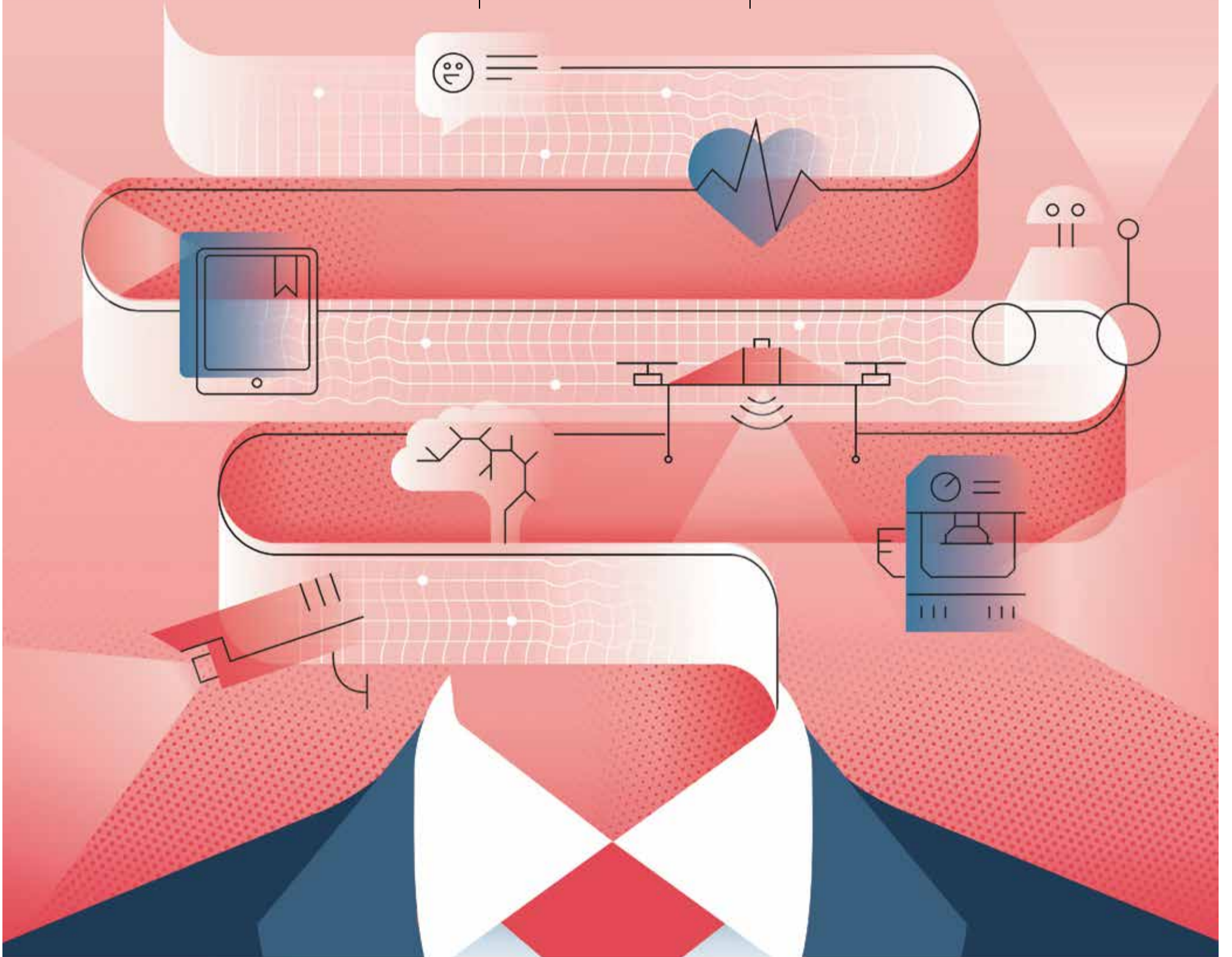


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Think big, start small and scale fast

Artificial intelligence is a smart software tool with seemingly unlimited potential, but many organisations need to devise a holistic AI strategy

DAVID BENADY

It's time to take a step back from the noise and hype surrounding artificial intelligence (AI). Businesses have been inundated with AI sales pitches promoting the technology's potential to automate tasks, increase speed and accuracy and cut costs. But what's the long-term plan? Most businesses lack a vision of how AI will transform their operations.

Rather than the piecemeal adoption of AI systems, some believe businesses need to develop an overarching strategy for how to embed AI in their organisation over time.

"The most important thing is having a comprehensive and holistic view of AI sourcing within the organisation," says Mohammed Chaara, a former Lenovo strategist who is now "an evangelist" for AI. Working out what kind of AI is needed for different processes and whether these will be carried out in-house, outsourced or in partnership is an important step to developing a strategy, he says.

Mr Chaara believes businesses need to base their AI strategy on four areas. Low-risk, low-value AI involves automating low-level repetitive tasks, such as data processing, which can be outsourced.

Low-value, high-risk AI includes audience-targeting driven by machine-learning, which can cut the costs of identifying and reaching audiences, and boost profits by targeting the right customers. But this risks wasting the marketing budget, if the targeting is wrong, and so is high risk. It should be developed in tandem with external partners, he says.

The third area is high-value, low-risk tasks, such as the credit scoring models in financial services. This offers high value, but is low risk and so complex no one else can decipher it.

Finally, there is high-risk and high-value activity, the uncharted territory where there is no solution on the market, for instance using AI systems to fuel new product development.

The last two categories could involve building in-house solutions or buying in the expertise through acquisitions.

"If you can adopt these four frameworks, you can have an idea of when you need to migrate AI from one point to another," says Mr Chaara. "Without having that comprehensive view, the organisation will not be



able to move quickly and in an agile way from one category to another."

Some doubt that businesses have the time to develop in-depth strategies for AI and are best off implementing it as needed. Dr Lee Howells, an automation and AI expert at PA Consulting Group, says companies should use AI to solve a specific business problem rather than being led by the technology. He fears an AI strategy could be outdated before it gets implemented as developments are moving so fast.

"When organisations try and introduce AI, they need to find a balance between their strategic ambition for AI and getting started quickly. You

can never have a strategy that is 100 per cent correct, and with AI people deliberate about it and the greatest problem is inertia; they don't want to get started," he says, adding that the best approach is to "think big, start small and scale fast".

One of the fastest growing areas of AI is robotic process automation (RPA), which uses software to automate repetitive tasks, such as replying to standard emails, processing customer orders and updating payrolls.

Guy Kirkwood, chief evangelist at RPA company UiPath, says: "When companies say they want AI, what they actually mean is they want the

tools necessary to automate more of their processes, because that is what the real strength of AI is."

But he adds: "RPA is a tool not a panacea." Mr Kirkwood believes organisations are adopting RPA so quickly because it cuts across all geographies, industries and services. "There is no limit to where it can spread," he says. "The addressable market for RPA is unlimited. It is one robot per employee everywhere - that's the potential, which is pretty staggering."

Many businesses are a long way from arriving at a holistic AI strategy. Jeremy Waite, chief strategy officer for cognitive computing business IBM Watson, says there is too much short-termism among businesses when it comes to AI.

"The people I see having least success are those looking for short-term results," says Mr Waite. These companies tend to invest the bulk of their budget in the technology, but spend too little on hiring the right kind of staff to manage the AI transformation.

"The ones that succeed are the ones that do it the other way round, because they look at something much smaller and more tactical," he says. "I would prefer businesses to look at one isolated use-case, attach an AI to that so you are spending 20 to 30 per cent of your budget on the technology, but then 60 to 70 per cent of the budget goes on people."

Mr Waite argues that an important area is how companies will train advanced AI's to interact with the public and carry out tasks.

"The challenge with AI is not so much with implementation; the big question is going to be how do you train the AI? And most important, how do you train it against bias whether gender, sexual, racial or against a political agenda? AI training is the most important part that people haven't looked at yet. No one has invested enough for long enough to realise it is a problem," he says.

This highlights the need to the think ahead when implementing AI. Such a powerful technology could create unexpected problems, as it becomes more deeply embedded in businesses, from discrimination to an inability to respond to individual needs.

Striking the right balance between forging a future-facing strategy and getting AI systems up and running will be a vital consideration for managements as they embark on this revolutionary path. ♦



79%

of companies implementing AI say it is bringing new insights and better data analysis

74%

say AI is making their organisation more creative

71%

say AI is helping to make better management decisions

Using tech to help teach students AI

Exploiting artificial intelligence within schools and teaching students how it is used in the workplace can help close the UK's digital skills gap

VIRGINIA MATTHEWS

If recent clickbait headlines are to be believed, robots are already taking over our schools, relegating "Sir" or "Miss" to the status of a second-rate computer dumped at the back of the class.

Yet to many experts, the real value of artificial intelligence (AI) to education may be far more humdrum as a back-of-house tool to free up time for human teachers to build students' social skills, resilience, appetite for learning and character.

Miles Berry, principal lecturer in computing education at the University of Roehampton and a key architect of the national curriculum for computing, introduced to replace ICT four years ago, is disappointed at how few schools have exploited the new programme fully.

"AI is difficult to teach and schools either lack relevant resources or don't know how to apply them, but in order to plug the technology skills gap, we must give our youngsters time to experiment with creating rudimentary chatbots for example," he says.

"Setting up a Google Assistant, Apple Siri or Amazon Alexa and getting it to answer some of the questions that come up in a lesson would be a fairly simple task for many computing teachers, but to get them on-side, we need to talk far more about the role of

machine-learning and far less about the dawn of the robots."

While Mr Berry agrees that for now at least, AI is better suited to subjects with right and wrong answers than to teaching the nuances of Shakespeare, or even sport, its ability to relieve pressure on teachers is, he says, "unignorable".

"Machine-learning can already play a vital role in setting work, in marking and assessment, and can track individualised learning very proficiently. If schools harness this power to its fullest extent, our human teachers are free to concentrate on the softer skills that are so vital to our employers," says Mr Berry.

While growing numbers of primary, as well as secondary schools, are now teaching their pupils how to code, this is only one tiny element of AI and a skill which will be "old hat" by the time they enter

As a result of AI not being on the core curriculum, finding time to dedicate to it in the classroom is a challenge and this is partly why adoption has been slow



PATRICK STOLLARZ/AFP/Getty Images

01 Do curriculums need to change to prepare children for the future workforce?

02 Some manufacturing roles could be obsolete in the coming decades as automation takes hold

the workforce, says Professor Rose Luckin of University College London's Institute of Education.

One of three expert witnesses invited last year to attend a House of Lords Select Committee session on AI education and digital skills, she argues that "overall computational thinking" is far more interesting and creative than the term "coding" would suggest.

"I have nothing against coders, but it's the easiest and arguably the least interesting aspect of AI, and one which deters many people, including women, from joining our tech companies at a time when we desperately need their skills," says Professor Luckin.

"When it comes to equipping our youngest children for a world where AI will be enormously influential in their working lives and at home, the vast majority of our schools aren't even at first base yet."

While Professor Luckin can't comment on whether staffroom Luddism or apathy may be factors, she does

believe that the scarcity of teachers with a grasp of AI is becoming a serious problem and calls for far closer collaboration between tech firms and educators.

"Some schools are drafting in tech experts to help introduce AI to the classroom, but this often fails because they don't create materials that work in a classroom setting and they don't know how to teach people," she says.

"It would be unthinkable for the medical profession, say, to introduce AI without the direct input of medics in the actual development of resources and exactly the same should be true of education. Teachers don't need fancy equipment, they need easy-to-use, easy-to-explain materials which don't necessarily require a tech person to be in the room."

IBM developer Dale Lane, who helped create the educational tool Machine Learning for Kids, believes that while the "most critical aspect of AI education is helping teachers

to improve their own skills and educate our children more effectively", this continues to be overlooked. He shares Professor Luckin's frustration over the lack of progress so far.

"As a result of AI not being on the core curriculum, finding time to dedicate to it in the classroom is a challenge and this is partly why adoption on the ground has been slow," he says.

"Where IBM has had more success has been with activities which include elements of AI in non-computing subjects; for example, getting kids to train a chatbot to answer questions on the Vikings or using 'text classifiers' to understand how different newspapers report on the same story."

Former teacher Tom Ravenscroft, founder and chief executive of Enabling Enterprise, which aims to bring the world of work into the classroom, has a very different perspective on the nature of the UK's skills gap to that held by Mr Lane.

"The qualities which employers across every sector crave above all others, including tech skills, are those which are essentially human, including persuasive presentation and interpersonal skills. However hard some people may try to argue this, these abilities cannot be taught by machines," says Mr Ravenscroft.

"While I would agree that there is a role for AI in the classroom, the biggest skills gap in the UK is not related to our interface with robots or our ability to code, but in our day-to-day dealings with other human beings."

Mr Berry stresses that despite AI having no official place on the school curriculum, its applications are already making their mark on the lives of learners.

"Google Translate is helping millions of students whose first language isn't English and, at a very



Andy Kelly/Unsplash

Thanks to their familiarity with computer games, children are less apprehensive than their parents about letting a computer mark their work or provide feedback

believes industry can do more to help.

Paul Drechsler, chairman of Teach First and president of the CBI, says: "All of us would agree that our young children need to be properly equipped to enter the workforce of tomorrow, and I would urge all businesses both inside and outside tech to look again at what more they can do to provide knowledge, support and funding to teachers and pupils.

"If we accept that one day computers are going to be far better than we are at processing all forms of explicit knowledge, including literacy, numeracy and languages, we see the real AI challenge isn't about creating more computer experts, but about building the skills which machines cannot emulate.

"Teamwork, leadership, listening, staying positive, dealing with people, and managing crisis and conflict are know-how skills, not know-what skills, and that's where we humans will always triumph. But we need teachers, business-people and policy-makers to be in the same room to develop an education strategy appropriate for the next generation." ♦

basic level, spelling and grammar correction is making the polishing of our prose easier for all of us," he says.

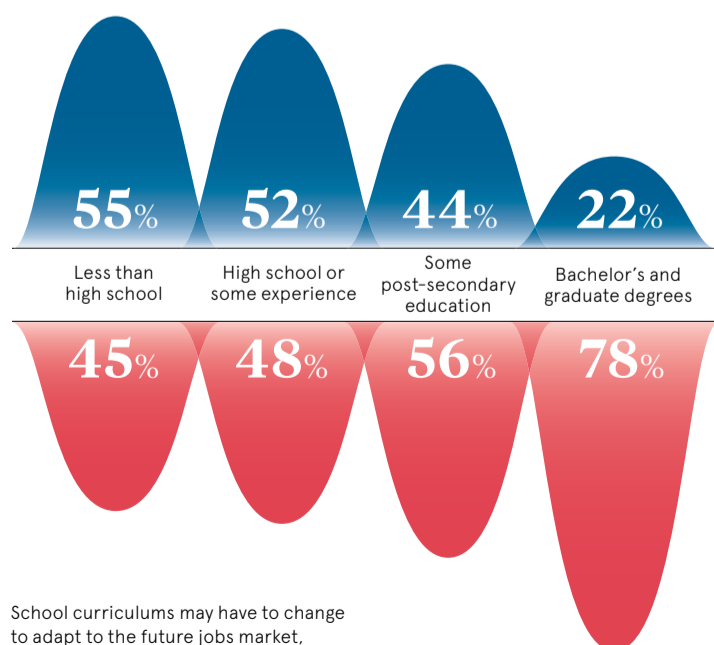
"AI can present information and provide practice time and time again, without becoming impatient or judgmental. Thanks to their familiarity with computer games, children are less apprehensive than their parents about letting a computer mark their work or provide feedback."

Although Mr Berry believes that the biggest names in tech, including Microsoft and Apple, are "very generous in sharing free content with schools", one man with a foot in both business and education camps

Technical automation potential, by work activity/education

Based on an analysis of the United States labour market in 2030

◆ Automatable ◆ Non-automatable



School curriculums may have to change to adapt to the future jobs market, given the high automation potential for those with lower education levels

McKinsey 2017

Is your organisation AI ready?

Artificial intelligence (AI) has been talked about for more than half a century, mostly by academics and science-fiction writers, until recently, says **James Petter**, vice president, Europe, Middle East and Africa, at Pure Storage

So why all the excitement now? Finally, AI has caught up with the hype and is starting to overtake human imagination.

Made possible by a convergence of technologies – namely big data, secure storage, machine-learning and graphics processing unit processors – it is becoming a game-changing accelerator for innovation. AI, even in its relative immaturity, is arming business leaders with the tools to remap and transform every element of their organisation.

Early adopters are gaining significant ground over their competitors, and the gap between AI pioneers and laggards is quickly widening. It is already having an incredible impact on many industries and society as a whole, whether enabling smarter healthcare and better genomic testing, for example, or providing a greater understanding and improved management of everything from crop disease to inner-city traffic.

AI is fuelled by data and there is huge untapped potential. Sitting back and waiting for AI to be perfected, though, is not advised. Put simply, if you are not ready for AI, it will still affect your organisation, because you can be certain that rivals will embrace it and leave you behind.

Indeed, industry analysts Gartner estimate that AI will be built into almost every new software update to hit the market by 2020. It's important to stress that the industrial revolution powered by AI will neither be earth shattering nor something business leaders should fear. The reality is AI will free humans from motivation-sapping, mundane tasks. It will allow human resources to focus on creative, strategic and business critical projects. Ultimately, everything that can be automated will be.

A high majority of C-level decision-makers think that using AI and machine-learning to derive intelligence from data is going to be critical for their organisation in the future, according to our newly published *MIT Technology Review* survey, which explores the vast potential and challenges businesses must address to unlock data intelligence with AI.

According to the report, 85 per cent of the 2,357 global executives surveyed believe AI developments will mean that their teams are going to be able to dedicate more time to thinking creatively about the business challenges they face.

However, 74 per cent of the respondents feel that people in their organisations underestimate the value of data – and this is a telling statistic. Many

Unlock data intelligence with AI

Survey of 2,357 global executives



82%

of respondents reported that AI will have a positive impact on their industry in the future



85%

agree that AI will allow them to dedicate more time to thinking creatively about the business challenges their customers face

MIT Technology Review survey commissioned by Pure Storage

business leaders are unsure about how they will generate value while on their AI journey. In limited use-cases this can be achieved by directly using advanced analytics, machine-learning and domain-specific AI.

Great value can also be gained, in a much broader sense, by organisations leveraging their data. This is an essential step en route to harnessing AI, because putting data at the heart of the decision-making process will enable organisations to be more effective, and man and machine can combine to achieve a much higher level of optimisation.

Our research shows the three biggest barriers to moving to better data management are uncertainty about existing data infrastructure, privacy and confidentiality concerns, and budget. Fortunately, we have reached the point where, with technological advancement, these can be overcome.

In March, for instance, Pure Storage teamed up with NVIDIA and launched the industry's first comprehensive AI-Ready Infrastructure (AIRI). It's a plug-and-play device that is purpose built to enable data architects, scientists and business leaders to activate AI at scale for every enterprise.

Data-hungry AI has levelled the playing field by providing organisations of all shapes and sizes with new opportunities to transform and augment their core processes. In the near future the most successful businesses will not necessarily be the biggest companies



James Petter
Vice president, Europe Middle East and Africa, Pure Storage

or the ones with the best marketing. Rather, they will be the ones that prioritise adaptability and innovation.

This is why, in the increasing number of conversations I have about AI, I urge executives to focus on investing in equipping their organisation with the tools and infrastructure to manage and curate data. AI technologies are becoming more readily available, so organisations need to try them out and see the competitive advantage they give their business.

For more information please visit www.purestorage.com



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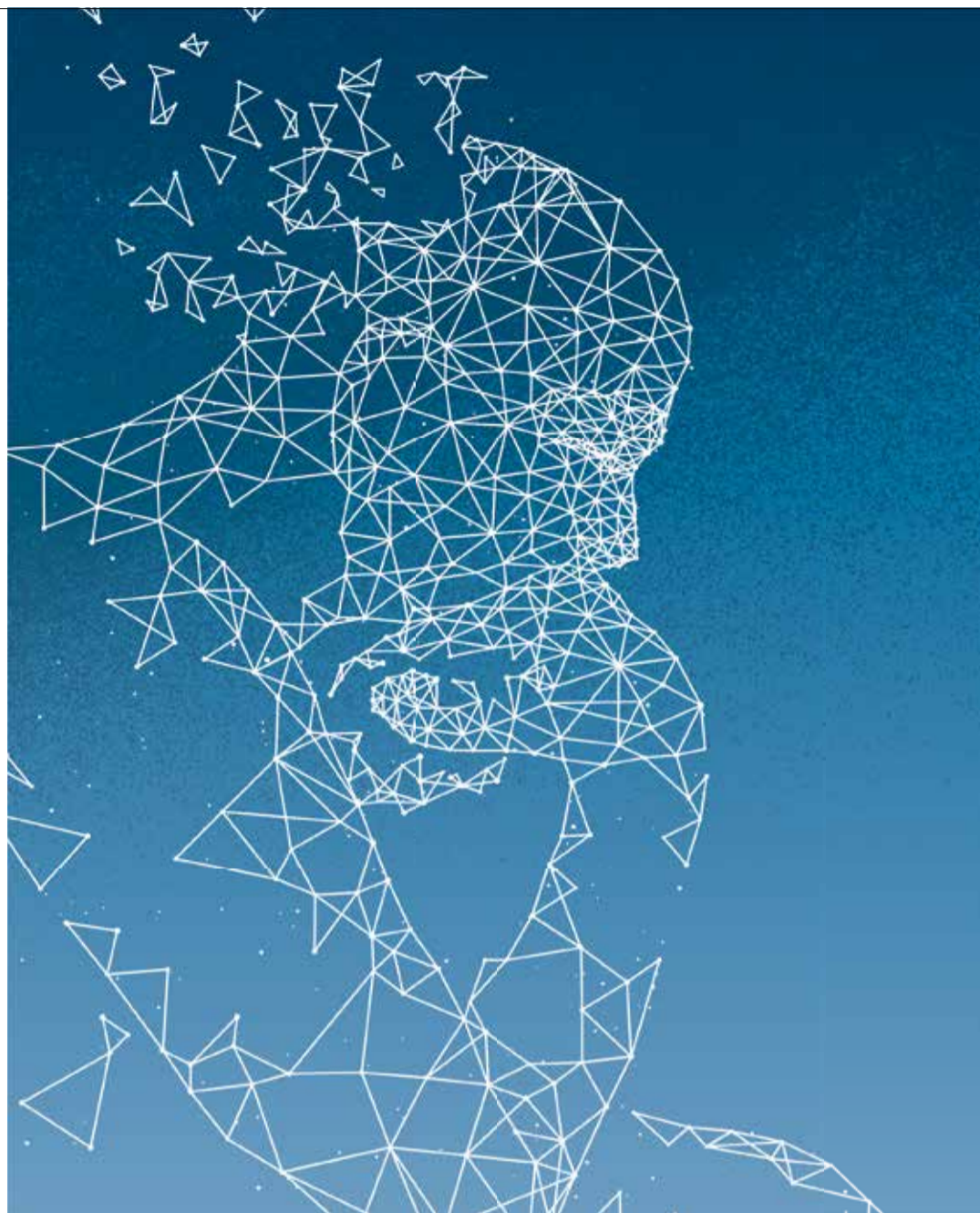
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Content Review/Augmented Moderation

EMOTIONAL INTELLIGENCE



Teaching bots how to cope with emotions

Developing chatbots with emotional intelligence is a breakthrough area which has great potential in sectors such as healthcare

ELLEN MANNING

From booking systems to customer and feedback services, chatbots are ubiquitous in business. But in areas, such as health or the home, people seem less willing to engage with what is effectively a computer running smart software or a machine that “learns” thorough artificial intelligence (AI).

However, businesses are increasingly taking advantage of advances in emotionally intelligent AI to open up new opportunities to gain people’s trust when it comes to more sensitive subjects.

Nowhere is the use for emotionally intelligent AI more apparent

than in healthcare. When pharmaceutical company HRA Pharma Deutschland was looking at using a chatbot to give women in Germany advice on the morning-after pill, it needed it to do more than parrot its website. As well as using questions and answers to understand what people are looking for, it had to be discreet, private and put them at ease.

The chatbot, called Ella, launches on the www.pille-danach.de website when it detects behaviour suggesting someone hasn’t found an answer to what they’re looking for, using questions and answers to help people find what they need and encouraging them to share experiences they might not want to share with a human.

“We have created a sympathetic, reliable and easy-to-talk-to dialogue partner for girls and women facing an unbearable uncertainty of possibly becoming pregnant after unprotected sexual intercourse,” says Nadine Scholl, senior brand manager for women’s health. “In that situation, most women are emotionally heavily taxed and often unsure – unsure who to talk to and where to find answers to their questions. With our conversation design, Ella guides them through the most important questions and helps to quickly get the urgently needed information on the morning-after pill.”

That same drive for emotional intelligence was behind the creation by Boehringer Ingelheim (BI) of Tabatha, a Facebook Messen-

Emotionally intelligent assistants

Global survey of smartphone users



Mindshare Futures 2017

Building a social robot has the promise to tap into the emotional intelligence system we have built-in and to communicate with us on our own terms

ger-based AI chatbot to encourage people suffering from asthma symptoms to seek medical advice.

"In healthcare, if you layer emotional intelligence into a chatbot, it can make the bots very powerful," says Maximilian Boost, head of social media at BI. "It was important for Tabatha to communicate with people who have asthma in a friendly, empathetic and informative way. Tabatha herself needed to appear emotionally intelligent as she was guiding people to self-identify with having asthma symptoms, while not imitating a doctor."

Tabatha even learnt how to recognise emotions and what people meant when they expressed them, says Mr Boost. And while she's upfront that she's a chatbot, it hasn't discouraged thousands of people from engaging with her. "We have been really impressed with how many people were willing to talk to Tabatha about their asthma symptoms and how it made them feel as a result," he adds.

BI plans to continue its work with emotionally intelligent AI at its recently founded digital laboratory, BI X, working on several projects including the analysis of digital biomarkers to support early diagnosis of diseases such as Alzheimer's.

It's not just healthcare where emotionally intelligent AI can be useful. Catherine Keddie, managing director of healthcare at Cohn & Wolfe London, which worked with BI on the Tabatha project, sees it as a disruptive tool for communications and marketing.

"AI has incredible scope within the communications industry, for example the use of chatbots can revolutionise patient engagement within healthcare public relations," she says. "The use of chatbots in global PR programmes is still in its infancy and even more so in the pharmaceutical industry. For us, it was the perfect solution for the evolution of a disease-awareness programme."

For Swedish-based company Furhat Robotics, there are opportunities for emotionally intelligent AI in areas from education and elderly healthcare to cognitive therapy. The company uses what it calls "social robotics" to create robots that don't just carry out tasks, but engage with humans in ways they understand.

Frankfurt Airport's concierge robot is one of its creations and Furhat also helped develop a pilot in Swedish schools as well as partnering with Honda in the development of a "smart" care home. "Human beings are social creatures and hardwired to respond emotionally to almost everything around us," says co-founder and chief executive Samer Al Moubayed. "Building a social robot has the promise to tap into the emotional intelligence system we have built-in and to communicate with us on our own terms, so that robots can engage with us in much more fundamental and impactful ways."

"These are still early days for emotionally intelligent AI and a lot of advances are a few years away from having any tangible effect on a particular sector. There are hundreds of situations where humans would rather interact with another human rather than a machine. However, the reality is that humans are less and less present in such situations, such as receptions, shopping malls, in waiting rooms at clinics and in classrooms.

"What could happen in the longer term is harder to predict. But there is a good chance that emotionally intelligent AI will have a significant impact on all types of sectors – legal, medical, manufacturing, transportation and even creative industries." ♦

Winning the AI security arms race

It is not news to anyone that the security threat landscape is increasing in scope and sophistication on a daily basis, says Avast researcher **Martin Hron**

People, businesses and governments alike are all rightly investing in new technologies, such as artificial intelligence (AI) and analytics, to stay one step ahead of cybercriminals to predict attacks and behaviours before they happen. This is touted as the future of cybersecurity and the key to protecting people's online lives and businesses.

Cybercrime is a multi-billion-dollar industry and criminals are harnessing the power of AI and machine-learning too. While very rudimentary AI-like capabilities have been used for decades and given virus programmes the ability to self-replicate, today it's all about increased automation. This is leading to an exponential rise in the volume of attacks and the speed at which they can occur. And this is just the beginning.

Machines can recognise patterns and analyse vast amounts of data at a speed and with comprehension that humans can't. As a result, we are moving from the age of man versus machine to an age of machine versus machine. So what will this mean for the threat landscape and more importantly how do we protect against it?

Using AI and machine-learning technologies, "bad actors" are beginning to launch wider and more personalised attacks on vulnerable users. There are two main ways machine-learning and AI are being used.

One is through phishing campaigns. Using AI, these can be much more targeted, adapting and personalising the copy to what people are most likely to respond to. The second is to use machine-learning to try to "fool" detection or antivirus systems. Threats can be adapted very quickly depending on how an antivirus is responding to it.

And as our personal and business lives increasingly rely on internet of things (IoT) devices, we will see more examples of AI used by hackers. Botnets can leverage AI, for example,

Using AI to detect threats enables Avast to deliver robust security solutions that keep our homes and workplaces safe



to create stealthier ways to communicate with the command-and-control servers without being spotted by antivirus as they appear like innocent internet traffic.

On the other hand, AI and machine-learning also have a big role to play in security. The threat landscape is huge and constantly expanding, and automation and machine-learning allow us to stay one step ahead of new threats by spotting connections and identifying new samples all the time.

Speed is one of the key advantages of machine-learning in security. The speed at which the data is generated and processed is important, because security threats spread and morph extremely fast. Most threats have very short longevity, some only exist for a few minutes. Before being detected they try to morph into something else, which is one way malware tries to escape from automatic detection systems. Machines can act much faster than human analysts.

We are using it to protect hundreds of millions of people online through our complex security solutions. This user base also means that our algorithms are also constantly being "fed" new threat information. Just as a hacker can use AI to teach its malware to fool security systems, our systems are learning just as quickly to identify and stop new threats.

It's a cat-and-mouse game we see every day in our threat intelligence work. As new technology evolves, such as the IoT, our lives become more convenient, but cybercriminals see new opportunities to attack the user and their devices. Whether it's collecting user data they can monetise in some way, or to abuse hacked devices to create a botnet, taking down websites and important server infrastructures, getting ahead of the bad guys is the priority for security providers.

Using AI to detect threats enables Avast to deliver robust security solutions that keep our homes and workplaces safe. This is exactly what AI and machine-learning should be used for to automate tasks where the data is too much for a human to process effectively, like threat detection, and utilise people more usefully in the process by freeing them up to analyse unusual trends or new information that require a level of analysis automation cannot provide.

For more information please visit www.avast.com



Artificial intelligence: putting technology to work in tax

Machine-learning tools can now free the tax professional from repetitive tasks, enabling greater focus on strategy

Advances in artificial intelligence (AI) in recent months, combined with increasing volumes of data and falling technology costs, are radically transforming the world of business. A survey conducted by EY with Forbes Insights shows 66 per cent of global companies are investing upwards of £4 million in analytics software and 78 per cent agree that analytics are changing the nature of competitive advantage. Leading companies reported a significant shift in their ability to meet competitive challenges by using data.

The impact of AI on finance functions is well documented, but its ability to unlock value in today's tax function less so. Nevertheless, its impacts can be just as dramatic. Machine-learning software, a form of AI, can read thousands of lines of business transactions and instantly assess whether an item of expenditure is tax deductible. Where once armies of tax accountants trawled through corporate accounts to work out tax liabilities, a single machine can do this work in seconds with improved accuracy and consistency.

Notwithstanding the impressive results of putting AI to work in tax, the businesses in our survey said they encourage data analysis to be carried out by someone who knows the organisation and is familiar with the business objectives. This highlights the importance of human oversight of AI processes and data analytics.

As a result, the introduction of AI is triggering a rethink of the responsibilities of the tax function and, by extension, those of finance departments in businesses. It is also fundamentally changing the role of the tax professional, freeing them from repetitive tasks to concentrate on higher-end strategic business partnering.

"Accounting and compliance work will be changed irrevocably by adopting these technologies," says Charles Brayne, chief tax innovation officer at EY. "In common with other global organisations, we are going through a process of looking at our business and asking how we can apply machine-learning and AI in different areas. I foresee accounting compliance and diligence work, risk management and tax review being almost entirely automated, data driven or machine driven."

As an example, tax compliance (be that corporate tax, VAT or employment taxes) for a business involves going through lists of hundreds of thousands of items of expenditure, from marketing costs to travel expenses, then deciding which items to tax effect. This is a huge volume of work for tax professionals to carry out. It requires deep knowledge of tax law and the ability to make informed judgments. The process is open to error given the sheer complexity and repetitive nature of the work.

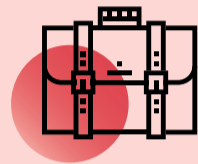
Search tools and rule-based systems can speed up the process. If a description of a transaction contains a certain keyword, for example, it is automatically assigned to a tax category. However, it is impossible to capture the full complexities of tax law by simply setting up such a system.

This is where machine-learning approaches, such as text classification, are reshaping tax practice and is the basis of a new tool we have created at EY called the Automated Ledger Review Tool, or ALeRT. It is a machine-learning system that infers tax rules from data with which it is presented rather than being explicitly taught them.

ALeRT is first shown "training data" from which it learns how the descriptions of transactions relate to tax treatment. It is language and alphabet agnostic, but it is data that has already been labelled or categorised by a human. For

Current tax landscape

Survey of senior executives from 1,722 large companies around the world



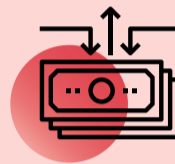
Workload

Firms are facing increased workload and risks from transparency initiatives, and don't have resources to cope with major legislative changes expected



87%

expect the workload to increase as a result of complying with the various transparency initiatives



Cost and risk

Tax and finance functions are having to deliver significant cost cuts at the same time as coping with increased risks



95%

have a plan to reduce the cost of their tax and finance function over the next 24 months



Tax and finance skills

Tax and finance skills needs are rapidly changing and organisations don't have confidence in their ability to hire and retain the right people



91%

find it a challenge to attract and retain the appropriate talent needed in the tax and finance function



Disrupting the tax function

In response to all these pressures, tax functions are grappling with how they will have to change



3 in 5

organisations are either looking to outsource or re-engineer their current tax function

Reimagining the tax and finance function: find your path forward, Euromoney Institutional Investor Thought Leadership

example, it could be a previous year's accounts, where each transaction, such as an item of marketing expenditure or a travel expense, is marked up as being tax deductible or not. The machine figures out which features or words in the description help it to discriminate between the different categories. When it has observed certain patterns of words many times and in each case the answer was always "deductible", it learns that whenever it sees a similar combination of words and letters, the answer should again be "tax deductible".

Training is a vital stage in creating a machine-learning system. Before letting ALeRT loose on live corporate data, its accuracy, along with other key performance metrics, are validated against other training data. This is another essential feature of ALeRT; it states the confidence it has in every one of its conclusions and whether or not it is confused. Scrutinising these outputs is where the human mind and the tax professional's craft are brought back into the process, and where true business advantage lies.

ALeRT offers great opportunities for directing tax professionals to where their judgment is most needed, as there may be just 200 out of 10,000 that merit a human review. Our experience of using ALeRT suggests that to create value from big data, you need to

ALeRT offers great opportunities for directing tax professionals to where their judgment is most needed

analyse, review and act on data findings intelligently, not apply them blindly.

A further benefit of AI and machine-learning lies in its accuracy. The machine is deterministic, so when it sees a description and gives a category, it replicates this exactly for each example. Humans are not so consistent, so there is a greatly improved consistency of output. The risk associated with transaction analysis therefore goes down as a result of using this technology. This can save businesses money as they often err on the side of caution and miss out on full tax reliefs due to their complexity.

According to Harvey Lewis, chief data scientist for tax, technology and transformation at EY, the growing use of AI and machine-learning means tax professionals will require a broader set of skills. "They will need their tax training and expertise, but they will also need other skills. They'll have to understand how the software works and they will

need to develop the art of storytelling and giving insights to clients about the data. The upshot of AI is that their skillsets will start to expand rather than contract. Businesses are realising that success in AI depends on a strong focus on people," says Dr Lewis.

EY is looking at greater use of AI in future, for instance it is prototyping a chatbot that can answer questions about taxation from clients. Tax accounting will undergo huge changes over coming years with the application of AI. This will bring broad benefits to clients, to consultancies and to the accountants themselves.

For more information please visit EY.COM/UK/ALERT

See why your best digital strategy should be a human one at <https://betterworkingworld.ey.com/digital/why-your-best-digital-strategy-should-be-a-human-one>



Charles Brayne
Chief tax innovation officer,
partner, EY



Harvey Lewis
Chief data scientist,
associate partner, EY



Building a better
working world

Technology that gives machines a voice



Ben Kolde on Unsplash

Ever wondered how a virtual assistant, such as Google Home or Amazon's Alexa, responds when asked a question? The answer is with natural language generation

HEIDI VELLA

Companies that aren't investing in artificial intelligence (AI) risk falling behind their competitors. Yet because AI is an umbrella term for several different technologies that each have distinct uses, it is often challenging to know which solution is right for a particular work process.

The most well-known subsets of AI are robotic process automation for automating repetitive tasks, machine-learning to give computer systems the ability to "learn" and improve work processes, and natural language processing (NLP), which enables machines to analyse and understand humans' imperfect way of writing or talking.

A lesser-known AI technology, however, is natural language generation (NLG). At its simplest, an NLG platform is a computer process that can generate natural language text and speech from pre-defined data. At its most advanced, it powers the responses given by AI assistants, such as Google Home and Amazon's Alexa, when asked a question.

Though currently relatively nascent, the technology has huge

potential for many industries, including journalism, finance, business service and healthcare, for both customer-facing and internal work processes.

A booming use case for NLG is as a tool to translate the hordes of data businesses now collect into intelligent, understandable and actionable insights. A platform can be given a set of rules and parameters to work within, and then fed structured data to output reports, paragraphs and emails that appear as though written by a human.

Automated Insights' NLG platform, called Wordsmith, was originally built to generate sports post-match recaps and player notes, but the company is now seeing an upswing in demand from firms wanting to generate business intelligence reports.

These include marketing analysis and coherent narratives derived from data straight into company dashboards, so complex statistics can be easily understood by everyone in an organisation without being verbally explained by analysts.

"This automates their expertise in a way everyone can understand to alleviate some of the manual work. Every company is collecting data and people want to know what

it means immediately; NLG translates it into something anyone can read and understand," explains the company's marketing manager Laura Pressman.

This is a huge time saver for businesses. *Associated Press*, for example, produces 4,400 quarterly business recaps using Wordsmith. Every quarter, when a public company publishes its corporate earnings, instead of a journalist sifting through the information, the technology automatically scans and derives insights from each release, and trans-

lates it into written, plain language narrative.

In a similar vein, Emmanuel Walckenaer, chief executive of Yseop, an NLG software platform used by Moody's, Zachs and Societe Général, says the technology can provide financial advisers with a coherently collated written summary of a client's transaction history that offers recommendations on where they might like to invest next and why or whether they are risk adverse or not.

Typically, these insights will only be one or two paragraphs in length. Creating longer, more in-depth reports is possible, but requires more rules, protocols and system-training, and several weeks to build, which can be a barrier to adoption.

However, in this capacity the technology has great potential for any situation where data needs to be understood quickly, including complex compliance laws or investigating fraudulent data.

Mr Walckenaer says NLG is currently being used in a "simplistic" way, but disruption will come when it can generate intelligent, informal dialogue for customer interaction management through chatbots or AI assistants.

In April, *Call of Duty* announced a beta release of the Alexa Skill for *Call of Duty: WWII*, which enables players to ask Amazon's Alexa how they performed in their last computer game.

Through the home assistant, the gamer will get a response in a character's tone of voice, giving them analysis of their performance comprising more than 20 factors. It also offers gaming tips and answers to 2,500 questions about the game and an individual player's performance.

This is a cutting-edge technology that also requires NLP for the machine to understand the question and NLG to reply.

Apoorv Saxena, product manager for cloud AI and AI research at Google, says customer and machine-voice interaction is "the next level of technological difficulty" for NGL, but will eventually improve productivity and economies of scale.

"Businesses have a lot of inquiries they are not able to answer because someone can't take the call, but if you have a chatbot to do it that helps scale small to medium-sized business and improve productivity," he says.

Like other AI technologies, NLG has advanced considerably over the last ten years, but there is still a lot of work to do around customisation and conversation. Furthermore, even for the more simple use-cases, such as generating reports, it can still take a few weeks to adopt.

Mr Saxena says the technology will evolve "but we don't know how yet", adding that Google is investing significantly in developing NLG.

Further down the line, perhaps there will be NLG voice systems that recognise when a customer is upset and adjust their tone accordingly or give basic financial advice over the phone based on a person's financial statistics, freeing up staff for more complex tasks. ♦

Factfile

NLP

Natural language processing enables machines to analyse and understand humans' imperfect way of writing or talking

NLG

Natural language generation is a computer process that can generate natural language text and speech from pre-defined data

UK minister issues grand AI challenge

Greg Clark, government minister for artificial intelligence strategy, says the UK can claim a multi-billion-pound economic prize as world leaders in AI

STEPHEN ARMSTRONG

Having lurked in the corners of computer labs for the past ten years and sci-fi movies for five, 2018 marks the year artificial intelligence (AI) can finally be applied widely, according to a 2017 report from PwC.

The report warned that 30 per cent of the country's jobs might be under threat from the technology, but predicted the UK could see productivity boosted by up to 30 per cent and savings generated of up to 25 per cent.

Steering the right path forward is going to be hugely complicated, although Greg Clark, Secretary of State for Business, Energy and Industrial Strategy, and the minister in charge of the UK government's AI strategy, is resolutely upbeat.

"We are at the cusp of one of the most exciting times in our lives and, if we get our strategy for AI right, then the UK will be able to reap the rewards for our economy for decades to come," he argues. "To secure the huge potential of AI, we need to be strategic and focused, recognising the increasing convergence of technologies and focusing on the areas where we can compete globally."

Industry is aware of the size of the problem. Demis Hassabis, chief executive of AI pioneer DeepMind,

has spoken of creating an "Apollo programme for the 21st century" on AI. Mr Clark agrees that's the kind of ambition and investment needed, if the AI industry is to generate his hoped for £232 billion for the British economy by 2030, although he's fighting shy of the \$110 billion required to fund the Apollo Moon shot.

"I want the UK to lead from the front, to help our world-leading businesses exploit the potential of AI, encourage companies to engage and grasp the opportunities ahead," he says. "There is no doubt that machine-learning and AI are already improving peoples' lives, from intelligent personal assistants that can prepare us for changes in the weather, to systems that protect our money from criminals, or devices offering medical advice from the comfort of our own home. We know the challenge lies in harnessing technology."

In April, Mr Clark launched the UK's *AI Sector Deal* policy paper, responding to a report on the UK's AI industry by Professor Dame Wendy Hall from the University of Southampton and Jerome Pesenti, Facebook's vice president for AI. Professor Hall and Mr Pesenti concluded: "The UK could stay among the world leaders in AI in the future or allow other countries



Chris Ratcliffe/Bloomberg via Getty Images



Jonathan Nicholson/MurPhoto via Getty Images

01 Automated robots stacking pallets of paint stand at the end of the production line at Akzo Nobel paint factory in Ashington, Northumberland

02 Secretary of State for Business, Energy and Industrial Strategy Greg Clark

in support of the sector, including new government, industry and academic contributions up to £603 million, up to £342 million from existing budgets, and £250 million for connected and autonomous vehicles. It also aims to invest £400 million into maths, digital and technical education to address the shortage of STEM (science, technology, engineering and mathematics) skills.

Launching the strategy, Mr Clark stressed: "It's evident that Britain is a place that people want to come to for AI. We have a position of strength that we want to capitalise on because, if we don't build on

to dominate. We start from a good position in many respects, but other leading countries are devoting significant resources. The UK will need to act in key areas and to sustain action over a long period, and across industry sectors, to retain its

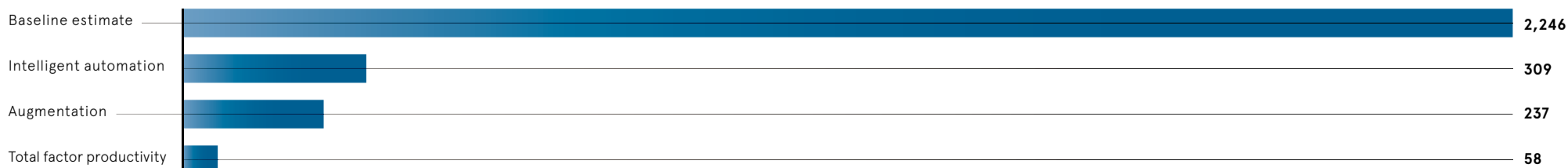
world-leading status, and to grow our AI capability as well as deploying it much more widely."

The *AI Sector Deal* puts many of Professor Hall and Mr Pesenti's suggestions into action, such as a fresh package of almost £1 billion

“Creating an economy that harnesses AI and big data is one of the great opportunities of our age

UK gross value added by 2035 (£bn)

Artificial intelligence has the potential to add an additional £604 billion to the UK's economy by 2035



it, the other countries around the world would steal a march.”

With the AI minister pushing for a post-Brexit customs partnership between the UK and the European Union, it’s notable that the new strategy includes a slight relaxing of immigration rules. The likes of Facebook and Google are opening huge new offices in the capital and promising to create thousands of jobs, but a third of tech founders reported they had already lost out on potential international hires due to Brexit, according to a survey released by Tech London Advocates last November.

With the UK tech sector vociferous in its pro-immigration views, warning that the country has a dire shortage of digital skills in programming and statistical analysis as well as AI and machine-learning, Mr Clark’s plan is to double the number of exceptional talent visas issued every year. These new visas to attract AI researchers, revised immigration rules for those considered as having exceptional talent, making it easier to apply for settlement after three years, and quicker routes for skilled students to work in the UK after finishing their degrees suggest the government has been listening.

“Creating an economy that harnesses AI and big data is one of the great opportunities of our age,” he adds. “AI is fundamental to our industrial strategy, so alongside the nearly £1 billion of support for the sector, we’re issuing an AI Grand Challenge to put the UK at the forefront of the revolution. Utilising AI could have a dramatic impact on our economy, but to realise all the social and economic benefits of AI, we know we need a strong

partnership between business, academia and government.”

He cites recent “votes of confidence” in the UK’s AI environment. “Global Brain, one of the largest venture capital firms in Japan with \$700 million under management, is opening its first European HQ in the UK,” he points out. “And it’s not just the established players; Kwiziq, Cleo and Mindtrace are examples of UK AI startups leading the way in areas as diverse as education, personal finance and autonomous vehicles.

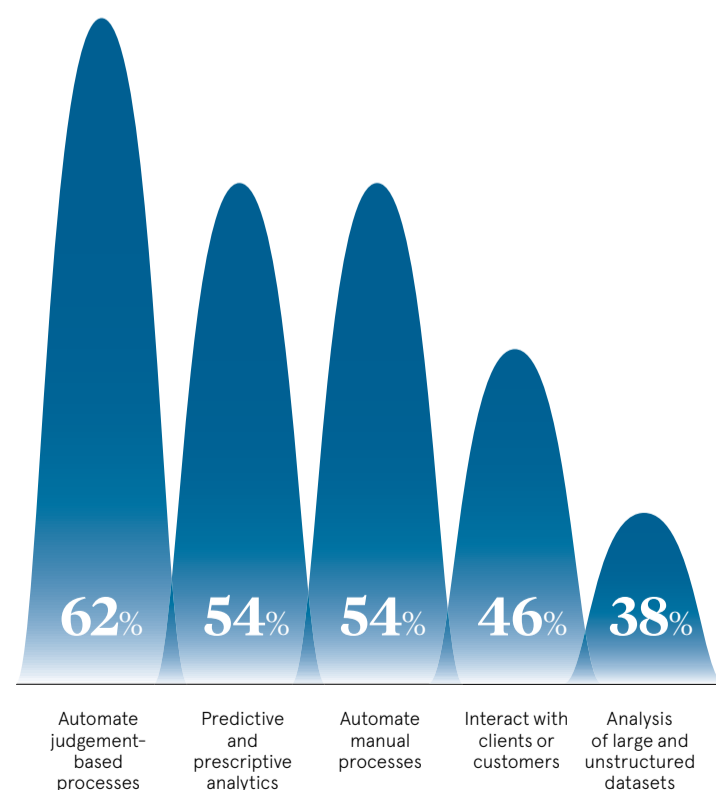
“We have already seen QuantumBlack, a British tech company using machine-learning and AI ‘in the wild’ to help clients in the government, corporate and third sectors increase their performance. QuantumBlack has grown from its early days in Formula 1 racing, where the three founders met, to 350 technology experts in the UK head office and also in Boston, India and Australia. I want to see this success replicated across the industry.”

In terms of specific industry or business advice, he offers big-picture thinking of industry and academia working together with the University of Edinburgh spinning out Skyscanner, BT opening a £29-million R&D facility in Belfast with Ulster University, and Welsh company IQE joining Cardiff University to develop a compound semiconductor cluster in the area.

Asked about ways for business to embrace AI, he argues: “Businesses have committed to supporting AI-related research and development to help boost productivity across our economy. Major established companies in the tech sector, but also increasingly beyond, are using AI to tune up their operations and services.” ♦

Top expected usage of AI by UK businesses

Survey of public and private-sector organisations; each picked their top three expected uses of AI



Deloitte 2017

AI: driving the new retail revolution

What was once the stuff of science fiction, artificial intelligence is transforming the business landscape as we know it. And it’s growing as insights-driven businesses grow eight times faster than global GDP



Richard Potter
Co-founder and chief executive
Peak

As companies seek to emulate success, embracing artificial intelligence (AI) is becoming one of the biggest imperatives in business today. It’s no wonder, with quirky startup turned \$100-billion entertainment company Netflix attributing 75 per cent of content consumed by some 125 million subscribers to its AI recommendation system.

Retail is one sector undergoing an AI-driven revolution, with predictions of application and services in the market reaching \$27 billion by 2025, up from \$713 million in 2016, according to the *Artificial Intelligence in Retail Market Report 2018-2025*. But, as with all revolutions, there will be winners and losers. We’re already seeing the winners emerge and AI is at the centre of their story.

Amazon is leading the way, with AI infused into its product recommendations and every part of its retail operations. Now more than a third of Amazon’s sales are driven by its machine-learning-powered recommendation algorithm, a form of AI, and 44 per cent of all US ecommerce sales in 2017 went to the retailer.

The technology is pivotal in driving the retail revolution, becoming as critical as a customer relationship management or automated marketing system for the sector’s big players. With a unique ability to make more informed decisions and act as a catalyst for business growth, the next wave of success is not possible without AI.

However, while leveraging AI and data is one of the most important things a business can do in this day and age, it’s also one of the most challenging. The technology is complex and fast moving, there is a severe skills shortage and, most importantly, deploying AI can be too time consuming

and expensive for most businesses to make a success of it on their own.

In response to this, Peak has taken the big idea of helping businesses do great things with data and developed its innovative AI System, enabling businesses to bring AI and data into the heart of their operations to drive growth through insights and optimisation.

The AI System acts as a centralised brain that is fully managed by our team of data scientists, applying machine-learning algorithms to data generated from multiple sources to deliver valuable insights continuously. These insights are then fed into wider business systems to drive automation, decision-making and ultimately improve the business’s bottom line.

There is a huge opportunity for retailers here if they want to outperform the competition and catch up with big players

For retailers, this could mean anything from predicting customer behaviour to boost sales and revenue, to forecasting demand based on buying patterns to optimise stock and inventory holdings.

Our cloud-based AI System has already been adopted by a number of retailers. Online motoring service Regit used it to predict when its 2.5 million users are likely to change their vehicle, enabling the company to send those customers relevant communications. This increased sales by 27 per cent in just 30 days and reduced Regit’s operational costs by 35 per cent, enabling them to staff their call centre at the optimal times of day, when sales were most likely.

There is much talk about high street stores struggling against online competition. Our research recently found that growth of online retailers is double the rate of those operating in-store, so by 2028 ecommerce will own a large portion of the market and account for 32 per cent of all sales made in the UK.

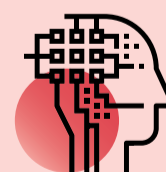
There is a huge opportunity for retailers here if they want to outperform the competition and catch up with big players such as Amazon, but they’ll need to move quickly to become smart – and AI is the only way to do it.

What was once a luxury is no longer an option and over the next few years this will become clear. The companies that fail to utilise AI and the insights it generates to optimise revenue and efficiencies will struggle. The winners in the retail revolution will be those that make their data work hard for them.

For more information please visit Peak.ai



DO GREAT THINGS WITH DATA



75%

of organisations implementing AI and machine-learning increase sales of new products and services by more than 10 per cent
Capgemini



£27bn

estimated size of the AI market in retail by 2025

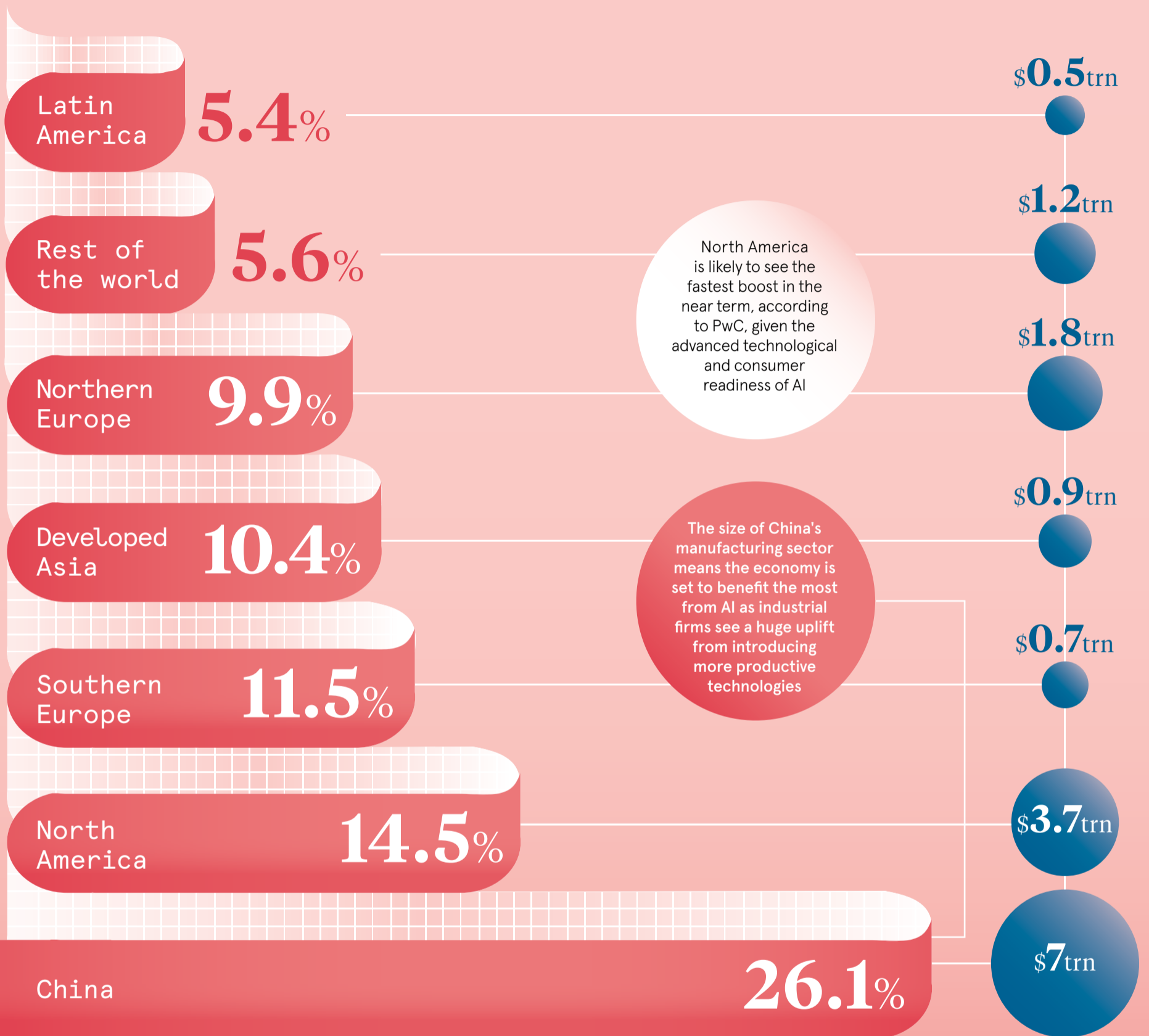
Artificial Intelligence in Retail Market 2025

AI fuelling growth worldwide

Potential impact of artificial intelligence on GDP by 2030

◆ GDP growth ◆ GDP growth

PwC 2017



Driving Growth with AI

Artificial intelligence could contribute an additional \$15.7 trillion to the global economy by 2030, but which countries and sectors will benefit the most?

Biggest business benefits of AI

Share of companies already implementing AI that have observed more than a ten percentage-point benefit in the following...

Capgemini 2017

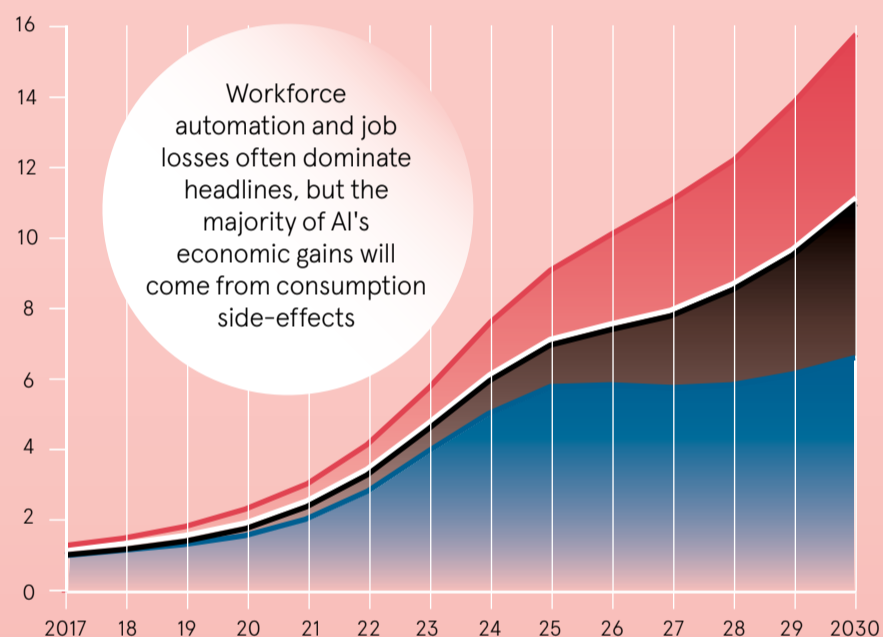


Where value gains will come from

Impact on global GDP by effect of AI (£trn)

PwC 2017

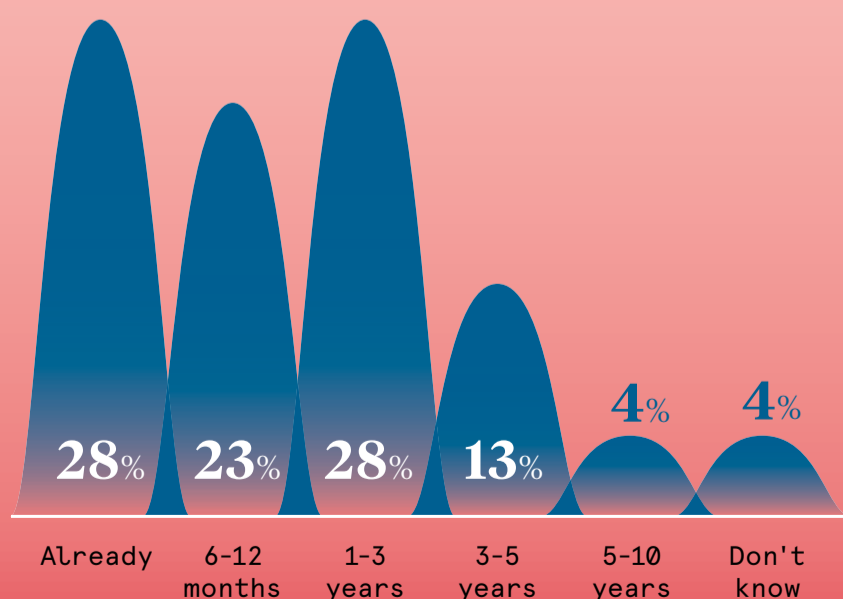
◆ Labour productivity ◆ Personalisation ◆ Time saved ◆ Quality



Return on investment

How long businesses believe it will take to realise tangible returns on their AI implementation

AI Business 2018

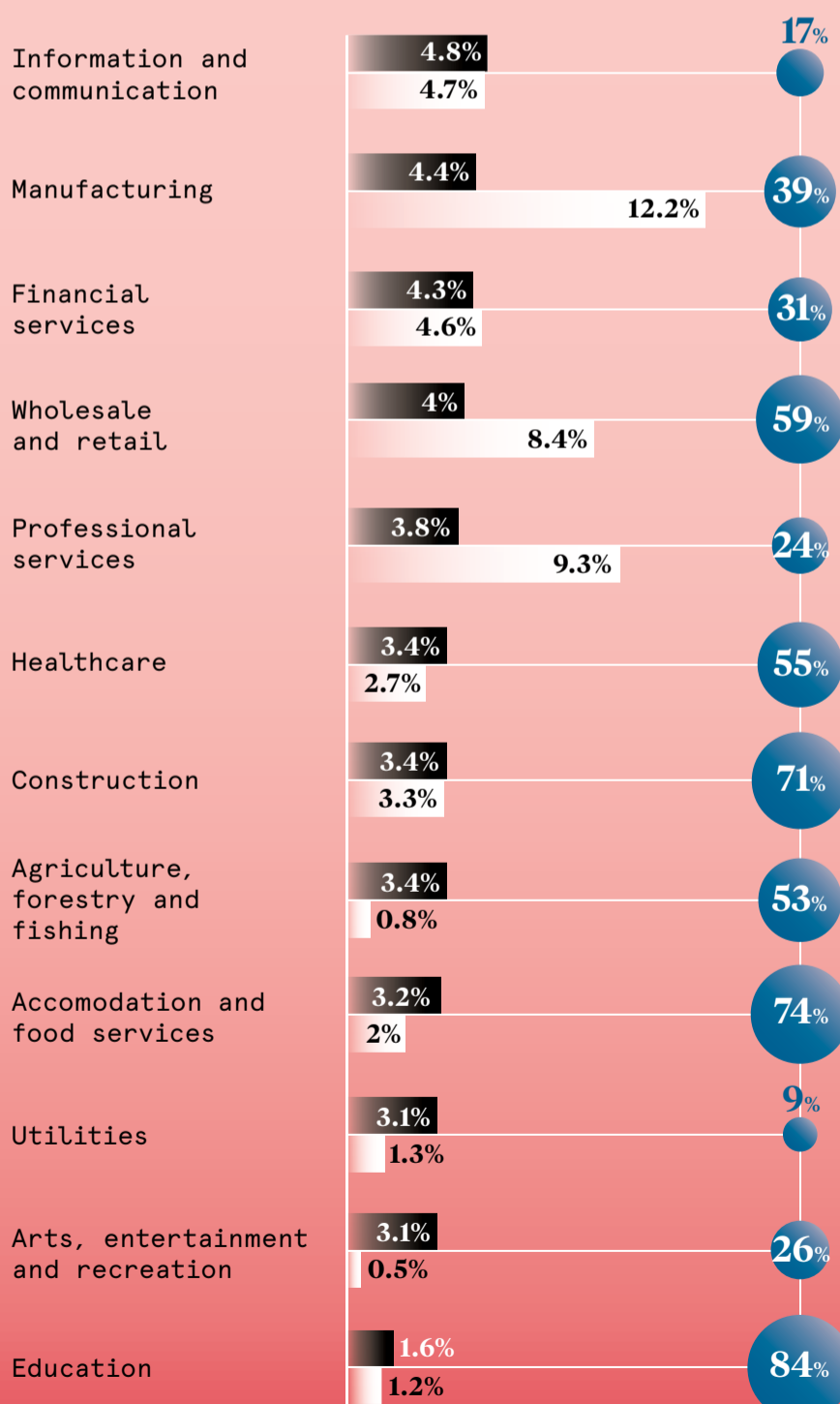


Sectors to benefit from AI

AI's estimated impact on industry growth by 2035, under a steady state adoption/implementation scenario

Accenture 2017

◆ Industry growth ◆ Industry output ◆ Share of estimated profit increase by 2035 attributable to AI



Self-service automation powers digital workforce in RPA 2.0

Alex Lyashok, chief executive of automation software company WorkFusion, says nearly half of knowledge work can be automated using software robots, also known as robotic process automation (RPA)



The technical roadblock for the first generation of RPA is unstructured data, such as invoices, email messages and web pages. Rules-based RPA 1.0 cannot process variable unstructured data, which comprises more than 90 per cent of the data in a typical business. This has left data-intensive industries like banking, insurance and healthcare unfulfilled by RPA 1.0.

Building artificial intelligence (AI) into RPA enables businesses to tackle high-volume unstructured work as well as automate simple rule-driven tasks. By extending the automation to unstructured work, we can double the rate of automation in business processes and therefore the benefits and value it creates.

Automation not only gives people the opportunity to reduce reliance on manual labour and through that reduce costs and increase accuracy, but it also offers them an opportunity to deal with complexities such as new regulation. If they're a leaner, more agile operation, they can adapt to change with agility and create better digital experiences for their customers.

WorkFusion's flagship product, Smart Process Automation (SPA), makes all the automation techniques available in one seamlessly integrated software, which doesn't require advanced skills to operate

Working side by side with software robots offers an opportunity for businesses, and the digital workforce they create, to transition towards data-driven, technology-first operations. This transition has already been evident in the marketing industry, which has shifted drastically from primarily direct mail and advertising to an extremely data-intensive digital discipline with real-time ad bidding and personalised segmentation.

Marketers have retooled their teams to enable this transition over the last decade and the same is now occurring in operations teams with AI-driven automation technology, also known as RPA 2.0. As business operations become increasingly automated and data driven, the teams behind them can stop managing bots and processing unstructured data, and focus more on making decisions through analytics generated by data from bots, people and processes.

As powerful technology evolves, it also simplifies and becomes less expensive, and RPA is no exception. WorkFusion offers a free self-service tool, RPA Express, which anyone can download

and use to automate simple processes in their immediate area of responsibility. Our company was also the first to create free online automation training through its portal, Automation Academy, which guides users through the automation upskilling journey.

It offers introductory courses they can go through at their own pace to learn the essentials of automation, all the way up to advanced courses for engineers of previous generations to become machine-learning engineers and practise AI.

Historical challenges have prevented companies from getting the benefits of AI-driven automation. AI has up until recently required data scientists to cleanse data, select and train machine-learning models, and tune models to ensure accuracy. The skill-sets to do this kind of work are in high demand and generally found only in big-name technology companies.

However, as the AI landscape evolves, new solutions are emerging that can help all companies enjoy the benefits of automating business processes, rather than just innovation leaders like Google and Facebook, which invest billions in AI talent and their own custom, proprietary and full vertically integrated systems, such as TensorFlow.

WorkFusion's flagship product, Smart Process Automation (SPA), makes all the automation techniques available in one seamlessly integrated software, which doesn't require advanced skills to operate. It can automate both simple

RPA 2.0 uses AI to predict the cost, capacity and productivity of a workforce

rule-based steps and subjective decisions through built-in machine-learning, all without the need for any data scientists or tools integration.

Machine-learning can be a difficult and cumbersome technology to deal with, often taking weeks to build a single model and then months to insert it into production systems so the business can actually start using it. With WorkFusion's patented Process AutoML™, data generated during business-as-usual work trains machine-learning models on-premise in a customer's own environment, on the hardware they already have and with very low data intensity, typically hundreds of examples rather than the hundreds of thousands required by cloud-based AI providers.

We also drive the benefits of having it all in one platform by providing our users with analytics. By having a single pane of glass across both their manual workers and software robots they can get diagnostic information on what has happened and predictive information on what will happen, such as forecasting process accuracy or capacity needs. This allows us to drive greater benefits for customers relative to what is possible

by approaching innovation through best-of-breed integration.

Our view is that AI is one of the key contributors to making automation more self-service. We're very much focused on creating a tool that reduces reliance on manual labour in business operations without running an IT project or hiring new people. Businesses want AI packaged in a way they can predictably manage, understand how it performs and explain the decisions that it makes, all at enterprise scale.

We are still in the very early days of this progression and a lot more will come. There is a study from McKinsey that says 40 per cent of work can be automated with technology today. Our mission is to package technology to actually accomplish that, but more importantly to push the capabilities of AI so we can train algorithms with even less data, do it even faster and solve a greater set of business problems.

For more information please visit workfusion.com

 **WorkFusion**

‘The long journey to an AI-powered economy has only just begun’

Georgios Kipouros

Co-founder, AI Business



In 2018, artificial intelligence (AI) has become central to the corporate agenda. Buoyed by predictions from firms such as PwC that estimate AI could add \$15.7 trillion to the global economy by 2030, enterprises are well aware of the potential of AI technologies to improve efficiency, accuracy and reduce overall expenditure.

Yet many are faced with significant challenges in adopting the technology. AI Business recently surveyed 500 Fortune 100 C-suite business leaders with the aim of deciphering what is preventing AI from really taking off in business.

The very first obstacle identified by the vast majority of respondents may come as a surprise to those irritated by the substantial media coverage surrounding AI. More than 92 per cent of respondents identified the lack of understanding about AI, its capabilities and overall potential as the number-one issue preventing them from making the most of the technology.

“The demystification of AI is vital, otherwise fear about what the technology can

do to jobs, skills and people will proliferate,” says Sandeep Dadlani, Mars Inc’s chief digital officer. “There is also this expectation that AI will produce magical results in a short period of time. That reality is far away – the truth is that AI is still in its infancy in terms of solving problems.”

Most organisations not only lack the necessary knowledge, but also the right talent to make a success of AI; an issue that nearly all members of the C-suite cited as a major hurdle. The race to recruit top AI talent has reached unprecedented levels among the industry’s leading tech vendors, to the point where even renowned universities are struggling to retain their staff on oversubscribed machine-learning courses. As a result, it’s even harder for enterprises to compete for AI talent, which is why many organisations have taken the route of outsourcing AI to external vendors.

Closely tied to the talent deficit is the pivotal issue of ownership of AI within the organisation, identified by nearly three quarters of all respondents. There’s no clear path to AI implementation, with some companies choosing to run small,

case-by-case projects and others opting for a comprehensive AI or digitalisation strategy.

Research consultancy Tractica recommends that centralised AI control is best for organisations on an advanced AI path, with multiple implementations at scale, while most businesses starting out in AI are better off with decentralised projects.

For many large enterprises, it falls to digital or innovation-oriented members of the C-suite, such as chief information officers (CIOs), to evangelise for the technology within the wider organisation, but building a coalition of the willing, based on clear use-cases, is vital.

“It can’t just be the CIO walking into the executive meeting with AI,” argues Sherif Mityas, chief experience officer at TGI Fridays. “You need to work with those who have been through the business case. There can be lockstep between the CIO and other board members who are able to see the impacts of AI in their own departments and areas of responsibility.”

The shortage in AI talent and literacy, as well as a nebulous implementation structure, leads to another significant obstacle of in-house versus outsourced AI. With understanding

of machine-learning murky at best among executives, selecting the right AI solution remains challenging for businesses. Cloud service providers such as Amazon Web Services and Microsoft Azure offer enterprises a base with which to clean their data and develop their own AI solutions, while a constantly growing base of AI startups offers specialised, use-case-oriented applications.

There’s no one-size-fits-all approach, which is why many AI vendors recommend starting with a specific business problem, rather than looking to apply AI for its own sake. “Business sectors should assess and align critical business problems with opportunities for AI technology to provide value through cost avoidance and/or new capability development,” says Andrea de Souza, global business development lead for NVIDIA. Ms de Souza recommends that businesses begin with one, two or three practical experiments to explore if AI could have a significant impact for their organisation. The key is to combine in-house and outsourced approaches to implementation according to circumstances and need.

The most persistent technical issue that prevents rapid deployment of AI in the enterprise is undoubtedly

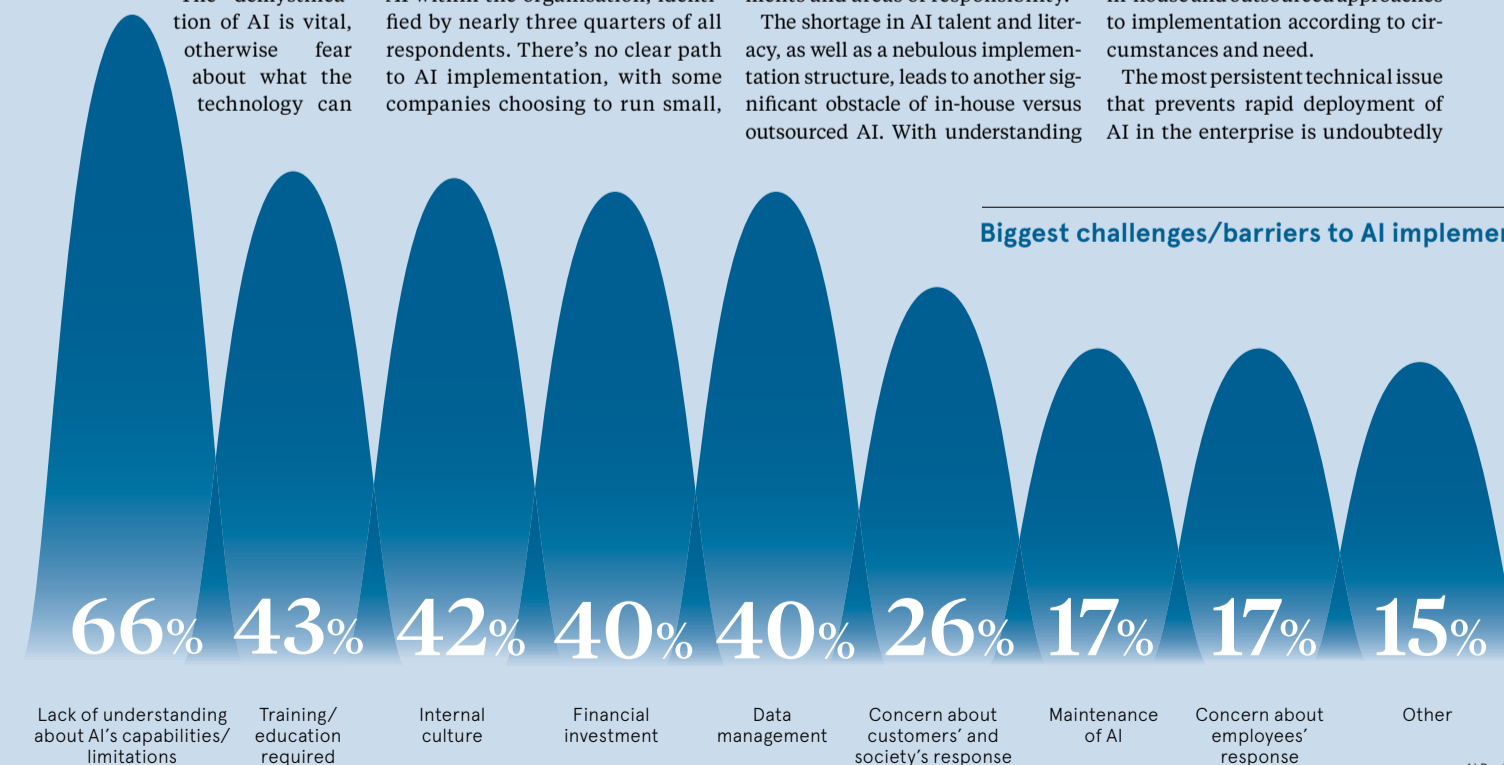
organisational data. Data is the fuel of AI and, in many cases, its starting point. Without a good data strategy and well-organised datasets, businesses will be unable to implement AI efficiently or effectively. Thankfully, enterprises are growing savvy to this, with many of them now investing heavily in their own data scientists and experts. For those operating on a lean business model, there exist plenty of third-party consultancy services to help with the heavy data lifting.

The elephant in the room is undoubtedly public trust. More than 80 per cent of our respondents remain concerned about customer and societal responses towards putting AI to work. More than 60 per cent also highlight worries about employee attitudes to working alongside machines. A larger conversation around ethics, AI and the overarching impact of the fourth industrial revolution has yet to take place.

Thankfully, this is one area in which the UK is an emergent leader. Parliamentary reviews into the prospects for AI in Britain have found that, while the UK might never match global competitors in spending, we have the infrastructure and know-how necessary to become a standard bearer for ethical AI. Lord Clement-Jones, chair of the Select Committee on Artificial Intelligence, says the UK has many of the right ingredients in place. “Businesses should focus on ensuring government delivers the climate for AI in terms of getting the context right for growth,” he says. “We don’t think a special AI regulator is the way forward. It’s really important that the tech industry gets behind all those principles around transparency and explainability, because we mustn’t lose public trust.”

The road to AI is long and bumpy, and uncharted territory. However, the opportunity is too significant to ignore. Businesses that don’t adopt AI will be left behind in the long run. AI is already enhancing human productivity, yet the long journey to an AI-powered economy has only just begun.

Biggest challenges/barriers to AI implementation



The only way is ethics in the world of AI

As machines become ever-smarter and make life-changing decisions, how do we ensure they behave ethically?

NICK EASEN

It sounds like a script from the Netflix futuristic dystopia *Black Mirror*. Chatbots now ask: “How can I help you?” The reply typed in return: “Are you human?” “Of course I am human,” comes the response. “But how do I know you’re human?” And so it goes on.

The so-called Turing Test where people question a machine’s ability to imitate human intelligence is happening right now. Powerful artificial intelligence (AI), pumped up on ever-complex algorithms and fed with petabytes of data, as well as billions of pounds in investment, is now “learning” at an exponential rate. AI is also increasingly making decisions about people’s lives.

This raises many burning ethical issues for businesses, society and politicians, as well as regulators. If machine-learning is increasingly deciding who to dole out mortgages to, tipping off the courts on prosecution cases or assessing the performance of staff and who to recruit, how do we know computerised decisions are fair, reasonable and free from bias?

“Accountability is key. The people behind the AI must be accountable,” explains Julian David, chief executive of TechUK. “That is why we need to think very carefully before we give machines a legal identity. Businesses that genuinely want to do good and be trustworthy will need to pay much more attention to ethics.”

The collapse of Cambridge Analytica over data harvesting on social networks, as well as the General Data Protection Regulation, now in force at the end of May, are bringing these issues to the fore. They highlight the fact that humans should not serve data or big business, but that data must be used ultimately to serve humans.

“The general public are starting to kick back on this issue. People say they do not know anything about EU law and information governance, but they do know about data



Protestors outside Facebook’s headquarters in April calling for better consumer protection in the wake of the Cambridge Analytica scandal, which sparked a debate around unethical uses of artificial intelligence

Five proposed principles for an AI code

According to the House of Lords report, AI in the UK: ready, willing and able?

01 Artificial intelligence should be developed for the common good and benefit of humanity

02 Artificial intelligence should operate on principles of intelligibility and fairness

03 Artificial intelligence should not be used to diminish the data rights or privacy of individuals, families or communities

04 All citizens have the right to be educated to enable them to flourish mentally, emotionally and economically alongside artificial intelligence

05 The autonomous power to hurt, destroy or deceive human beings should never be vested in artificial intelligence

Select Committee on Artificial Intelligence 2018

breaches and scandals like the one with Facebook,” says Lord Clement-Jones, chair of the House of Lords Select Committee on Artificial Intelligence.

Former Google engineer, Yonatan Zunger, has gone further saying that data science now faces a monumental ethical crisis, echoing issues other disciplines have faced in centuries past, with the invention of dynamite by chemist Alfred Nobel, for example, while physics had its reckoning when Hiroshima went nuclear; medicine had its thalidomide moment, human biology the same with eugenics.

But as history tells us, ethics tends to hang on the tailcoats of the latest technology, not lead from the front. “As recent scandals serve to underline, if innovation is to be remotely sustainable in the future, we need to carefully consider the ethical implications of transformative technologies like data science and AI,” says Josh Cowls, research assistant in data ethics at the Alan Turing Institute.

Ethics will need to be dealt with head on by businesses if they are to thrive in the 21st century. Worldwide spending on cognitive systems is expected to mushroom to about \$19 billion this year, an incredible 54 per cent jump on 2017, according to research firm IDC. By

“Businesses that genuinely want to do good and be trustworthy will need to pay much more attention to ethics

2020, Gartner predicts AI will create 2.3 million new jobs worldwide, while at the same time eliminating 1.8 million roles in the workplace.

The key concern is that as machines increasingly try to replicate human behaviour and deliver complex professional business judgments, how do we ensure fairness, justice and integrity in decision-making, as well as transparency?

“The simple answer is that until we can clone a human brain, we probably can’t,” explains Giles Cuthbert, managing director at the Chartered Banker Institute. “We have to be absolutely explicit that the AI itself cannot be held accountable for its actions. This becomes more complex, of course, when AI starts to learn, but even then, the ability to learn is programmed.”

Industry is hardly an open book; many algorithms are corporations’ best kept secrets as they give private businesses the edge in

the marketplace. Yet the opaque so-called “black box AI” has many worried. The AI Now Institute in the United States has called for an end to the use of these unaudited systems, which are beyond the scope of meaningful scrutiny and accountability.

“We also need to look at this from a global perspective. Businesses will need ethical boards going forward. These boards will need to be co-ordinated at the international level by codes of conduct when it comes to principles on AI,” says Professor Birgitte Andersen, chief executive of the Big Innovation Centre.

“Yes, we have individual moral rights, but we shouldn’t neglect the economic rights of society that comes from sharing data. Access to health, energy, transport and personal data has helped new businesses and economies grow. Data is the new oil, the new engine of growth. Data will need to flow for AI to work.”

The UK is in a strong position to take the lead in ethics for AI with calls from prime minister Theresa May for a new Centre for Data Ethics and Innovation. After all, the country is the birthplace of mathematician Alan Turing who was at the heart of early AI thought, and Google’s AlphaGo and DeepMind started here. It was the British



Jason Alden/Bloomberg via Getty Images

Insight

'Magna Carta' for AI

Of all the things prime minister Theresa May could have talked about at the World Economic Forum's annual C-suite fest earlier this year she chose to focus on artificial intelligence (AI), saying she wants the UK to be a world leader in its shaping global governance, with a fresh advisory board in the offing.

"We want our new world-leading Centre for Data Ethics and Innovation to work closely with international partners to build a common understanding of how to ensure the safe, ethical and innovative deployment of artificial intelligence," she said in her speech at Davos.

"This includes establishing the rules and standards that can make the most of AI in a responsible way, such as by ensuring that algorithms don't perpetuate the human biases of their developers."

After this came the UK's first public inquiry into AI in April. The House of Lords Select Committee on Artificial Intelligence recommended a national and international AI code of conduct, which organisations can sign up to. Their report also called for action by the Competition and Markets Authority into "the monopolisation of data" by large tech firms.

"In many ways we need a new Magna Carta, this time for AI," explains select committee chair Lord Clement-Jones. "I see it as a race against time already. AI is here and now. Complex algorithms are already impacting people's lives. What we need is a quick and comprehensive approach to the issue. We think we don't need new regulation in this space, but an ethical framework."

The committee's inquiry and move to establish a data ethics centre have already had an impact, putting ethics at the core of the UK's policy-thinking about AI. The work of the Ada Lovelace Institute, the Information Commissioner's Office and others is also gaining momentum as are calls to establish an AI Global Governance Commission.

"It's encouraging that the government is taking seriously both the opportunities and risks of these technologies," says Josh Cowls, data ethics research assistant at the Alan Turing Institute.

"Companies themselves also have an important role to play in the development of ethics. The more effectively these efforts are co-ordinated, the more successful they are likely to be. And if they are successful, it will enable the UK to play host to the development of AI technologies that are as beneficial for society as they are profitable for business."

who taught Amazon's Alexa how to speak.

British businesses are also hot on good governance when it comes to many other issues, including diversity and inclusion or the environment. "The country has some of the best resources anywhere in the world to build on this. Leadership on ethics can be the UK's unique selling point, but there is a relatively narrow window of opportunity to get this right. The time for action on all of this is now," TechUK's Mr David concludes. ♦

35%

of consumers said they are/would be comfortable with a business using artificial intelligence to interact with them

Survey of 6,000 adults across six countries
Pega 2018



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Machines learn how to help humans communicate smarter

Artificially intelligent technologies and algorithms are transforming how people conduct meetings in the workplace and bringing new meaning and value to team collaboration

Businesses at the leading edge of innovation are able to move and collaborate with an agility that is omnipresent throughout their organisation. Board directors are kept awake at night worrying of the consequences of being too slow to keep up.

In KPMG's 2017 *Global CEO Outlook*, 77 per cent of UK chief executives said they want their company to be the disrupter. As a result, speed of innovation has become the most critical differentiator in business today, and that speed relies on a unified cloud experience and a savvy approach to automation technologies such as artificial intelligence (AI).

In workplace meetings, AI is changing the way people collaborate. Videoconferencing has been prevalent for numerous years, enabling simple group communication, but a new generation of enterprise tools is now enabling teams to co-create in a smarter way, bringing together physical and virtual environments.

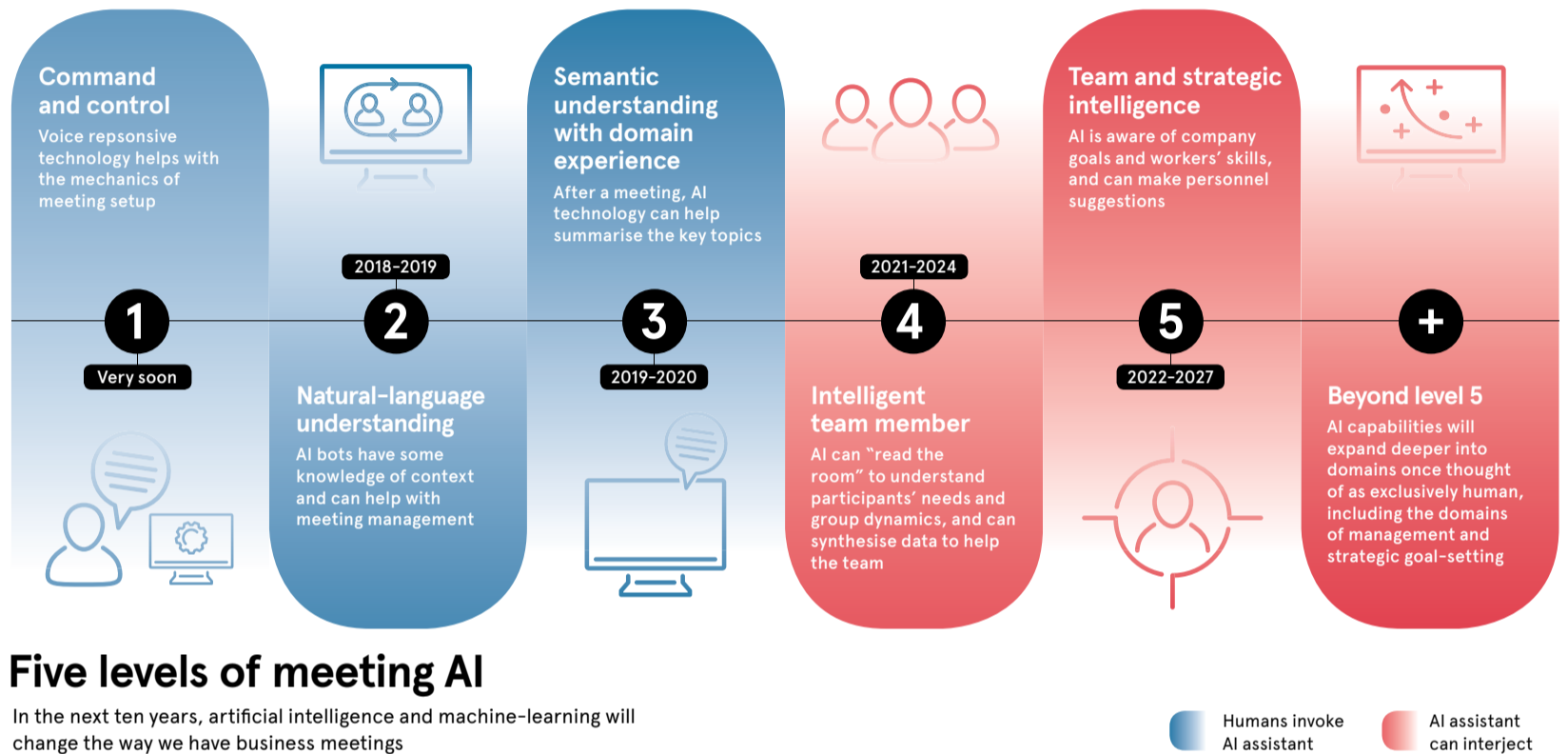
"We're already used to the likes of Google and Facebook knowing, for example, that I've searched for a flight to London and then for the next couple of weeks personalising my feeds with suggestions for what to do and where to eat and sleep while I'm there," says Snorre Kjesbu, vice president and general manager devices – team collaboration group, at Cisco.

"We've had that intelligence in our private lives, but as soon as we walked into a workplace and started working in groups, those same capabilities and experiences weren't there. Now the rise of AI in the meetings space is bringing virtual and physical team environments together to enable better collaboration."

At Cisco's Collaboration Summit in April, the company revealed a strategy built around enabling intelligent meetings and more intuitive ways of working. Its flagship cloud-collaboration platform Cisco Webex, which facilitates six billion meetings a month, is bringing together machine-learning algorithms in areas such as face and voice recognition, and sound mapping to create a new kind of meeting experience.

Last year, Cisco acquired AI company MindMeld, whose platform for deep domain intelligence delivers human-like accuracy to voice and chat assistants. The acquisition is bringing the capability to Cisco Webex to build conversational interfaces, enabling people to communicate naturally with their applications and devices.

With the new AI-enabled features, Cisco Webex now has algorithms that will recognise and filter out sounds such



as tapping keyboards or barking dogs. Cisco has also implemented AI technology that enables voice control in its intelligent assistant Webex Assistant. And it is bringing to the meeting room the same technology from chipmaker Nvidia that Tesla, Audi and Volvo count on for self-driving and collision avoidance.

The technology company has built further technology that enables Cisco Webex to track people during a meeting, understanding through machine-learning who is talking and to whom. This helps participants know exactly who is in the meeting.

"These are the first milestones for AI in the meetings space," says Mr Kjesbu. "They're already out in the market, they're working and they're really removing obstacles. We will go a lot further than that though. AI will be able to take notes, work on tasks, search documents, retrieve information and conduct calendar queries."

"We think of it as a journey where we start with command and control,

and then move into natural-language understanding. The third step, where we are now, is semantic understanding of what's happening, then it's about AI as an intelligent team member. Finally, in the fifth step, it will really be about team and strategic intelligence."

With 130 million active users a month, Cisco Webex is one of the largest and most widely recognised enterprise cloud services in the world. Recent developments include a video-first approach that encourages users to turn their camera on and see their teammates in crisp, clean layouts on a laptop, mobile device or Cisco video room device.



Snorre Kjesbu
 Vice president and general manager devices – team collaboration group, Cisco

Traditionally known as a meetings and videoconferencing application, Cisco Webex now represents a converged collaboration platform that also includes the company's team collaboration application Cisco Webex Teams, previously called Cisco Spark, as well as its video devices and a new hardware device, which can turn any workspace with a TV into a Webex meeting room.

"Under the Webex brand, we now bring together our meetings, teams and devices businesses, delivering a unified user experience and making it easier to buy by providing a complete menu of collaboration that gives users the flexibility to start with one product and then move on to others as and when they need," says Mr Kjesbu.

It is Cisco Webex's AI and machine-learning capabilities, however, which are really allowing Cisco to blend physical meetings with virtual environments. As the world's first enterprise-ready voice assistant for meetings, Webex Assistant uses natural-language understanding to enable users to join, start and end meetings with voice command. The ability to walk into a room and start collaborating just by talking to a device will remove delays and significantly boost engagement in the meeting room.

In a global survey of office workers by Cisco last October, 82 per cent, who had an administrative helper, said they would be more productive if they also had a virtual assistant. Six in ten of all

survey respondents said their teams would be more productive if a virtual assistant helped them to co-ordinate schedules, simplify meeting attendance, take notes, and collect and bring into meetings relevant information.

"AI will dramatically increase the efficiency of meetings," Mr Kjesbu concludes. "It will enable teams to speed up the work they're doing by adding relevant information into the feed. I think of AI as a journey, not an event. It's not something that's done in the next 12 or 24 months – it's going to take time. Where we have already been able to put machine-learning and AI into our products, we get great feedback from our customers."

"We're absolutely committed to AI and the heavy investments we've made in the technology demonstrate this. Going forward with AI requires the integration of machine-learning algorithms. Cisco has been at the forefront of this journey thus far and will continue to lead the way as meeting bots enhance collaboration and understand our needs in ways we can't do ourselves."

For more information please visit cisco.com/go/conferencing

OPEN SOURCE

RUPERT GOODWINS

Open source and the cloud have brought many previously unaffordable IT options to small and medium-sized enterprises (SMEs). The same is becoming true of artificial intelligence (AI), although it brings new challenges to all sizes of company.

Even though many of the commercial, high-profile products are aimed at Global 2000 companies, and others marketed at SMEs are perhaps heavier on hype than intelligence, the smarter smaller organisations can learn, build on and use AI techniques right now, with those same open-source and cloud-scalable advantages.

The most important single benefit of open-source machine intelligence for SMEs is early experience in what's important and how it works. Just don't expect business benefits from the start.

"It's possible to learn about AI with an open-source framework," says Chris Nicholson, co-founder and chief executive of Skymind, makers of open-source AI software. "In practice, AI is hard. The software is free and you can rent the hardware for pennies an hour in the public cloud, but AI is data science and that has two problems – one is the data and the other is the science."

All AI works through learning by example to find patterns in sets of data. For example, you might want to find which customer service staffer copes best with more demanding customers. If your customer relationship management data has this information – length of call, representative's name, how often a customer calls – then that



Hero Images/Getty Images

It's not a free path to gains but a guide

Artificial intelligence and machine-learning have become commercially significant in the age of open-source software and affordable cloud computing

might be a good problem to work on. "You need to identify a problem," says Mr Nicholson. "Then, ask yourself whether you have the data, whether it's suitable."

Billy Wallace, knowledge exchange fellow at Strathclyde University, runs workshops introducing SMEs to AI. He points out that modern software can provide a lot of data for AI to feed on. "Apps running on mobile

platforms and connected to the cloud can produce lots and lots of data, and lots and lots of opportunities for machine-learning," he says.

Once you have your first AI-tractable problem, the next task is finding the right platform or framework to construct a solution on. A key insight is that existing IT talent within your organisation will already know about

open-source AI, their depth of knowledge correlating more with personal aptitude than job title.

"If you have software engineers, they'll know a lot of the nuts and bolts of putting things together," says Mr Wallace. Most of the AI frameworks work with familiar languages – Python and Java are common – and TensorFlow is becoming a standard for building information flow within frameworks.

Choice of approach is next. There is no one AI technique, no one machine-learning algorithm, which is automatically appropriate. "You need to hire the talent to choose the algorithms," says Mr Nicholson, "That's difficult." Mr Wallace agrees: "Data scientists are like hens' teeth. You can outsource the expertise, but there's a lot of hype to deal with." However, SMEs may not be at much of a disadvantage. "Even Fortune 500 companies are finding this hard," says Mr Nicholson.

The right dataset has to be selected, cleaned and formatted for training the AI. The most appropriate algorithms and mechanisms have to be chosen. The results of the learning phase have to be understood, and the quality of the AI's output on live data properly assessed.

Modern frameworks make trying different approaches easier,

but they can't yet replace a good grounding in data science. Some claim to automate algorithm selection and training but, says Mr Nicholson, this just doesn't work. "There may be a couple of small steps out of many that can perhaps be automated, but platforms that claim to replace data scientists in developing AI just cannot. It's nonsense."

If you can't buy it in or farm it out, then leaning about AI means making full use of the physical and online communities which have evolved. Mr Wallace points out that there are many government training and incubator schemes, as AI skills are now seen as being of national importance. Moreover, cities with software developer communities normally have regular specialist public access meet-ups. "You'll find 20 to 40 people working in AI. Someone there may already have worked on your problem," he says.

There's a plethora of online communities too, some based around particular services or frameworks, others more general, but places such as Quora or Stack Overflow serve as clearing houses for any question of any level of expertise and specificity. They are also superb guides to training materials. Once you've selected your preferred platform and approach, you'll soon find where the best community support is.

AI won't be plug and play for SME developers for a long time, but effort gaining skills will be rewarded. "It's important for SMEs to keep an eye on AI. There's a lot of hype, but it is genuinely disruptive, with the potential for your little space in your business world to disappear," says Mr Wallace. "Don't panic, but you should be aware of how AI works and what it can do."

AI is data science and that has two problems – one is the data and the other is the science

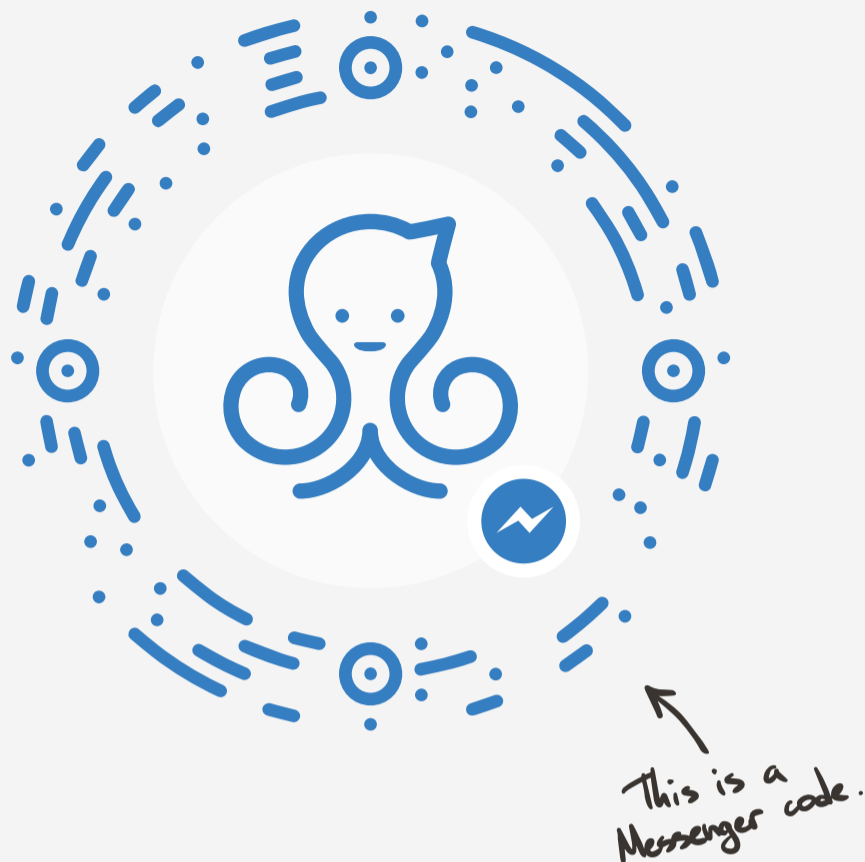
SMEs shouldn't expect open-source AI means a free path to business gains. But it is a path to giving you and your organisation the experience to look coolly at AI as it develops over the next few years, using it to your best advantage and on your own terms. ♦

Top drivers of open-source technology usage

UK survey of IT decision-makers



RackSpace/Vanson Bourne 2016



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EXPECTATIONS

It's not magic

Expectation and reality can differ such is the hype and public perception of artificial intelligence as perfection

OLIVER PICKUP

Elaine Herzberg's death, earlier this year will go down in history as the first fatality attributed to a self-driving car. It will not be the last. At around 10pm on March 18, the 49 year old wheeled her bicycle across a dimly lit road in Tempe, Arizona, and was struck by Uber's modified Volvo XC90 SUV, a prototype self-driving car powered by artificial intelligence (AI), travelling at 40mph.

Ms Herzberg's tragic demise triggered a widespread debate on the safety of fully autonomous vehicles, despite the fact that this AI-fuelled technology promises to save millions of lives around the world.

Uber was forced to suspend testing. Its crash report, published in early May, centred on a fault that decides how the car should react to objects in its path. Although the vehicle's sensors detected Ms Herzberg, the software was tuned too far in favour of ignoring objects that could be classed as "false positives", like plastic bags or other litter. The report also stated that the human safety driver was not paying close enough attention to intervene.

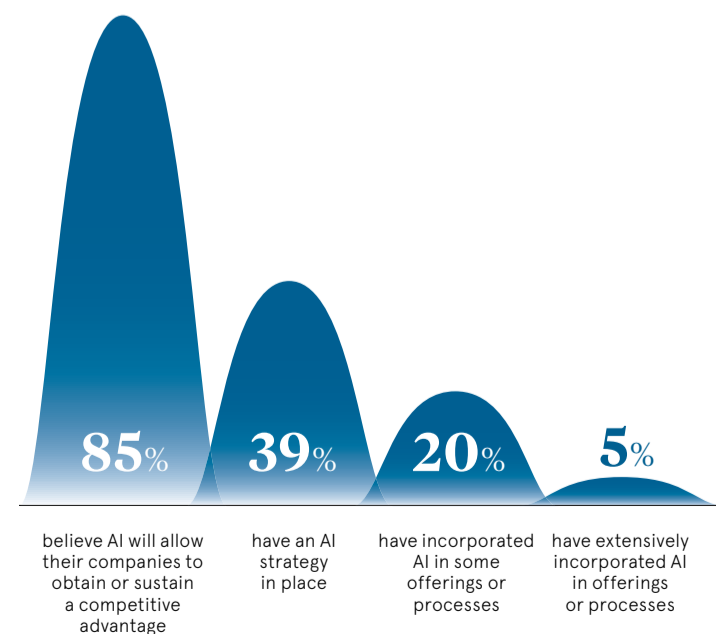


Pilot models of Uber's self-driving car

Consider that officially self-driving cars have been on roads since 2009, albeit in restricted conditions, and this is the first death. The latest National Safety Council statistics reveal that, on average, 110 people suffer non-autonomous traffic-related fatalities in America every day. Indeed, there were 40,100 such deaths last year and 6,000 of them were pedestrians. By allowing AI, which can't

Expectations are high, but adoption is low

Global cross-industry survey of executives, managers and analysts



and needs smart people as boss



ecosystems which will develop over the coming years.”

Peter Bebbington, chief technology officer of Brainpool, a worldwide network of AI and machine-learning luminaries, agrees. “There’s a preconception that AI is this perfect solution,” he warns. “Business is uncertain, life is uncertain and nothing can give perfect prediction. Only charlatans promise perfection. AI requires a level of experimentation to find the right business model, but experimentation isn’t always a term that sits comfortably in business or with the public.”

Emphasising the importance of accessible and clearly presented data, Dr Bebbington says: “Businesses can tend to believe that you plug in an AI solution and watch it go. But algorithms need to learn before they can give any high degree of accuracy. Algorithms on their own are stupid, they need pointing in the right direction with the correct data classification, otherwise it’s a case of garbage in, garbage out.”

Educating business leaders about both AI and data is imperative, urges John Ridpath, head of product at Decoded, a global organisation that aims to demystify emerging technologies. “There is a lot about AI in pop culture and because of that people think of it as some kind of awesome force, but in truth we’re on a continuum of technological change,” he says. “It’s not like everything will change as soon as we switch on the AI computer.”

“A lot of our clients want to understand AI, which has reached such a level of hype that it is hard to deconstruct. There has been excitement and fear about AI since the 1950s, when Alan Turing [mathematician and founder of computer science] was alive. Buying straight into the technology is not enough. You can’t just bring an AI expert or product into your business and expect it magically to start doing anything useful. A big part of this is ensuring

workers have access to the right tools and knowledge.”

Mr Ridpath lauds Airbnb as a pioneer in this area. Last year 700 – around 10 per cent – of its employees graduated from the in-house Data Academy. That understanding for tech is paramount, now and in the future. “If you want to do something deep and meaningful with your data that will offer a competitive advantage, it requires internal capabilities and skills,” he says.

“In 30 years, a robot will likely be on the cover of Time magazine as the best CEO”

While Jack Ma, Chinese business magnate, and co-founder and executive chairman of Alibaba Group, says provocatively: “In 30 years, a robot will likely be on the cover of Time magazine as the best CEO.” He adds: “Robots should do only what humans cannot.” His message is clear that blindly ceding all control to technology is fatal.

“The organisations seeing the greatest benefits from AI today are the ones deploying it alongside people, creating business processes powered by AI, yet with enough checks and balances through the right level of human intervention,” echoes Senthilkumar Ravindran, executive vice principal and global head of Virtusa’s xLabs.

In the Uber case, had the human safety driver been paying better attention perhaps Ms Herzberg’s death could have been avoided. While it will take more time to test and deploy AI, its potential is immense. Early adopters stand to benefit the most, though they must know when to apply the brakes. ♦

be drunk, distracted, tired or influenced by road rage and other emotions, to take the wheel, those figures could, in theory, be significantly dented.

“Human drivers are committing a holocaust, killing 1.2 million people every year on roads around the world and maiming another 50 million or so,” says Calum Chace, author of *The Economic Singularity*. “Road accidents are the most common form of death for people aged between 15 and 29. The sooner we can stop this carnage the better.”

The Uber incident serves to highlight the disparity between the current levels of expectation for AI and the reality of its relative maturity. For business leaders, education is essential to narrow that gap.

Mind-boggling AI figures abound. Global business value derived from AI is projected to reach \$1.2 trillion by the end of the year, representing a 70 per cent increase from 2017, according to industry analysts Gartner. It is forecast to hit \$3.9 trillion in 2022, with the three central sources of AI business value being customer experience, new revenue and cost-reduction.

Further, a Boston Consulting Group and MIT Sloan Management Review study suggests three quarters of C-level executives believe AI will enable their organisations to pivot into a new business. Additionally, almost 85 per cent think AI will allow their

“We risk discarding AI before it has had a chance to develop if we fail to recognise that certain traits we would associate with intelligence haven’t been achieved yet”

organisations to gain a competitive advantage. However, only 5 per cent have so far extensively incorporated AI into its processes.

As with self-driving cars, it appears C-suiters are excited by the potential of AI, but there is uneasiness about putting the pedal to the floor and committing fully. The chasm between ambition and execution is significant and growing. Why?

“AI has been a mainstay in science fiction since its inception,” says Ray Eitel-Porter, Accenture Applied Intelligence lead in the UK and Ireland. “And there’s a reason it does so well at the box office: we’re addicted to fantasies about super-intelligent robots. Despite AI progressively entering the real world, it’s hard to shake the image we’ve built up in our imagination.”

“Google’s AlphaGo and progress in image recognition show that AI has indeed surpassed humans in some areas. The gap between expectation and reality widens when it is put to the test in the real-world. It’s

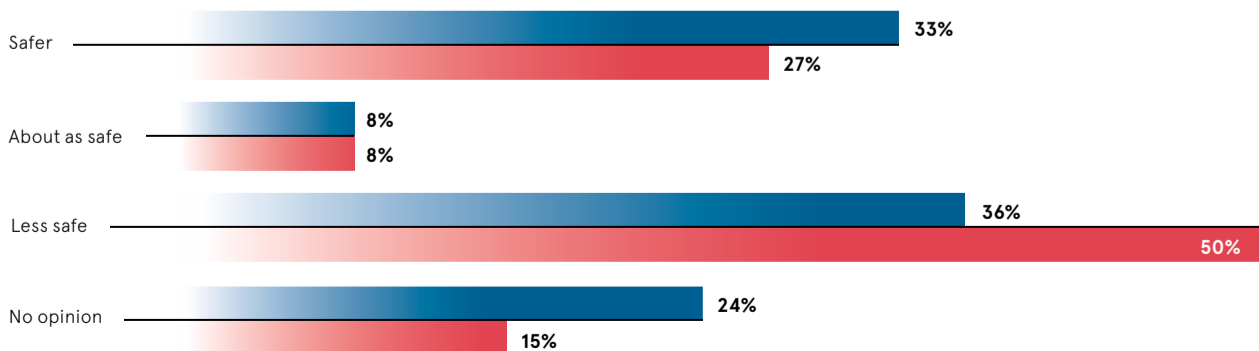
our own adaptability and common sense which make us so unique, and we often forget this. One of the best examples is autonomous vehicles, which can be duped by scenarios that would be easily understandable for a human.

“We risk discarding AI before it has had a chance to develop if we fail to recognise that certain traits we would associate with intelligence haven’t been achieved yet. We’re still in the early stages of a fast-moving field with limitless potential. Leaders should avoid locking themselves into contracts with one provider, maintaining the flexibility to take advantage across the vast

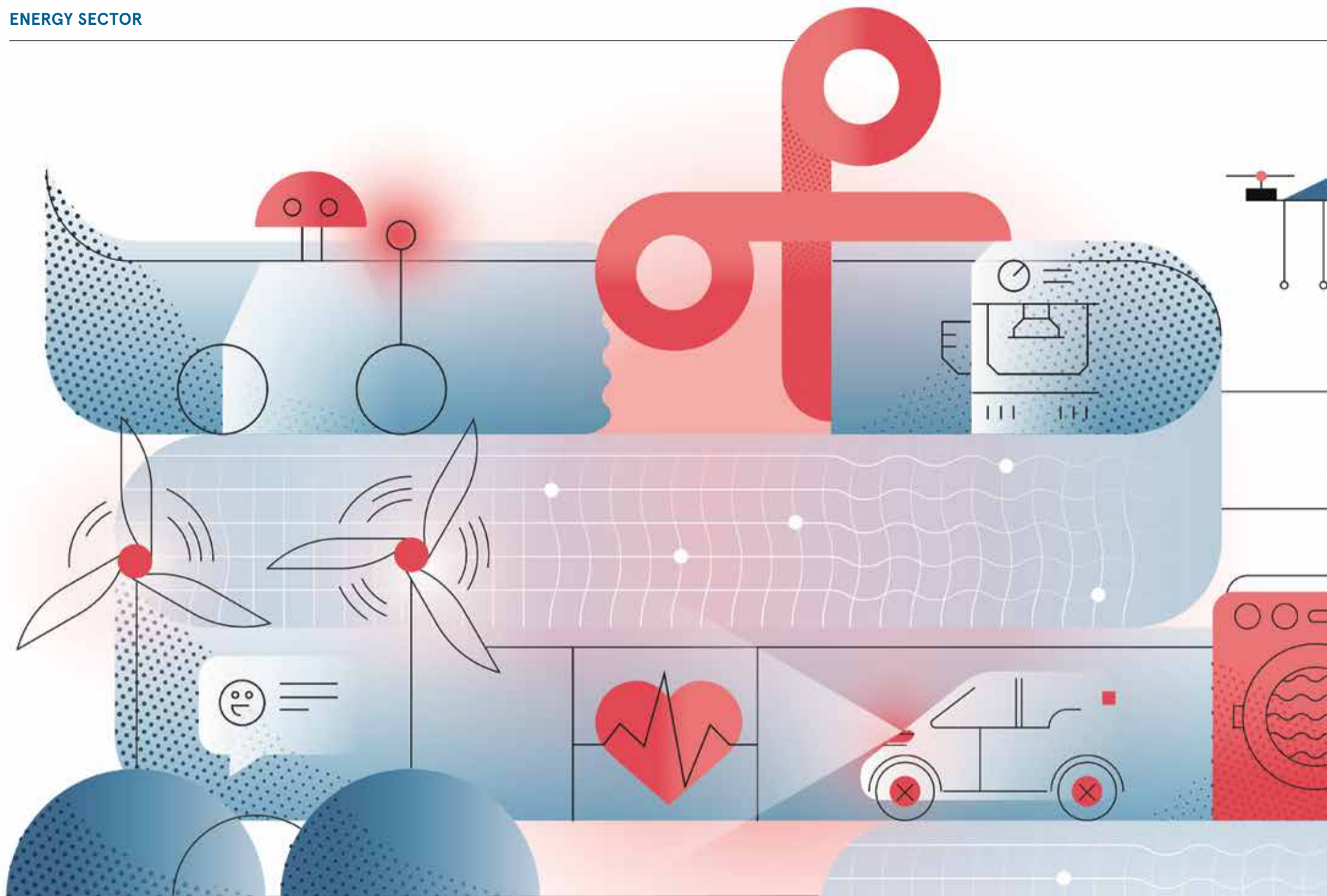
Fatal accidents have damaged trust in autonomous cars*

Percentage of Americans who believe self-driving cars are more/less safe than vehicles driven by humans

◆ January 11–16 ◆ March 29–April 1



*Based on two polls of around 2,000 US adults; one before and one after the death of Elaine Herzberg



Giving power to the people with AI tech

Artificial intelligence is set to help manage power generation and is already cutting consumers' electricity bills

OLIVIA GAGAN

The global energy industry is facing fundamental shifts in the way it generates, sells and distributes power. The pressure is on to cut carbon emissions and, as a result, methods must be found to manage the increasing gigawatts of unpredictable, weather-dependent renewable energy flowing on to power grids. The cost of electricity is also a concern, not just for consumers, but for governments keen to keep their voters happy.

In short, there is a global demand for clean, cheap, reliable energy – and artificial intelligence (AI) is increasingly being used to help meet this need. Enabling the growth of low-carbon, green electricity is an AI application with a potentially huge long-term impact.

Renewable forms of electricity are emerging as the successors to traditional coal and gas-fired power plants. A key problem with renewable electricity, however, is its inconsistency. A cloudy day or a string of calm, windless afternoons will cut generation and can create power shortfalls. Conversely, too much energy can be generated; in March this year, for example, a sunny, windy Portugal produced more renewable electricity than it consumed.

At present, this means backup forms of power, which can be switched on quickly, often dirty diesel generators or coal plants, are used to smooth out the troughs and costly storage solutions are required to manage peaks of excess generation.

Aidan O'Sullivan, head of University College London's energy and AI research, says using AI to create "forecasts for electricity demand,

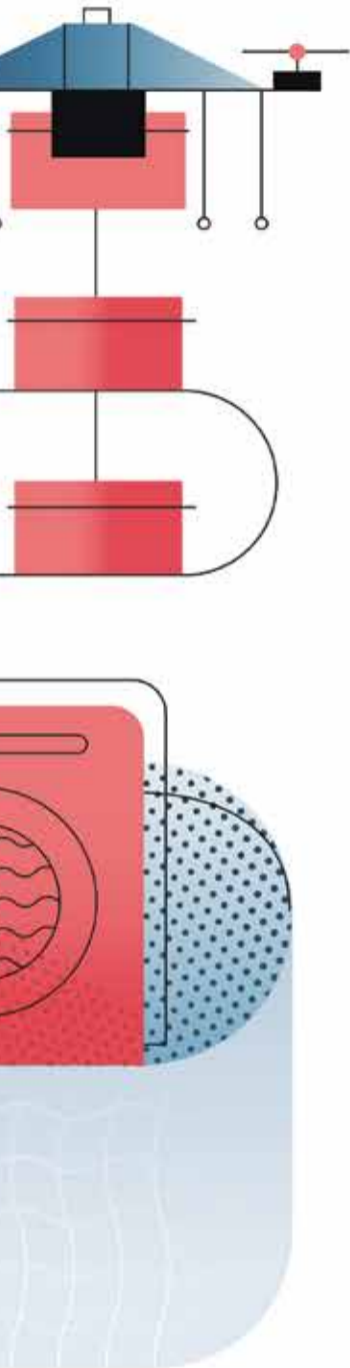
generation and weather can lessen the need for these backup mechanisms", by predicting and managing fluctuations in production.

AI research is also investigating decision-making with a "scale and complexity that begin to exceed that manageable by a human operator", he says. For example, AI could be used to manage electricity shortfalls by briefly switching off power demand across entire communities or regions. "This might be thousands of refrigerators in people's homes or large

sites of demand, such as industrial plants," he explains. "The speed and complexity of this task requires advanced AI."

Ceding control of your home to a remote AI might seem like the stuff of science fiction, but the integration of AI into our appliances is already underway. For example, AI is being used to manage energy use in a device most of us use every day – mobile phones. The latest iteration of Google's Android phone operating system includes a function which studies your app habits to ensure

Enabling the growth of low-carbon, green electricity is an AI application with a potentially huge long-term impact



The use of AI enables the consumer to have foresight over their energy profile for the first time

home energy management systems where, for example, rather than turn on your washing machine yourself, you schedule it to run when the electricity price is going to be lower.”

Businesses can also benefit from such advances. British AI developer Grid Edge has created technology which enables firms to control energy use in their buildings, making the most of low-demand, cheaper periods of electricity supply. As a result, companies can receive payments from the National Grid for taking strain off the grid at peak times. Chief executive Tom Anderson says: “The use of AI, in our case predictive machine-learning algorithms, enables the consumer to have foresight over their energy profile for the first time.”

This means energy providers could find themselves running to catch up with increasingly sophisticated customers, changing the power dynamic between supplier and consumer. Mr Anderson says the next frontier for AI and energy will be about “reshaping the relationship between consumer and supplier”. He predicts peer-to-peer markets for sharing electricity and “prosumer” models, where consumers generate and sell their own power, will multiply.

Passing the reins for energy networks to AI means new risks can emerge. Dr O’Sullivan cautions: “As the grid becomes more automated, it becomes more susceptible to cyberattacks. One area we are interested in is using AI to defend the grid and minimise damage from targeted attacks.”

Another risk is the potential for customers’ data to be exposed. Google’s Android app algorithm, for instance, will build datasets from your behaviour patterns, although Google says this knowledge will be stored solely on your device.

Dr O’Sullivan concedes that data privacy is a big concern. “There is the potential for people to infer all sorts of information from energy data, from occupation patterns even to religion,” he says. “Beyond that, there is the socio-economic concern this technology might benefit only those who can afford it and trap those who can’t in a more costly energy system.”

Despite these risks, Mr Anderson is positive about the future of AI and energy. He says the data such technology provides will empower, not restrict, electricity users. AI, he argues, enables citizens to question and work out “what is best for me from a comfort, carbon and cost point of view”. With such a proactive approach, the consumer can begin to be better informed and empowered in how they chose to engage with the wider energy system around them. ♦

battery is deployed only on the ones you like the most. Meanwhile, rarely used apps, which would previously hum away in the background consuming power, are shut down.

AI can now also work out how much electricity each of your home appliances is using, too. UK startup Verv uses AI to find the “fingerprint” of each appliance, using data from your electricity meter. Home appliance manufacturers will come under increasing pressure to produce energy-efficient products. With access to exactly what it costs to run a dishwasher or TV, consumers could rapidly become disenchanted with power-hungry devices.

Dr O’Sullivan says the proliferation of virtual assistants in homes, combined with such data, could fundamentally disrupt the way we buy and use electricity. “The integration of energy data with products like Alexa and Google Home may lead to AI



Power to predict

Artificial intelligence and machine-learning are transforming the energy sector, says **John Hague**, senior vice president and general manager of AspenTech’s Asset Performance Management Business Unit

We are living in a world defined by digital transformation. The ongoing evolution of analytics and business intelligence, the explosion in big data and world-changing innovations across artificial intelligence, machine-learning and deep-learning are all converging to provide businesses with unparalleled insight and a new understanding of their customers, competitors, challenges and future potential. It is this enhanced understanding of the future business landscape, the power of predictive analytics, which is driving real change across the energy industry.

Twenty years ago, if a plant shut down, maintenance was a “necessary evil” with the bottom line taking a hit from the resulting days of unforeseen downtime. C-level executives of energy firms were making decisions without the power to predict. Like a seismologist tracking the next big earthquake, there was no sure way of knowing when the next shutdown would happen, causing profits to plunge.

It was a huge and seemingly intractable problem for industry to address. Nothing hurts a capital-intensive business like unplanned downtime. As an example, one large mid-stream oil and gas company was recently reported to be losing close to \$1 million for each failure of an oil well pump or pipeline compressor.

Companies have spent millions in the past trying to address the unplanned downtime issue, but until now they have only been able to address wear and age-based failures because they lacked insight into the process-induced failures that are estimated to cause more than 80 per cent of unplanned downtime.

Today, however, through advances in machine-learning and the science

of maintenance, energy firms are empowered with technology and real-time operational data that can detect breakdowns before they occur. With a stable plant and active assets, business leaders can plan, increase performance of their business and raise profitability, safe in the knowledge that plant maintenance is seen as a way of delivering value to the organisation, and not as a cost centre and burden. It’s a complete transformation, but how exactly has it come about?

The power to predict is driving positive change across the energy sector

Digitalisation is far from new to the energy industry, after all. Asset-intensive industries have been capturing reams of data, much of it from internet-enabled sensors, but also from data historians and other information sources, since the late-1970s.

That process has accelerated significantly in recent years. Energy and other companies in capital-intensive industries now have access to growing volumes of real-time data, as sensors become more pervasive and less expensive, and as advanced analytics are fed through increased connectivity. But this high-speed access to more and more data is not by itself giving decision-makers the time or the insights they need to break through operational excellence barriers.

Finding a solution: machine-learning and APM deliver results

The tipping point comes with the practical and reliable application of machine-learning. Asset performance management (APM) has always been key in this industry in keeping assets up and running, but it had previously relied on statistical projections and rule-of-thumb estimates to define likely future performance.

APM is evolving fast, driven by the catalyst of low-touch machine-learning. This represents a breakthrough in automating data collection, cleansing and analysis to provide prescriptive maintenance protection for equipment. The integration of the two marks a transition from estimated engineering and statistical models towards measuring patterns of asset behaviour.

Deployed coherently, with appropriate automation, low-touch machine-learning enables greater agility and flexibility to incorporate current, historical and projected conditions from process sensors, and mechanical and process events. Systems become more agile and are able to adapt to real data conditions – and incorporate the nuances of asset behaviour.

Now previous maintenance practices can be improved to recognise issues affecting asset degradation. Operational integrity improves when organisations implement strategies to detect root causes early and avoid unplanned downtime. The latest breed of APM solutions is ready to improve reliability, lift net product output and increase profitability, making it clear that the power to predict is driving positive change across the energy sector.

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