."

Howard Williams, director at Parker Software, believes CEOs have the challenge of ensuring the use of robots in business is not just to balance the books.

"Finding the automation sweet spot of increasing productivity and efficiency, without losing ethical ground will be a challenge in the years to come," he says.

Chief financial officer

The share of finance professionals adopting RPA is expected to surge from 38 per cent to 86 per cent in the next one to two years, according to The Hackett Group. And yet, it may seem unclear what the exact benefits of automation are for the function.

Vanessa Keating, director of finance advisory at The Hackett Group, says the indirect benefits of automation are not described widely enough for finance, which can negatively impact adoption, and many face the obstacle of not knowing where to start.

"It can seem overwhelming and many have to prove cost-savings from day one, which can impact their way of approaching automation strategically," she says.

For example, selecting an easier automation implementation could help the team to learn how to go through the automation life cycle, but it may not deliver the high return on investment a more complex process would, influencing their prioritisation and roadmap development.

But there are plenty of opportunities for CFOs when it comes to adoption. Raymon van Viegen, CFO at Onguard, says the time saved on manual activities, such as chasing up debts, means CFOs are "able to focus more closely on the bigger-picture issues, as well as those accounts that are in greater need of their attention".

Ms Keating says organisations will need to optimise their investment: "This means co-ordinating across digital and human workers to make the most of both, which is the most important factor to consider within the smart automation framework. Finance is in a great position to be a leader in this space."



Chief technology officer

Perhaps surprisingly, there was a lower share (24 per cent) of IT respondents to the Hackett survey who said their department had adopted RPA compared with finance function. But this is set to treble in the next one to two years to 75 per cent.

The CTO will inevitably be involved in helping to implement automation into the business, as it requires a certain infrastructure for it to scale.

Mr McGarry at UnitedHealth Group believes it is a great opportunity for CTOs to begin to understand what every element of an organisation does: "Never before would the company have embarked on such a detailed analysis of what processes the different teams and employees are performing. This gives the CTOs more data, in an organised fashion, and with data comes the privilege of knowledge so they can better steer the company to become more efficient," he says.



Mark Ridley, director of CTO advisory firm Ridley Industries, says automating existing processes makes them more repeatable, reduces manual errors, lowers costs and improves speed in a business.

"A major obstacle for CTOs is having a legacy IT environment or an older business where there is a wide variety of systems and departments involved in processes," he adds.

Other challenges include finding the right technologies necessary and ensuring it makes financial sense to implement them.

Mr McGarry believes that even after working this out, finding the right people to run the programme and ensuring the rest of the workforce is properly trained to support an RPA programme remain difficulties CTOs would have to overcome.



Human resources director

BNY Mellon's head of digital Roman Regelman believes the human resources director (HRD) is the first person who can really benefit from automation as it can help them to carry out low-variance work.

"It allows them to automate the more menial, paper intensive, repetitive tasks, enabling them to focus on high-quality work," he says.

RPA adoption is slow in HR. Only 11 per cent of HR departments have

adopted the technology, but this is expected to rise to 28 per cent in the next one to two years, which is still considerably less than expected in finance and IT. This is perhaps because some of the benefits of RPA remain unknown.

UnitedHealth Group's Mr McGarry says RPA could help HR when it comes to making key decisions during disciplinary actions against employees, as HR could hold more information on what the employee does and has done over time.

"In addition, I believe HR will

be able to better understand the company's needs in terms of skill-sets and devise more accurate job descriptions, and then it can use automation to screen candidates more efficiently," he says.

But to get these benefits, HRDs are faced with a number of obstacles, including employees potentially believing analytics that show how long they work and which applications they use the most could be an invasion of privacy.

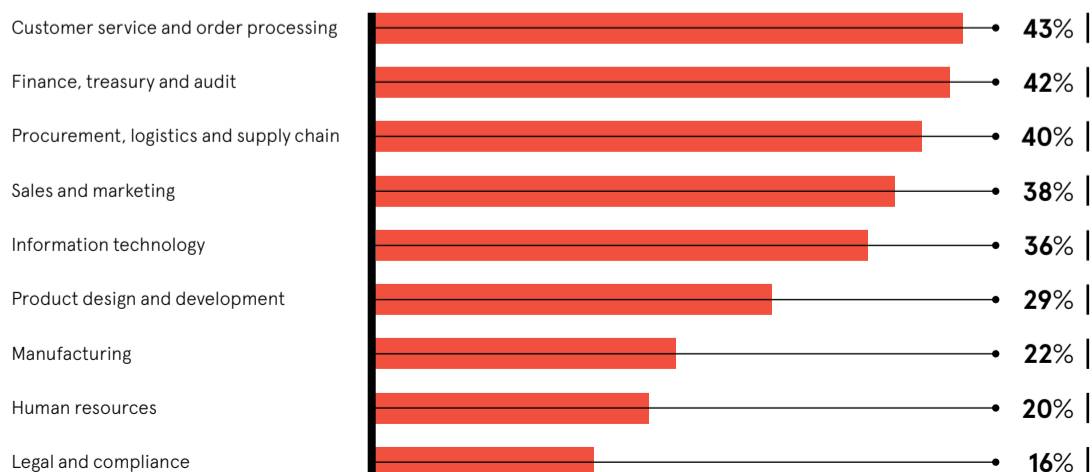
In addition, Mr McGarry believes HRDs have the difficult task of ensuring employees are retrained, and that these employees maintain positivity and are kept motivated, as otherwise RPA can be seen as negatively disrupting existing company structures.

It's clear that each role has its own obstacles and opportunities when it comes to automation. For a business to make RPA work most effectively, the C-suite should work on a co-ordinated plan to implement automation. This is the only way RPA tools and other automation technologies will be able to provide the benefits executives are seeking. If only organisations could automate implementing automation. ●

TOP AREAS OF THE BUSINESS MOST AFFECTED BY RPA

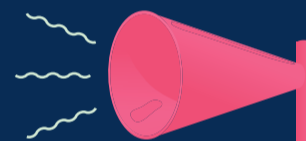
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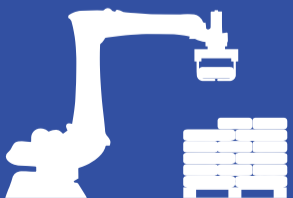


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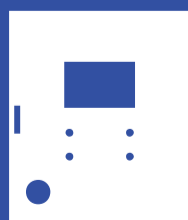


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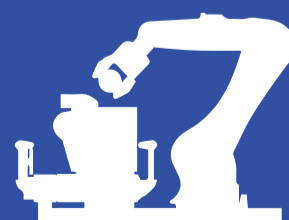
Palletisers



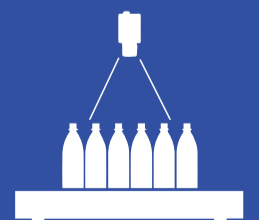
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