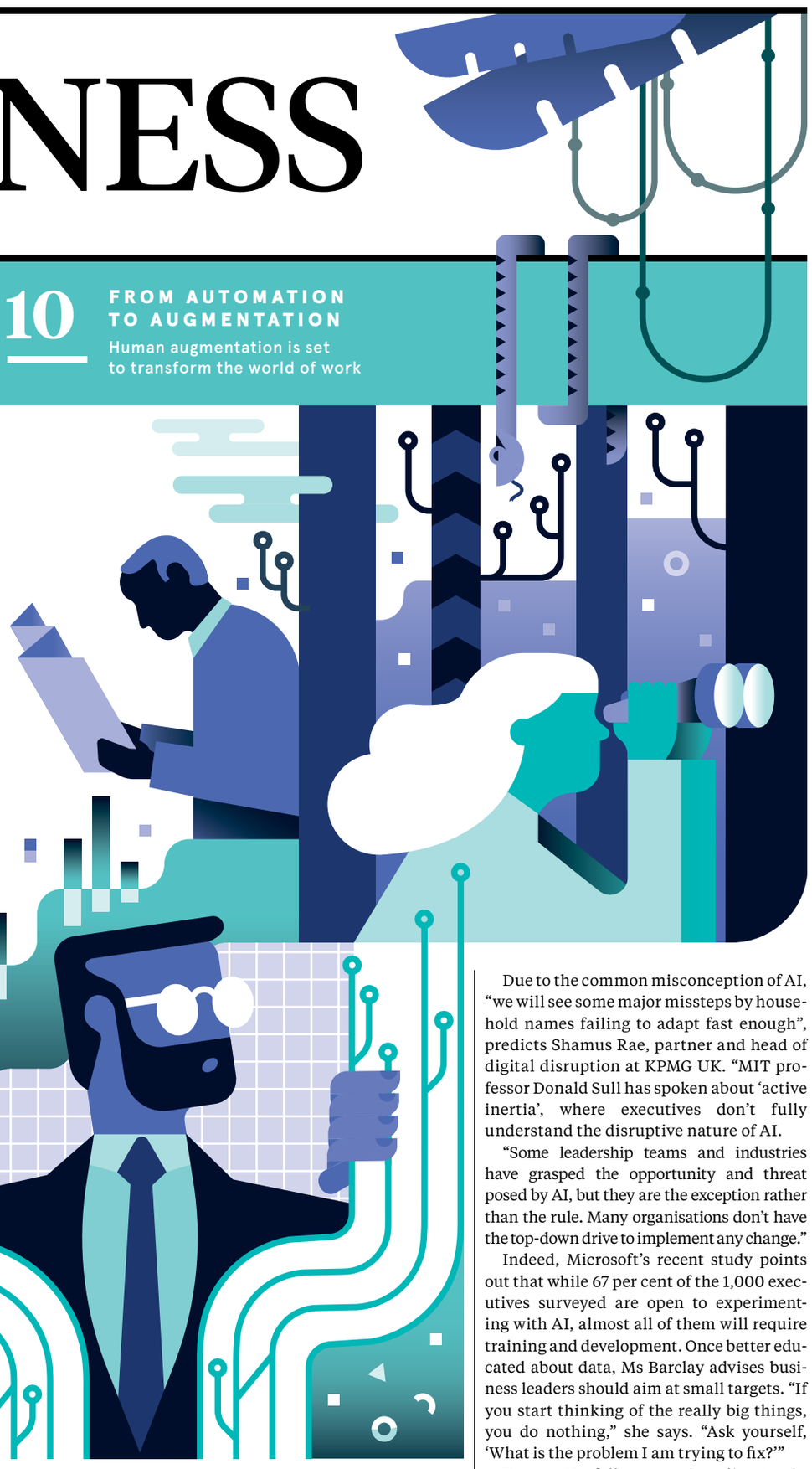
AI FOR BUSINESS



OPPORTUNITY

Navigating AI hype in search of success

Endless buzzwords and misconceptions confuse leaders and dilute the true purpose of artificial intelligence (AI) as a means to achieve business objectives rather than the end objective itself

Oliver Pickup

A couple of years ago, there was a joke doing the rounds at technology conferences that AI for business is like teenagers and sex: everyone talks about it, but few actually get it.

Is the ribald witticism outdated in 2019? Or has the increased hype enveloping AI that it will magically solve most business problems only further confused executives? So much so they are not engaging with AI's myriad technologies or are left clumsily fumbling with algorithms that fail to perform, while cannier rivals score big?

Moreover, has the crucial point that AI for business is best utilised as a means of achieving very specific, narrow-focused objectives, and is not an end point in itself, been obscured by the sheer volume of misleading buzz?

AI technologies are now being deployed in a wide range of industries, from healthcare to warfare, enhancing life and death, yet the individual applications are limited in scope to so-called "narrow AI". However, with the correct guidance it can drive cars, automate systems, understand speech, diagnose life-threatening conditions, and predict business outcomes in ways, and at a speed, beyond comprehension for us mere mortals.

"A big stumbling block for AI adoption has always been the term 'AI' itself," argues Antony Bourne, industries president of global enterprise software company IFS. "It misleads many businesses, suggesting a large, end-to-end system.

"In reality, AI is a collection of targeted technologies, from machine-learning to natural language processing and vision identification, from chatbots to analytics and automation, each with its own strengths and applications. What they all share is the intelligence factor: a high degree of accuracy and an incredibly fast, smart ability to learn from their mistakes."

> **AI can signal all the needles in all the haystacks of data they train on; humans must decide which of the outputs apply to the change the business is trying to introduce**

AI, then, is not the silver bullet, though it can be forceful if the user's aim is good. "AI can signal all the needles in all the haystacks of data they train on; humans must decide which of the outputs apply to the change the business is trying to introduce," says Jacqui Taylor, chief executive and founder of trailblazing web-science company Flying Binary, and smart cities adviser to the government.

Much like big data and analytics have joined forces to become a method for converting huge data volumes into next-level insights, organisations must pivot their approach to AI and realise it offers a cluster of powerful weapons for technological transformation, though is not the ultimate goal.

"AI is an arsenal: a vast array of techniques and technologies and research directions," says Marko Balabanovic, chief technology officer of Digital Catapult. "Members of the C-suite tend to underestimate how much AI systems are in daily use already. They also overestimate the speed with which it can be adapted and applied to solve their specific business problems."

Dr Will Venters, assistant professor of information systems and innovation at the London School of Economics' Department of Management, agrees. "Wars are never won by a single bullet, silver or otherwise," he says. "AI can only ever be part of the complex digital ecosystem upon which businesses depend. Only if the whole digital ecosystem is efficient, well managed, strategic and agile can AI achieve its potential."

Microsoft's *Maximising the AI Opportunity* report, published in October, reveals that early adopters of AI for business in the UK have already seen a 5 per cent improvement in productivity, performance and enterprise outcomes, compared with those that have not explored its growing range of capabilities.

"As AI reshapes organisations and becomes an evermore important part of our lives, the opportunity for UK businesses is enormous," says Clare Barclay, chief operating officer of Microsoft UK. "Yet despite this opportunity, 51 per cent of business leaders still say their organisation does not have an AI strategy in place.

"Add to this the fact that 41 per cent of leaders believe their current business model will cease to exist within five years and there's a clear need for organisations to act today."

Given that 450 billion business transactions will take place via the internet every day by next year, according to International Data Corporation projections, it is hard not to conclude that the AI challenge must be tackled, head on, before it is too late.

Due to the common misconception of AI, "we will see some major missteps by household names failing to adapt fast enough", predicts Shamus Rae, partner and head of digital disruption at KPMG UK. "MIT professor Donald Sull has spoken about 'active inertia', where executives don't fully understand the disruptive nature of AI.

"Some leadership teams and industries have grasped the opportunity and threat posed by AI, but they are the exception rather than the rule. Many organisations don't have the top-down drive to implement any change."

Indeed, Microsoft's recent study points out that while 67 per cent of the 1,000 executives surveyed are open to experimenting with AI, almost all of them will require training and development. Once better educated about data, Ms Barclay advises business leaders should aim at small targets. "If you start thinking of the really big things, you do nothing," she says. "Ask yourself, 'What is the problem I am trying to fix?'"

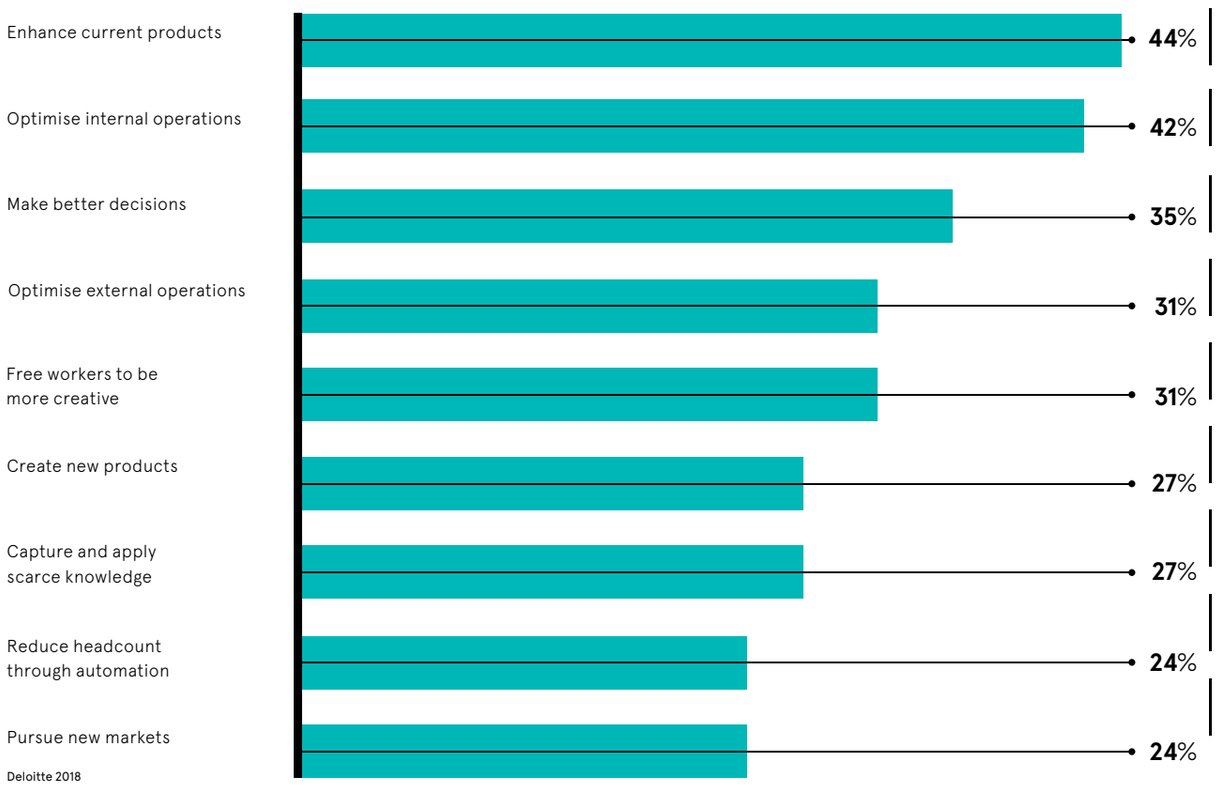
Darren Norfolk, managing director in Europe, the Middle East and Africa for cloud computing company Rackspace, echos this warning. "AI has massive potential for organisations, particularly in improving productivity and customer experiences," he says. "There's a temptation to 'keep up with the Joneses', with some firms taking a magpie approach to AI-based technology purchasing.

"But enterprises risk doing so at the expense of their authenticity and what makes them special. Business leaders must ensure they don't get blinded by the bright lights. Creating a robust plan for where AI technologies can authentically augment and improve existing market differentiators is key to driving return on investment."

Dr Taylor at Flying Binary stresses the urgency required for business leaders to engage with AI. "Within the next five years, every single sector will begin to use machine-learning, AI and deep learning," she says. "Although many businesses will deploy these technologies, the organisations which will benefit the most are those that realise the tech is not the outcome, it is the enabler."

LEADING BENEFITS OF AI ADOPTION

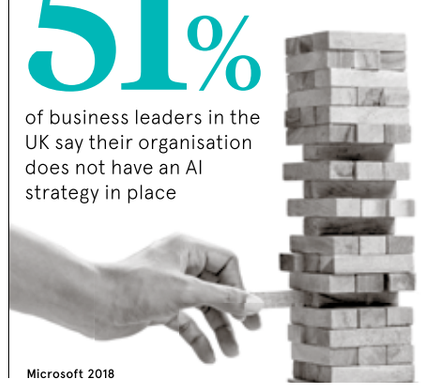
Percentage of US IT leaders and business executives who rated the following as a top-three benefit



Deloitte 2018

51%

of business leaders in the UK say their organisation does not have an AI strategy in place



Microsoft 2018

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Contributors

Adrian Bridgwater
Specialist author on software engineering and application development, he is a regular contributor to *Forbes* and *Computer Weekly*.

Tim Cooper
Financial journalist, he has written for publications including *The Spectator, London Evening Standard, Guardian Weekly* and *Weekly Telegraph*.

James Gordon
Journalist and executive writer, he has written extensively on business, technology, logistics, manufacturing and sport.

OIiver Pickup
Award-winning journalist, he specialises in technology, business and sport, and contributes to a wide range of publications.

Daniel Thomas
Writer and editor, he has contributed to the *BBC, Newsweek, Fund Strategy* and *EducationInvestor*, among other publications.

Davey Winder
Award-winning journalist and author, he specialises in information security, contributing to *Infosecurity* magazine.

Emma Woollacott
Specialist technology writer, she covers legal and regulatory issues, and has contributed to *Forbes* and the *New Statesman*.

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Publishing manager
Helen Glynn

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RESPONSIBLE
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Enterprises enter the next phase of AI

As chatbots powered by artificial intelligence reach a level of maturity in contact centres, businesses are looking to other parts of the organisation where this kind of automation can bring value

The journey to deploying chatbots hasn't been an easy one for enterprises. Ten to fifteen years ago, when companies first started experimenting with them, consumers were exposed to several bad implementations due to the immaturity and poor implementation of the technology.

The natural language processing that powers conversational artificial intelligence (AI) experiences has developed considerably since then, and is now capable of powering seamless and authentic interactions that reflect human conversations. While there are still things AI cannot do, its ability to understand intent and match it to existing content has enabled companies to transform how they engage with customers across the entire journey.

In retail, for example, AI chatbots are being used to help customers easily find answers to frequently asked pre-order questions, such as what types of delivery options are available, active order questions like where an item is or how it can be returned, as well as for post-order onboarding and troubleshooting.

"The technology behind chatbots and the quality of conversation is so much better than it used to be," says Sandra Schroeter, international head of customer engagement technologies at LogMeIn, which provides AI-powered customer engagement solutions for companies of all sizes. "AI won't answer 100 per cent of questions, but it does remove the simple repeatable queries from the live agents' plate so they can spend more time with the customers who need them most.

"With Bold360, LogMeIn's first product to leverage conversational AI for customer experience, if the chatbot doesn't know the answer or identifies a high-value transaction that requires a human touch, the technology can seamlessly transition the customer to a human agent, including the full context of the interaction. Further, the bot stays as an active participant in the conversation, helping both the customer and agent along the way."

Beyond customer service

With contact centre deployments of chatbots becoming more mature every day, use-cases are now expanding as enterprises become more accepting of AI and are increasingly inspired by the value it brings to the business. Sales and marketing functions are leveraging the capabilities to transition chatbots from being a simple hub of knowledge for customers to using them to help proactively assist in the buying process by providing customers content and suggestions as they are shopping.

Within the same example of retail, companies are beginning to use chatbots not only to help customers make the right purchasing decision, but also actively encouraging them to do so. AI technology can recognise when users are browsing an item and offer help in finding what they want, while guiding them through to the transaction stage. By providing automated assistance, retailers can reduce the costly issue of returns.

Further use-cases are emerging to assist human staff in customer service or to enable all employees to find answers quicker for questions relating to core business functions such as human resources and IT. Internal chatbots enable companies to keep information consistent during onboarding and regular training, for example, or to help employees easily reset passwords if they forget them. This reduces the volume of inquiries coming into help desks and keeps employees productive.

Organisational culture shifts

As these new customer and employee engagement technologies continue to increase in momentum, more and more organisations are creating executive-level roles to help navigate this new way of doing business.

"As Bold360 continues to evolve in both technology and use-cases, the decision-makers within our customer organisations have varied quite a bit," says Ms Schroeter. "Where a deployment like ours might have been an IT decision a few years ago, today the driving force behind these types of new technologies is coming from positions like chief digital officer or chief innovation officer."

> **"Creating a good harmony between bots and humans will allow companies to leverage the full potential of their human workforce, and will result in happier and more productive employees**

Hiring somebody into such a role helps to lay down a strong foundation for businesses that want to move to this next phase of AI, positioning them as internal champions for digital transformation. According to analyst firm Forrester[1], companies that fail to differentiate their customer experience will engage in price wars that may reap short-term gains, but will lead to a destructive race to the bottom in the long term.

These hires can also lead the crucial task of overcoming the cultural barriers that may stand in the way of expanding the influence of AI within organisations. Some people naturally feel threatened by the prospect of tasks and processes being automated, so it's important to educate them on how AI deployments will benefit them.

"Like any digital transformation project, bringing your people along the journey with you is crucial for adoption, especially when it comes to AI," says Ms Schroeter. "Employees need to establish trust in the technology and be given the opportunity to see it as a colleague, rather than something that will threaten their jobs. There is no denying that AI will likely impact our workforce in a similar way to other technology advancements, but it will more likely evolve job roles, not eliminate them. In fact, many of the jobs that our children will have don't even exist yet. AI brings change and with it a lot of opportunities.

"From a cultural and organisational perspective, educating the workforce on these opportunities will be an important first step. AI has the power to make all our jobs easier by allowing us to step away from monotonous tasks and focus on what we do best: being human. Creating a good harmony between bots and humans, where humans can focus their days on being strategic, empathetic and creative, will allow companies to leverage the full potential of their human workforce, and will result in happier and more productive employees."

And it's this harmony where LogMeIn's Bold360 shines. As a customer experience platform that delivers both AI and agent technologies, Bold360 is the foundation for the triangular collaboration between agents, customers and AI. Customers can communicate both with AI-powered chatbots as well as with live agents. Agents can communicate directly with customers while receiving help from AI on the backend. And the AI learns from both the customers' and agents' interactions to ensure it is always improving.

"While AI is becoming a critical piece of an overall customer experience strategy, the human component is equally crucial," says Ms Schroeter. "As companies start down their AI journey, it's a good idea to identify an area where AI can have the biggest immediate impact, test the technology, educate and bring employees and customers along with you, learn, adjust and expand from there. AI is having an undeniable impact on business success, if implemented the right way. Those that are getting on board now are in a position to differentiate themselves from competitors; those that don't are getting left behind."

SEVEN MYTHS OF CUSTOMER EXPERIENCE

What companies report and what consumers experience are at odds

88%

of businesses are investing in or exploring AI

88%

believe they provide excellent to very good service. Only 21 per cent of consumers rated their most recent interactions as "excellent"

11 hours

is the average time taken for a client's interaction with a brand, to be solved

71%

of businesses believe chat with bots and agents will be one of the most common channels within three years

49%

of customer enquiries are resolved during the first interaction

65%

of businesses said that AI would allow them to retrain their agents, or shift them to new types of work

76%

of businesses believe AI is changing the customer experience for the better

2018 *AI Customer Experience Report* by LogMeIn

[1] Predictions 2019: Customer Experience Customer Experience Comes Under Fire, November 5, 2018, Forrester Research, Inc.

Agents work hand-in-hand with AI

See Tickets turned to Bold360 when its call centre and live chat software could no longer cope with the demand of answering questions from millions of eventgoers

Global ticketing services firm See Tickets sells and distributes millions of tickets for music, theatre, festival, sport, comedy and lifestyle events each year. As a result, it must deal with a huge volume of incoming customer inquiries every day.

In 2015, it sold all 150,000 tickets for that year's Glastonbury Festival in just 29 minutes, but the subsequent questions it had to field from customers placed enormous pressure on staff. Working with more than 5,000 clients globally and with over 40,000 events on sale, the onus always was on the customer service team to answer queries on each one.

"It was labour intensive, costly and almost impossible for staff to know every detail about every event from a customer service perspective," says Rob Wilmshurst, chief executive at See Tickets. "We needed to move away from call centre activity and live chat software."

Though the nature of the challenge made automation a strong fit, See Tickets had never implemented artificial intelligence (AI) before and it didn't seek a specific technology. "We're committed to the best in client and customer service and any tool, AI or not, that helps us achieve that in a cost-effective manner would be considered," says Mr Wilmshurst.

Following a live demonstration of LogMeIn's Bold360, an AI-powered customer engagement solution, See Tickets could instantly see the software would be able to provide accurate and fast information to its customers, as well as drive large cost savings. Bold360 empowers businesses to create better experiences in their current and future engagements in a scalable way.

"Inside minutes, we set up a few frequently asked questions and challenged the platform with a range of sometimes deliberately stupid questions to see how it responded," says Mr Wilmshurst. "It responded accurately and we were immediately impressed. The interface is very simple to understand and gave us confidence this was a tool the existing call centre and customer service staff could work with."

Thanks to Bold360's simple and intuitive set-up process, See Tickets was able to deploy the technology immediately to its customer service team with minimal effort from the technical parts of its business.

Since using the AI chatbot, See Tickets contact centre volume decreased considerably. Previously, every single inquiry required human interaction, but the new technology means 95 per cent of inquiries are now handled without any human interaction at all.

The software has also provided new insights for See Tickets. It analyses customer intents across channels, displaying the voice of the customer in real time and enabling businesses immediately to resolve friction points in the customer journey.

Insights from AI-driven engagements constantly fuel customer experience strategies, enabling businesses to leverage the voice of the customer to improve strategic decision-making across the business. In addition, Bold360 gives managers the flexibility to view an overview of trends and to dissect data by context, geo-location and customer profiles. With a complete view of the customer, it enables users to improve strategic decision-making across the business.

The real-time statistics interface enables the See Tickets customer service team to see what issues are impacting the business at any given time. Through those insights, they can alert management or clients and quickly find a resolution, acting as an early-warning system that steers the company away from potential problems.

> **"We are committed to the best in customer service. With Bold360 our customers get accurate and consistent information, that has been pre-qualified by our team. 95 per cent of the enquiries are now dealt with without any human interaction**

This means See Tickets human agents are now able to focus on higher-value and more complex conversations and tasks, including making sure the information on Bold360 is as good as it can be. Customers get accurate and consistent information that has been pre-qualified by the customer services team and tuned by the platform, while See Tickets gets more productive agents.

"Reviewing the statistics in real time allows staff to see how the answers are being received and rated by the customers," says Mr Wilmshurst. "Where necessary, staff can adjust the answers or create new or supplementary ones knowing the platform will assimilate these into its knowledge base and start to rely on these immediately."

For more information please visit bold360.com

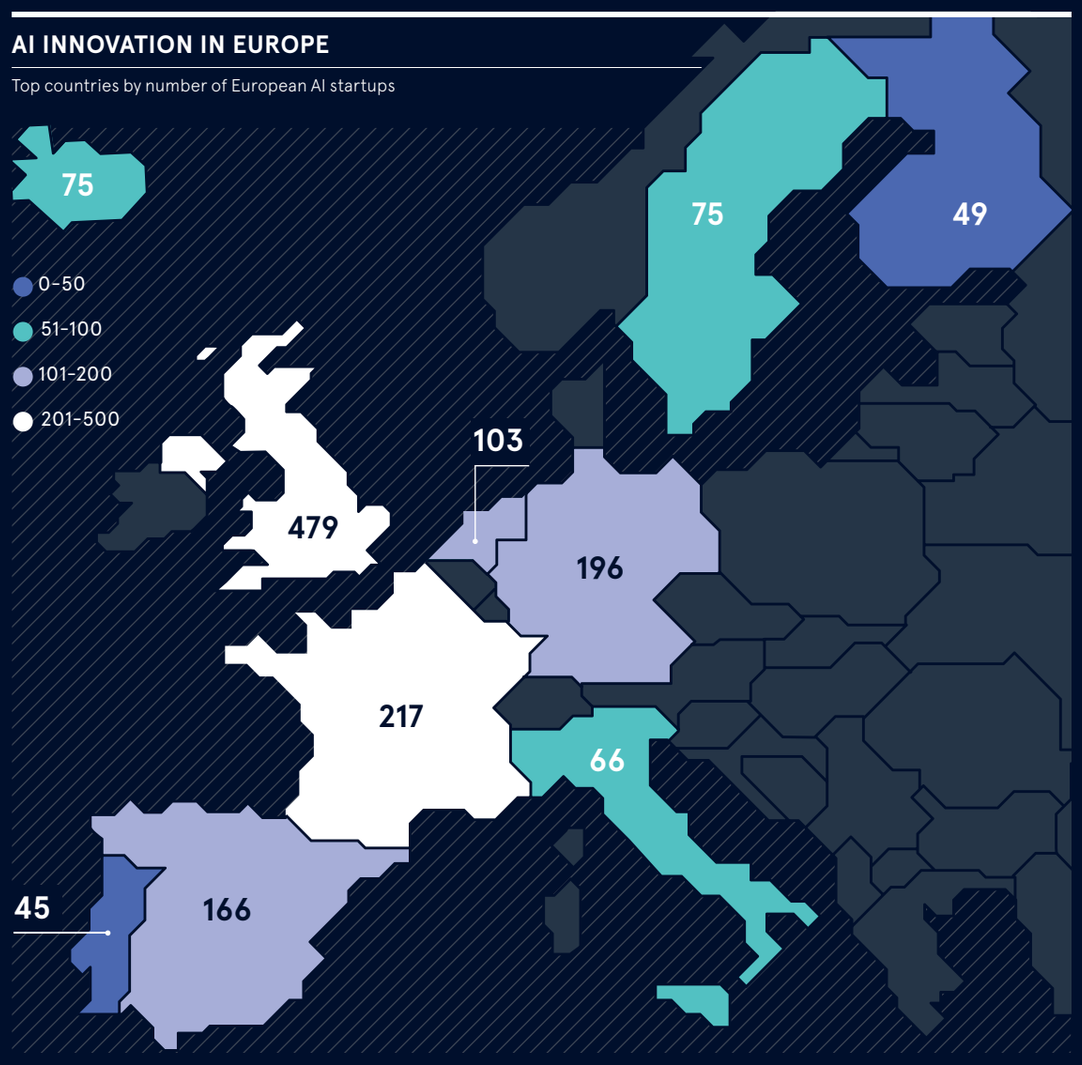
bold360 by LogMeIn

AI LEADERS

There has been a 270 per cent increase in the number of enterprises implementing AI over the past four years, according to research by Gartner, but which countries, sectors and companies are leading the way in terms of deployment? This infographic explores how AI is being adopted in different industries, and where innovation is stemming from

AI INNOVATION IN EUROPE

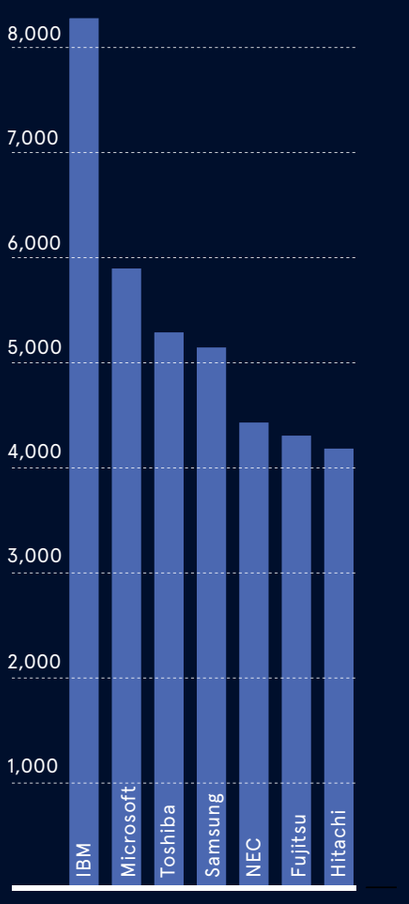
Top countries by number of European AI startups



MMC Ventures/Beauhurst/Crunchbase/Tracxn 2019

SOURCES OF AI INNOVATION

Top applicants by number of patent families



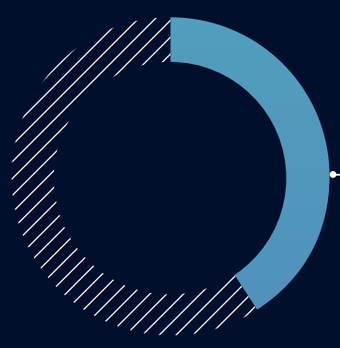
World Intellectual Property Organization 2019

TOP AI APPLICATIONS IN USE

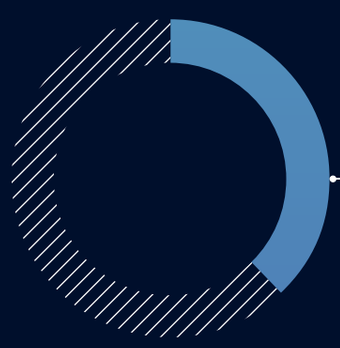
Percentage of companies that are focused on the following use cases of AI

47% IT automation

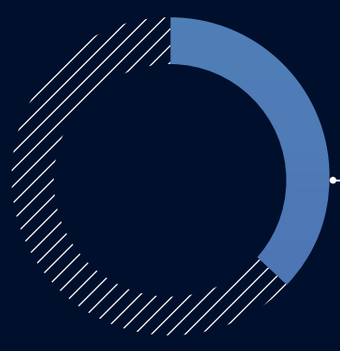
46% Quality control/ detecting defects



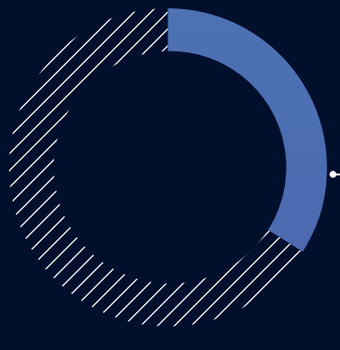
41% Cybersecurity



38% Predictive analytics



37% Customer service

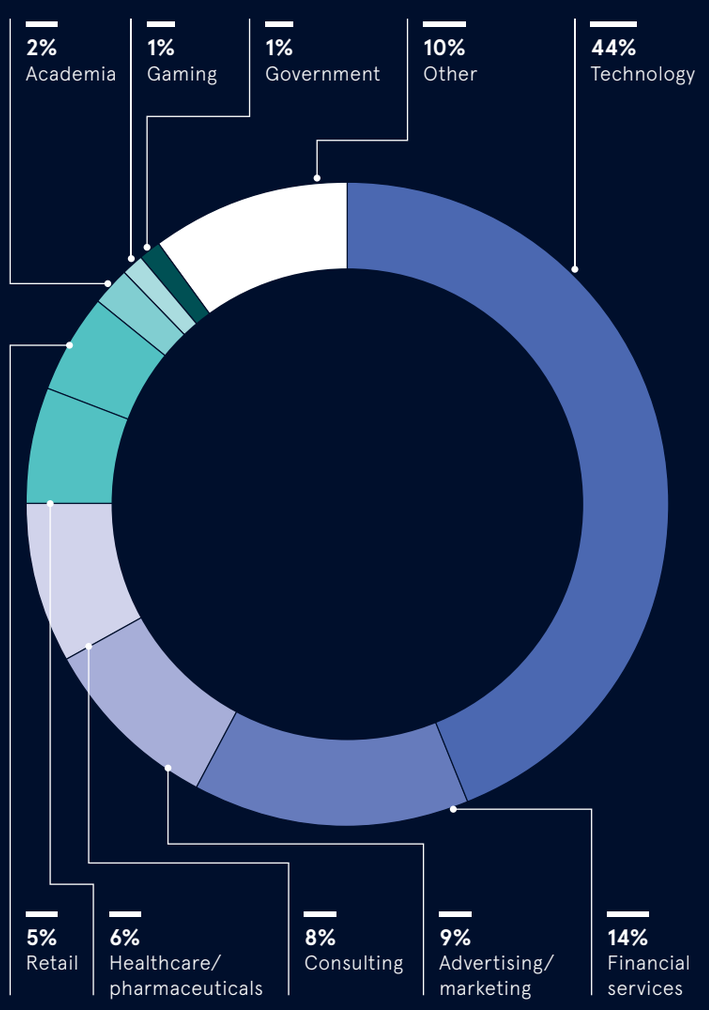


34% Risk management

Deloitte 2018

WHERE THE AI TALENT WORKS

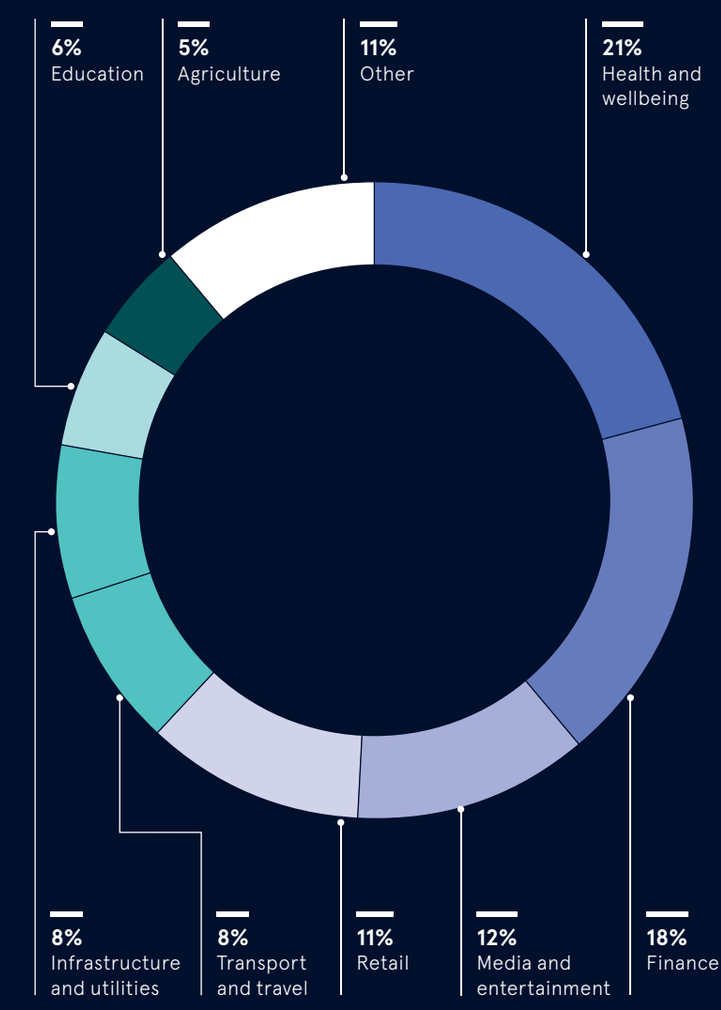
Distribution of data scientists by sector



Burtch Works 2018

TOP SECTORS FOR AI STARTUPS

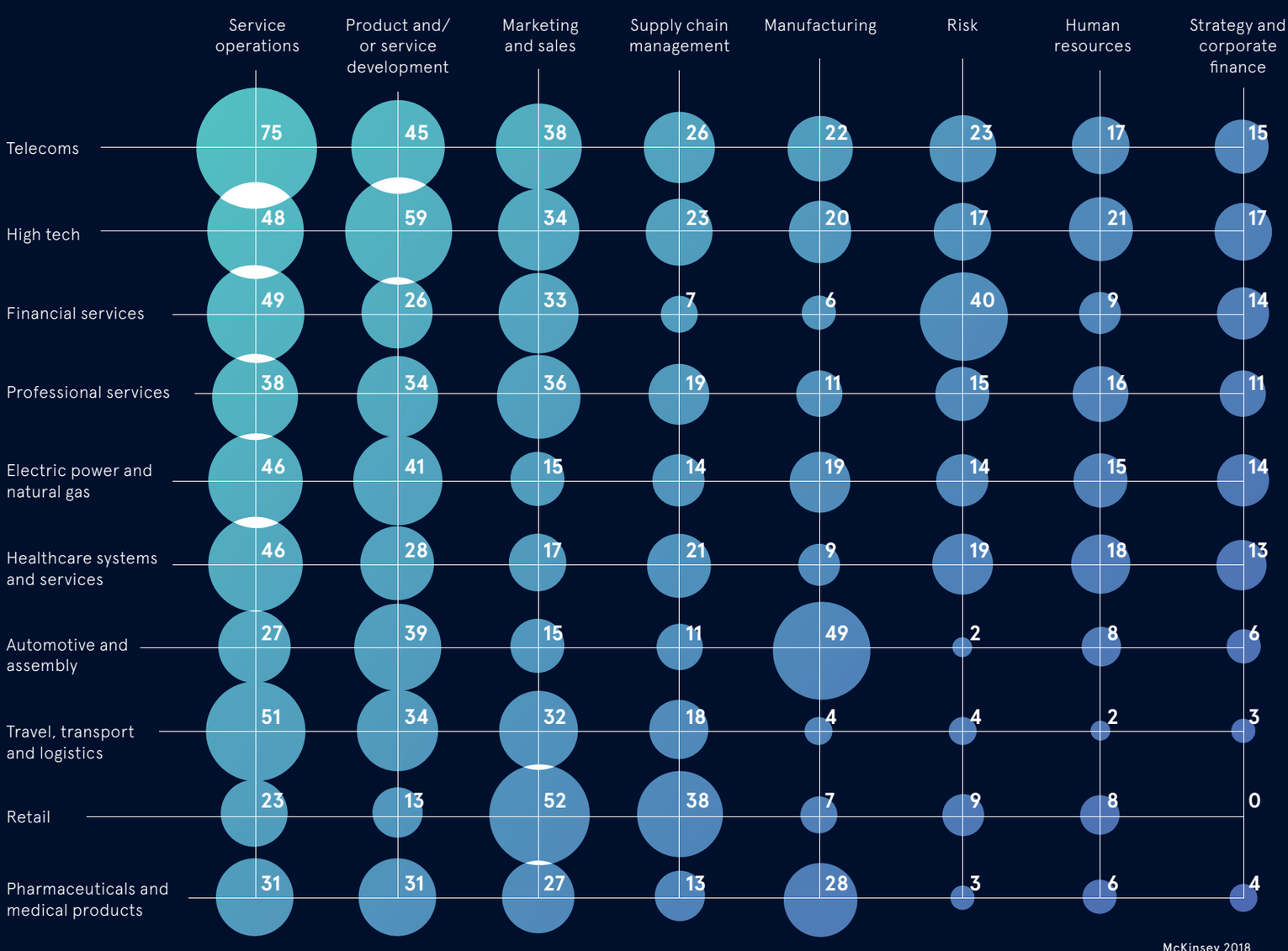
Distribution of AI startups by sector



MMC Ventures/Beauhurst/Crunchbase/Tracxn 2019

AI DEPLOYMENT BY INDUSTRY AND FUNCTION

Percentage of companies that have deployed AI within the following business functions; survey of companies who have piloted and embedded AI only



McKinsey 2018

GLOBAL SECURITY

When AI and national security collide

Their stranglehold on data has brought into question big tech's role when it comes to national security and what the future holds for the development of nation-state artificial intelligence

James Gordon

Marco Restivo/Getty Images

For many it conjures up images of machines replacing human beings in the workplace, but artificial intelligence (AI) could have an even darker side. What if AI were to be misused on the battlefield? What if the armies of tomorrow were to create robot armies that could decide through the narrow lens of AI who lives and dies in the theatre of war? What if the fighter jets of the future no longer needed pilots and used AI-driven autonomous weapons systems instead?

Of course, the picture this paints has more chance of being played out in a Hollywood science-fiction film than in near-time reality, but nevertheless it does raise important questions concerning how we should respond to AI in the future.

Take the so-called tech titans, many of whom must answer to their shareholders, for example. All are deeply wedded to environmental, social and governance or ESG for short. Whether those in charge actually believe in ESG is not the point. The point is that it makes them money and helps them attract the brightest staff. After all, who wouldn't want to be paid a lucrative salary to work for an ethically minded company?

But there may be a downside to ESG. Could it be, for example, that a set of standards, which openly encourages businesses to champion social good, is actually putting global security at risk from rogue states? Take Microsoft, for example. In February, Microsoft employees urged its chief executive not to honour a $479-million contract to make 100,000 augmented reality headsets for the US military.

Elsewhere, Google bowed to pressure after more than 3,000 Google staff expressed their dissatisfaction at the company's decision to work with the Pentagon on Project Maven. Google employees feared Maven, which uses AI technology to improve images on the battlefield, could one day be used to improve the accuracy of drone strikes. Last June Google announced that it was not renewing the contract.

But there's the rub. Many tech giants not only operate an ESG business model, but also appear to have a firm stranglehold on research and development. Ewan Lawson, senior research fellow at the Royal United Services Institute (RUSI) and an expert on cyberwarfare capabilities, says: "It's impossible to avoid the fact that the big tech companies have a critical role to play in considering future national security challenges, including AI, given their role in developing the sort of technologies which can and will be exploited.

"The companies and their employees may have ethical concerns and governments need to ensure, therefore, that they engage openly about the purpose of any programmes that involve AI for national security purposes. That said, there are plenty of small tech startups that could be encouraged in this space if the larger companies, or their employees, decided it wasn't a part of business they were interested in being involved in."

But in an age of data, some believe that the tech titans' stranglehold on data makes them indispensable. Could their reluctance, therefore, to develop AI systems for the military in the future give rogue states, whose state-sponsored technology companies have no such qualms in doing so, a clear advantage over Nato armies on the battlefield?

Professor Alan Woodward, computer security expert at the University of Surrey, does not think so, at least not yet. He explains: "There's no doubt that this presents a problem for armies in the West, especially when you consider that many of them, including the US and UK militaries, rely on commercial contractors to supply them with technology and high-tech weaponry.

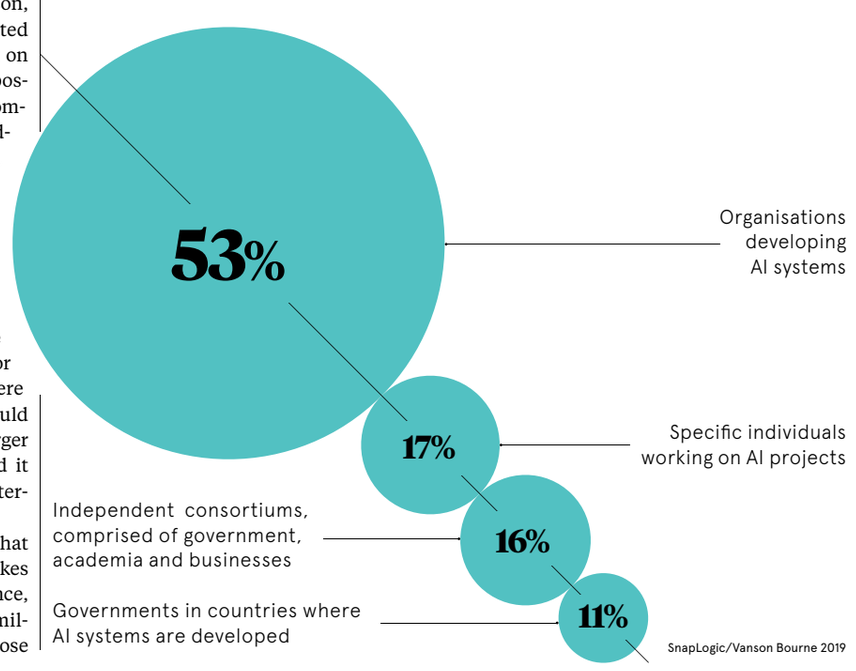
"But Google not wanting to be in 'the business of war' does not put our national security at risk in the long term, providing Western governments using the commercial off-the-shelf [COTS] system take urgent steps to rectify the situation in the next two years. If they do nothing, however, then it could give China, a country that wants to be the world leader in AI by 2030, and Russia the upper hand."

Kevin Curran, professor of cybersecurity at Ulster University, agrees that a short interregnum period will not endanger global security. On the contrary, he says, it could actually make us all safer.

Professor Curran explains: "Google pulling out of a military contract may cause a financial and logistical headache for the Pentagon in the short term, but the US, UK and Nato countries should see it as an opportunity to get rid of the COTS system, which is expensive, and develop their own AI software. Furthermore, operating systems that work well in civvy street aren't always transferable to the battlefield."

WHO BEARS PRIMARY RESPONSIBILITY FOR ETHICAL AI DEVELOPMENT?

Percentage of US and UK IT leaders who agree with the following



SnapLogic/Vanson Bourne 2019

> **Governments need to ensure they engage openly about the purpose of any programmes that involve AI for national security purposes**

Take the Trident missile system installed on Royal Navy Vanguard-class submarines, for instance. It runs on a bespoke version of Windows XP, which Professor Curran says "makes it much more susceptible to malware than a military-built operating system".

It is a view shared by Professor Woodward, who adds: "When private civilian contractors build software and hardware for the military, the systems have to be 'hardened' before they can be used on the ground. This adds an extra step to the process and, in a time when armies are being cut, this could save valuable funds that could be spent elsewhere."

But is it really possible to think that the armies of tomorrow can become self-reliant and build AI systems in-house? They may be able to construct their own operating systems and software, but with "data being the new oil" and the tech unicorns having a monopoly on it, what if these leviathans choose to limit licences for civilian use only?

Professor Woodward says: "I think they would be naive to do this. If they did, rogue states would simply find a way of circumnavigating the restrictions. And what's more, the companies responsible for the curbs would probably never know and, even if they did find out, there would be very little they could do. So I don't see the data giants imposing controls on who can and cannot access data."

Instead, if the tech behemoths and the military want to continue collaborating, RUSI's Mr Lawson says that "the onus is on governments to make the tech giants part of the conversation".

"Traditionally, the UK and US have been very secretive regarding their cyber-capabilities. That needs to change. No one's asking them to reveal what they do. Instead, they just need to enter into a more open dialogue with large private sector data companies and involve them regarding what future safeguards we need to put in place and why."

Commercial feature

Technologies collide to accelerate the value of data

Artificial intelligence, the internet of things and 5G technology are converging to present a huge opportunity for companies to gain great value from data. But they will not be able to do so unless they can store, manage and automate data at serious scale

A coincidence of transformational innovation is emerging in the coming years. Artificial intelligence (AI), the internet of things (IoT) and 5G are disruptive technologies in their own right, but they happen to be rising together and when deployed in conjunction they become something even more powerful to businesses wanting to leverage the full force of data.

> **The application of AI and the challenges of extracting more value from data will move on to steroids in the IoT and 5G era**

Enterprises already have a huge amount of data at their disposal and have begun to manage that data more strategically in recent years. In industries including autonomous driving, life sciences, retail and finance, where the most valuable data sets are particularly large, companies are implementing their first AI production systems to bring new experiences and services to their consumers, and to realise the potential locked in that data.

With wider availability and capabilities for IoT and 5G technology on the horizon, however, AI use-cases are set to multiply rapidly. As creation rates of information spirals through 5G, and IoT brings data storage closer to the users, companies will need to take more advantage of streaming analytics and AI to manage data and deliver ever-richer and faster services to their consumers.

"The application of AI and the challenges of extracting more value from data will move on to steroids in the IoT and 5G era," says James Coomer, senior vice president for products at DataDirect Networks (DDN), a leading supplier of high-performance data management solutions for customers at scale. "But when you need to apply advanced analytics just to cope with your data volumes and optimise your network streams, how do you build an environment scalable and sophisticated enough to ensure your business is managing its data?"

As data volumes continue to grow, companies face the challenge of extracting value at organisational scale. Managing data is now not just about operations and life cycles, it's about ensuring data with value isn't hidden, lost or underutilised.

DDN has been well focused on these challenges. Last year it acquired Tintri, which implements advanced analytics that can drive efficiencies that would be extremely difficult and time consuming for administrators. The technology detects anomalies, inefficiencies and poor policies, and delivers actionable, high-level advice on how to create a more efficient data environment.

So DDN doesn't just store data; it is also building the mechanisms, tools and software to enable companies to optimise their end-to-end AI process. In the autonomous driving use-case, for example, neural network models are trained using supervised learning techniques and virtual training environments designed to prepare a model for production. Evidently, the development process for a self-driving car needs to be as close to ideal as possible to ensure it is optimally prepared for the road.

"There is a big area of oversight, audit and governance around the AI training and production cycle, and we work closely with a company called Dotscience, which is building this kind of software," says Dr Coomer. "Within DDN, the focus is also on maximising the movement of that data at extreme scales. We have for 20 years worked at the upper echelons of data challenges of scale, movement, ingest and manipulation, all with predictable, low latencies. That storage engine is crucial for what's coming.

"It's tough working out which data has the most value, where it is, where it's replicated, how you can move it and how best to apply analytics. To do that on an organisational scale with the sizes of data that AI is going to bring about requires new levels of automation in the storage environment.

"DDN delivers simple visibility into your storage and our technology allows us to move towards full automation of data management, which is a necessary step to overcome the challenges of competing in the world of IoT and AI."

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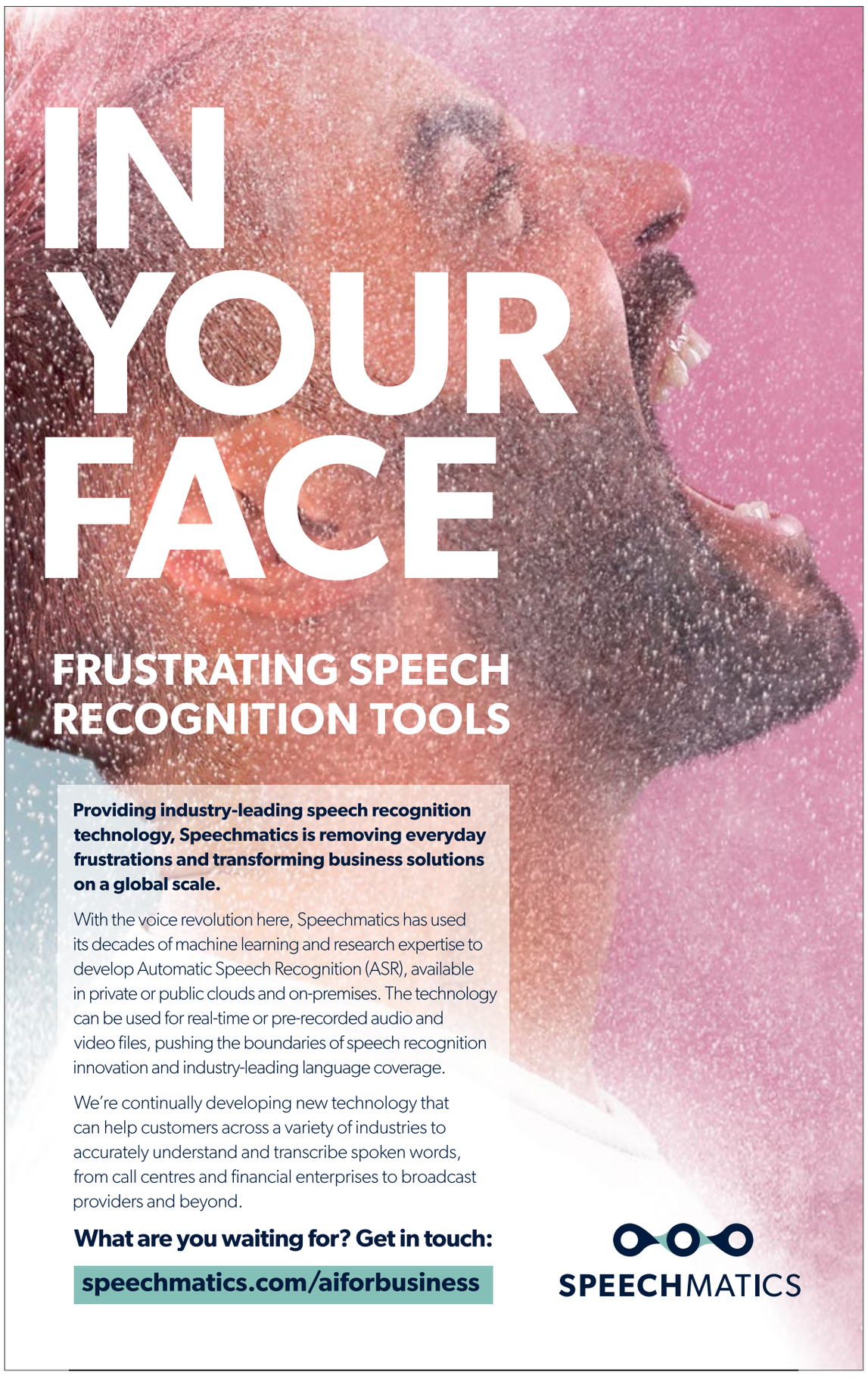


SOCIAL GOOD

Four ways AI is being used for social good

Beyond efficiency savings in the business world, organisations are using artificial intelligence to tackle some of the world's most pressing social issues

Tim Cooper

The explosion of artificial intelligence (AI) is not just a boon for business. It is also helping solve some of the world's biggest social problems, from reducing crime to eradicating disease and tackling climate change.

The amount of available data and technology that can process it intelligently has snowballed as the internet has increasingly integrated with our lives through tablets, phones and wearables. The advent of the internet of things – the extension of internet connectivity into everyday objects – has taken this even further.

These advances have enabled a wide range of bodies, including companies, governments and non-governmental organisations, to start working together to use AI for social goals and has already produced some groundbreaking results in vital areas. And some of the most powerful organisations in the world, such as the US government, Google, Microsoft and Facebook, have all deployed AI for positive social initiatives.

"I hope that using AI to address areas like hunger, disease and poverty will make us better humans

1

Zika crisis

IBM Research's Science for Social Good initiative has, among many other things, produced a project that helps stop the spread of the deadly Zika virus. The initiative, run in collaboration with the Cary Institute, uses machine-learning techniques to identify surveillance priorities in the battle against the virus.

By analysing data on viruses and the primates that carry them, then comparing these traits to 364 primate species around the world, the model identifies known carriers with 82 per cent accuracy and assigns risk scores to other likely Zika carriers. It then produces an interactive map showing where people are most at risk.

Despite the huge advances in technology, Saska Mojsilovic, head of AI foundations at IBM Research, says initiatives like these come with big challenges.

"Society doesn't have enough of the right mechanisms to invest in such development," she says. "We typically invest in revenue-generating applications of AI rather than these less comfortable social issues.

"Any such initiative needs three things: to understand the problem, to find funding and to find the skills to develop it. Companies are often best placed to co-ordinate this because they can have control of all three. However, with humanitarian work, the knowledge of the problem is with people working on the frontline. We don't yet have good mechanisms to join these two together or with funding institutions such as governments or big foundations.

"Another mistake is to think the technology will perform miracles. Every technology is just one piece of a bigger equation. So it's important to study the solutions in the context of end-users."

2

Countering crime

AI is also being used to protect the public against crime, including terrorist attacks. For example, Carnegie Mellon University has been working with the US coastguard to use AI in protecting the Staten Island Ferry, which carries more than 60,000 passengers a day, against potential attacks.

Fei Fang, assistant professor at the university's Institute for Software Research, says: "We have proposed a branch of AI called game theory that helps solve security problems. This helps the coastguard by suggesting randomly changing patrol routes to improve overall protection. We used a similar paradigm for tiger conservation in Southeast Asia, and to help rangers protect wildlife and reduce poaching in Uganda. The result in those was more snares being found."

Dr Fang says one of the biggest limitations of any AI project is that humans must ultimately use and interpret the data.

"AI can't replace human work in many cases," she says. "We suggested patrol routes for the rangers, but the rangers do the job and still have to use their expertise to identify the snares.

"It can be hard for academics and government or NGOs to understand each other's language, what is important in their field and what AI is capable of. It needs education both ways."

3

Emergency information

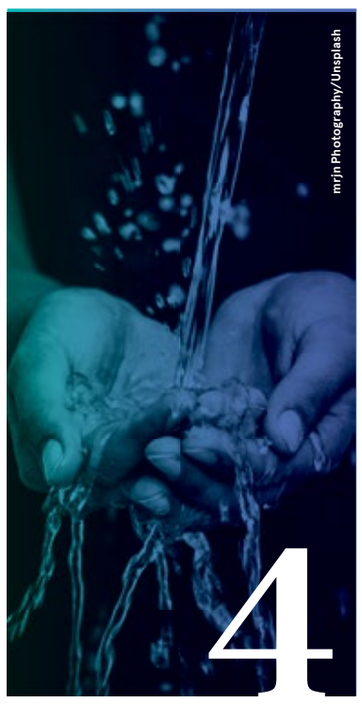
Google's AI for Social Good initiative aims to support and fund ideas on how AI can help address the world's biggest societal problems.

One development with a high impact has been Google's Public Alerts and SOS Alerts, which use AI to make emergency information more accessible. Since its launch in 2017, the scheme has activated more than 200 SOS alerts and tens of thousands of public alerts, which have been viewed more than 1.5 billion times.

Google also has a major project to help predict flooding. Every year, floods affect an estimated 250 million people around the world and cost billions of pounds in damages. Google is using AI with a wide range of data to create better models that predict when and where floods will occur, then incorporating that information into public alerts. The first alert went out in India in September 2018. Google is also building similar initiatives for predicting earthquakes and wildfires.

A Google spokesperson says these initiatives create wide-ranging challenges and risks. To help mitigate them, it has set guidelines that AI should be socially beneficial, avoid creating or reinforcing unfair bias, built and tested for safety, accountable to people, incorporate privacy design, uphold standards of scientific excellence, and made available for the right uses.

"Also, our AI applications will not pursue weapons, technologies that cause overall harm, technologies that use surveillance violating internationally accepted norms, or those that contravene international law and human rights," Google says.



4

Access to services

Palladium is an Australian group that helps clients in 90 countries link commercial goals with social impact, including through technology such as AI, data networks and modelling. Cassian Drew, managing partner for the group's Asia-Pacific unit, says AI will become increasingly mainstream, enabling ordinary people around the world to use it for social good, including in developing nations.

"There has already been a major shift in how AI is used," he says. "For example, people are now more willing to participate in studies involving wearable technology, in developed and developing countries, providing accurate insights and real-time data into how we lead our lives.

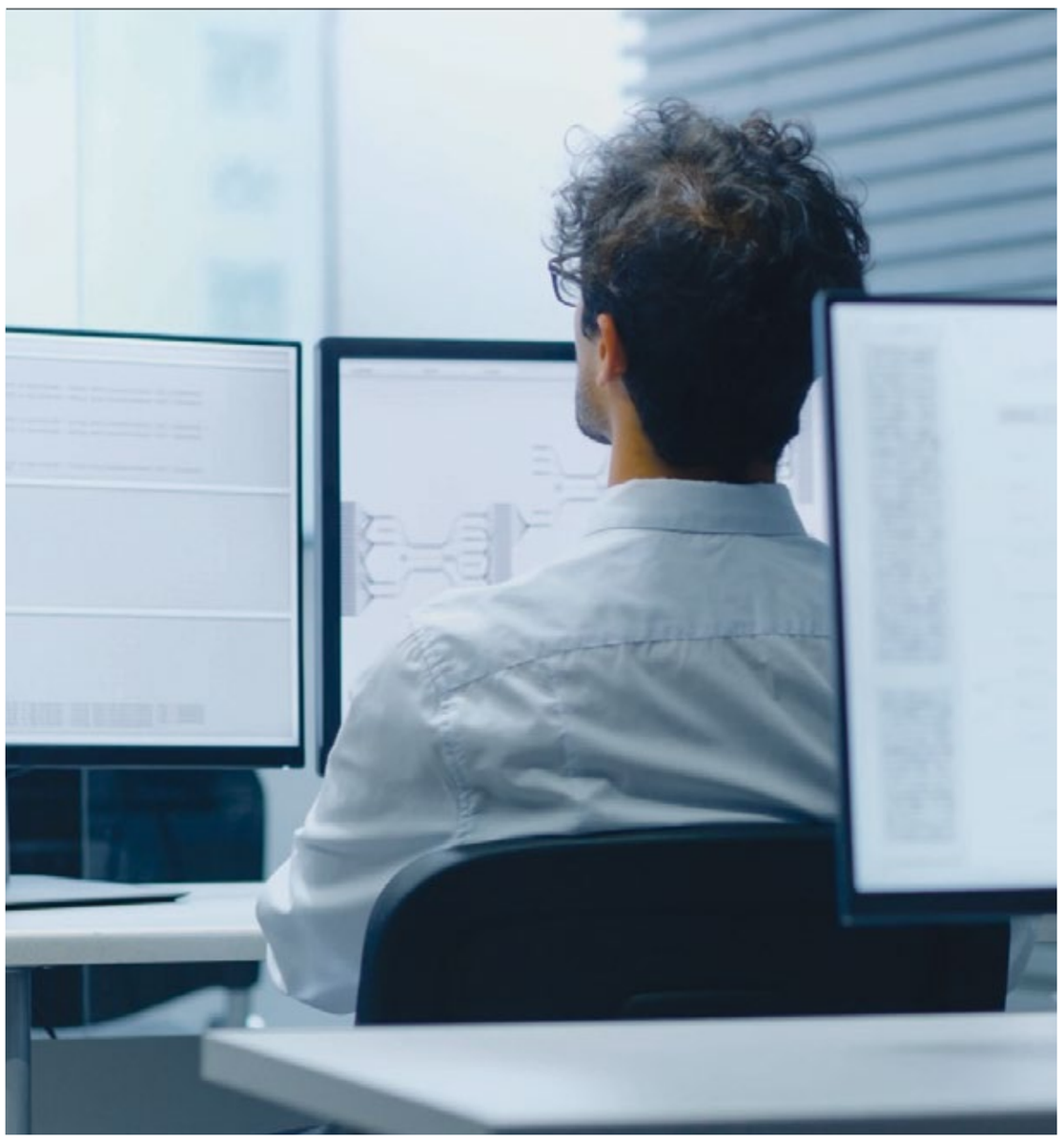
"For instance, we already see more international development teams using AI to design water distribution networks. A good example is the non-profit organisation Global Water Challenge, which uses AI and predictive analytics to solve problems associated with developing water services in rural communities."

The challenge in many developing countries is that there is less useful data and it is not necessarily digitised or centralised, says Mr Drew.

"But there are hundreds of potential applications," he adds. "AI for social good is still in its infancy."

Ms Mojsilovic at IBM Research agrees: "Many NGOs and government agencies are not yet using the power of AI in the same way as commercial companies. In the next ten years there will be more effort devoted to AI for social good," she says.

"I hope that using AI to address areas such as hunger, disease and poverty will make us better humans. It comes down to what we choose to design and invest in; the technology will exist, but the choice is ours."



How AI is powering the next generation of work

Companies know they must respond to tech-fuelled disruption, and artificial intelligence can enable them to transform and evolve their people and processes

Customer preferences are changing rapidly as consumers demand more engaging, intuitive and accessible digital experiences and services from companies. At the intersection of these dramatic changes is artificial intelligence (AI), powering the biggest transformations in operational and workforce processes since the internet.

In this increasingly challenging business landscape, digitally native companies such as Netflix and Amazon have ripped up rule books and disrupted industries with their agility and innovation. Traditional firms are left struggling to keep up.

Board directors at these incumbent players now accept that transforming their enterprise environments to digital is a must. But executing that is easier said than done when layers and layers of legacy systems exist. Creating digital touchpoints to attract more customers requires a complete revamp of core systems to connect them with newly digitised processes.

Meanwhile, jobs in the knowledge worker environment are transforming too, as single-domain roles become increasingly amenable to automation that might address more than 50 per cent, or sometimes nearly 100 per cent, of their tasks. Workers who become dislocated from their job functions need to be upskilled and refocused towards higher-value assignments that enhance the customer experience.

$1 trn+
in potential business value

25 m FTE
in support functions

$2.5 trn
in associated costs

$1 trn
value

McKinsey

"AI is at the top of the agenda for many of the large enterprise companies we work with," says Alex Lyashok, chief executive at automation software firm WorkFusion. "For decades, large organisations have deployed deep, complex technology in buckets and siloes. With AI, they can break down the complexities and introduce self-service automation that allows operational teams with very little technological knowledge to very quickly deploy software robots which learn and repeat what people do, at scale.

"In addition to traditional, large-scale IT projects, we see a whole trend emerging with intelligent automation, where operational teams get a degree of agility and self-service they didn't have before. AI enables this because they no longer have to code these systems; they simply need to train the AI by feeding it with data."

AI is predominantly deployed in two ways to support and empower people who have traditionally worked in non-digital or physical labour roles to do their job better, and to work side by side with humans who can contextualise business outcomes and offer additional training or maintenance when required. Although AI will often replace roles done by humans, in turn, it also creates additional work around itself that enhances performance.

Particularly in skilled organisations, there are opportunities for companies to introduce agility into their operations by automating mundane, repeatable tasks with AI. Robotic process automation, for instance, is the agent for many pragmatic applications of AI. On the consumer side, this is visible with the development of self-driving cars. More subtly, in the enterprise, automation offers simple answers to the massive complexity of processing numerous unstructured data.

"In many cases, intelligent automation deployments allow organisations to achieve 30 to 40 per cent cost-savings while improving outcomes by two to three times," says Mr Lyashok. "There are many scenarios where automation offers companies the chance to grow their business, whether it be better managing revenue cycles, real-time adjustments of retail promotions, or responding to insurance claims or opening bank accounts faster.

"If a bank account can be opened in 15 minutes versus 22 days by automating manual steps and checking things like proof of income or residence in near real time, this technology clearly offers companies the opportunity to grow their business at an unprecedented rate."

Indeed, applications of AI are most effective in data-intensive and service-focused companies, and banks often provide ideal use-cases. As an industry that is mostly service driven, yet also highly powered by data, applications in financial services offer both low-hanging fruit and areas where tremendous outcomes can be achieved.

Industries that rely less on data and more on assets have until recently offered fewer opportunities for AI-powered outcomes, but this is changing. The manufacturing sector, for example, is traditionally an asset capital-intensive business, but is being transformed by the internet of things, which generates data by attaching sensors to physical objects. Until that sector catches up, service industries like banking and retail continue to lead the way.

"Intelligent automation can be used to release 60 to 70 per cent of a company's manual labour, allowing the business to focus on customer experience and digital growth

However, even within the most suitable environments for deploying AI, challenges exist. Particularly in large companies, it can be difficult to scale AI and systems powered by machine-learning. It might be easy to run several experiments, but when deployed at scale these systems experience pitfalls related to the smart management of data and infrastructure that AI and machine-learning systems rely on.

"While we see some companies trying to do it successfully themselves, we also see many companies struggling," says Mr Lyashok. "Part of WorkFusion's promise is a single, unified platform that helps customers start quickly with a small footprint. But we also help them manage the solution at scale when they have hundreds or thousands of software robots running in their organisation across multiple divisions and touchpoints.

"We're in the very early days of automation-driven transformation, but we are starting to see the promise of dramatic business results. The mundane repeatable work that has had to be done by people, due to the slowness and difficulty of using coded software, is starting to become addressable with AI. In most cases, intelligent automation can be used to release 60 to 70 per cent of a company's manual labour, allowing the business to focus on customer experience and digital growth. That redirection of labour is the key to growing this trend."

Please visit workfusion.com for more information, or to learn more about these real life, real impact case studies.

WorkFusion

DEMOCRATISATION

Self-service analytics on the rise

Pre-built algorithms and off-the-shelf tools are increasing access to artificial intelligence solutions, but experts warn democratising AI in this way can be a dangerous game

Oliver Pickup


Cavan Images/Getty Images

By 2020, with ten billion connected devices, estimated data volumes will be fifty times greater than they were just three years ago, according to Microsoft's projections. The lamentable paucity of skilled technology talent has been well publicised, but with a gargantuan, and growing, amount of data from which to draw business insights, the gulf between supply and demand for data scientists and analysts already seems unbridgeable.

Capgemini research last year found 64 per cent of organisations view a lack of people with the skills to take advantage of artificial intelligence (AI) as a big barrier to adoption. More recently, the *Harvey Nash/KPMG CIO Survey* for 2019 goes further by revealing data analytics is where the greatest dearth of tech skills currently lies for global organisations. Indeed, almost half (46 per cent) of the chief information officers quizzed reported that they are experiencing a shortage in this area; a figure that has risen for the last four years.

To help bridge this gap and counter the talent challenge, there has been an explosion in the availability of off-the-shelf AI tools that promise to be simple to integrate and straightforward to use. The introduction of pre-built algorithms and open source machine-learning libraries is helping non-experts grapple with organisations' data and deliver insights through AI.

This democratisation of AI solutions is popular, unsurprisingly when early adopters of AI in the UK have already seen a 5 per cent improvement in productivity, performance and enterprise outcomes, according to Microsoft's *Maximising the AI Opportunity* report, published in October.

The trend is so pronounced that Gartner predicts in 2019 workers using self-service analytics will generate more value from data analysis than professional data scientists. "Rapid advancements in AI, internet of things and software-as-a-service analytics are making it easier, and more cost effective than ever before, for non-specialists to perform effective analysis and better inform their decision-making," says Gartner research director Carlie J. Idoine.

Mark Skilton, professor of practice in information systems and management at Warwick Business School, heralds this newfound accessibility for AI solutions. "Nvidia Jetson hardware products and AI on a chip, which come with a sub-£1,500 cost, bring AI automation to the 'edge' of networks for most software developers to start building their robotics and deep-learning models from image, text, voice and data analysis," he says.

Professor Skilton lauds the "astonishing" amount of often free online machine-learning and AI training on offer from Coursera, Udemy, as well as Stanford and Harvard universities, and many others. "These courses have further democratised that knowledge, bringing AI into the mainstream," he adds.

Similarly, Liz Sebag-Montefiore, director and co-founder of 10Eighty, a London-headquartered career management and employee engagement organisation, welcomes the drive to democratise AI and lower the barrier for entry. "AI is critical to our success given the current talent challenges we face, so an open and collaborative approach to harnessing such powerful technologies will produce a thriving ecosystem for agile and adaptive enterprises," she says.

However, there are risks to democratising AI; for one, it won't address the talent shortage and the services of the best data scientists will be more coveted. "Anyone can pick up a hammer, but it requires a skilled tradesperson to use it to build high-quality products," says Jonathan Clarke, statistical modelling manager for LexisNexis Risk Solutions.

John Abel, Oracle's vice principal of cloud and innovation, UK and Ireland, agrees. "Businesses should not expect the democratisation of AI technologies to turn employees into effective 'citizen data scientists' magically. They need to be coupled with solid training on how to interpret and analyse data properly, as well as robust data governance to make sure the data being used is reliable," he says.

"This requires trained data scientists to play a critical oversight role in the short term to ensure the proliferation of AI provides businesses with reliable insights in the longer term."

Kasia Borowska, managing director and co-founder of Brainpool.ai, which boasts a network of more than 300 AI experts for consultancy and strategy, says: "Off-the-shelf AI solutions very rarely work well without customisation. A lot of clients fall into the trap of getting things done quickly and at a lower upfront cost and then spend years fixing the solutions that didn't end up bringing the desired results."

> **Organisations are forced to rely on the black box without understanding the logic behind its decision-making and they could risk reputational damage when things go wrong**

Additionally, for businesses that fail to either understand or display the workings out of AI programmes, it could have dire ethical and financial consequences, especially since the introduction, in May 2018, of the European Union's General Data Protection Regulation (GDPR).

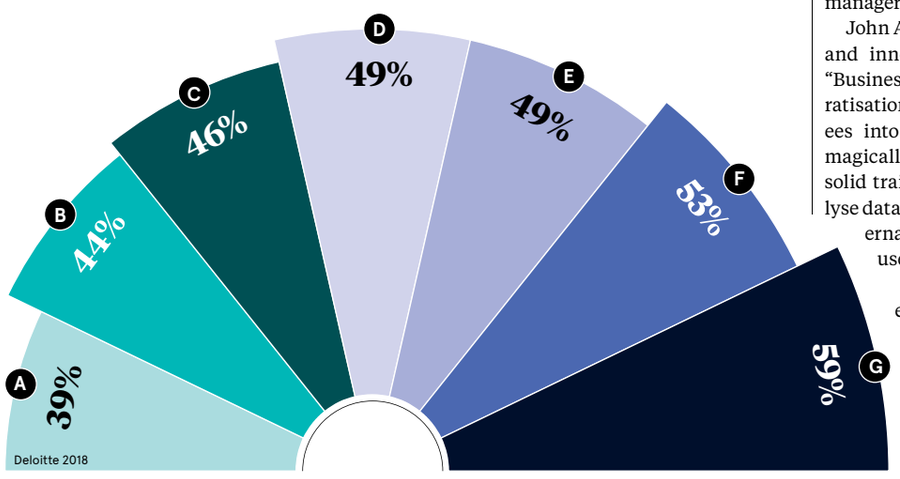
"While pre-built algorithms and open source machine-learning libraries can be used to create automated, 'hands-free' AI solutions, and produce short-term results, democratising AI in this way can be a dangerous game," warns Iain Brown, head of data science at SAS, UK and Ireland.

"Organisations are forced to rely on the black box without understanding the logic behind its decision-making and they could risk reputational damage when things go wrong.

"GDPR requirements state that organisations must be able to demonstrate how a decision about a particular customer has been reached, so there must be clear data lineage and explainability to meet compliance requirements."

MOST POPULAR PATHS TO AI

Percentage of companies who have used the following methods of acquiring and/or developing AI



OPINION

'It is vital for the C-suite to educate themselves, offer realistic adoption goals and provide sufficient training'

With $15 billion invested over the past three years, artificial intelligence (AI) is rising up the boardroom agenda at many global enterprises. CxOs across a wide range of industries are well aware of the transformational impact this technology is bringing, and are assessing how to invest effectively in new products and solutions. With this, business leaders have a growing responsibility to understand the many opportunities and challenges that can arise when implementing AI in the workforce.

The noise surrounding AI can at times be deafening, and there is a constant stream of new AI offerings which are said to revolutionise the way businesses can run. For business leaders, however, keeping up with the constant stream of change and innovation can be incredibly challenging.

As businesses continue to ramp up AI investment, it is vital leaders are given the means to decipher which technologies are the right ones to invest in. A recent Genpact report found that a quarter of senior executives say they plan fundamentally to reimagine their business with AI by the end of 2021. This is therefore a critical time for CxOs to educate themselves and have a full understanding of the technologies they are adopting to reap the rewards for their workforce and customers.

The rollout of this technology is incredibly vital too. A recent study by PwC found that only 4 per cent of executives have successfully implemented AI in their business. Historically, a chief executive relied on the chief information and chief technology officers to make the correct decisions when investing in and implementing technological changes. However, chief executives themselves now have a central role to play in decision-making and rollout.

The buck doesn't stop there. As AI has become a board-wide responsibility, many businesses also lean on the operating, digital and administrative heads, and now the chief AI officer, to drive AI projects and initiatives. The traditional organigram is continually evolving and, as new roles emerge, boardrooms are taking a new shape, evermore focused on the importance of technology.

Some sectors have been more open and adaptable to the changes that AI brings. Industries that have invested most heavily are financial services, retail and automotive, with financial services forecast to become a billion-dollar AI industry before the end of the year.

CxOs are increasingly shining a spotlight on their company's customer experience strategy. With growing choice and competition, it has become important to provide the best possible customer journey at every touchpoint.

Sainsbury's has introduced AI to improve its supply chain availability of products for customers, while NatWest's decision to implement AI by offering its chatbot Cora has resulted in an enhanced customer service experience. The bank has also introduced a system that uses robotic process automation, which enables it to respond more quickly and effectively to customers' simple email requests. The implementation of these technologies will undoubtedly continue to improve the customer experience and, as a result, retain customers and increase revenues.

NatWest's introduction of chatbots is a great example of business leaders understanding the need to transform into a 21st-century business by using the latest technologies. Moreover, the change was managed seamlessly and shows the bank's executives ensured its workforce was trained and properly educated on the impact these updates would have throughout the organisation, as well as how they would affect customers' experience with the bank.

As with any new technology, there is a huge appetite among business leaders to invest and roll out new AI technologies. We saw 2018 as a breakthrough year for investments in AI, and there are no signs of activity and investment slowing down in 2019. However, there is a growing need for executives to understand where to invest and seek the partners best suited to deliver the solutions required.

We can expect to see increased pressure to keep up with the rapid pace of change. It is vital for C-suite executives to educate themselves, offer realistic adoption goals and provide sufficient training for their workforce. Business leaders who fully understand and acknowledge the challenges faced when implementing AI will be best equipped to adapt to these changes. Others will be left behind and, far worse, those stood on the sideline will become increasingly irrelevant in the new AI-powered enterprise landscape.

George Kipouros and Daniel Pitchford
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MONITORING EMPLOYEES

The problem with workplace surveillance

Technology to monitor employees in the workplace can be put to good effect, but not if it is used to control and micromanage workers

Emma Woollacott

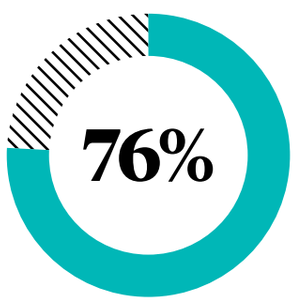
US supermarket chain Walmart has patented surveillance technology that would enable it to eavesdrop on employees' conversations with customers.

The aim, according to the patent application, was to establish whether "employees are performing their jobs efficiently and correctly", and improve both cost-savings and customer satisfaction. Worker satisfaction wasn't mentioned.

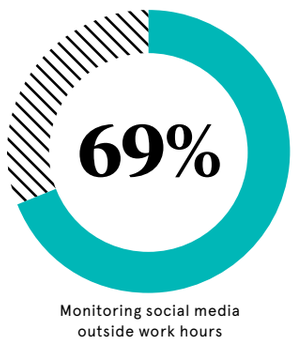
This is just one example of the ways in which artificial intelligence (AI) is increasingly being used to monitor workers in the workplace. While the Walmart technology isn't yet in use, and may never be, other companies are enthusiastically surveilling every aspect of their staff's activity at work.

LEAST PREFERRED TYPES OF WORKPLACE SURVEILLANCE

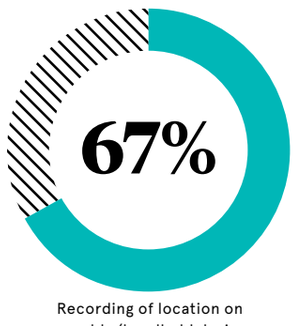
Net percentage of workers who believe the following are unacceptable



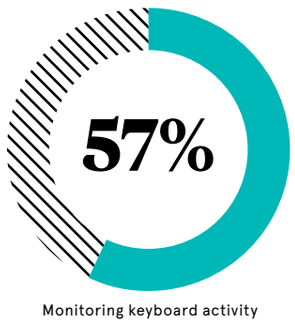
Facial recognition software and mood monitoring



Monitoring social media outside work hours



Recording of location on wearable/handheld devices



Monitoring keyboard activity

TUC/Britain Thinks 2018

In a survey last year, Gartner found that 22 per cent of organisations around the world are collecting data on their employees' movements. Some 17 per cent are monitoring computer usage and 16 per cent are monitoring staff calendars. Most notably, though, nearly six in ten said they planned to be using such technologies in future.

The advantages for organisations are, at least on the surface, clear. They can track the productivity of individual workers, compare the efficiency of different projects, and maintain traceability, accountability and compliance. In recent research, consultancy Accenture found that seven in ten business leaders expected workplace data analysis to improve productivity.

"Workplace data can be used to spot and improve work patterns to speed time to market or improve speed of adoption of change programmes with customised incentives for individuals," says Eva-Sage Gavin, who leads Accenture's talent and organisation practice globally.

"Overall, 77 per cent of business leaders say new sources of workforce data will help them grow their business, 76 per cent say it will help them transform the business for agility and efficiency, and 74 per cent say it will help unlock the full potential of their people."

However, staff monitoring only improves performance under certain circumstances, according to research by Bartels and Nordstrom in 2012. It was only when monitoring was combined with a clear performance management framework, and linked with employee compensation and benefits, that real improvements were seen.

When employees were monitored without any explanation or when there were no corresponding performance measures or rewards, performance stayed much the same.

Employees, meanwhile, are suspicious. In a recent survey by the TUC, British workers revealed that most believe they are being monitored by their employers, and two-thirds said they feared this was fuelling distrust and discrimination. They were concerned that the use of AI in the workplace meant that surveillance data was being used to set unfair targets, over-scrutinise their work, and take away autonomy and control.

"Employers must not use tech to control and micromanage their staff," says TUC general secretary Frances O'Grady. "Monitoring toilet breaks, tracking and snooping on staff outside working hours creates fear and distrust. And it undermines morale."

In America, in particular, the use of staff surveillance combined with AI in the workplace is booming and extending into areas that would once have been inconceivable.

Aiha Nguyen, labour engagement lead for the Data & Society Research Institute, cites the use of fitness trackers, now supplied to staff at one in five large US firms offering health benefits. She says: "The type of data being collected is well beyond what many would argue as elements of your job. What does your food consumption have to do with how well you do your job?

"It's the question of whether the purpose of this type of tool is to really improve productivity. And, really, it is tied to efforts by companies to cut the cost of employees, so theoretically the fitness apps and devices are meant to cut the cost of providing health insurance for employees."

There are also, she says, several instances where these devices have raised issues regarding discrimination.

"If an app can give an employer information about whether an employee is going to be pregnant, could that be used to fire them or somehow not promote a woman because she's pregnant?" she asks.

"I think there have been instances where this could be bordering on breaking some other laws, so in addition to new regulation there has to be a better way of looking to see whether the data is being used as a proxy and these other laws are being broken."

Such techniques could in theory be just the tip of the iceberg. In China, for example, businesses are reportedly even monitoring employees' brain waves to detect their emotions using a combination of EEG sensors and AI in the workplace.

Unsurprisingly, workplace surveillance can lead to a lack of trust among employees and it's this that's fatal to any hoped-for productivity benefits, according to the Accenture report.

"Seventy per cent of employees say that in return for their permission to collect data, employers need to give them control over how it is used," says Accenture's Ms Gavin.

> **Monitoring toilet breaks, tracking and snooping on staff outside working hours creates fear and distrust**

"Give employees the ability to see, manage and even delete their own data when appropriate; ask for consent when possible and when it makes business sense."

Australia's largest telecommunications company Telstra, for example, maintains an internal site called MyCareer that allows workers to keep and update their own career data, and even challenge any incorrect or incomplete entries.

Organisations should also build a governance system to make sure workplace data and technologies are used responsibly, with a clearly accountable C-level executive supported by an executive coalition. They should use AI in the workplace to identify hidden skills and offer staff targeted training, says Ms Gavin.

Similarly, the TUC is calling on employers to only use surveillance for legitimate reasons that protect the interests of workers, such as ensuring people can work safely.

"We'd like to see the law strengthened with a legal requirement for employers to consult workers before introducing surveillance technologies," says Ms O'Grady.

"Data protection law places limits on when and how employers should use new technology to monitor staff, but employers are not always aware of how the law applies in the workplace. So the government and employer organisations should consider how they can help improve awareness."

In the European Union, the General Data Protection Regulation means workers do at least have the right to know what data is being collected on them and how it's being used. However, Ms Gavin says two thirds of workers are still concerned their data could be misused. Reassuring them is key to success.

"If businesses gather data in a way that diminishes trust, they risk losing more than 6 per cent of future revenue growth," she says. "But if they adopt responsible strategies, the trust dividend could be worth more than a 6 per cent increase in future revenue growth."

Making a success of AI projects

Understanding what artificial intelligence can do for your organisation requires collaboration with an experienced partner in delivering successful transformation

There's no question that artificial intelligence (AI) has already moved from being a technology rooted in science fiction to one of the most powerful tools businesses can use to transform how they operate. From driving down costs through the automation of repetitive tasks to the creation of new services and products that enable companies to reach new customers, few innovations have such a wide range of potential applications.

"Businesses can no longer avoid AI; it's here to stay. Today, not incorporating the benefits of AI into your operations is like not having a website," says Marta Markiewicz, head of data science at Objectivity, digital transformation specialists.

For example, retailers that don't integrate advanced recommendation engines into their online platforms will be at a disadvantage when competing with rivals driving forward with AI-backed solutions. Great recommendations engines significantly improve the experience of a website visitor and drive up sales.

But the relatively recent advent of business-friendly AI tools and a general lack of understanding of how to utilise AI products is hindering this technology from becoming a truly revolutionary solution. To effectively execute an AI project, corporate leaders need to have a specific goal or improvement in mind, rather than simply embracing AI because it is seen as a "must" for progressive companies.

"We've found it useful to divide the different types of AI projects into three main categories. The first class of projects involves the use of off-the-shelf AI products, moving on to bespoke AI solutions further down the spectrum, and finally high-risk, high-reward projects that require a great deal of resources and a long-term commitment to achieve," says Ms Markiewicz.

A company may consider the use of AI as a service component in a traditional type of business project, as this would demonstrate the power of this burgeoning technology in a relatively low-risk approach. Yet it's unlikely that such a limited use of AI would have a profound impact on how a firm operates, with examples of this method being the use of handwriting or voice recognition in typical projects.

The next step along the AI spectrum sees businesses using bespoke solutions to make an improvement that would be impossible without the use of AI. "This could include, for example, creating an AI-based solution to recognise products on a supermarket shelf to check they are in the correct position and priced correctly or to create a digital twin that can accurately forecast revenues," says Ms Markiewicz.

Objectivity know first hand the benefits of bespoke AI solutions as they have been using this approach to improve understanding of their future revenues. By using AI to predict their resource needs effectively, Objectivity have been able to ensure their IT recruitment plans are in line with accurate forecasts and not rely solely on guesswork and less accurate estimates.

"It's not some side feature; it's become a key feature that has revolutionised part of our business and made it easier for us to plan. We've seen a great improvement in margins because now we have very few people who are not working on customer projects as we haven't recruited too early, so it's an enormous improvement in financial performance," says Ms Markiewicz.

There is an element of risk in creating bespoke AI solutions as, although patterns of AI usage are well known and understood, applying these models in the specific context of your business has yet to be done. But the rewards can be significant and, as Objectivity has shown, have the power to change how you do business.

> **Starting the AI project with full immersion in our clients business is a very important part of our process**

Leaders who want to transform their business fundamentally can embark on an AI project that starts from scratch and attempt to create new algorithms with the potential to advance what is possible to achieve with AI. This high-risk approach requires completely new models to be developed and is usually reserved for only the largest companies and universities that have a large pool of resources to tap.

No matter what category of project you choose, there will be challenges and pitfalls that have the capability to derail your AI solution. By using the wrong model or data, businesses can fail to solve the right problem within the company and result in no clear positive result.

Spending time before starting an AI venture to consider if it is the right approach for your business can help reduce the risk of wasting resources on an inappropriate project that does little to improve the bottom line.

At this initial stage in the overall process, Objectivity can work with clients to consider if there is another project or approach that would be more relevant for the specific challenge the business is dealing with and ensuring the risk-to-reward ratio is as attractive as possible.

The Augmented CRISP approach created by Objectivity helps to simplify AI projects and makes certain the right problem is chosen to solve, gathers the right team to make the collaboration a success and establishes the criteria that address the risks the project may face.

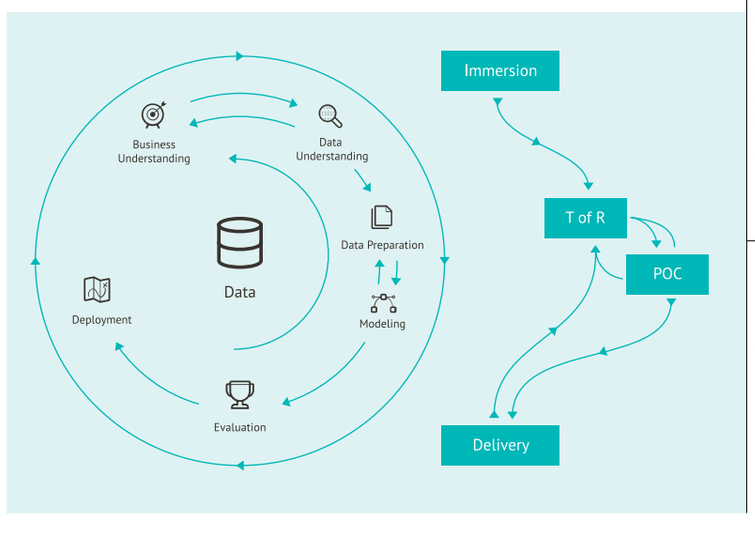
"Starting the AI project with full immersion in our clients business is a very important part of our process. It allows us to understand not just the business and the hypotheses, but also the culture of the organisation, the strengths of their teams, what they will bring to the party. And, of course, the data they hold. These elements are vital to improve the chances of the project being a success. Without a proper understanding of all these factors, some organisations can be tempted to start data-crunching without a real comprehension of what they want to achieve and what is possible," says Ms Markiewicz.

Possessing high-quality data that is reliable and available in sufficient quantity is clearly of central importance for any AI project as it will be extremely difficult to define what exactly success looks like if the data used is not classified.

"Only when you are sure you understand the data and when you are sure the terms of reference are clear for both Objectivity and yourself can we then move to proof of concept (PoC). PoCs must be chosen carefully and are designed to remove risk by tackling the hardest parts first, in isolation. It can be very tempting for clients to build the low risk parts first, because it feels like progress. But it's not progress. PoCs help everyone to iterate faster, save money and increase the chances of success," she says.

It's critically important to collaborate with a partner that has practical experiences of delivering AI solutions for both themselves and their clients.

"Successful projects need a diverse team of specialists. For the last six years, we've been developing our people, methods and processes to maximise the value we create in AI projects for ourselves and our clients. There's a reason why we work closely with Microsoft, and we're a valued data and AI partner. I think it's because we're good at this stuff and we're passionate at creating value for our clients," Ms Markiewicz concludes.



For more information please visit www.objectivity.ai

Objectivity

Nicholas Barbaros on Unsplash

COMPUTER VISION

Teaching computers to see the world like us

Machines that can obtain information from images and multi-dimensional data have been around for years, but what does the future hold for computer vision?

Adrian Bridgwater

Building computers with enough intelligence to perform tasks that are as complex as those carried out by the human body is difficult; obviously it is. As we now strive to bring the advantages of computer vision to modern IT systems, we are faced with some tough challenges as we attempt to teach computers to actually "see" the world around us.

Over and above near-perfect levels of speech recognition and so-called natural language understanding, we have also fine-tuned optical character recognition (OCR) tools and text-to-speech technologies. But despite massive progress in image processing and object recognition, computer vision remains a comparatively wild frontier in terms of tech intelligence.

As Fei-Fei Li, computer scientist and director of Stanford Vision Lab, remarks on the complicated nature of human vision and its intersection point with computer vision: "Just like to hear is not the same as to listen, to take pictures is not the same as to see." Getting computers to really "see" what they're seeing is a lot more complex than capturing an image, in any scenario.

To appreciate how computer vision will now develop, we first need to know how computers process visual information and understand how this differs from the core functions of the human eye and human brain. David Talaga, senior product manager at data integration company Talend, points out that computer vision systems don't learn in the same way as humans. He says the process is much more data intensive.

"A human infant, for example, might only need to see four or five dogs to be able to recognise in the future that a newly sighted animal is also a dog. Training a computer to recognise a dog in an image, and eradicate false positives, is likely to require large data sets of hundreds of thousands of images," says Mr Talaga.

There's only so much we can do to bring down this reliance on data if we want to maintain high levels of accuracy in computer vision systems and keep errors to an absolute minimum. Deeper still, we have to ensure data sets have the highest possible levels of integrity to ensure they haven't been compromised or fail to adhere to appropriate data governance processes.

"One advantage of the deep-learning through exhaustive data ingestion method is that if we expect that a human child will make mistakes – for example, it may mistake a fox for a dog – then we wouldn't expect a highly trained computer vision system to make such a basic error. In fact, there are plenty of applications where such an error would prove actively dangerous. Consider an autonomous vehicle which misclassifies a cyclist as a motorcyclist and makes incorrect assumptions about how that road user will behave as a result," says Mr Talaga.

As we now seek to engineer vision technology and computer vision algorithms into our lives, we need to understand our own limitations to decide where we should apply these technologies. Luka Crnkovic-Friis, chief executive of operational artificial intelligence (AI) platform provider Peltarion, says humans are good generalists when it comes to vision, but aren't great when it comes to specialised visual tasks.

"For example, it takes many years of training for a radiologist to be able to identify a tumour in an MRI scan accurately. Currently, many hospitals are sitting on image backlogs. In these understaffed facilities, scans may not be analysed for weeks. Tumours can actually move in this time, rendering treatment ineffective and causing unnecessary exposure to radiation. Deep neural networks, on the other hand, can be trained on a specialised data set and can exceed human accuracy while being orders of magnitude faster," says Mr Crnkovic-Friis.

He points out that computer vision can be applied to machinery, water pipes or any type of hardware to detect for signs of wear and tear. We have even seen the use of satellite images to identify areas of crop disease before they spread.

"Computer vision is already present everywhere in our lives, from driving your car, to using your favourite search engine

"Computer vision is already present everywhere in our lives, from driving your car, to using your favourite search engine, or looking to buy something from a retailer online," says Mr Crnkovic-Friis.

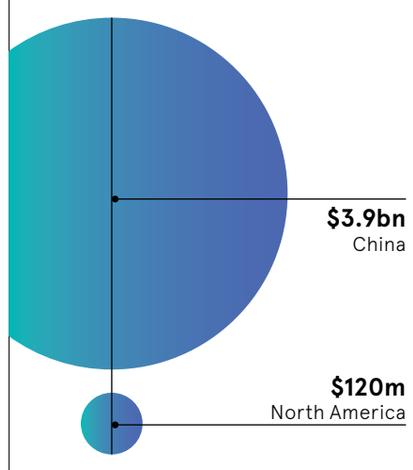
"Generally speaking, the typical application of this technology is tasked with similarity matching (if you've indicated that you like a particular sock, a computer vision system will find similar socks and display them), classification tasks (when you search your photo library for 'dog', it finds all images with dogs) and semantic segmentation (an image taken from the camera of a car needs to separate out the road, other cars and so on)."

Jabe Wilson, consulting director of text and data analytics at scientific and medical information company Elsevier, says computer vision has been used for many years in lots of diverse use-cases. Dr Wilson says computers have been reading handwritten UK postcode characters for some years now.

In addition, he points to the use of systems to identify people in CCTV records, OCR systems that read number plates to help locate where you parked in a car park, as well as technologies for scanning a house key and cutting a new one in a hardware store vending machine. Deep-learning computer vision techniques can also be used to represent non-visual data in image form, for example, when tagging music on a streaming service or building a map to predict the weather.

In the immediate future, we can look forward to new smart product offerings as AI works in union with computer vision to help automate the mundane tasks in our lives. Computers will never really see like we do, but their ability to classify the world around us into definable shapes and textures is becoming more advanced every day.

COMPARISON OF NATIONAL SPENDING ON COMPUTER VISION SOFTWARE



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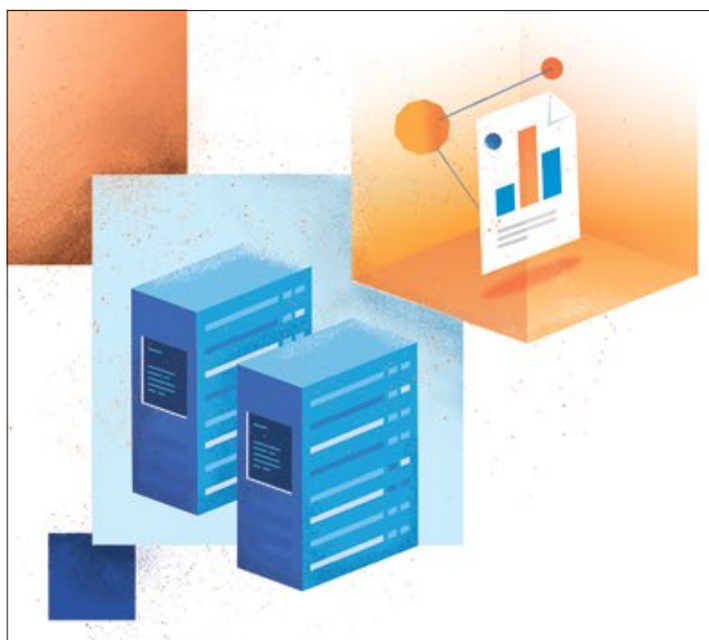

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ADVICE

Eight AI tips for business leaders

An organisation's first foray into the world of artificial intelligence can be a daunting task, so data scientists and tech experts share some vital advice to help those on their journey to full AI deployment

Oliver Pickup

Don’t ignore AI – whatever you do

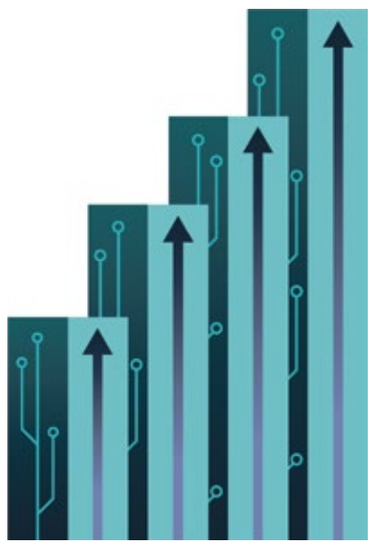
The most important thing for executives is to just start engaging with AI today – tomorrow is not good enough,” warns Shamus Rae, partner and head of digital disruption at KPMG UK. “Business leaders need to understand the capabilities of these new technologies and put in place an AI strategy that includes some clear self-challenge. This ensures that they don’t get stuck in ‘play’ mode and fail to make any tangible change to their operations or business model.” Mr Rae predicts that, due to the common misconception of AI, “we will see some major missteps by household names failing to adapt fast enough”.

Target low-hanging fruit

Clare Barclay, chief operating officer of Microsoft UK, advises business leaders to aim at small targets, or minor improvements – the so-called “low-hanging fruit” – when it comes to AI. “If you start thinking of the really big things, you do nothing,” she says. “Ask yourself: ‘What is the problem I am trying to fix?’” Dr Will Venters, assistant professor of information systems and innovation at the London School of Economics’ Department of Management, adds: “Starting with process improvement – perhaps through robotic process automation or simpler and proven AI algorithms – is more likely to be more profitable and successful than trying to push the envelope.”

Work out what specific challenge you're trying to solve

“Think hard about what problem in your business you want to solve, not with artificial intelligence but with data,” advises Kim Nilsson, founder and chief executive of data science hub Pivigo. “The solution always needs to come from that intersection of where your business challenges overlap with available data sets. Only there will significant value lie in data science and AI.” Antony Bourne, industries president of global enterprise software company IFS, agrees. “Before you initiate any project, you must figure out your ‘why’,” he says. “What exactly do you want to improve and enhance? The more targeted your objectives, the more competitive and transformative your results.”



Understanding data is critical to business success

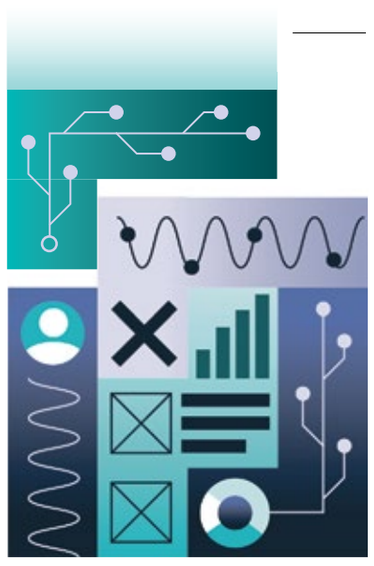
David Gonzalez, head of big data for Vodafone Business, believes employees at every level should analyse data to maximise the potential of AI technologies. “A chief data officer and trained data scientists are very important to organisations looking to implement AI solutions,” he starts. “The integral role that data plays in powering businesses to succeed in today’s economy means that understanding data even at a basic level really has to be everyone’s job. The entire C-suite has to provide support, ensuring that their area is primed to harvest robust data and that stakeholders understand the value of using it in conjunction with analytics and AI.”

Decide whether to build or buy AI solutions

John Abel, Oracle’s vice principle of cloud and innovation in the UK and Ireland, says: “The next logical question is: ‘How do I implement?’” He continues: “This essentially boils down to either buying a pre-built AI application, or building your own. If you choose the former, your implementation time will likely be shorter, costs lower and maintenance easier. You won't have to employ data scientists or pay for development platforms and architectural components to learn, buy, maintain and integrate. Buying a ready-to-go AI application provides the lowest barrier to entry, near-immediate benefits and they are often bundled with third-party data sources.”

Don’t forget about ethics

“A major issue with AI is trust,” posits Mr Abel. “The machine provides an output, but how can the user trust it made the right decision, or is recommending the correct action? To establish trust, a machine-learning algorithm needs to show its working and what data was important for the machine to make a particular output.” Ms Barclay of Microsoft UK urges executives to “establish a clear set of ethics, commitments and values around the use of AI. Not only will this ensure ethically grounded innovation, but it can support your bottom line, too. Microsoft research shows companies that consider what AI ‘should’ do have been shown to outperform those that don’t by 9 per cent.”



Preach to the converted to accelerate workplace AI adoption

According to *Maximising the AI Opportunity*, Microsoft’s study published in October, some 67 per cent of the 1,000 executives and 59 per cent of employees surveyed are open to experimenting with AI – however, almost all of them will require training and development. For AI to stand the best chance of success in your organisation it is critical to seek out those workers who are most excited by its potential and nurture that interest. “By involving employees, you’re culturally engaging with them around the things that are going to change, and you’re equipping them with new skills,” suggests Ms Barclay.

Take advantage of AI democratisation

In a bid to help overcome the barrier to AI adoption because of a huge skill shortage, the introduction of pre-built algorithms and open-source machine-learning libraries is helping non-experts grapple with organisations’ data, and deliver insights through AI. Mark Skilton, professor of practice in information systems and management at Warwick Business School, heralds a newfound accessibility for AI solutions – the so-called democratisation of AI. He lauds the “astonishing” amount of, often free, online machine-learning and AI training on offer from Coursera, Udemy, as well as Stanford and Harvard universities, and many others.

Don’t be left behind in the AI revolution

Artificial intelligence is the game-changer of our time. Its impact will revolutionise work, life and play; it will affect everything from medical practices to buying onions. Conventional wisdom is under attack and business leaders need to understand this new world fast if their organisations are to survive, says **Filippo Rizzante**, chief technology officer at Reply

No matter what the sector, artificial intelligence (AI) will challenge your business; in many industries, it already is. There are three key and often linked ways in which AI will impact business: perception, prediction and automation.

We have been interacting with machine-learning for quite some time. Most of us will have experienced the frustration of a less than perfect chatbot, a conversational interface that is anything but conversational.

However, as the technology improves, so does the interface; last year Google Duplex showcased a voice-controlled interface to book appointments that can understand the nuanced conversation of the human on the other end of the phone and respond accordingly, even adding “um” and “er” for added authenticity.

Such a program drew on all Google’s knowledge of deep-learning, natural language processing and texture speech to handle context and conversation gracefully. But the technology goes further, with emotionally intelligent and empathetic robots reaching into our lives and our homes via gadgets and smartphones.

Far from being perceived as a frightening sci-fi movie brought to life, consumers are welcoming such interactions; 59 per cent of customers are open to companies using AI to improve their experiences and 87 per cent believe AI will transform their expectations of companies within the next five years, according to the State of the Connected Customer report from customer relationship management platform Salesforce.

Of course, this needs to be balanced against a wariness and concern as Salesforce’s survey also found that 62 per cent of customers were more afraid of their data being compromised than two years ago. The key is to define the areas in your business where an AI-enabled conversational interface will make the customer experience quicker, easier and more simple.

Many of these opportunities will be app-related; an AI-enabled loss adjuster, for example, which will be able to assess an insurance quote straight after receiving a photo of your dented rear bumper.

But not all are about the customer journey. Combine robotics, which has been quietly transforming the productive process for decades, with AI and you get collaborative robots that can learn valuable skills, such as quality control for factory production.

With a combination of sensors, internet of things platforms and AI-controlled analysis tools, companies will be able to utilise equipment more efficiently, predicting downtime and moving fast to minimise disruption.

This is not just about the technology, but is a mindshift in our dealings with machines. Virtual reality opens further possibilities for us to experience products, but no business can survive unless we actually buy those products. Here, it is AI’s predictive capabilities that are having the greatest impact. Big data is offering business an unprecedented means of optimising product manufacturing and stocking, while personalising the customer journey as never before, and all in real time.

> **We are living at a time in which AI is rapidly finding its way into everyday life and the workplace; some advances happen so fast that today we can hardly imagine the things which will be possible tomorrow**

Customer expectations are extraordinarily high in today’s interconnected world. Driven by disruptors such as Uber and Amazon, they expect instant results and will quickly dismiss companies that fail to provide the high levels of service shown elsewhere. Organisations no longer have the luxury of analysing feedback and customer surveys over weeks and months; the insights have to be actioned immediately to connect and engage with the consumer.

Analytics companies know how huge this area is likely to be. According to market researcher Zion Market Research, the predictive analytics market is expected to be worth $11 billion by 2022; in 2016, only three years ago, it was a mere $3.5 billion.

Machines can help make decisions faster, with dynamic responses and behaviour-tracking that can put products right under the customer’s nose. But it’s about more than speed; it’s about a seamless journey that connects and engages whenever and wherever the customer wants. It’s about the ability to create an impactful interaction at each and every touchpoint, whether via the screen in our pocket, the machine-led phone call that is intercepted at just the right moment by a person or the human on the shop floor who can tap into our personal likes and dislikes in record time.

Customers have unprecedented choice in today’s global marketplace and AI can help create a much deeper, emotional engagement that distinguishes one business from another.

The third area of impact for AI is automation. Again, the field is not new, but the power and capability of present-day automation is driving new solutions. Instead of disjointed and sometimes siloed systems, AI automation is driving office work as never before, simplifying functions such as straight-through processing for invoices, but also opening up the possibility of more complicated automation including as driverless cars.

Such technology may seem many years away, but don’t underestimate the speed at which tech is moving; the high levels of investment – Toyota put $500 million into Uber’s self-driving cars in 2018 – are a clear indication of the possibilities.

Automation can be applied anywhere there is a repetitive task, saving time and money, and freeing up staff for higher-value work. Such a process requires businesses to upskill employees, which is a process that, as with any major innovation, can lead to tensions.

But it is up to all of us, whether as organisations and as individuals, to engage with this dynamic, rather than shy away from it; there is no doubt that automation can do the boring, simple tasks quicker, faster and, therefore, cheaper than humans.

From its earliest beginnings more than half a century ago, AI has been pushing the boundaries of human and machine capabilities. The processing power now available puts a range of analytics within the grasp of all sizes and types of business, and what used to take weeks can now be completed within a matter of hours.

Such technology does come at a cost, but without it your business is unlikely to thrive or even survive; other organisations will be deploying this technology to gain that competitive advantage. The key is to find those areas that maximise your investment in AI, either through data insights specific to your customers or by clever use of the human-machine interface.

But one thing’s for sure: this fourth industrial revolution will bring exceptional change. It is up to us to use it wisely.

For more information please visit www.ai.reply.com

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AUGMENTATION

Automation is not the future, human augmentation is

We've long heard that artificial intelligence will free up humans to carry out more interesting and valuable roles, but what exactly will these jobs look like, and what benefits will they bring?

Daniel Thomas


Eddie Kopp on Unsplash

When Tesla boss and tech billionaire Elon Musk proclaimed that in the future, robots would "be able to do everything better than us... I mean all of us", he wasn't going out on a limb. For years, academics and experts had been warning that rapid developments in artificial intelligence (AI) and machine-learning were set to destroy hundreds of millions of jobs around the world, leaving many of us out of work.

But more recently experts have coalesced around a more nuanced point of view: that AI could help us to work faster and smarter, boosting productivity and creating as many – if not more – jobs than it displaces in the coming decades.

One proponent of this idea is Mind Foundry, an AI startup spun out of University of Oxford's Machine Learning Research Group in 2015. The firm says its state-of-the-art machine-learning algorithms are already helping clients make better use of their data to gain "deeper insights" about their business. But chief executive Paul Reader readily admits there are certain things that algorithms will never be able to do without a human there to guide them.

"Automation is not the future, human augmentation is," the former Oracle director tells Raconteur. "Algorithms can't tell you how you can create value in your business, asking those sorts of questions is an innately human capability. Algorithms rely on humans having done that work first."

A 2018 study by the accountancy giant PwC forecasted that machines would create as many new jobs in the UK as they destroyed over the next 20 years – although it said there would be "winners and losers" by industry sector, and many roles were likely to change.

Rob McCargow, director of AI at PwC in the UK, says he is cautiously optimistic about the job-creating potential of AI, and says that "augmentation" will play a big part in the future workforce – be it by enhancing the skills we already have or freeing us up to do more interesting or important things.

He accepts that most industries will delegate tasks and roles to machines as time goes, and that will displace jobs. But he says humans will still be needed to oversee these systems to make sure they work properly.

Machine-learning systems can already discern patterns from huge swathes of data much faster that humans can, but they are fallible. Take the internal recruitment engine that Amazon was reportedly developing to enhance its search for top software engineers and other technical posts.

Last year, Reuters reported that the ecommerce giant had scrapped the system after realising that it was not selecting candidates in a gender-neutral way. It turned out Amazon's computer models were trained to vet applicants by observing patterns in resumes submitted to the firm over a ten-year period – and most came from men.

"However smart these systems become there is an increasing need to check the findings and interpret results," Mr McGarow says. "Most of us are happy to let AI make decisions for us about trivial things, like movie recommendations, but we are less so when there's any risk involved."

He says human oversight of AI apps will be needed in any regulated industry, including banking, healthcare, diagnostics and insurance, because firms will need to ensure decisions have been reached transparently and fairly, and regulators will want to know how decisions have been made.

AI should also augment the way we work, allowing us to be more productive. Most experts agree that roles involving more repetitive tasks are at a higher risk of automation – think transportation or manufacturing. However, offloading them onto robots could free us up and allow us to focus on other things, says James O'Brien, a research director at IDC.

"Anywhere there are stretched resources, and/or too much information or data to manage, is a great place to start with an AI-led strategy," he says.

He gives the example of the Babylon Health app, a subscription-based service in the UK that allows you to book video consultations with UK GPs. It features AI-powered chatbots and a symptom checker. "It frees up GPs and augments their stretched resources," he says.

Mr O'Brien expects that as roles requiring less innately human skills are automated, others that do, such creative roles or those in social care, will expand. We could see totally new sorts of jobs, enabled by AI, emerging too.

One area could be in so-called "social physics", he says, where humans use machine-learning to crunch masses of structured and unstructured data to gain better insights into social problems or public health issues. Firms are already hiring "data ethicists" too, to look beyond immediate risks posed by AI programs and monitor unintended consequences of the technology.

"We may also need to create roles to help with the increasing convergence of new technologies, as AI is used in combination with 3D printing, the internet of things and augmented and virtual reality," says Mr McGarow.

Much further into the future, some have suggested we could even see human workers being physically augmented with AI systems. Facebook's Mark Zuckerburg, for example, has invested in a company that, among other things, is researching ways to implant computer chips in the human brain, albeit to cure neurological diseases. And Tesla's Mr Musk has reportedly backed a brain-computer interface venture called Neuralink.

"Over time I think we will probably see a closer merger of biological intelligence and digital intelligence," he told a conference in Dubai in 2017.

While that sort of augmentation may sound like science fiction, experts do expect to see a tangible economic boost from AI in the near term. The Organisation for Economic Co-operation and Development argues that data-driven innovation will be a "core asset" of 21st-century global growth, driving productivity and efficiency, fostering new industries and products, and creating "significant competitive advantages".

PwC estimates it could boost global growth by up to $15.7 trillion in 2030 – more than the current output of China and India combined. However, Mr McGarow warns of big obstacles to realising this potential.

Firstly, he says the global labour force will need to be retrained for the jobs of tomorrow, and that will take time and cost money. Moreover, if people aren't upskilled, the threat of job displacement will rise.

> **Throughout history innovations have come along like electricity and steam, and they do displace jobs. But it is about how we shape those innovations. Any tech can be used for good or for evil, and we want to use it for good."**

"You then find yourself in a conversation about the purpose of work – do we always need to work, or should the purpose of AI and machine-learning be to free us up for other things? If there are fewer jobs, will there be a social safety net or universal basic income?"

He adds that while some countries, such as the United States and China, will benefit from the AI revolution, developing regions like Africa could miss out. That is because the intellectual property rights of any new innovations will remain in the country that develops them, along with most of the economic benefits that accrue from it.

Mr Reader is more optimistic, though, and believes humans have always adapted to disruptive new innovations and will continue to do so. When it comes to retraining the workforce, he says, it will be an "incremental" rather than massive step change.

As for certain regions and professions missing out, he accepts there are likely to be winners and losers. But he points out data scientists are now being hired in almost every function of big companies – from the finance department to the mail room. Other wrinkles will likely iron themselves out in time, too.

"Throughout history innovations have come along like electricity and steam, and they do displace jobs. But it is about how we shape those innovations. Any tech can be used for good or for evil, and we want to use it for good." ●

Five jobs for tomorrow's "augmented worker"

AI OVERSIGHT MANAGER
AI systems are becoming increasingly sophisticated, and can analyse large amounts of data much faster than humans can. But they can also get things wrong. Systems have been shown to be vulnerable to bias, and specialists will be needed to interpret their decisions and make sure they are fair and transparent.

DATA ETHICIST
If an autonomous car causes a crash, who is to blame, if all of the decisions made by its algorithms have first been programmed by humans? AI-powered platforms are likely to throw up a host of ethical dilemmas and firms will require hordes of data ethicists to help address them.

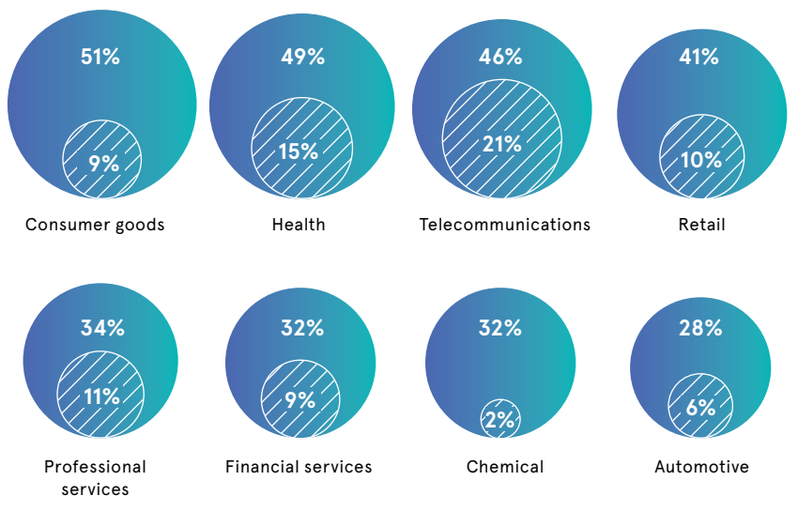
SOCIAL PHYSICIST
Advanced AI tools will enable NGOs, researchers and governments to parse through hordes of structured and unstructured data and find insights that help solve real-world problems. Be it tackling health epidemics, famines or crime, big data will be key.

COBOTICS TRAINER
In an AI-powered future, humans are likely to collaborate with robots on many tasks, and knowing how to control these machines will be vital. Training will help us learn us how to interact with, manipulate and repair our autonomous colleagues so that we get best use from them.

TECHNOLOGY CONVERGENCE TECHNICIANS
We are not going to be using AI in splendid isolation, but alongside a host of other disruptive technologies, from virtual reality and 3D printing to the internet of things. Computer scientists who can help firms integrate these technologies, or combine them to create new offerings, will be in high demand.

WHO WILL GAIN THE MOST FROM HUMAN-MACHINE COLLABORATION?

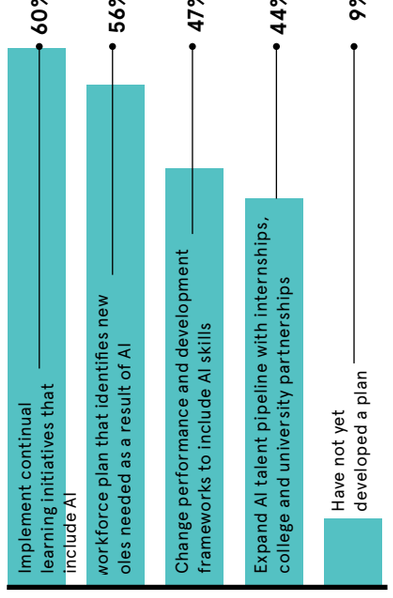
Estimated revenue and employment increase over the next five years for companies investing in AI and investing in human-machine collaboration at the same rate as top-performing businesses



Accenture 2018

BUILDING AN AI-READY WORKFORCE

Percentage of technology executives who plan to do the following



PwC 2019

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MACHINE-LEARNING

What if machines could teach themselves?

One of the big conundrums with AI is the paradox that it will help solve the skills shortage across many sectors but will require skilled operators to 'teach' the machines how to think

Davey Winder

Can you imagine a world without the kind of voice assistant technology provided by Amazon Alexa, Google Assistant, Siri on the iPhone or Cortana for Windows? Probably not, as we tend to take such technological leaps forward pretty much for granted.

But behind the scenes there's a whole new world of machine-learning that drives their collective ability to seemingly answer any question put to them. It's not so much knowing the answer that's the technological miracle – because, well, the internet – but rather that these virtual assistants are able to understand the question in the first place.

Machine-learning is, in the broadest possible terms, what you might expect in that computer algorithms can be trained to understand how to correctly respond to an input by way of a human telling it what that response should be. Over time the collective inputs and outputs enable the computer to learn, albeit within a relatively narrow and defined speciality, all thanks to the skilled operators that handle this education.

Which is where one of the biggest conundrums surrounding AI pops up: the paradox that it will solve the skills shortage across multiple industry sectors yet requires skilled operators (who are in very short supply themselves) in order to achieve it. But what if the machines could teach themselves?

When talking about the machines teaching themselves, this is what's known as unsupervised machine-learning. The simple definition of which is that the machine, or rather the algorithm running it, can be trained without the classification or labelling of data. In other words, the algorithm takes the input and determines the correct response itself, without the need for the output confirmation part of the learning equation.

But have we really reached that far in the development of thinking machines? Labhesh Patel, chief scientist of Jumio, answers with a qualified yes. Mr Patel, whose company uses machine-learning to deliver identity verification and authentication solutions, says that the best machine-learning models start with supervised training and once the AI system is regularly outputting correct results then unsupervised models become a viable proposition.

"Think about sites like Amazon or Netflix that offer recommendations," Mr Patel explains, "once the machine-learning models have been created, they will learn based on user behaviour. If a recommendation keeps getting clicks, those clicks will feed the intelligence of the algorithms and that recommendation will become more prominent."

> **We need to be thoughtful about how AI technology can be used to enable responsible innovation**

Another example is language modelling, according to Dr Tom Ash, a machine-learning engineer with speech recognition company Speechmatics. Language modelling involves "learning about grammar and sentence structure from large bodies of text without any labelling of those words into different classes," he says. In other words, algorithms can be applied to identify patterns in random data without the need for human input.

"This perspective is hugely interesting as human beings live in a world full of patterns," says Antonio Espingardeiro, Institute of Electrical and Electronics Engineers member and an expert in the field of robotics and automation. "Humans tend to observe and generalise," Mr Espingardeiro says. "These algorithms apply formulas and present possible results without generalisation."

Such an ability comes to the fore in areas where there is either a lack of 'pre-labelled' data or a requirement to minimise the bias that 'expert knowledge' inevitably brings with it. "Without target information to train on, the learning algorithm must learn from general patterns inherent within the data," says Chahmn An, principal software engineer for machine-learning at next-generation threat intelligence provider Webroot, who continues: "such as the shape of edges within images or syntax patterns within natural language."

Not everyone agrees, however, and some insist that it's a myth to suggest an AI can teach itself anything outside of the context of its learning environment, which means it is only as good as the combined forces of the human teacher and the data it is fed. And there is certainly an argument to be made that, currently at least, human oversight is required to ensure that machine-learning-driven decisions are transparent and trustworthy.

"An insurance AI let loose on unstructured driver data might decide blonde people are a higher risk of having accidents because they happened to be over-represented in the sample of risky drivers," argues Ben Taylor, chief executive at Rainbird, which helps deploy AI across multinational corporates. Mr Taylor points out that the insurance industry is not alone in having poor data hygiene, which could lead to unsupervised AIs making critical errors.

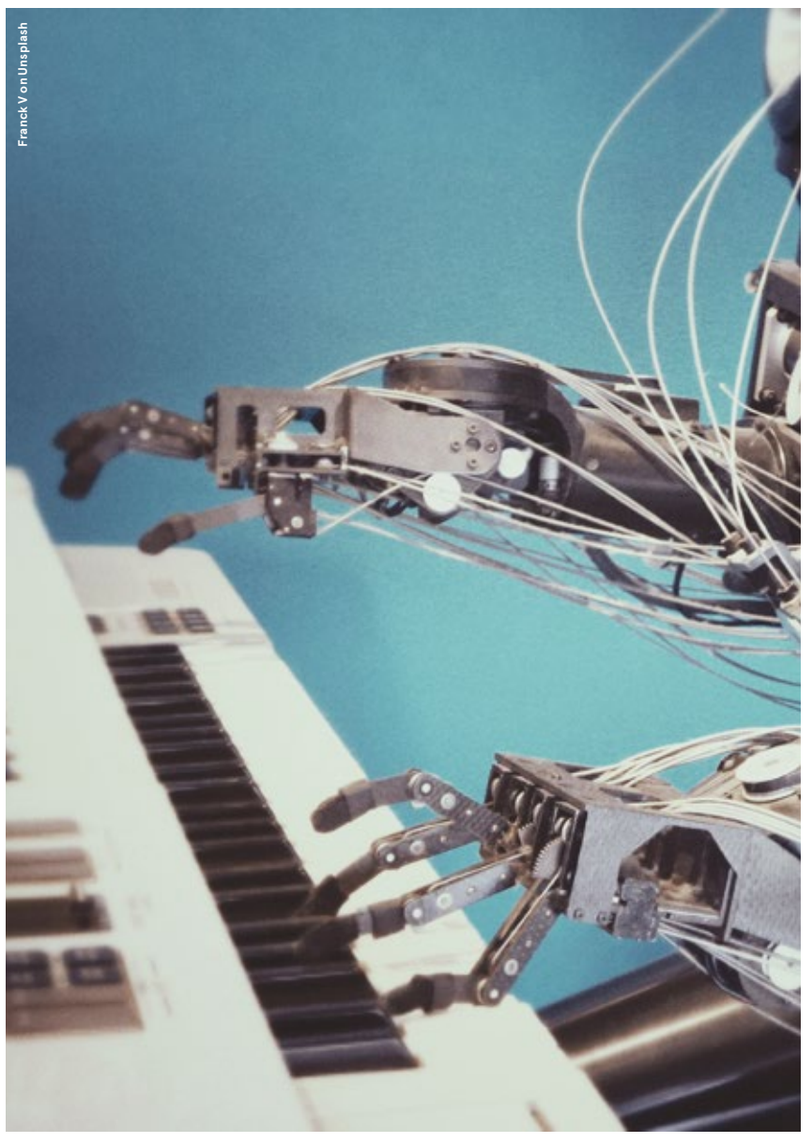
But what of that skills shortage paradox mentioned earlier; will unsupervised machine-learning help to break out of this seemingly unending contrary loop? Mastercard has been pioneering the use of AI that tests the algorithms used to detect fraud and anomalies in payments, and has had some success using AI that monitors other AI models through unsupervised learning techniques.

Ajay Bhalla, president for cyber and intelligence solutions at Mastercard, is certain that machine-learning will plug the skills gaps across a range of industries, at both the skilled and unskilled ends of the spectrum. "By supporting the performance of routine tasks, AI tackles 'thought labour' for high-value roles, freeing up experts to do the critical thinking machines simply can't do," he says.

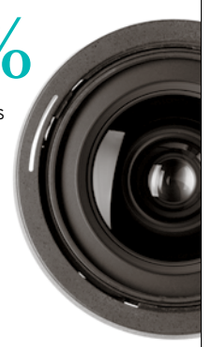
But that doesn't mean that unsupervised machine-learning is automatically a win-win. "We need to be thoughtful about how AI technology can be used to enable responsible innovation," Mr Bhalla says. "This will inevitably require greater collaboration and transparency as solutions advance, as well as attention to how data is handled and how we address issues such as unintended bias."

And while nobody is suggesting a Skynet scenario here – the fictional AI network that features as the main antagonist in the *Terminator* film franchise, for those who are not familiar – issues surrounding misuse of data and the potential for bias that could have negative consequences for customers and companies alike, cannot be ignored.

"The release of the EU's ethical guidelines for trustworthy AI is a step in the right direction," concludes Peter van der Putten, assistant professor of machine-learning and creative research at Leiden University and global director of AI with customer relationship software outfit Pegasystems. "But it will be up to the individual providers to comply and iron out any ethical issues with the AI they are using before it is fully implemented."


Franck V on Unsplash

96% of IT decision-makers believe AI and machine-learning will have a slight to significant impact on society over the next two years



69% see this impact as somewhat or mostly positive

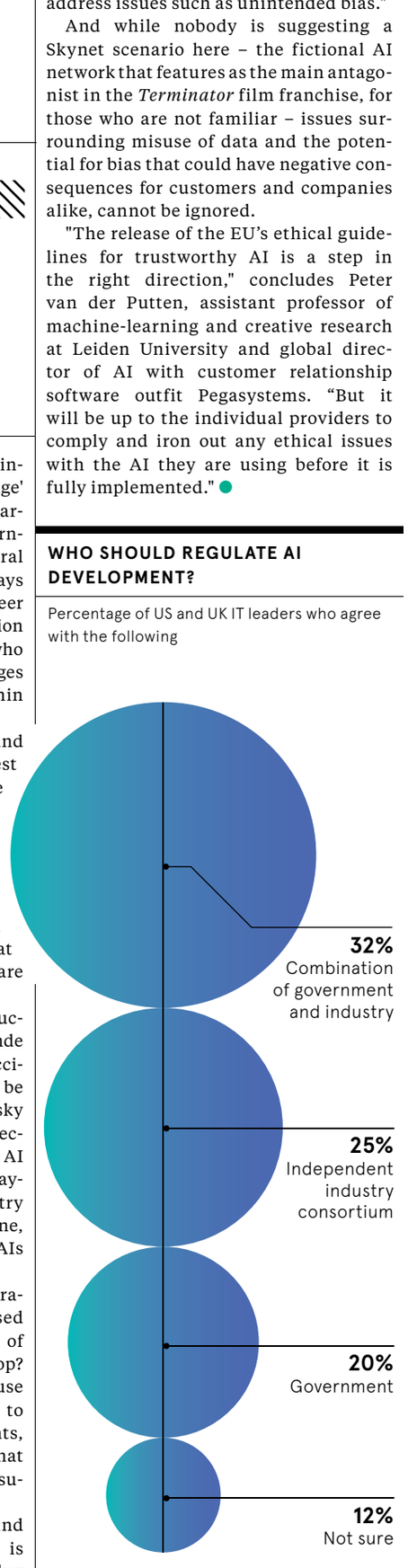
451 Research 2018

54% of tech executives believe that *the* regulation of AI is critical and should be done by a public body

Edelman 2019

WHO SHOULD REGULATE AI DEVELOPMENT?

Percentage of US and UK IT leaders who agree with the following



SnapLogic/Vanson Bourne 2019

Commercial feature

BIG DATA SET EXISTS

32% No

25% Yes

43% To some extent

DATA WAS LABELLED

29% Yes

71% No

DATA HAS PREDICTIVE POWER

25% Some predictive power

29% Strong predictive power

46% No predictive power

TIME TO ESTIMATE THE VALUE OF THE MODEL TO BUSINESS

Average 6 months

Median 4 months

TASK HAS BEEN COMPOSED APPROPRIATELY BY BUSINESS

54% Yes

46% No

Embracing the transformative power of artificial intelligence

The ability of artificial intelligence and machine-learning solutions to reshape entire companies and business models is now widely acknowledged

Thanks in part to growing computational power, firms are able to carry out trials with innovative tools backed by artificial intelligence (AI) and uncover exciting use-cases that were not achievable in the recent past.

"It's clear that AI will fundamentally change how human beings live. At the moment we are in an experimental period, when a lot of companies and leaders are testing AI to see its true value," says Alexey Tsyvunchyk, chief technology officer of InData Labs, a leading data science services provider. "Some of these projects will not survive, but the ones that do will have a substantial impact on virtually all industries."

According to research from Gartner, 85 per cent of the interactions customers have with businesses will be handled without any human element by 2020. This radical shift will reduce costs for companies and enable employees to undertake more complicated tasks that require human intelligence.

"Adopting AI and machine-learning (ML) will provide you with the tools to optimise costs by learning from previous business experience in an automated way. It's possible to create new models inside your company that learn from historical data and make accurate predictions on the future of the business," says Mr Tsyvunchyk.

There are literally hundreds upon hundreds of potential applications of AI tools that have the ability to upend traditional processes and business models. For example, InData Labs developed a natural language processing (NLP) solution for an international games developer that helped them quickly and accurately analyse customer feedback from YouTube and online forms, which was a major improvement on the previous manual processes.

The first step before a business moves forward with any type of AI initiative should be to define what the exact business problem is that AI is attempting to resolve.

"AI is not a magic solution that will fix all of your problems; it has to be targeted at specific challenges. It's best suited to the automation of routine activities or obtaining insights from a large volume of historical data, which is sometimes difficult for human beings to understand and process," says Mr Tsyvunchyk.

The conversation around AI and ML has already developed from its initial hype-based discussion into a search for how to uncover practical solutions. Yet not all businesses will be ideal candidates for advanced AI solutions as the data they hold may not be appropriate for these tools to be effective.

"We had a case where we were approached by a mobile fitness company to assist them in creating a personal assistant that would provide personalised recommendations to the user to help them lose weight. They did have a dataset, but they had not collected a user's height, making it impossible to compute BMI, which is the key indicator in this solution," says Mr Tsyvunchyk.

In some cases, the lack of certain data may make it impossible or extremely difficult to make an accurate prediction. It's vital that as much relevant data as possible is collected before implementing an AI solution, as the end-results of any data-driven tool will rely heavily on the data input.

As the rapid growth of challenger firms such as Uber illustrates, disruption can come to any industry and firms that don't implement AI solutions will be threatened by up-start competitors. The growing use of powerful AI tools in all manner of consumer applications, most notably by Netflix, Uber and Amazon, is increasing customer expectations and making it vital for all companies, no matter what industry they operate in, to embrace AI.

"Financial organisations, primary banks and debt collection organisations, will be able to predict their customers' behaviour more precisely and apply a more personalised approach to each customer. For example, contacting them with advice and checking the creditworthiness of customers," says Mr Tsyvunchyk.

> **Artificial intelligence and machine-learning, in conjunction with big data processing technologies, uncover the possibility to personalise services for each individual user**

Most aspects of customer service will be impacted by AI and related technologies with the management of customer interactions being improved through automation. Chatbots and virtual assistants, backed by NLP, can provide around-the-clock support to consumers with relevant advice as well as tailored product recommendations.

Even traditional industries, such as the railway sector, can make use of sophisticated AI solutions. A train operating company approached InData Labs looking for help to improve the process customers have to go through to receive a refund after their train is cancelled.

"When there are multiple trains that had been cancelled, a lot of travellers would try to get the cost of their ticket reimbursed by sending a photo of the ticket to the train operator. Instead of wasting the time of staff by manually checking the ticket information, we recommended the client create a system that used computer vision, NLP, AI and robotic process automation to automate this process," says Mr Tsyvunchyk.

Alexey Tsyvunchyk
Chief technology officer
InData Labs

This example of the ability of AI-based solutions to transform conventional business processes and operations saw important ticket details, including the customer's name, destination and ticket number, extracted from the image and input into an internal system to reimburse automatically without human involvement.

"AI and ML, in conjunction with big data processing technologies, uncover the possibility to personalise services for each individual user. Businesses will be able to deliver the right message at the right time through the right channel by understanding customer needs and offering them the most appropriate products or services based on customer behaviour and historical data," says Mr Tsyvunchyk.

But there remains a lack of understanding among many firms around how to incorporate AI tools into their operations and ensure they get the most value from these burgeoning technologies.

Embarking on an AI project can signal the start of an exciting new stage of development for companies. But for these often complex and elaborate ventures to be successful, partnering with a skilled AI expert can be vitally important.

InData Labs has substantial experience as a data science services supplier and works with firms that want to implement practical AI solutions in their business. By exploring the exact business areas where AI and ML services can have the most positive impact, InData Labs can establish a reasonable explanation on why the company is either suitable or not for these innovative tools.

"From performing an exploratory data analysis to building machine-learning models and integrating them into the company pipeline, and setting up an internal data science team, we help companies at every step of the AI and ML journey," Mr Tsyvunchyk concludes.

For more information please visit indatalabs.com

InData Labs

CREATIVE INDUSTRIES

When AI gets creative

Artificial intelligence is shaking up the world of work, automating out routine tasks and freeing workers to concentrate on the more creative elements of their job. But it can often be surprisingly good at mimicking human creativity, and with varying levels of human involvement is now making inroads into new areas of work

Emma Woollacott


Lexus

FILMMAKER

Last year, an ad for the luxury car brand Lexus boosted sales in Europe by 35 per cent more than expected.

The ad showed a craftsman finishing his work on the ES sedan before watching it go out into the world. The car's just about to crash dramatically when the automatic emergency braking system cuts in, saving it from destruction.

The ad was directed by Kevin Macdonald, director of *The Last King of Scotland* and *Whitney*, but was written by an AI developed by creative agency The&Partnership London and marketing technology firm Visual Voice, and based on IBM Watson.

Watson was fed data on 15 years' worth of successful car ads, as well as those for other luxury brands, along with data on human emotional intelligence and intuition. It opted for limited dialogue and certain visually appealing scenes: for example, a winding road with trees on one side and water on the other.

"I thought I'd be writing an ad with the assistance of AI. Instead it took over and wrote the whole script," says Dave Bedwood, creative partner at The&Partnership.

He does, though, describe the story as "charmingly simplistic" – it seems there's room for human beings in the process still.

JOURNALIST

The *Washington Post* has a broad remit and a well-staffed newsroom, but naturally lacked the resources to cover every single high school football game in the area. That is, until it put its AI reporter Heliograf on the case.

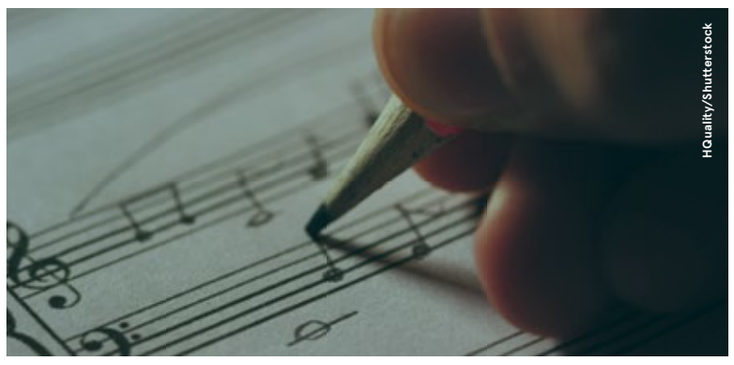
Based on data supplied by high school football coaches, the system identifies what's important, matches it to a template, and then publishes short reports across several platforms.

Similarly, the *Associated Press* has used robots to automate some of its earnings coverage, and says that AI has freed up 20 per cent of reporters' time, while at the same time cutting the error rate. *Bloomberg* does the same, with around a third of its coverage having been produced with the help of automation.

And the *Los Angeles* Times uses similar technology to publish earthquake alerts, sometimes within minutes of the shaking starting.

So far, AI isn't producing longer-form articles on its own, but it is already helping journalists to do so. *Forbes*, for example, has a content management system called Bertie that suggests real-time trending topics to cover, appropriate imagery and even compelling headlines.


Brian A Jackson/Shutterstock


HQuality/Shutterstock

MUSICIAN

Musicians have always experimented with technology, and composition is no exception; several companies have created AI-based systems that can write short pieces of music.

OpenAI's MuseNet, for example, can generate four-minute musical compositions with ten different instruments, and can combine different musical styles from country to Mozart to the Beatles.

Meanwhile, IBM's Watson Beat has been given the basic principles of musical theory, and can create short pieces of music when provided with a few seconds of melody and instructions on mood, genre and tempo.

Writing longer pieces of music is a taller order for an AI, thanks to the sheer level of complexity involved. Multiple motifs and phrases, repetition and rhythm based on relative distances and recurring intervals, rather than absolute timing, all present problems.

Google's Music Transformer, part of its Project Magenta, is aimed at overcoming these problems through the use of 'relative attention', focusing on relational features. When given Chopin's 'Black Key Etude' as a starting point, it was able to produce a song including many of the original piece's motifs that was consistent in style throughout.


Symrise

FRAGRANCE DEVELOPER

Developing new fragrances is about more than creating the next Chanel No 5; they're used in everything from deodorant to washing powder and air fresheners. And while the high retail price of a designer perfume makes expensive ingredients cost-effective, this isn't the case when it comes to fabric conditioner.

As a result, fragrance producer Symrise teamed up with IBM to create Philyra, a machine-learning system that sifts through hundreds of thousands of formulas and thousands of raw materials. It can access fragrance formulas, data about fragrance families – fruity, oriental or flowery – and historical data, helping identify patterns and new combinations of ingredients.

"Philyra's understanding of consumer preferences and knowledge of formulas and ingredients led to new fragrance combinations, which allowed our perfumers to accelerate the creative design process and focus on perfecting the final products," says Alexandre Bouza, marketing director of Brazilian cosmetics manufacturer O Boticario, one of Symrise's customers.

The resulting two fragrances, including one designed specifically for Brazilian millennials, are set to come to the market this year. Symrise is also planning to introduce Philyra into its Perfumery School to help train the next generation of perfumers.


Kartell

FURNITURE DESIGNER

This summer, furniture company Kartell will start selling a new plastic chair designed by Philippe Starck – with some help.

The system used – not, perhaps, strictly an AI – was a generative design software platform from Autodesk. Supplied with initial design goals, along with parameters such as materials, manufacturing methods and cost constraints, the software explores all the possible permutations of a solution to generate design alternatives. It tests and learns from each iteration what works and what doesn't.

"As the relationship between the two matured, the system became a much stronger collaborative partner, and began to anticipate Starck's preferences and the way he likes to work," says Mark Davis, senior director of design futures at Autodesk.

The final result, a sleek and streamlined dining chair with a comfortable seat, has itself been named 'AI'.

In the later stages of the design process, there was significant human involvement – not least because the Autodesk software had difficulty making the chairs stackable. Nor were all its designs particularly beautiful.

However, says Mr Starck, "AI is the first chair designed outside of our brain, outside of our habits of thought."

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KORN FERRY

"Like many professional services organisations, we were struggling with content management and knowledge sharing.

This traditional challenge was heightened by three factors: the incredible islands of content and knowledge held broadly in the legacy brands; the fact that one in five employees has been with the company for less than a year with millennials being the largest workforce demographic; and the workforce becoming much more mobile."

Bryan Ackermann, CIO, Korn Ferry