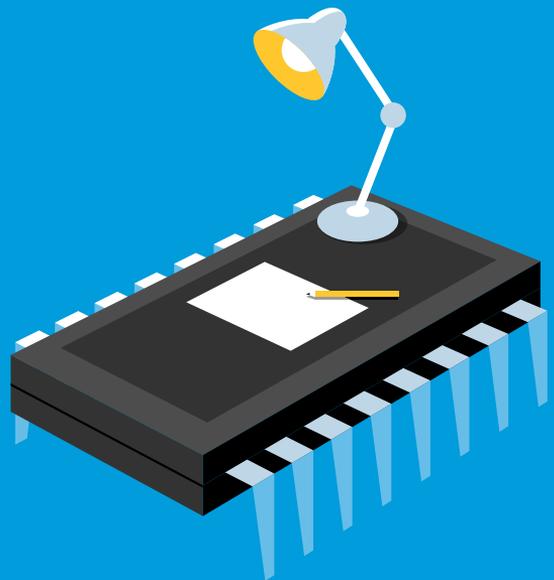




The dawn of digital labour

Cognitive automation has come of age, and can transform your enterprise. Are you ready?



Cognitive automation is here

We're now at the start of a revolution, as cognitive systems enable the transfer of millions of tasks and functions considered inherently human into the digital domain. The opportunities for competitive advantage are huge: from reduced labour costs to more productive, innovative workforces. Are you ready?

Artificial intelligence is no longer a distant goal. The technology is fast becoming a commercial reality in the form of cognitive systems with the ability to execute numerous tasks hitherto considered to be inherently human, such as perceiving, inferring, gathering evidence, making hypotheses and reasoning.

The ramifications are huge, as cognitive systems usher in a new class of digital labour that can both enhance human skills and replace human functions altogether.

The applications of this technology – and their benefits – are varied, also.

By taking on the more repetitive tasks within an organisation, cognitive automation allows staff to devote more of their time innovating to give the enterprise a competitive advantage.

Cognitive systems can also give generalists the ability to perform like specialists, and less experienced employees the ability to perform like seasoned veterans. For example, a young tax accountant who once may have struggled to interpret a general ledger can now use a cognitive system to instantly analyse enterprise transactions. Likewise, a paralegal can use cognitive software to parse massive amounts of data to identify legal precedent and synthesise their findings into a compelling rationale.

These systems can also play a valuable role in scaling expertise across the enterprise, observing and learning from top performers, and quickly transferring best practice to other employees via digital assistants. An example of this is the use of cognitive systems to quickly scale medical expertise from the most experienced and specialised doctors across a number of locations and markets. This can particularly benefit markets where local doctors may not have the same knowledge or training as their counterparts in other countries.

This huge and varied potential means that cognitive automation will have a dramatic effect on business, with KPMG predicting that 30% of corporate jobs could be done by robots by 2026.

Now is the time to start planning how cognitive automation can drive your enterprise forward, but the questions are numerous. How can you apply these new technologies to complex workflows? What are the challenges of getting the best out of your people, while implementing a cognitive automation strategy? And what are the risks to your enterprise in the event of a cognitive systems failure? This booklet explores some of the challenges ahead.

**Shamus Rae, Partner, KPMG in the UK
Head of Innovation and Investments**

The crowd in the cloud

Over the past two decades, offshoring has revolutionised business. Now cognitive automation threatens to sweep the model away altogether. Mark Harris meets Shamus Rae, Head of Innovation and Investments for KPMG in the UK, to discuss the future of outsourced labour, and how the cloud may play a role.



Over the past 20 years, offshoring has transformed business, allowing enterprises to move segments of their operations to locations with lower labour costs. But, critical as this labour revolution has been, it's offshoring where the impacts of cognitive automation will be felt first.

"Labour arbitrage, or offshoring, is going to die very quickly," says Shamus Rae, Head of Innovation and Investments for KPMG in the UK. "The next wave of robotic process automation, which will be about bringing more intelligence to robots, is coming down the line very quickly."

Businesses that outsource work to countries with cheaper personnel – currently a \$300bn market – will find that a robotic system might be one-third the price of an offshore worker, according to a study by the Pew Research Center. And as cognitive automation systems mature, they will increasingly compete with local workers, too.

"In the UK, you can imagine that over the next decade, there will be 10 to 15 million jobs that will be rotated because of this technology coming through," he says. "That will mean millions of people trying to maximise their income when jobs are scarce."

One place they are likely to head is the cloud. There are already more than three million so-called crowdworkers in the US, people working from home on digital platforms like Amazon Mechanical Turk, CrowdFlower and Upwork. Much of the work they do today is similar to the tasks that robotic process automation is being developed to tackle: the collection, categorisation and transcription of data.

But there is no reason why on-demand digital workers cannot be professionals – or at least do the work that professionals have traditionally done. Online education providers are using virtual professors to mark work, law firms are outsourcing document processing, and some researchers are even experimenting with using untrained crowdworkers to analyse medical imagery.

"The problem the crowd has is the lack of trust gained from an established brand," says Rae.

"To make a policy decision about pricing in Latin America or have someone look at your medical X-ray, I suspect you're not going to go to the crowd. Businesses will want to have some brand association that allows them to believe in a result."

KPMG in Australia operates a platform called Marketplace that gives on-demand access to professionals trained in project administration, financial modelling, analytics and book-keeping. "It effectively creates a crowd environment of staff for our clients to access," says Rae. "They can say, I just want this one task done and I need these skills."

A platform like this could provide a seamless transition into a robotic system as the technology improves. At first, says Rae, expert workers will use the cognitive automation system as they would any other digital tool: "You can imagine us creating a bot for tax service and having a crowd with the right skills checking its work, or answering questions that can't be answered by the bot."

The robot would gain experience from its many interactions – potentially thousands each day – and gradually improve its responses. People would be involved every step of the way, directing the way the robot learns. "You can imagine a world in five years' time when teams are made up of company employees, crowd specialists and cognitive robots, all creating and collaborating together," says Rae.

While customers' experience would barely change, businesses could eventually deliver high levels of service with far fewer personnel. "As people get displaced out of larger organisations, small and medium-sized enterprises (SMEs) will pick up the slack," says Rae. "The crowd system will become more and more important, and will be a way for SMEs to pick up specific skills."

Come the cognitive automation revolution, corporations will slim down, the SME sector could become much more vibrant, and many more workers – human and robot alike – are set to be labouring in the cloud.

Digitising expertise

Cognitive automation promises a great deal... but how do you get started, and exactly how can a process be transferred from human workers to software?

Oliver Franklin-Wallis interviews Vinodh Swaminathan, Managing Director of Innovation and Enterprise Solutions at KPMG, to find out.



As artificial intelligence matures, we're entering an era in which a significant proportion of work hitherto considered inherently human can be automated.

But incorporating these technologies into your business requires a major transformation from top to bottom. "This is not a technology discussion. This is a business strategy discussion," says Vinodh Swaminathan, Managing Director of Innovation and Enterprise Solutions at KPMG. "It starts at the top with leadership and stakeholder management."

The first step is to identify the areas within the business where automation will offer an advantage. "You need a sense of what your people do, where they're spending a lot of their time, and which tasks qualify to be automated," says Swaminathan. "You can then pick off tasks and start to automate them."

The easiest tasks to automate will be routine, repetitive and well-codified. In the past, enterprises have often found that these tasks are not quite as straightforward as originally envisioned, still requiring significant human oversight. However, the cognitive technologies becoming available today solve this problem by bringing a much higher level of "human" judgement and expertise to task automation.

Similarly, enterprises can identify areas where existing expertise could be amplified and augmented with the help of cognitive automation.

One example might be proficiency training: using AI systems to augment the capabilities of new hires – for example, in call centres. "With these machines you can significantly shorten the time it takes for a new hire to reach proficiency," says Swaminathan. In other areas, cognitive automation can diagnose problems and suggest smart solutions – such as processing back-office payments, parsing large volumes of legal research or narrowing down medical diagnoses.

As with any such major shift, it's important to identify the individuals and departments who will be managing the transition to automation. "This is not a traditional IT project," says Swaminathan. "The chief information officer will always play an important

role because these are all technology deployments and use enterprise data. But you don't install these in the same way that you would install your e-mail – given the enormous input from domain experts in training these systems to mimic human thinking, the business typically ends up playing a more significant role in deployment."

Be prepared: incorporating these new technologies into a business is not an overnight process. "As we speak, IBM is trying to recreate a physician workflow in an oncology environment. That's an 18- to 24-month process – and even that doesn't get you all the way," says Swaminathan. "But if you're looking at creating a paralegal or a customer-service representative, that's relatively straightforward compared to getting an oncology exam."

While some large companies are already bringing products to market, such as IBM with its Watson cognitive system, it's also vital to consider that technologies like deep learning and AI systems are new and emerging – and bring challenges with them as a result. "There is a degree of learning and experimentation," says Swaminathan. But as industries inevitably begin to adopt digital labour, the rewards for success will be vast.

"We have plenty of recent history: you look at the web, you look at e-commerce, you look at mobile, you look at social. We know that you cannot sit on the fence and wait for these things to play out," Swaminathan says. "We don't believe 'fast follower' is the right strategy for cognitive automation. Cognitive automation is fundamentally about how knowledge capital is deployed in a disruptive way – playing catch up once your industry has been disrupted is much harder. You really want to be the innovator in the early part of the cycle, because the investment will pay off in the form of a very significant competitive differentiation."

The most successful businesses in the future will be those that embrace new technologies. "You've got to take an experimentation approach – companies that fail to prepare now risk being left behind."

My co-worker is a robot

How will cognitive automation affect the HR function within large enterprises? Oliver Franklin-Wallis considers the way ahead with Robert Bolton, Partner at KPMG's Global HR Centre of Excellence, and Mark Williamson, Lead Partner within KPMG in the UK's People Powered Performance division.



So far, public discussion of cognitive automation has focused on the technology's impacts on human employment; but according to Robert Bolton, Partner at KPMG's Global HR Centre of Excellence, these concerns are overplayed. "Throughout history, when there is technology that starts to be adopted at a significant level, we have all this talk about job losses. And so far, we've never seen that," he comments. "Computers have come in and it's created work. Steam engines created work. Industrialisation created work."

Instead, the office of the future will offer an explosion in collaboration between smart tools and people. "Our belief is that it will help people to make better, higher quality, more accurate decisions, more quickly," says Mark Williamson, Lead Partner within KPMG in the UK's People Powered Performance division. "We've called it the Leveraged Professional." For example: paralegals working in concert with artificial intelligence (AI) systems that can comb through decades of court rulings to establish legal precedent and suggest relevant legislation, or AI programs such as IBM's Watson, that can already help doctors narrow down diagnoses. "So, if you think about that overall, that is a huge release of capability," says Williamson.

That release – letting individuals do far more, with less – will mean that future organisations and individuals need to re-think notions of career development. "We're still reasonably used to vertical career ladders. You might want to think about career lattices – sideways moves, diagonal moves, where a core competence can be conceived in a different context," says Bolton. "We will see an explosion in the need for employers to re-think who they train and how they train them. So it's not just training you to do your current role, but training you to be ready for future roles – and possibly unimagined roles. That plays to customised and peer-to-peer learning, rather than just an approach of 'here's a curriculum, learn this!'"

The make-up of organisations, from team structure to staffing levels, will also change, Bolton predicts.

"We might see organisations re-thinking what proportion of their people need to be full time or permanent, and what proportion of their staff are contingent."

HR departments – focused on training and retaining talent – will play a reinvigorated role, as will new "digital labour" divisions within organisations to develop and integrate cognitive technologies. This will be vital for enterprises with a lot of proprietary IP or private data, such as pharmaceuticals, where general-purpose tools might not suffice. "I can see companies setting up departments that work in this area and drive innovation, exploiting these technologies," Bolton says.

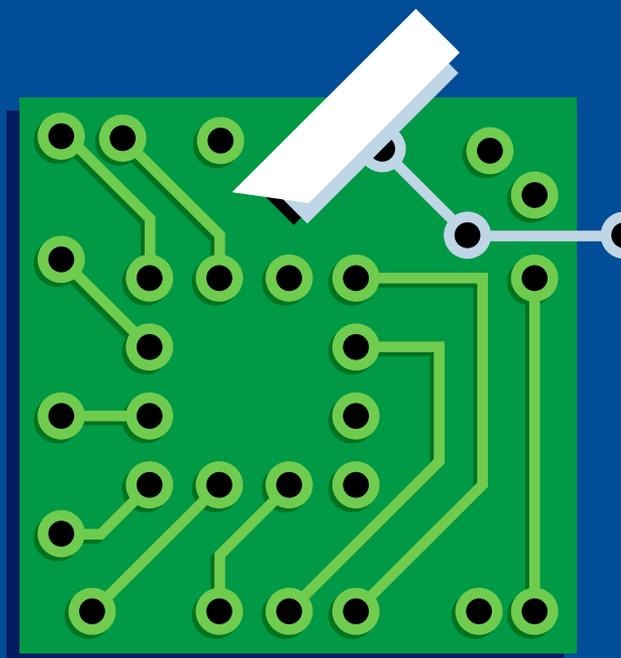
Digital labour will also lead to an explosion in entrepreneurship, as compact, nimble teams use cognitive automation to deliver services previously beyond the means of small businesses. "You can see how this will potentially create an explosion of global micro-organisations," says Williamson. "The tools that people have to build businesses quickly, and to develop new products and services – it's just something that we've never seen before."

Be prepared: the day when your co-worker might really be a robot isn't far off. "I think whenever we see these types of technologies, there's a slow burn, and then there's an acceleration that catches us by surprise," says Bolton.

"I do think we're reaching the point of inflection," Williamson agrees. "This could be the next revolution in the way that the world works, and in the way that the world delivers products and services."

Cognitive chaos

The more capabilities that you automate, the more can go wrong when there's a failure in quality or security. How do you maintain control? Olivia Solon discusses the issue with Paul Taylor, Partner and Head of Cyber Security at KPMG in the UK.



Humans can be fooled but thankfully our brains can't be hacked... yet. However, cognitive software that mimics human activities can be. While these systems can free people from repetitive, data-heavy tasks, oversight of them requires a specialised approach to cyber security.

As with human beings, keeping tabs on artificial intelligence (AI) requires a focus on behaviour. It's critical for security professionals to understand how such systems are supposed to behave. Which patterns of behaviour are typical of "business as usual"? And which might indicate something fishy?

Networks built with AI should be better at resisting attack through self-monitoring and diagnosis, explains Paul Taylor, Partner and Head of Cyber Security at KPMG in the UK.

"The same way a human being might feel they are running a temperature, a network AI should have the equivalent," he explains.

Taylor cites the example of the Typhoon fighter jet, which is aerodynamically unstable in subsonic flight and requires a complex control system, made up of three computers, to continually change its aerodynamic profile in order to keep it in the sky.

"It has three times the system requirements and the computers each check each other's homework. We'll see that in AI networks," he says.

When it comes to spotting malware, researchers at the Massachusetts Institute of Technology have developed an artificial intelligence system called AI² that does just this. The software is able to scan through data from billions of log files each day to get a sense of what normal behaviour on the network should look like and when anything looks suspicious. After a week of training, the AI is 85% correct at identifying malware and finds five times fewer false positives than the industry standard¹.

The same approach could be applied to networks of driverless vehicles. Many companies and individuals balk at the idea of relinquishing control of the wheel, fearing that a cyber attack could result in "killer robot" headlines and a liability nightmare. Taylor, however, is

more measured, saying that just as cars have safety brakes, so too should the systems that oversee them.

"It's easy to get apocalyptic about being targeted by a cyber attack," he says, "but I'd expect there to be a system in place that notices the system is behaving in a way that's not safe, or is unexpected, and would automatically shut it down."

All organisations face cyber attacks, but smart organisations can make sure that they don't spread across infrastructure. This requires detecting the intrusion and responding as quickly as possible.

"You need responsive, agile systems that get back up and running fast and prevent lateral transfer of attacks," he says.

In addition to monitoring automated systems, AI can also be used to monitor humans within organisations. People might not get infected with malware, but they can be vulnerable to manipulation or, when it comes to corporate espionage, corruption.

Taylor explains: "Are you sending multi-gigabyte files to your home email? Are you looking up the file system in a different way than expected? An ideal cognitive computer could spot these sorts of things and ask: 'Why is Paul coming in a lot earlier, staying later and sending gigabytes of company data?'"

Although the machines are coming for cyber security jobs, they won't replace humans altogether.

"Companies will still require a small number of people with sophisticated tools looking under the surface of these cognitive computers," he says. This means there will be great demand for data scientists and AI experts in the future.

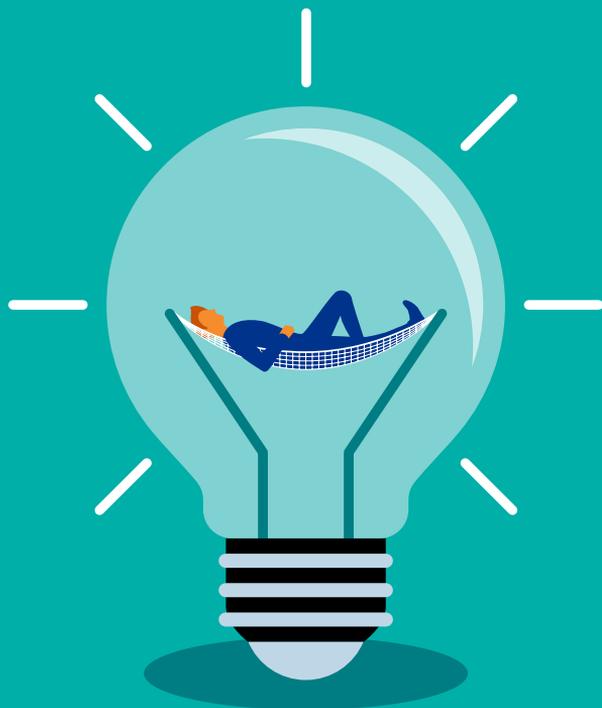
In addition to technical skills they will need to be able to translate jargon into terms that can be understood by the rest of the business. "It's no longer just speaking to the technical community – you need to speak to the boardroom," he explains.

"Where people go wrong is to think it's an IT department problem. Information security is a company problem."

¹ Massachusetts Institute of Technology

Thinking exponentially

What sort of a future does cognitive automation offer our world, and what does the path to that place look like? Mark Harris looks ahead in conversation with Shamus Rae, Head of Innovation and Investments for KPMG in the UK.



Is cognitive automation really about to change the world, or is this just more high-tech hysteria? "There's been a lot of hype around these technologies for four or five years," says Shamus Rae, Head of Innovation and Investments for KPMG in the UK. "But now the technology is being delivered and the hype is becoming reality."

Rae points out that cognitive automation is already changing the way large businesses operate – and not just in Silicon Valley. "Major telcos, oil and gas companies, and retail and investment banks have already dipped their toes in the water," he says. "There's a global organisation where the chairman doesn't have an HR business partner any more. If the chairman or CEO wants to know about hiring policy in Bangladesh or New Zealand, they just talk to an agent in a virtual HR system instead."

The benefits of these new technologies for many businesses are already pretty clear: lower costs, smoother workflows and the ability to scale services rapidly for little or no additional money. And as the word gets out, Rae expects the pace of change around cognitive automation to pick up significantly: "There's a slight delay between industries but as people get comfortable and understand the reality, they're going to start accelerating."

Rae predicts that efficiencies at larger companies – the most likely early adopters of automation – will quickly benefit smaller businesses. He notes that KPMG has many thousands of tax experts in member firms all over the world helping all sizes of organisations. "Imagine industrialising all the knowledge of all the tax partners in KPMG and then providing that quality of insight all the way along the long tail," he says, "Whether you're a small manufacturer in the Midlands or a big corporate, you'll get the same high quality of service. That's exactly where we'll be in five to 10 years' time."

Simultaneously, small and medium-sized enterprises (SMEs) will experience similar shifts in everything from IT and legal advice, to marketing, to customer services.

"By having a whole series of bots in the service industry, you create the ability to bring different technologies together very quickly," says Rae. "For the first time, SMEs will be on a level playing field with the biggest corporates," says Rae, who predicts a massive job churn in large organisations, including government institutions.

Such rapid shifts in the way businesses operate will bring with them equally dramatic changes in employment, admits Rae. "By using specialist robots, particularly in fields such as finance and law, SMEs will be able to compete and grow, employing more staff in the areas of their work that are unlikely to be automated."

KPMG estimates that 30% of corporate jobs could be done by robots by 2026. "The view that about half of all jobs are susceptible, with the Bank of England saying 15 million jobs in the UK could be displaced, I think is very accurate," says Rae. "The job rotation over the next 10 years is going to be extremely difficult to manage."

Rae considers that economist John Maynard Keynes's famous prediction, made in 1930, of a 15-hour working week by 2030 could well come true. The challenge, however, will be achieving that without massive social unrest. "If we do all of this at a country level, then it can work," he says.

"We have the potential to reorganise society over time, getting the people rotated out of their current jobs, encouraging SMEs to build, and allowing more people to have more flexible lifestyles. But it will only work if we face up to it today, politically and publicly."

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Learn more

For more KPMG insights on cognitive automation, robotic innovations and the digital workforce, please visit

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