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Daniel Sorabji/AFP/Getty Images

A recent tribunal ruled that Uber, which is developing driverless technology, must class their UK drivers as "workers", not contractors, making it more expensive for the company to employ human drivers

Making machines work for people

History may teach us not to stand in the way of technological advances revolutionising the future of work, but the lesson to be learnt is progress should benefit the workforce

OVERVIEW
EDWIN SMITH

There's an old story that some people in the pro-tech lobby like to tell about progress. A mound of earth needs to be dug up and moved from one spot on a construction site to another. The site manager decides to use a mechanical digger, but gets chastised by a union representative: "Without your machine, that job could be honest work for ten men with shovels." "Yes," comes the reply, "and without your shovels, it could be honest work for 100 men with teaspoons."

It seems to be a compelling fable about the future of work and the way we live: it's foolish and futile to resist advances in technology and the benefits they bring. But perhaps this glosses over important nuances.

Some of those nuances were pulled into focus on October 28 when a tribunal delivered its verdict on the question of whether taxi app Uber should treat its UK drivers as "workers", rather than mere contractors. Its ruling might just have provided us with a glimpse of the future.

The decision – that Uber must elevate its UK drivers to "worker" status – was revealing for at least two reasons. The first is, since Uber's business model hinges on maximising efficiency, it's likely the development, which makes it more expensive and onerous to employ human beings, will hasten the arrival of autonomous cars (which the company is already developing), and add "driver" to the list of professions at risk of extinction authored by artificial intelligence (AI).

The second reason is that the judgment hints at the new political and legislative environment that may be created to protect people from the new generation of powerful tech companies and, in the not-too-distant future, the inevitable rise of their machines.

But the courts and policymakers will have their work cut out if they're to keep up. Frank Lansink, chief executive for Europe at IPsoft, says one of the largest telecoms companies in the world is using his company's virtual assistant, Amelia, to replace human employees in its customer service function. Amelia's ability to understand natural language and use her interpretation of real people's emotions to guide her decision-making means, according to her creators, that she not only does the same job as humans more cheaply, she also does it better.

> Previous disruption often resulted in a deterioration of wages and quality of life for the poorest, lowest-skilled people, at least initially

"This is happening today," says Mr Lansink, who explains that his client doesn't want to publicise the efficiency drive itself. "And the impact in the next 18 months will be significant – we're talking about hundreds of thousands of jobs that will be repurposed."

The jobs being made redundant by Amelia are, so far, relatively low skilled. But the difference between the anticipated AI revolution and technological revolutions of the past is that it's no longer just the simplest tasks that are being taken care of by machines. Bankers, lawyers, doctors and, yes, even journalists are under threat as pattern-learning programmes and machines are developed to make investment decisions, extract meaning from documents, interpret scans and compose sentences.

Mr Lansink, who believes that fighter pilot is the occupation least susceptible to AI-induced redundancy, describes himself as a "digital optimist" and argues the new technology will free up time to spend on things that only humans can do. As such, he says, it is good news, echoing the experts who say more, high-quality jobs will be created than the relatively menial tasks lost to robots.

But a smooth transition through what World Economic Forum founder Klaus Schwab has dubbed the "fourth industrial revolution" is far from assured. Ryan Avent, author of the recently published *Wealth of Humans*, points out that previous disruption often resulted in a deterioration of wages and quality of life for the poorest, lowest-skilled people, at least initially. That observation raises bigger questions about what society will do this time around and whether 2016's political shock waves will be amplified or dampened in the years to come.

Mr Avent hints that the answer to human job losses on a massive scale could be a kind of "techno-socialism", a thought that has been echoed by business magnate Elon Musk, who floated the idea of a universal basic income as a way to solve the problem.

Of course, this would have consequences for the companies and high-skilled, well-educated workers creating value and wealth in this new world as their tax contributions would be needed to pay for the solutions. And, it's worth noting, the voting public's perception of those companies and people would matter too.

For all his confidence in his company's virtual assistant Amelia, Mr Lansink is keen to point out that he doubts whether computers will ever be capable of true creativity or of combing various types of unstructured data without a helping hand. And, having studied the human brain, he reckons that computers are centuries away from equalling it.

This may be true. The AI revolution might take place at a manageable speed, and be informed by intelligent policy and reasoned public debate. But then again, it might not. Sometimes things change more quickly than you expect – just ask those ten men with shovels.

CRIMINAL INTELLIGENCE

DAVEY WINDER

What if cyber gangs control the robots?

If machines powered by artificial intelligence threaten the way we work, what if cyber criminals take control of the AI?

There has been a lot written about how artificial intelligence or AI, usually in the guise of machine-learning, is changing the way we defend networks and data from criminal endeavour. But what if we flip this around; what can AI do for the bad guys?

Forget the rise of the robots enslaving humanity, a far more likely science factual future sees criminal gangs in possession of AI applications. What kind of crimes could AI drive in the years to come?

To answer this question, we should first look at where the criminal fraternity is now, as far as shifting the cyber-crime model is concerned. Certainly, over the last few years there has been a move away from transitional online "smash-and-grab" crimes to more sophisticated and structured "as-a-service" models.

These leverage commercially available applications such as predictive data analytics to identify future trends from past attacks, optimal timings and even victim profiling to determine the most likely to yield the best attack exposure.

"AI can provide cyber criminals with data-driven models for crime 'return on investment' much as retailers can predict consumer spending patterns," warns Peter Tran, general manager of the Worldwide Advanced Cyber Defence Practice at security consultancy RSA. "As-a-service models are quite profitable over the dark web." All of which is unsurprising as they enable criminals with little technical skill to purchase ready-to-hack toolkits once reserved for the elite hacking underworld.

Not that the criminal underground is short of elite hackers or PhD scientists and maths wizards for that matter. Together they are increasingly employing AI-powered tools to expose weaknesses in corporate defences.

"It is relatively easy for AI-powered tools to learn how to fake biometric data," says Scott Zoldi, chief analytics officer with behaviour prediction specialists FICO. "This is done by layering noise on top of an image to cause recognition systems to misclassify it. Criminals are developing subtle ways of attacking an organisation that are nearly unperceivable to humans and that can trick the machines we increasingly depend upon to protect us."

Given the growth in intelligent voice services such as Amazon Echo, Apple Siri and OK Google, it seems likely that voice could also become vulnerable to AI-driven crime, especially as banks move to voice security systems.

"I can foresee this being so vulnerable," says Tracey Follows, chief strategy and innovation officer from The Future Laboratory, "because it is such a natural human behaviour. Once machines can learn and mimic unique voices they can carry out crimes under a cloak of trust."

We should also expect a shift in the criminal business model to start affecting strategic business decisions, instead of just stealing data. What if hacktivists could have smart malware hidden in geophysical survey databases which change underlying data, so that the multi-million-pound drilling rights are bought in the wrong places with oil rigs coming up dry?

"Even if you think the survey database is too well protected," says Dave Palmer, director of technology at machine-learning security specialist Darktrace, "you could attack the ocean sensors that are collecting the data in the first place, to ensure you are still able to influence the decisions right from the start of the information supply chain."

So, what can the programmers of AI applications do to prevent it being used with criminal intent? It's reassuring to think that Asimov's three laws of robotics might apply. These dictate that a robot may not injure a human or allow a human to come to harm through inaction; must obey the orders a human gives it unless they conflict with the first law; and must protect itself unless that conflicts with the first or second law.

But is this actually possible? Javvad Malik, an advocate at security vendor AlienVault, likes to think there might be specific use-cases where ethics, parameters or safeguards can be built in. However, as things stand now and in the foreseeable future, Mr Malik sees AI as a knife-like tool. "The knife will cut regardless of whose hand it is in," he says, "and whatever object it is slicing, be that bread or another person."

> AI can provide cyber criminals with data-driven models for crime 'return on investment' much as retailers can predict consumer spending patterns

Even if it were possible to embed some kind of ethical safety valve into AI code, Ms Follows points out, whose ethics would it be? "Is it Google's ethics we are programing into the system or Amazon's?" she asks. "It seems likely that those who are used to executing and legislating our moral codes will not be the ones in control of the AI."

So, will ethics be embedded by commercial enterprises and, in that case, what might be their agenda? This is why governments need to get on the front foot with this and it is a good sign that, in the United States, the White House published their *Future of Artificial Intelligence* initiatives earlier this year. It's an area in which the UK currently lags, although MPs on the House of Commons Science and Technology Committee have called for a commission to provide leadership on the legal and ethical implications of AI.

As Bertrand Liard, partner at global law firm White & Case, advises: "The allocation of risk and liability for AI is an enormous decision. While companies are quick to claim ownership of data and discoveries made by such devices, they will undoubtedly want to limit their liability in the event of something going wrong."

Mr Liard even suggests that maybe a codicil to Asimov's laws is required. "Every act of AI that causes damage to AI, man or humanity obliges him by whose fault it occurred to repair it," he says.

One thing we can say with certainty is that both public and commercial enterprises need to prepare for cyber crime rapidly pivoting to AI-driven micro-breaches focused on data manipulation and disruption rather than exfiltration alone.

"Think global financial market manipulation, critical infrastructure disruption and long-term corporate espionage," says RSA's Mr Tran.

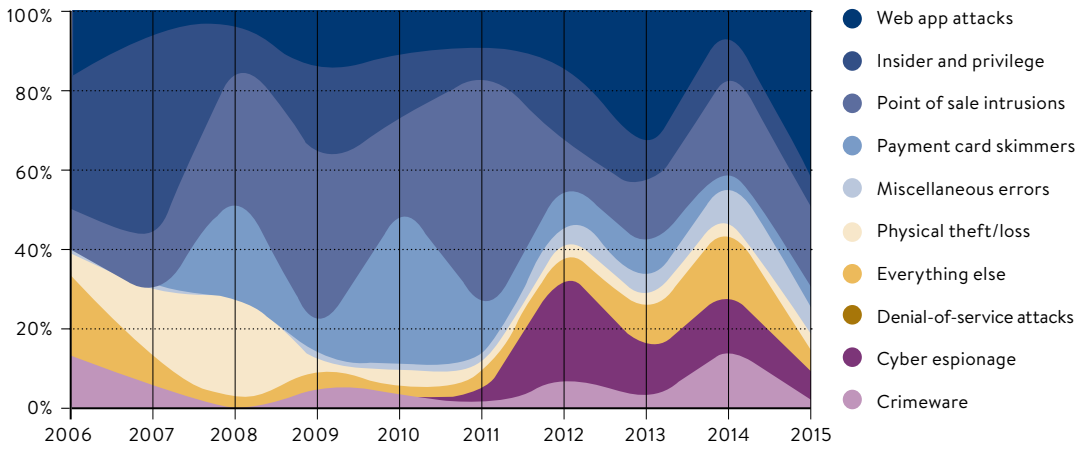
Think *Minority Report,* the movie based on Philip K. Dick's story of a future where people are arrested and convicted before a crime is committed. Ms Follows concludes: "The only way to deal with AI crime will be to forecast it in order to fight it. An industry will spring up that is about tracking behaviours, pattern recognition and anomaly-spotting that might become a more prevalent force than the traditional police."

85%

MIT's Computer Science and Artificial Intelligence Laboratory have developed an AI system that can detect 85 per cent of cyber attacks

CHANGING FACE OF CYBER CRIME

SHARE OF CONFIRMED DATA BREACHES OVER TIME



Source: Verizon 2016

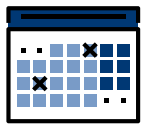
Five ways your working life will be changed

Already they are beginning to take the drudgery out of office admin – now virtual personal assistants are set to get even smarter

TOP FIVE
FINBARR TOESLAND

01 ARRANGING MEETINGS

Scheduling meetings can be a tedious task, with countless hours lost each year trying to pin down busy contacts. But personal assistants powered by artificial intelligence or AI, such as X.ai and Mimetic.ai, can effortlessly arrange meetings simply by being copied into an online meeting request. These intelligent schedulers automatically check your calendar and preferences to work out a convenient meeting time with the recipient, without you having to do anything more.



02 DICTATION

Dictation software is far from a new innovation, but the accuracy of speech-to-text solutions has yet to be perfected. Apple's Siri claims to have an industry-leading 95 per cent speech recognition rate and processes more than one billion speech requests every week. However, this still means 50 million questions to Siri are misheard, wasting time and frustrating users. As dictation technology continues to advance, AI assistants will be able to carry out more tasks for their human masters.

03 BUSINESS TRIPS

Travel agents may soon see their commissions dry up if users turn to virtual AI assistants to plan business trips. AI-based apps including Lola and Pana, which combine the expertise of travel agents and AI-learning, are available now, but the AI assistants of tomorrow won't need any human input at all. AI assistants will be able to learn your travel preferences, down to time of departure or arrival, favourite airline and hotel chain, to create a hyper-personal itinerary in seconds.

04 TRAVEL SUPPORT

Driving to see clients out of the office is easy enough if they work nearby, but for businesspeople who regularly drive long distances or in places they are not used to, knowing where to find a petrol station or parking space can be a problem. Smart AI assistants can do more than just give you directions to a meeting; they can proactively tell you where the nearest car park is when you get close to the destination and even suggest suitable restaurants for a quick business lunch.

05 JOB SEARCH

Finding the right job can often be a stressful process, with many positions that look like a good fit on paper turning out to be completely different. Intelligent artificial assistants will be able to build up your ideal job profile, based on factors like how many hours you want to work, the corporate culture and the amount of travel required. Then all you have to do is look through a carefully curated job selection and apply for the jobs you're most interested in. Then take your virtual assistant with you to your new role.

COMMERCIAL FEATURE

ENABLING GROWTH WITH THE POWER OF IDENTITY

In an increasingly complex security and regulatory landscape, the ability to manage user access is allowing organisations to embrace the connected age without fear of data breach, says ***Jon Burghart****, who leads the Europe, Middle East and Africa region for identity management firm SailPoint*

SailPoint

The world today is more advanced and interconnected than ever, creating lucrative opportunities for businesses. But it is far easier to gain information and access through these new channels, so the advances come at a cost. Businesses have had to secure their prized and sensitive information against cyber attacks to keep afloat.

The consequences of not protecting sensitive information, no matter where it "lives" within an organisation, are catastrophic. This fear can create a state of business paralysis, which displaces innovative drive and forces companies to forego competitive advantage to stay safe.

While the opportunities in this new business reality are endless and hugely lucrative, further integration between the physical and digital worlds comes at a time when the cyber-threat landscape is becoming an increasingly critical issue for organisations, large and small, around the world.

PROTECTING IDENTITY

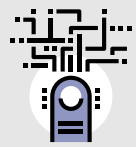
Too many organisations aren't taking cyber crime as seriously as they should. Access to insightful information can create business value, but companies also need to protect sensitive data from hackers.

> Organisations require an identity and access management strategy that doesn't allow security to inhibit growth

Many of the cyber attacks that have received the most press attention recently were down to people's identities being taken. These people were mainly inside the organisation with access to too much information.

2in5
vital opportunities halted by security concerns

201
days to detect a security breach



2in3
breaches involve insider access

Source: SailPoint

Organisations require an identity and access management strategy that doesn't allow security to inhibit growth.

The security problems facing businesses certainly can't be attributed to a lack of investment in protective technology. What businesses are failing to invest in, however, is educating their employees to be more security savvy when accessing sensitive information. Humans are the biggest vulnerabilities of all.

Meanwhile, most organisations allow their business users, spanning employees, contractors, vendors and partners, to access far more corporate systems than they require to do their job.

With all the applications and users, enterprises could easily have a billion points of access, and it is quicker and easier to fool a person than it is to penetrate a network. Identity is becoming the attack vector of choice for hackers.

Organisations that can set up business users to access only the right information at the right time, with the ability to change what they can access immediately, can focus on innovation and driving value from new streams of data without worrying about who's getting their hands on it.

Any business that can do this already has the majority of its security issues dealt with. Organisations need to understand what data they have, what data is critical, who has access to it, and then make sure they limit access to people who should have access to it.

FEARLESS INNOVATION

To make matters more complicated, new regulations are emerging that are adding to the fear that organisations already face when it comes to protecting sensitive data. They now need to prove it. For example, the General Data Protection Regulation will come into force in 2018, unifying data protection laws across the European Union's member states. The new law will hold organisations fully accountable for implementing a comprehensive data governance policy.

With non-compliance and data breaches set to result in fines of up to 4 per cent of a company's total global annual turnover, IT security and identity management must become a greater focus for all companies with data that relates to EU citizens or passes through EU countries.

Identity management not only enhances a company's ability to comply with data regulations, but also helps them strategise and innovate without the looming fear of data breaches. The advanced visibility over user access allows companies to detect and mitigate a data breach, and ultimately focus on their business priorities.

Many companies are still focused on parameter security, trying to stop people getting into their physical infrastructure. The world has moved on. Companies shouldn't care if somebody accesses their corporate infrastructure – they need to make sure nobody can access sensitive data.

For more information please visit www.sailpoint.com

Are gender quotas in the boardro

Women account for almost half the UK workforce and yet their representation on executive boards remains po per cent female representation in 2015 following the Davies Review – there's still a long way to go. Here two ex good thing for businesses or will they just result in more cases of positive discrimination? And how long will it b

FOR

RAINBOW MURRAY

Associate professor of politics
Queen Mary University of London

In an ideal world, no one wants gender quotas. True gender equality means selecting people on merit, not gender, and without having to enforce a gender balance. The problem is that the world we live in is far from ideal and also far from meritocratic. And as long as that is the case, with women excluded from boards on the basis of their gender, quotas are the best way of moving towards the meritocratic ideal.

To understand why quotas are a necessary solution, we need to understand the problem. Why aren't there more women on boards and how do quotas sit alongside broader solutions? Women are often stuck at the lower echelons of a company; quotas force companies to figure out why this is and redress it. Some women leave or cut their hours after having children; if quotas force companies to make more effort to retain these women, the problem can be mitigated by offering childcare facilities, flexible working and paternity leave to encourage shared parenting responsibility. Many women lack mentors and role models at the top of the company; only by getting women on to boards can this vicious circle be broken.

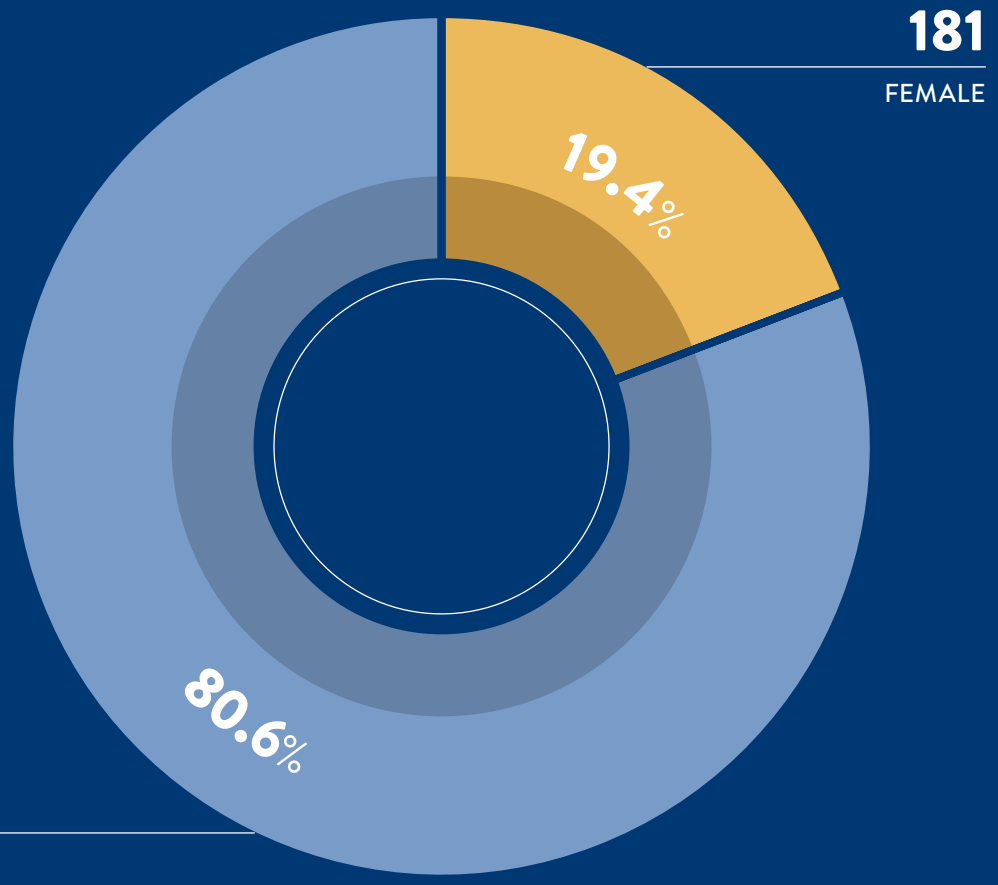
Perhaps most importantly, women don't make it on to boards because the men already there don't give them the opportunity. This might be the result of direct discrimination; more often, it is the result of unconscious bias. Numerous studies demonstrate that women are rated less highly than men, even when their experience and 'merit' is identical. A proven example is when prospective employers rate the same fictional CV more highly if it has a man's name on it rather than a woman's. So the problem isn't necessarily one of supply (enough qualified women), but of demand (underestimating women's worth). Men often form networks with other men and recruit in their own image while overlooking women. In addition, the very definitions of 'merit' and 'qualified' are far less objective than they sound, and are often used to justify appointing men using subjective criteria that disadvantage women.

Forcing women on to boards using quotas helps solve this problem in three ways. Firstly, it gives women the opportunity to prove that they belong there. Secondly, it helps shift attitudes and breaks the psychological association of competence and board membership with men. Thirdly, it places more women in recruiting and mentoring roles to ensure a future supply of women on boards.

> No one wants to appoint board members who aren't able and willing to do the job, so quotas force companies to think more deeply about how to recruit, retain and reward female talent

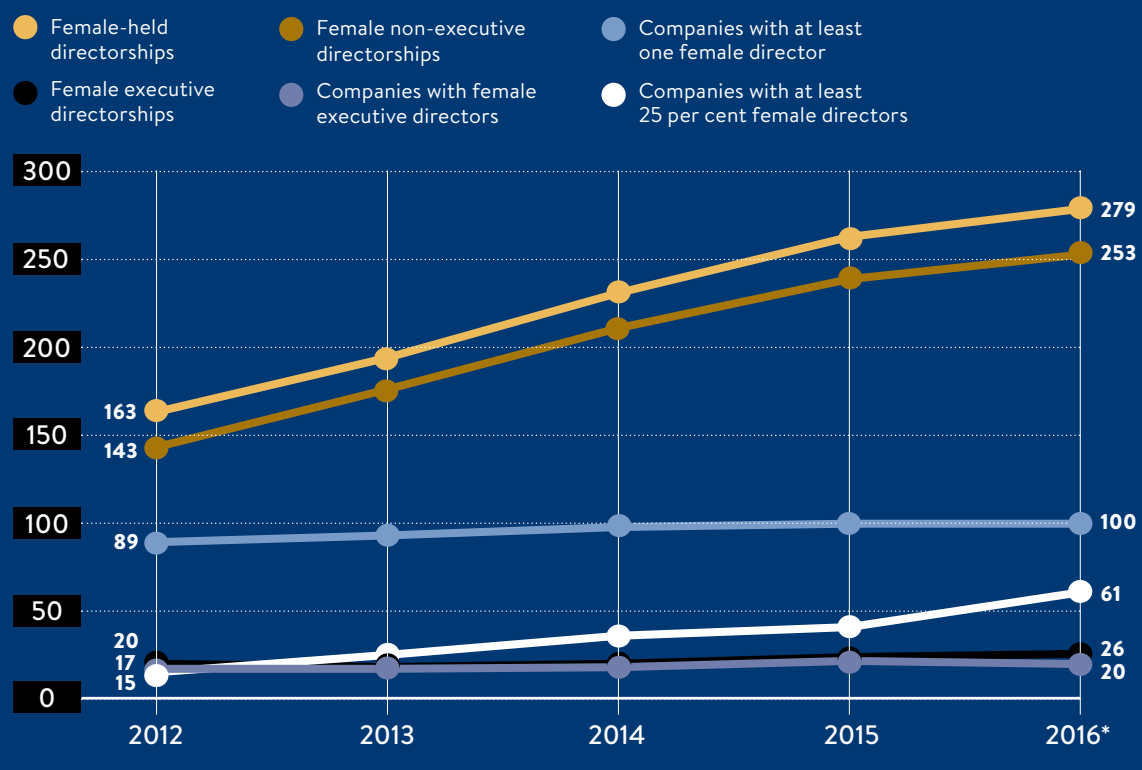
Quotas may seem like a simplistic solution to a complex problem, when in fact they are a mechanism for kick-starting more complex solutions. No one wants to appoint board members who aren't able and willing to do the job, so quotas force companies to think more deeply about how to recruit, retain and reward female talent. The argument that quotas undermine meritocracy is also a smokescreen. At present, we do not have meritocracy as men benefit from an unfair advantage, gaining access based on their gender rather than merit. When quotas break this gender bias, they actually enhance meritocracy, forcing companies to choose the best person, not just the best man.

GENDER COMPOSITION OF FTSE 100 EXECUTIVE COMMITTEES



FEMALE REPRESENTATION ON FTSE 100 BOARDS BY YEAR

DATA SHOWS THAT PROGRESS HAS BEEN MADE, BUT THERE'S STILL A LONG WAY TO GO



*June 2016

Source: Cranfield School of Management 2016

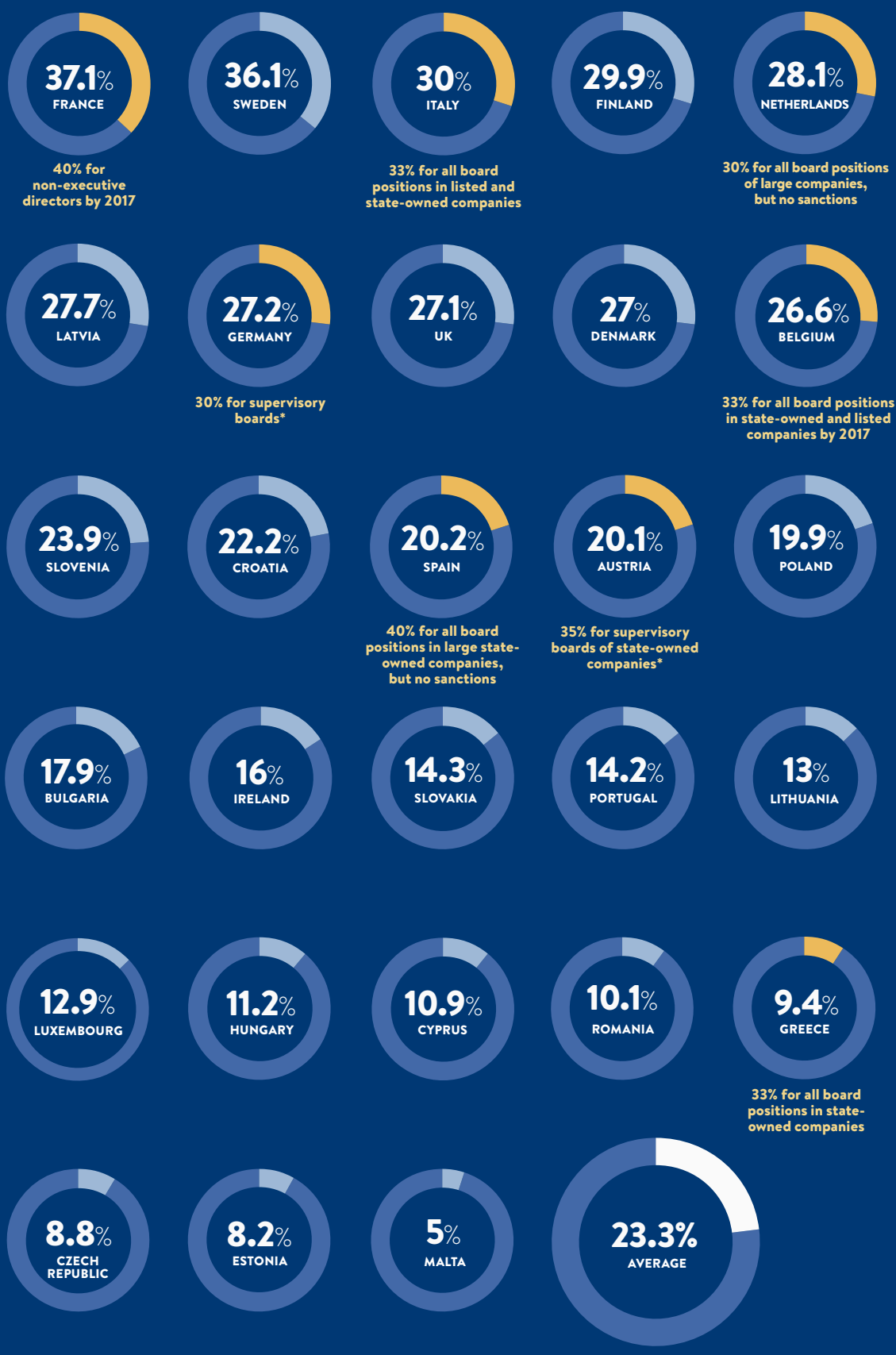
oom of the future a good idea?

or. While some progress has been made over recent years – FTSE 100 boards met a voluntary target of 25 xperts on gender equality go head-to-head on the question of boardroom gender quotas. Are gender quotas a e before we reach a level gender playing field in the UK?

FEMALE REPRESENTATION ON BOARDS OF LARGE LISTED COMPANIES IN THE EU

APRIL 2016

Countries with quotas in place



Source: European Commission 2016

AGAINST

RUTH SEALY

Associate professor of organisation studies
Exeter University Business School

Quotas offend our sense of meritocracy, legitimacy and democracy. Yet all evidence shows that we do not live in a meritocracy and are somehow managing to ignore the more qualified female half of the talent pool at senior levels. Ironically, issues of legitimacy are highlighted for women when they are the only 'different' candidate in the room, with all the negative group dynamics of tokenism. These issues are overcome with the 'critical mass' of women ensured by most quotas. So, unless we really believe that men are better qualified for leadership positions, quotas become a rational, legitimate response to structural barriers, ensuring more meritocratic outcomes.

Critics of quotas across European countries point to increases only in the non-executive population, but forget that most EU countries have a two-tier board system and the quota only applies to supervisory directors. In the UK, it is true, similarly, that most of the change following the Davies target was initially among non-executive directors, but the woefully small female executive figures are finally beginning to rise.

What is most exciting is the number of large corporations that have now publicly stated gender and diversity targets for their senior management levels. Just five years ago, this idea would have been completely rejected by most large firms. But the success of the boardroom targets, as opposed to quotas, on what had previously been a long-entrenched issue has shown how measurable objectives, which of course would be used in any other business change programme, do work.

Another problem with quotas is that we do not know how we define success: are we seeking descriptive change, meaning increasing the number of women, or substantive change, in other words changing the corporate culture? Quota discussions are often 'either/or' and unclear as to which should come first. But in the UK, following the hard work of the last few years, we are making progress that could allow both descriptive change and substantive change.

There is so much well-documented evidence of the additional challenges to leadership that women face at individual, organisational and societal level, based solely on their gender. This leads to market failure because resources are not used efficiently and therefore, even within the rules of capitalism, intervention is needed.

> Companies need ambitious, visible targets with clear accountability to grow their talent pipelines, reviewing and reporting their gender metrics on a regular basis

In the UK concerted application by multiple stakeholders is achieving results. While I reject many of the common anti-quota arguments put forward, in this country quotas would not currently be the most desirable response to help tackle the problem of lack of women in leadership positions. We need to apply the same discipline the Davies Committee had to boards, with regards to monitoring executive and senior management levels. Companies need ambitious, visible targets with clear accountability to grow their talent pipelines, reviewing and reporting their gender metrics on a regular basis.

And finally, how long before parity? At the rate of change before targets, our UK data showed it would be another seven decades before this happens. I'm an evidence-based optimist, with an 11-year-old daughter, so I believe the critical mass of individuals now invested in this agenda can and must make her working environment much more gender inclusive by 2030.

COMMERCIAL FEATURE

GETTING TO MARKET FAST AND STAYING RELEVANT...

In a fast-changing digital world, ***Jabil*** *can help companies stay ahead*

JABIL

"Our cities, hospitals, workplaces and schools are being changed by the people who use them, rather than by the people who manage them," says Joanne Moretti, chief marketing officer and general manager of Jabil's innovation and development consultancy, referring to the impact technology and data are having on the world.

Advances in mobile technology and digital channels mean users have higher expectations of every service being delivered to them, creating opportunities for every sector. This represents a great opportunity on one hand, but also huge pressure to get new products and services to market, and deliver them to customers in ever-shorter timeframes.

"Everything is being turned completely on its head. And our OEM [original equipment manufacturer] customers are telling us they no longer fear failure – their worst fear is irrelevance," says Ms Moretti.

Manufacturing advances such as 3D printing or digital prototyping have helped organisations, but have also increased the competition from new entrants. Indeed, the biggest concern for many businesses nowadays is not the fear that a new product will fail, but that it will not reach the market fast enough or will be obsolete by the time it hits the shelves.

For many organisations, says Ms Moretti, the real issue is that underneath all the digital veneer and digital marketing tactics, they are ill-equipped to respond to the changing environment.

"People want instant gratification, personalisation, customised experiences, all topped off by speed," she says. "Many businesses have focused on creating spectacular 'front-end experiences' from a digital perspective, but underneath their value chain is nowhere near ready to handle putting out new product releases at this speed or customising new gadgets on the fly."

In fact, many businesses with digital front ends are still trying to operate their supply chains on the back end with antiquated software packages or product life cycle management practices.

"Digital marketing does not equal digital business," says Ms Moretti. "There are a lot of things underneath in terms of getting something to market, which we think can be done easier and faster, but people have to collaborate, and systems and data have to come together. You can't modernise your marketing system if you're using an old customer relationship management system or your product life cycle management system is 30 years old."

Jabil has gone through its own transformation journey, putting in place digital processes which will help its customers get their products to market much quicker.

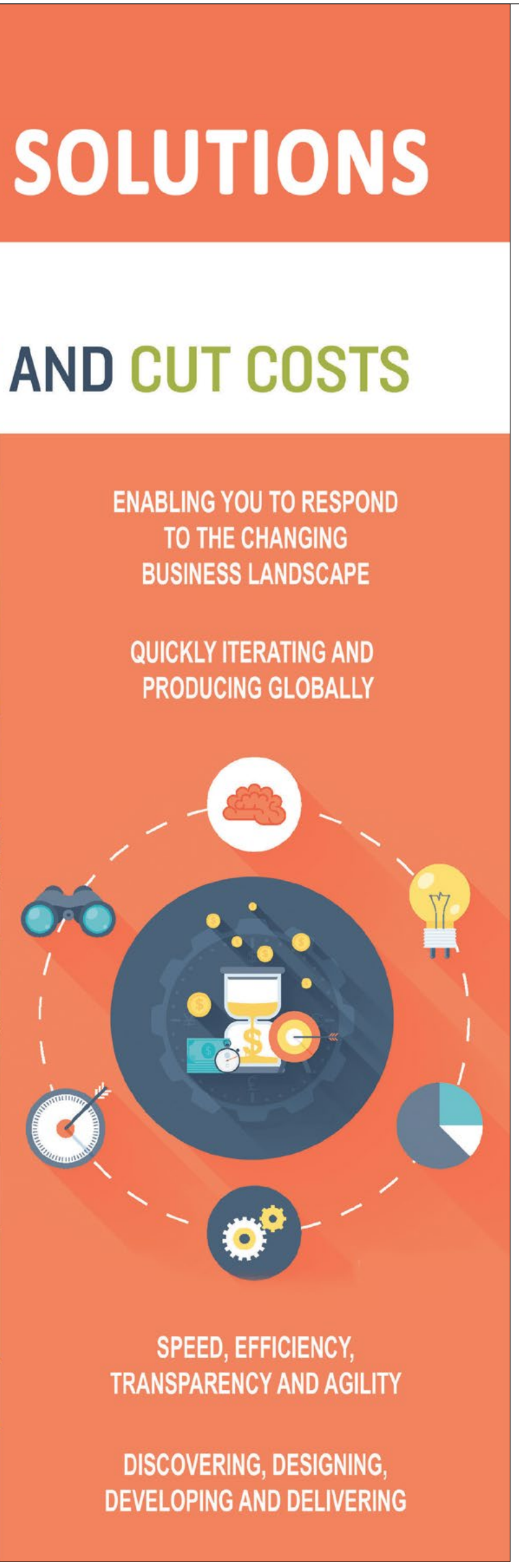
"We have been working on completely digitising our supply chain, connecting our people and giving them visibility," says Ms Moretti. "We've been digitising our prototype and product life cycle processes, and have been leveraging 3D printing and additive manufacturing so we're a better partner for our customers who want to take solutions to market quickly and stay relevant."

Helping customers design, manufacture and bring to market new products is the basis of Jabil's offering to customers, working in 14 sectors ranging from automotive to healthcare.

"We cut across the whole life cycle for all of those sectors, even managing end-of-life situations," says Ms Moretti. "It means they get the ability to really engage with customers and to focus on their broader strategy."

> Jabil has gone through its own transformation journey, putting in place digital processes which will help its customers get their products to market much quicker

COMMERCIAL FEATURE



Central to this has been its digital platform, which brings together a wide range of people, processes, tools and technology to support the entire product development cycle. "We have 1,600 engineering capabilities across Jabil and the products that are most in demand are those such as optics because today there are cameras in everything – sensors, near-field communication, additive manufacturing and 3D printing. These key capabilities are at the centre of the company and can be leveraged by any of the market-facing business units we have."

Working across a wide variety of sectors means the business can "cross-pollinate" concepts from one industry to the other, she adds, although each customer is allocated their own "work-cell", which ensures there is no risk that intellectual property could be compromised.

The organisation's Blue Sky Innovation Center, located in San Jose, California, is where a lot of the magic happens. The building is located on a 100,000sqft campus and is made up of a number of collaboration, innovation and design labs, including rooms dedicated to prototyping, 3D printing and the internet of things.

"It's where we bring all our scientists together and work with customers to help them get to market faster," says Ms Moretti. "For all the digital manufacturing and supply chain capability, there is still nothing like people coming together to generate innovation."

> Companies need to work with trusted partners, who can engage with their customers on growth strategies, and then move with an outrageous sense of urgency

She gives the example of a healthcare business which was looking to differentiate itself from the competition and offer enhanced benefits to hospitals through developing a more high-tech feeding tube.

"We suggested putting a camera and an LED light in it, which has made it a much better process for the doctors and a better experience for the patient," she says. "It also means the business is delivering more value for its customers and can charge more money for the product."

The Blue Sky Innovation Center houses the Digital Prototype Lab run by Radius Innovation & Development, a consulting business acquired by Jabil in 2012, which is also helping customers bring products to market much quicker than would have been possible in the past. A full-service rapid prototyping facility in the heart of Silicon Valley, this features state-of-the-art technology and brings together teams of skilled technicians and integrated design and engineering professionals.

John Van Akkeren, president of Radius, says the rapid pace of change means organisations have to ensure they are well placed to respond to new opportunities.

"We have a growing population, rapid urbanisation and a huge demand on smart cities to serve these digitally enabled consumers," he says. "At the same time, technology means previously stationary services such as healthcare have now moved into the home through connected solutions. So there is this crossover between people's home and work lives, which has created an organic workflow process that really requires people to be collaborative across teams."

As well as increasingly demanding customers, organisations are under pressure from new, more nimble competitors, says Ms Moretti. "Competitors are leveraging technology, data and cloud to offer solutions in new ways, such as subscription or lightweight models, so our traditional customer and enterprise base is under huge pressure, and it all revolves around technology," she says.

The reality is those businesses that are unable to respond quickly will find themselves increasingly left behind, she warns. "We're seeing the lifespan of traditional companies shrink significantly," she says. "In the 1960s, companies lasted 60 years. In the early-2000s, it was 25 years. We're now down to a 12-year lifespan.

"It's not business as usual – companies need to work with trusted partners, who can engage with their customers on growth strategies, and then move with an outrageous sense of urgency."

For more information please visit www.jabil.com

NIMBLE FEET

Shoe insole manufacturer Superfeet recently turned to Jabil to help develop and bring to market a new product that could be made in just 15 minutes.

"Jabil's Digital Prototype Lab, Radius team and 3D printing changed the research and development landscape at Superfeet by enabling us to customise in ways we've never done before," says Superfeet's vice president of marketing and product Eric Hayes.

"It took us two years using traditional R&D to create a custom insole that could be produced in 15 minutes. Jabil, in just four months, proved how we could use 3D printing to produce custom insoles more efficiently and with an extremely high degree of replication, at a fraction of the development cost of other methods."

Joanne Moretti, chief marketing officer at Jabil, adds: "In this case, because we could collaborate and work together as a team, leveraging our digital thread, we brought that idea to prototype in five weeks. We then brought the prototype to production using digital manufacturing and 3D printing in two-and-a-half weeks."

Being able to move quickly can be the difference between success and failure. "It's make or break for some companies," says Ms Moretti. "They will capture first-mover advantage and much more revenue if they can get products out there faster."

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Actual depiction of connections happening between Box users in the construction industry.

Minding your language when abroad

Language is no longer a barrier to international trade and working across borders as high-tech translators speak and listen in many tongues

TRANSLATION

MARK FRARY

In *The Hitchhiker's Guide to the Galaxy*, writer Douglas Adams describes a "small, yellow, leech-like creature" called the Babel fish which "feeds on brain-wave energy, absorbing all unconscious frequencies and then excreting telepathically a matrix formed from the conscious frequencies and nerve signals picked up from the speech centres of the brain, the practical upshot of which is that if you stick one in your ear, you can instantly understand anything said to you in any form of language".

Botanists have not discovered anything like the Babel fish, but the science fiction of universal translation is rapidly becoming reality thanks to technological advances.

Most exciting for *Hitchhiker* fans is the Pilot earbud, backed by $3.5 million in crowdfunding raised by a startup called Waverley Labs.

The company's chief executive Andrew Ochoa says: "We were really inspired with wearable technology and began working on the idea of a smart earpiece that could solve a global challenge. We were a small team back then, but we all came from different backgrounds and spoke different languages, and that's how we came up with the idea."

> Technology will be there to help the human, but will not be in competition

Pilot combines a number of technologies – capture using speech recognition, machine translation, which includes machine-learning, and speech synthesis into a new language. It is a hybrid of existing, proprietary technologies, but this will be the first time they have been combined into a wearable device.

"The full conversation system is designed to be used by two people who are both wearing a Pilot earpiece. First we set the languages which we're speaking using the mobile app and the earpieces simply translate what we're saying," says Mr Ochoa.

No working Pilot earbud has yet been seen in the wild, but Mr Ochoa says the first version of the app, which provides basic translation, is soon to be released with a fully conversational system and the first commercial devices coming next spring.

Getting machines to do our translation is not new. Systran, a pioneer, was founded in 1968. One of its earliest customers was the US Air Force who needed software to translate Russian into English quickly.

The company is behind many of the best-known examples of machine translation (MT).

In the late-1990s, it partnered with AltaVista to provide the first, free web-based translation service. In a hat-tip to Douglas Adams, this was known as Babelfish.

Waverly Labs

Waverly Labs

Pilot earbuds promise to translate in real time between users speaking different languages

Back in 2001, computer-aided design software provider Autodesk began using Systran's MT to translate customer support documents and the company said at the time it cost 50 per cent less to use a computer than a human. Human translators are naturally concerned that MT may put them out of a job.

Systran's chief operating officer François Massemin says for many years there has been a battle between machine and human translators. "It was nasty," he says. "Human translators saw machines as a threat; they took away some of their jobs and cut their margins down."

Mr Massemin says we are now seeing the rise of augmented translators. "We are reaching a stage where technology will be there to help the human, but will not be in competition," he says.

He draws an analogy with commercial pilots. "Someone piloting an Airbus is not controlling every second of the flight, but they are offering a guarantee that you will arrive safely at your destination. Similarly, the translator will be the expert driving the translation technology. The control will still be with the human."

Trials in 2011 for Autodesk found an increase in productivity for translators of between 42 per cent and 131 per cent when they used the open-source Moses MT engine.

Until recently, the two main techniques used have been statistical machine translation (SMT) and ruled-based machine translation (RMT). SMT is based on the analysis of huge volumes of bilingual texts – think Google Translate. RMT, on the other hand, uses grammatical and linguistic rules of languages to help translate.

This year has seen the emergence of NMT, or neural machine translation, with Systran launching its Purely NMT engine in August. This approach uses artificial brains to process entire sentences, paragraphs or documents. As in a human brain, sub-networks handle different parts of the job at the same time; one might extract the meaning, another trained in syntax and semantics enriches this understanding, while a third analyses context.

These new developments are challenging the role of English as a *lingua franca*. Systran's Mr Massemin points to translations the company is facilitating directly between Chinese and German.

"We used to have a vernacular language, which is English for historic reasons. Nowadays, I don't think this is true. Chinese and Arabic are more present than they used to be. English is not sufficient to deal with a global organisation in our view," he says.

> You have to establish a rapport and language is not always the key to that

Systran recently started working with German tyre manufacturer Continental. Systran's chief executive Jean Senellart says: "The engineering team speaks German, but they produce the tyres in Poland, China and Brazil. They have to translate their German into technical Polish, Chinese and Portuguese. They use [human] translators, but their privacy and security is not always as high as it could be, and it creates a bottleneck in the time to market."

Commercial organisations are not the only ones using MT. Translators without Borders (TWB), a non-governmental organisation (NGO) that helps bodies including Doctors without Borders with translation, is also using MT. Mirko Plitt, TWB's head of technology, says the NGO has recently helped develop an app to translate Kurdish languages and English.

One of the biggest challenges in getting real-time translation to work in devices such as the proposed Pilot earbud is the way people speak. "Sentences are not completed and they are often repeated," says Mr Senellart.

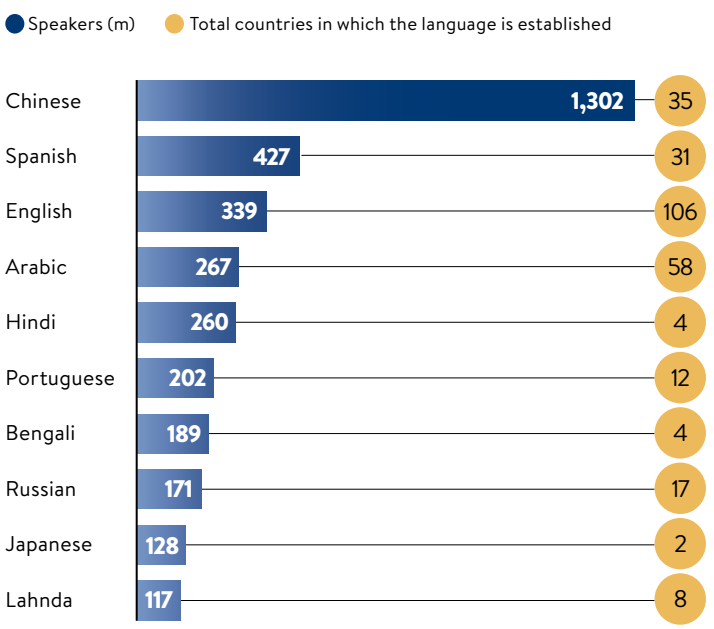
There is also the problem of the environment in which the technology has to work. An AI assistant in a quiet home will do much better than a smartphone in a train station.

TWB's Mr Plitt adds: "If you want to sell abroad, language may seem like the biggest hurdle. Yet once you speak the same language, you still have to be able to sell, to understand your customers and their specific needs. You also have to establish a rapport and language is not always the key to that."

Even Douglas Adams recognised this. In *The Hitchhiker's Guide to the Galaxy*, the Babel fish is blamed for causing "more and bloodier wars than anything else in the history of creation".

MOST POPULAR LANGUAGES SPOKEN

BY NUMBER OF FIRST-LANGUAGE SPEAKERS



Source: Ethnologue 2016

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