

The Connected Business

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News media move to ban ad blockers from websites

Industry acts to preserve revenues, but internet users have genuine concerns, says *Robert Cookson*

People using ad-blocking software who visited the The New York Times website in March were shown a message. This read: "The best things in life aren't free". It went on to explain that "advertising helps us fund our journalism" and gave the visitor two options to read the newspaper's online content: disable their ad-blocking software or pay for a subscription.

Many angry internet users took to sites such as Twitter and Reddit to vent their frustrations: "It's not OK to show me ads that detract from your website design and make it ugly," said one. Others argued that ads were more than just an irritation as they could compromise user privacy and security.

Despite this opposition, the newspaper is pressing ahead with plans to block the blockers. Dozens of other

global media companies are preparing to do the same to protect their online revenues from the rapid and unrelenting rise of ad blocking.

PageFair, a company that helps publishers overcome ad-blocking software, had estimated that more than 200m people now use some form of blocker on their laptop or desktop computers, as do more than 420m of the world's 1.8bn smartphone users.

For years, there was little publishers could do about people using programs such as Adblock Plus and uBlock Origin, which are free to download and highly effective at eliminating ads from web pages. In most cases, the software works by blocking communication between a web browser and a "blacklist" of internet addresses that are known to serve ads. As a second line of attack, blocking software can also prevent the browser



from executing certain types of code associated with ads. However, there is an Achilles heel: blockers cannot work if a website serves both ads and content from a single computer server and shields both using techniques such as encryption. In such circumstances, ad blocking software cannot block the ads without also blocking the content.

A flurry of start-ups – including Sourcepoint and Secret Media – now offer publishers ways to circumvent ad-blocking software.

Another of these, Oriel, in June launched an anti-ad-blocking tool for WordPress, the content management system and blogging platform used by more than 60m websites. This will allow small bloggers as well as large media

'Ad blocking is a blunt instrument which does not differentiate between poor and quality advertising'

companies to take action against blocker software.

Aidan Joyce, chief executive of Oriel, says: "Ad-blocking technology is a blunt instrument which, by default, makes no differentiation between poor and quality advertising. Most ad-blocking users do not object to a reasonable advertising experience in return for quality free content."

The New York Times found in its March experiment that more than 40 per cent of adblock users agreed to "whitelist" the website – thereby allowing ads to appear on their screens – so they could see the content.

Mark Thompson, the group's chief executive, said at a conference in June: "No one who refuses to contribute to the creation of high-quality journalism has the right to consume it. We are not there

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The Connected Business

Lack of role models keeps women out of cyber security

Recruitment Old-boys' networks still dominate the industry when it comes to hiring staff, writes *Emma Jacobs*

As a maths undergraduate, Holly Rostill went to a lecture about the internet. The speaker raised the point that, despite people using it every day, few understood its inner workings. This sparked Ms Rostill's curiosity and she studied computer science modules as part of her degree, including programming, testing systems for vulnerabilities and cryptography. Ultimately this set Ms Rostill on a

path that is relatively uncommon for young women: cyber security.

According to trade training body (ISC)2's 2015 Global Information Security Workforce Study, 10 per cent of those working in the information security profession are women – unchanged from two years ago.

For Ms Rostill, who is now employed by PwC, the professional services firm, the work is "like a puzzle and I see it as a challenge to be solved". Many of the skills she has developed, she says, are about logic and persistence.

Popular mythology has it that it is teenage boys, who have sat in their bedrooms to hone their hacking skills, who populate the industry. Ms Rostill says that she goes into schools to talk about cyber security and technology to raise interest among young women. "It's



Faces of cyber security: Holly Rostill, left, and Claire Reid

important that we attract the younger generation, to try and break the negative cycle that surrounds the industry for many women."

The lack of female role models in the field, she says, means a cyber security career can seem unrealistic to most.

Jennifer Steffens, chief executive at IOactive, a cyber security company, says that young women need to be encouraged to get involved in science, technology, engineering and mathematics – so-called Stem-related – activities and classes to make an early impact.

"It's important that we provide strong role models for young women early in their careers, highlighting female professionals that have successfully broken through gender barriers and are influential," she says.

Recruiting women is a problem, says

Nicole Eagan, chief executive officer of Darktrace, a cyber security company. "Legacy security companies hire from the same pool of men. It is an old-boys' network."

Claire Reid, also at PwC, is a partner specialising in risk assurance and process improvement who has worked in technology all her life. She believes that the cyber security industry is seen as an offshoot of "the young hacker culture" and that this deters women. In fact the work is "more than just tech", she says. "It is a multidisciplinary role. You need people who understand how business and governance works. How to respond to clients, managing data and risk."

Ms Rostill agrees. While she currently has a technical role there are "many different skills required for a job in this field and a huge variety of different areas to get into".

Tammy Moskites, chief information security officer at Venafi, a cyber security firm, says she enjoys the variety of work. "You get to wear multiple hats as a chief information security officer, often all on the same day. Whether it's dealing with regulatory or compliance issues to dealing with human resources, through to securing and protecting data – you have to be ready at all times."

The business and the roles within it are very diverse and require different perspectives, something that women might be well able to supply.

Cheryl Sims-Hancock, an organisational psychologist who works at Deloitte's cyber security practice, says that the field "is quite difficult for people to get their head around... they think they just need technical skills".

Cyber security is mainly discussed in terms of passwords and hacking, she notes. "But there is a cultural aspect that

involves psychological engagement, organisational psychology and is not just about security breaches."

While clearly the jobs are rooted in technology, professionals working in the field do not necessarily need engineering or coding backgrounds. "Too frequently the specs are too technical", says Ms Reid. "It might put women off."

Ms Reid also believes that men and women approach job advertisements differently. "Women need to feel fully qualified to apply for a role whereas men are not so worried about it."

This is view backed up by (ISC)2's report, which found that women were more qualified than men.

"Academic achievement is a characteristic of material difference between genders, the report noted. The percentage of women with either a masters or doctoral degree exceeds the percentage

FT **Regulators turn to AI**
Algorithms can now spot incidences of market manipulation
ft.com/ETC

of men. For example, of women leaders, 58 per cent have advanced degrees versus 47 per cent of men."

Ms Steffens makes the point that more could be done to highlight the importance and positive aspects of the work done in the industry, not just its challenges. "When we over-emphasise the challenges, like gender disparity, it can actually be a deterrent to women pursuing cyber security careers."

Ms Eagan is quick to underline the progress she has seen in 25 years. "When I got involved in the industry there were very few women – that's changed," she says.

'Too frequently the jobs specs are too technical. It might put women off'



Tread carefully: the UK government faces some tough choices when considering a new data protection regime — Thomas Trutschel/Getty Images

Data regulation Britain faces splendid isolation

Strict EU rules on privacy mean that online data — whether pictures, emails, health records — can only be transferred within the trading bloc or to countries that guarantee an "adequate" level of protection.

Currently personal data can whizz between EU countries, such as Britain, France and Spain, but can be transferred to places outside the bloc only if certain criteria are met.

When — or if — Britain leaves the EU, the right of UK businesses to spray data wherever they like within the union disappears and British companies face being treated like any other non-EU organisations.

As the future of much of the world-wide tech industry, from fintech and cyber security to connected devices and cars, and the development of artificial intelligence, will be dependent on the storage, quick accumulation and analysis of mass data, this poses big questions for British businesses.

The UK government faces a tough choice on its new data protection regime, which would be outside of EU rules for the first time.

Julian David, chief executive of techUK, an industry lobby group, says the UK should tread carefully. "Urgent consideration should be given to the relative merits of maintaining, adapting or completely

re-legislating the UK's data protection laws," he says.

A Brexit Britain would probably have two choices. The first is simplest: Britain could choose to implement the EU's rules on general data protection, due to come into force in 2018.

These would empower regulators to dish out fines of up to 4 per cent global turnover to businesses in the event of a security breach. The laws were hammered out over the past four years, with the UK a significant pro-business voice in their making. But for some companies they still represent the cumbersome type of rules many talked about avoiding by leaving the EU. For example, even small companies will need to hire a data protection officer.

The second option is more complex. The UK could devise its own data protection rules based on the EU's and hope Brussels agrees to them.

This carries risks. European regulators could decide the rules are inadequate, which would mean isolation for UK-based businesses, increasing both cost and inconvenience to companies.

Similar problems have already been encountered in relation to other parts of the world. A data transfer agreement between the EU and the US called "safe harbour" was struck down last year, after judges at the

EU's highest court ruled that overzealous snooping by US spies violated the rights of EU citizens.

Negotiators have spent the past two years hammering out a replacement agreement between Washington and Brussels. But it is still not in place and lawyers suggest it may be vulnerable to legal challenge. In the meantime, companies such as Google and Facebook have scrambled to find their own solutions. Most have opted for so-called "model contract clauses", although these too face legal challenges.

Britain would be likely to run into the legal objections faced by the US if it decided to go it alone on data protection, particularly because of its GCHQ spying network.

Jan Philipp Albrecht, a German MEP who worked on the EU's data protection rules, dismissed the possibility of UK rules being deemed adequate by the European Commission. "Due to GCHQ blanket surveillance [programmes] and less safeguards for intelligence services than in the US I doubt it," he tweeted.

Given such factors, there might be a part of Britain's statute book that remains forever European.

Duncan Robinson

Media in move to ban ad blockers from websites

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yet but, if we judge that it will strengthen the long-term prospects of that journalism to prevent non-subscribers who employ ad blockers and refuse to whitelist us from reading it, we'll do it."

To cater for people who hate advertising, the news organisation plans to introduce a higher-priced, advertisement-free subscription.

Ben Barokas, chief executive of Sourcepoint, predicts that most publishers will have adopted some kind of technology to circumvent ad blockers by 2020. In his view, media groups should offer consumers a range of different ways to access content, including for-free with ads, micropayments and subscriptions.

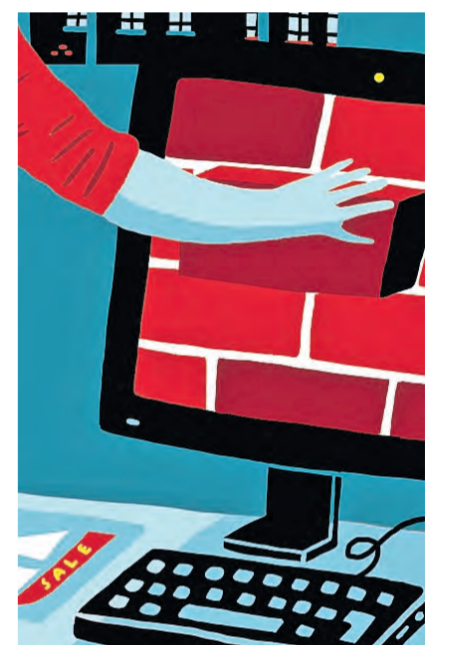
"Ad blocking is a canary in the coal mine for the media industry to be more transactional and more transparent in its relationship with consumers," Mr Barokas says.

However, Sean Blanchfield, chief executive of PageFair, argues that publishers need to exercise care in how they use ad-blocker circumvention technology. He warns that such technology should not be used to preserve the status quo.

"Users have fundamental, legitimate concerns," he says. "Ads that are served today have serious privacy and security problems."

Mr Blanchfield says that PageFair aims to help publishers "redefine the advertising experience in a way that the typical ad-block user wouldn't find objectionable".

He argues that publishers who fail to improve the ads they serve will alienate people and drive them towards platforms such as Facebook.



Publishers that ban ad blockers also risk losing their audience to rivals that take a more permissive stance. In some ways that matters little, since ad-block users do not generate ad revenues. But this argument ignores the fact that internet users are not just passive consumers; they often help distribute a publisher's content by sharing links with friends through email, forums and social media.

More than half of UK adults using an ad blocker said they would switch it off if doing so was the only way to access a website, according to a survey by

'Ads that are served today have serious privacy and security problems'

YouGov for the Interactive Advertising Bureau. But 59 per cent said they would not disable their ad blocker for any site.

Meanwhile, Sweden's biggest publishers will join forces next month to call the ad blockers' bluff. In a month-long experiment the publishers will collectively block people who use ad blocking software. The idea is that by acting en masse, they will be able to turn the ad-blocking tide.

Helpful chatbots are all the rage, so prepare to be frustrated

ON TECH

Maija Palmer



"Conversation is the new interface." The tech community's use of this expression does not mean that we are going to start talking to each other more on a human-to-human, face-to-face level. It means rather that we will be talking more to robots, specifically those artificial intelligence programs that pop up on the likes of Facebook Messenger, Twitter, Slack and so on, to help you with tasks from scheduling to shopping. Rather than going to a website to find information or downloading yet another app, we will summon these artificial intelligence assistants to do our

bidding. Bark "find me a flight to Chicago on Saturday" into your phone and a "bot", which understands your location and the fact that you mean this Saturday, will return with some choices.

Chatbots will become the predominant way we interact with companies. Apple's Siri, Microsoft's Cortana, Google Now, Amazon's Alexa and Facebook's Messenger are among prominent examples. In addition CB Insights, a venture capital database, has identified 21 start-ups building virtual assistants designed to help with everything from finding restaurants to monitoring your health. These have collectively raised over \$120m in funding from venture investors.

You know the trend for chatbots is exploding when an accounting software company builds one. Sage, which has been providing small and medium businesses with business software for more than 35 years, is planning to

launch a chatbot this summer. This will help anyone from freelancers to small business owners manage invoices and expenses. Send the bot a picture of a receipt, for example, and it will store this away with your expenses claims.

Kriti Sharma, who built the bot for Sage, says one of the challenges has been ensuring that it is not annoying. She has

Kriti Sharma: I now need to hire a bot personality trainer



spent considerable time thinking about how the bot should react in different situations. Ms Sharma was keen to avoid a fiasco like Microsoft's Tay chatbot, which was taught to parrot hate-filled posts by Twitter users.

Swear at it and the Sage bot responds

with a sad face emoji and says "I'd rather talk about accounting". Tell the bot you love it and it says you have excellent taste before gently steering you back to accounting. The responses sound remarkably similar to the self-deprecating but quietly determined way that Ms Sharma herself speaks.

"We are very careful about the frequency with which the bot responds, and we have built the personality over time," says Ms Sharma. "I now need to hire someone to take this further — a bot personality trainer." Such a person might be a creative writer rather than a technical specialist, she says.

A vision of a future job flashes in front of me: as newspapers shed journalist jobs in the face of declining ad revenues we are gradually rehired as microcopy writers providing the "voice" for robot interactions.

Companies would do well to invest in bot personalities. Remember Clippy, the

animated paper clip that used to pop up on Microsoft programs when you were trying to type something?

"It looks like you are writing a letter," Clippy would observe, sending users into such paroxysms of rage that Microsoft itself was openly mocking Clippy when it scrapped the software-based help system in 2002.

People dislike computer agents who disregard the human rules of etiquette, observed Stanford University student Luke Swartz in his 2003 thesis: "Why people hate the paper clip".

The difference between Clippy and today's chatbots is the arrival of deep learning, which makes computers capable of a far more complex level of pattern recognition and allows them to follow natural language and speech better.

However, they are still not "smart", says Jonathan Mugan, co-founder and chief executive of Deep Grammar, a

start-up company building a grammar-checking bot. "There is no way for a chatbot to be interesting or terribly useful right now," says Mr Mugan. "The bot still doesn't know what 'Chicago' is, it is just following trend data."

The real revolution will be when bots understand the meaning of words as a human would, associating them with experiences it has had. This is not impossible, says Mr Mugan, although it would require a huge acquisition of data, with a robot possibly living with humans for several years to learn associations as child might. Helping an artificial intelligence program reach the level of understanding that a four-year-old child has is the goal, Mr Mugan says.

Of course, only one robot would have to do it once and then the programme could be copied a limitless number of times. Until then, prepare for some frustrating virtual interactions.

The Connected Business

Tech investors taste success in food delivery

Venture capital
Backers have been scrambling to grab a slice of the market, reports *Lauren Fedor*

The appetite for food delivery in the UK has never been greater. Data from Euromonitor, the market research company, show that growth in the home delivery and takeaway food sector has outpaced that of restaurants each year since the financial crisis, as consumers place a greater value on ease and convenience than ever before.

Between 2010 and 2015, the western European market for takeaway and delivery grew 2.2 per cent, to £18.4bn, while the value of food bought in restaurants fell by 7.6 per cent to £135.3bn, Euromonitor says.

Investors have been scrambling to grab a piece of the growing market, pouring hundreds of millions of pounds into start-ups such as Deliveroo, whose latest investment round last November gave the London-based company a reported valuation of about \$600m.

Deliveroo, which was set up just three years ago, now operates in 12 countries, targeting restaurants that do not have their own couriers. In London alone, its network of more than 3,000 self-employed cyclists delivers food for over 2,500 restaurants.

"It is a huge space in terms of consumer demand," says Luciana Lixandru, an investor who helped lead venture capitalist company Accel's investment in Deliveroo. "People eat three times a day."

"It is one of these markets, like the transportation market, that is so large and it is expanding because it is more affordable now," she adds, before adding that no new food delivery start-up should be discounted. "It is very early days in Europe. I don't think you can underestimate anyone."

To be sure, Deliveroo is just one of many well-funded food delivery companies in Europe vying for the same meals. For example, Take Eat Easy, based in



On your bike: Deliveroo's latest investment round gave it a reported valuation of about \$600m
Mike Kemp/Getty Images

Brussels, counts among its backers Rocket Internet, a German investor that has acquired more than €600m of equity in food delivery rivals across Europe and Asia.

Larger competitors include the UK's Just Eat, which debuted on the London Stock Exchange in 2014 and now has a market capitalisation of close to £3bn, and Germany's Delivery Hero, which has raised \$1.4bn from investors. Both target the less-expensive end of the takeaway market.

And then there is the latest, and larg-

est, entrant into the increasingly-crowded space: Uber. The San Francisco-based company, whose ride-hailing app has already caused upheaval in the taxi industry, is aiming for similar disruption in the food-delivery market, landing in London and other big cities with an aggressive marketing campaign and free introductory offers for its UberEats app.

Most analysts agree it is too soon to tell what effect UberEats will have on existing food-delivery companies, as the app was only rolled out in select

Young professionals are less likely to cook and more likely to shop online

markets for the first time earlier this year.

But Uber, which is known for investing heavily in new markets in order to drive out competition for its ride-hailing app, recently received a \$3.5bn investment from Saudi Arabia's sovereign wealth fund, which means Uber now has about \$11bn in its war chest, leaving few to believe it will tread lightly in the restaurant delivery space.

To make matters more worrying for incumbents, Uber's move into the market comes at a time when investment in

food delivery companies is beginning to slow. According to CB Insights, an investment data service, funding to food delivery start-ups, including not only restaurant delivery but also grocery delivery services such as German meal-kit company HelloFresh, has increased rapidly since 2012. It reached record highs last year, when nearly \$5.5bn flowed into the category globally.

But CB Insights says food delivery start-ups have pulled in just over \$609m across 23 deals in the first quarter of 2016, which puts the category on track for only half the funding it saw last year, and fewer than half as many deals since 2015. Yet the slowdown does not appear to be troubling bullish investors, who say the trend reflects the so-called "hype cycle" – a term used by research firm Gartner to describe a pattern often seen with tech companies.

"You have the early stage, where you see a lot of fast-growing companies," says Martin Mignot, a partner at Index Ventures, a London and San Francisco-based firm that has invested in both Deliveroo and Just Eat, among other food start-ups.

"That attracts a lot of interest, attention, funding and competition," Mr Mignot adds, saying consolidation and a "harder time" often follow. "We are kind of at the trough after the peak," Mr Mignot says. Overall there will be fewer companies, but the winners are going to do well, he says.

Mr Mignot does not deny there are difficulties in running a successful food delivery company – many start-ups in Europe, Asia and the US have failed, foiled by the complexities of a three-sided business model that needs to satisfy restaurants, consumers and couriers. But he insists that a handful of market winners would continue to see growth fuelled by a fundamental change in consumer behaviour.

"I think we are looking at a major shift in the way people are eating, and buying and consuming food," Mr Mignot says. He notes that younger professionals are less likely to cook and more likely to shop online than their older peers, most of whom still use the telephone to order an occasional takeaway.

"We are just scratching the surface of that shift," Mr Mignot says.

Increase in data collection drives growth in outsourced services

Management

Clients must consider costs, location and reliability before choosing a data centre, explains *Jane Bird*

Remote data centres are expanding as more organisations outsource in-house computer systems to networked computer servers for the storing or distribution of large amounts of information.

Data centre services range from the actual physical space needed to house an organisation's private computers and software, to hosting data and applications and cloud computing. Big names already operating in the sector include Amazon Web Services, which belongs to the US-based online retailer.

Market watchers say one driver of future growth is likely to be the increasing amounts of data needed to operate driverless cars, which require large quantities of real-time data that will be gathered from and interpreted by sensors inside and outside the vehicle.

Some estimates put the amount of information that will need to be gathered and analysed to operate a driverless car at 1 gigabyte a second, equal to about five hours of streamed television.

Growth will also be driven by the so-called internet of things. According to BroadGroup, a consultancy, the value of the data-service sector in western Europe alone will rise from €4.5bn in 2014 to more than €8bn in 2019.

The vast amounts of data being collected have already led to consolidation in the industry. For example, US-based Equinix acquired UK-based

TelecityGroup for £2.6bn in January as part of a bid to increase its European operations.

Location is important for both clients and service providers because of the need to comply with different jurisdictions' data protection regulations. Rules on what information can be stored and for how long can vary from place to place and also because of changes in legislation. For example, the EU scrapped its data-sharing agreement with the US last year following the revelations about data gathering by US security agencies in documents leaked by US intelligence contractor Edward Snowden.

A new agreement, the EU-US Privacy Shield, has been beset with wrangling and has yet to come into force. The UK vote to split from the EU is further likely to add to the confusion about where companies can store their data (*see story on page 2*).

Amazon Web Services has announced plans to open a UK data centre, its third in the current EU member states, partly as an effort to address sovereignty concerns for European clients.

€8bn

Estimated value of western Europe data centre market by 2019

\$740,000

Average cost of a service outage

Despite the growth in outsourcing data centre services, executives seeking to hire external providers need to be aware of attendant risks.

Alex Rabbetts, chief executive of MigSolv, a UK-based data centre, says it can be hard for would-be customers to gauge how effective data service providers may be because certification

standards are often meaningless and confusing to non-specialists. One standard is energy consumption, which is used to measure centres' effectiveness.

"A data centre may claim a certain power effectiveness rating but this may not include the whole facility. So it is hopeless as a comparison tool and confusing," Mr Rabbetts says.

Another problem is poor customer service. A 2015 survey of more than 30,000 data centre users by MigSolv found the industry produced low levels of customer satisfaction.

Stuart Barnett, chief technology officer of Wi-Q, an online restaurant ordering service, has tried several big providers and says that technical problems are often handled by email. This does not matter if you are just using a data centre for storage, Mr Barnett says. "But we're running a service and our clients – bars and restaurants – need to know that their customers' orders have been received. Being able to interrogate data fast is core to our business."

Reliability is also important. The average cost of a data centre outage has risen from \$506,000 in 2010 to \$740,000 now, according to some estimates.

Costs can also be an issue. Some older data centres have been accused of imposing unreasonable fees for routine services and long contracts.

However, increased competition is also leading to more flexible purchasing and pay-monthly options that can reduce fees. Steve Wallage, managing director of BroadGroup Consulting, says: "A number of smaller providers is starting to appear with a 'we try harder' approach and a customer relationship and support mentality."

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The Connected Business

Education struggles to provide right tech skills

Millennials Emerging markets' young face steep learning curve. By *Simon Mundy*

Workplace automation in the developed world is adding to career anxiety among young people, many of whom seem to feel they will be worse off than their parents as a result of technological change.

But youngsters in big emerging markets are significantly more confident that they have the skills needed for a successful career, according to a study of 8,700 apparently largely well-educated young people in nine developed and developing nations commissioned by the Indian IT services firm Infosys.

This bullishness stems largely from their greater focus on technological skills, the study says. Three quarters of young people in India and China want to develop skills in data science and analytics, compared with less than half in France and Germany.

Infosys's upbeat claims about IT potential in developing countries contrasts with the bleak assessment of a UN report in 2013. This warned they were particularly vulnerable to skills shortages given that people with IT skills tended to pursue opportunities abroad.

But citizens of developing nations are making use of technology and online resources to train themselves, increasing the stock of skilled people. This is particularly noticeable in China, where there is a proliferation of fast-growing digital education companies, such as 5WIn. This provides online tuition to nearly 1m users in subjects including IT.

The China-focused analysis firm iResearch says that the number of people studying online in the country rose 21 per cent last year to 72m. Most online

students are outside larger cities, Chinese group Baidu said in separate research, suggesting that the internet is allowing skills to be acquired evenly across the nation.

The public sector is also playing an important role in helping Asian students to make the most of technology, says Zoraini Wati Abas, who has worked on integrating technology into university courses in Indonesia and Malaysia. Poor Indonesian students who struggle to afford expensive textbooks have benefited as universities rely more on digital resources, she says, while Indonesia's government is encouraging universities to set up online courses that can be used by people who cannot benefit from conventional campus-based tuition.

Cheap smartphones have enabled millions of relatively poor young people to go online. Many are more interested in chatting with friends on social media than in educational resources but these activities can also provide them with useful skills, even if they do not realise

In India, technology has been a route to prosperity for thousands of people

it, says Bunni Banjo, who works on digital education for Google in Nigeria.

The US technology group in April announced plans to help train 1m young Africans in IT skills such as digital marketing. "People in Africa are generally optimistic about the future – there's a sense that Africa is growing, and tech-

nology definitely plays a big role in that. It's the next frontier," Ms Banjo says.

In South Africa, the Google-backed Digify Africa project is focusing on training that will help young people find work, crucial in a country where youth unemployment is over 50 per cent. For many, the learning curve is extremely steep, says programme manager Mazuba Haanyama. "There are some sessions where people don't have email addresses. How would you research the range of work you want if you don't know how to [use] the internet?"

Google has rolled out regional-language tools in India for the growing number of Indians with smartphones who are not comfortable using English or Hindi. Such efforts reflect a growing awareness in Silicon Valley of the importance of emerging markets.

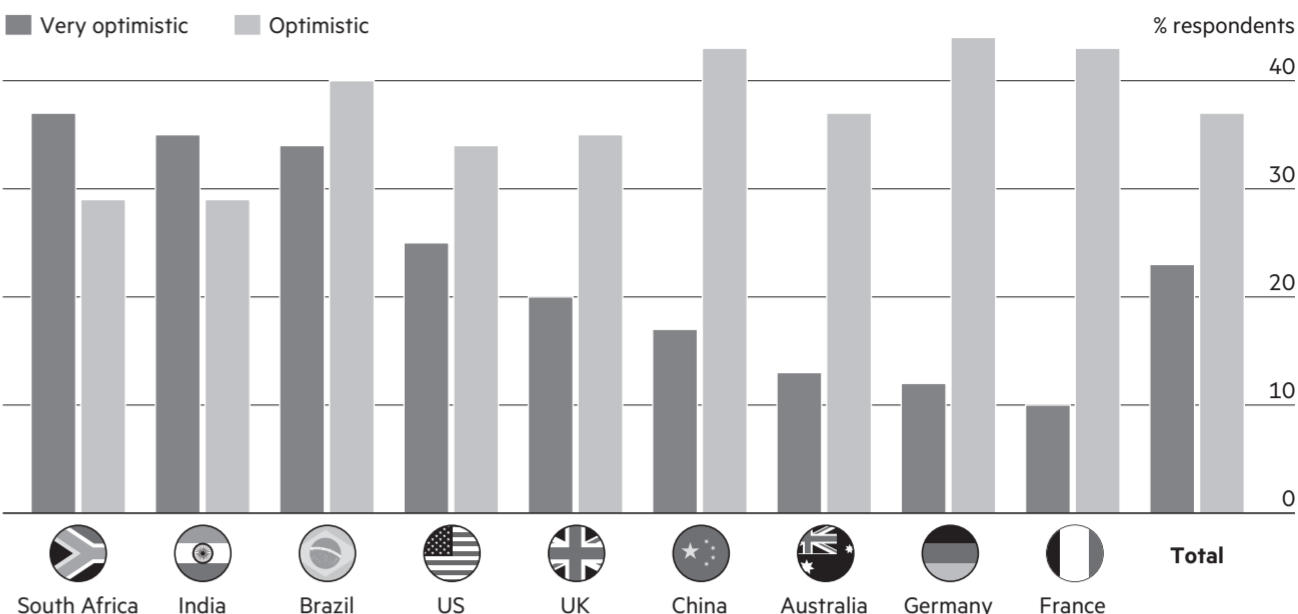
But the skills being developed abroad are seen by some as a threat to America's tech dominance. Of the US technology executives surveyed by law firm DLA Piper in 2014, two-thirds saw a "significant or moderate threat" from emerging tech centres in Asia, South America and Europe.

In some emerging markets, however, there are concerns about whether young people have the skills needed to compete internationally.

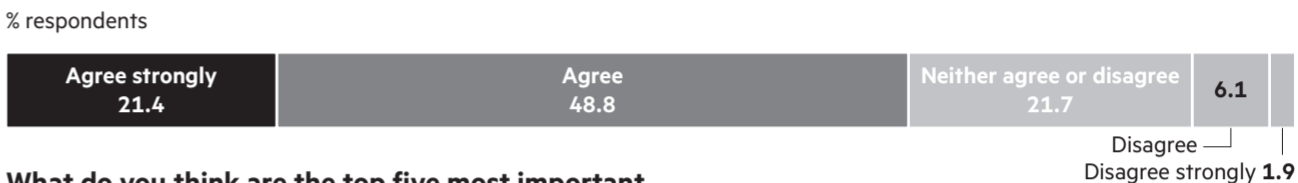
In India, technology has been a route to prosperity for thousands since IT services groups such as Infosys rose to global prominence in the 1990s, providing support services for developed-world companies. But as they move into more advanced fields such as data analytics, companies are now struggling to find graduates with the necessary skills,

Online survey of 8,700 people aged 16-25 in education, work or seeking a job

How do you feel about your future job prospects?

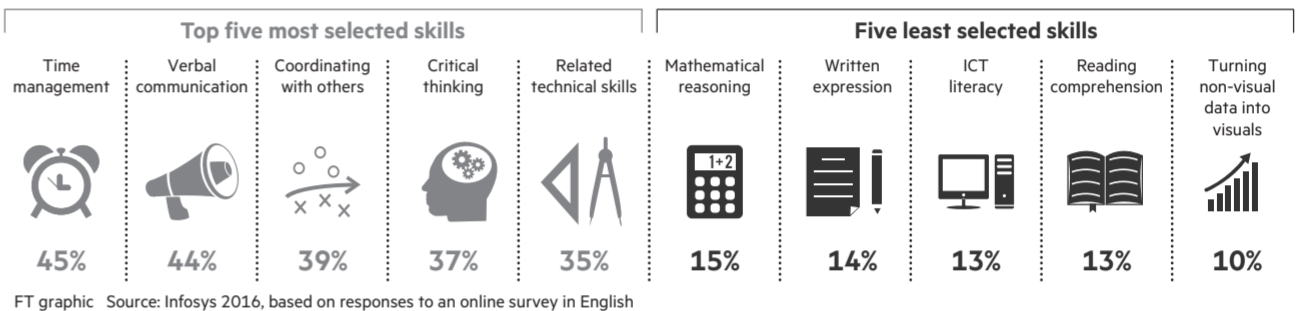


Globalisation has made the job market in my country more competitive for young people like me



What do you think are the top five most important skills you will need to have a successful career?

% who chose the following in their top five



FT graphic. Source: Infosys 2016, based on responses to an online survey in English

says Nirmal Singh, chief executive of Wheebox, which provides skill assessment services to employers. "Formal education is struggling with this," he says, noting that companies such as Infosys invest heavily in extended training for new recruits.

In Thailand, meanwhile, the enthusi-

asm for IT training could prove short-lived once young graduates realise that there are not enough jobs on offer, says Jirapon Sunkpho, a professor in the innovation college at Bangkok's Thammasat university.

"The number of students graduating with IT-related degrees is about 30,000

a year but the total number of IT jobs in Thailand is only about 50,000," he says. One problem is cuts in state funding for Thai universities, which have prompted them to ramp up enrolment in popular areas such as IT to increase fee revenue. "We produce more graduates than the market can take," Mr Sunkpho says.

Bendy phones could be the new black bricks

Design

Flexible shapes and modules have become the new focus, says *Maija Palmer*

The designers of mobile phones have become fixated on the black rectangle, with almost identical handsets emerging at every trade show and product launch. This may be about to change, however, as a number of designers attempt to create devices that can bend, fold and change – "morph" – or be customised by changing or adding different modules.

In June, Chinese technology group Lenovo gave a taste of the future with the unveiling of two prototype devices: CPlus, a bendable phone that wraps around the wrist, and Folio, a tablet with a screen that folds in half to become the size of a smartphone. Both are still some way away from going on sale.

"We expect that we'll need to further refine and enhance the technology before these concept devices are ready for market," says Daryl Cromer, Lenovo's vice-president of research and technology.

Cubimorph, a prototype phone created by researchers at the universities of Bristol, Lancaster and Sussex in the UK and Purdue in the US, takes this idea further. Their phone is a set of 16 cubes that can be reconfigured in almost any shape, from a cube to a long thin line.

"When I look at phones at the moment I see bricks," says Anne Roudaut, lecturer at Bristol University's computer science department. "They don't seem organised around the way we handle things."

The Cubimorph, she says, might in the future be able to reconfigure itself automatically – such as by turning into a game console or going flat when you need a display screen.

But this technology is at least 10 or 15 years away from being available, she says, and at the moment such a phone would be prohibitively expensive to make. The motors that power the cubes cost about £500 and 32 of them are needed for the prototype Ms Roudaut and her team created. Some technical problems need to be resolved as well, such as how to allow the device to reconfigure safely while in a user's hand without trapping their fingers.

But some modular phones are coming

to market in a modest way. South Korean LG's G5 phone and Lenovo's Moto Z, for example, allow users to attach extra features such as a camera, camcorder or speakers. But these devices have so far had a limited impact, says Ben Wood, chief of research at CCS Insight, a technology research company. "Consumers really loved the idea when it was launched. But in reality remembering to take along all the different attachments you need is difficult."

More ambitiously, Google has been working on Project Ara, a phone in which components can be removed and swapped. Originally this was to include crucial elements such as the central processing unit (the part of the phone that controls and executes operations), display and battery, but more recently plans have been scaled back so that it is mainly peripheral functions such as the camera and speakers that can be changed. Google has said these devices could be on sale by next year.

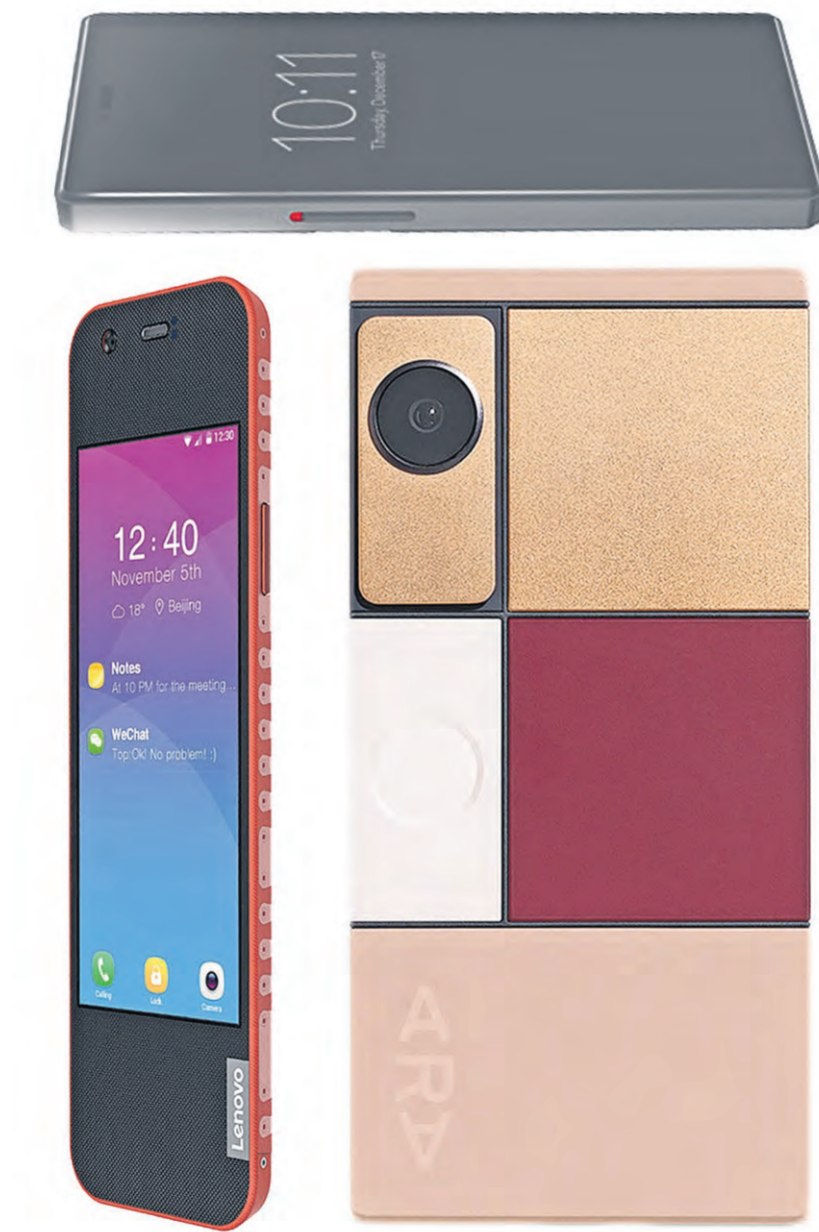
Some mobile phone start-ups are exploring more extreme forms of modularity. PuzzlePhone, based in Finland, is building a phone in which the display, processor and battery can all be replaced. Founder Alejandro Santacreu, came up with the idea after becoming frustrated with the difficulties of trying to have his Apple iPhone repaired.

"Fifteen years ago you would change the smartphone battery yourself," he says. "But now mobile companies have moved towards gluing everything together so that they cannot be easily repaired."

Limited repair options are increasingly becoming a concern for mobile phone owners, to the point that four states in the US – Minnesota, Nebraska, Massachusetts and New York – have proposed legislation to make it easier for devices to be repaired. Tech companies such as Apple have lobbied against these moves, however, and the New York effort to introduce a "right to repair" has been dropped.

Mr Santacreu, who has raised £1.4m in funding from a combination of EU grants and angel investors, says that a phone that is easy to repair and upgrade would be a more sustainable choice, less likely to end up in a landfill site in short time.

"The mobile phone industry is guilty of adding to the great pile of crap in our disposable culture," he says. "PuzzlePhone gives us the option to not take part in that culture." The first of its phones, some of which are expected to



Hold the phone (clockwise from top): the PuzzlePhone, Project Ara and Lenovo's CPlus bendable phone

cost more than €700, are expected to go on sale in the final quarter of this year.

Amsterdam-based start-up Fairphone is even more explicit in saying that modularity is an eco-friendly choice. The company started by creating phones that used fewer minerals that came from conflict zones, such as the Democratic Republic of Congo, and has designed a phone that is easy for customers to upgrade and repair. The battery is replaceable and the screen unclips easily so that, if it is cracked, it can be replaced – at the cost of about €85 – even by a non-expert.

"We want to extend the lifespan of the phone. If you can replace the electro-mechanical components, such as the camera or speakers, when they begin to wear out," says Miquel Ballester, co-founder of Fairphone. "You can extend the life from two years to around five."

The company has found a small but dedicated niche market and expects to sell about 140,000 handsets this year. However, Mr Wood says it is unlikely that this kind of modularity would be adopted by the mainstream manufacturers.

"It is just not the way the market works," Mr Wood says. "Making something as intrinsic to the device as a replaceable screen isn't going to happen. But replaceable batteries are the low-hanging fruit, that could be coming."

Health apps take pain out of waiting

Wellbeing

Mobile services are changing how patients receive advice, writes *Andrew Ward*

Fall ill in London at the weekend and you will either have to wait in a walk-in National Health Service clinic, often for a long time, or wait several days to see your general practitioner.

But Anshumen Bhagat, a GP with 15 years' experience in public and private practice, has founded a doctor-on-demand service called GPDQ – GP Delivered Quickly – that aims to dispatch a physician anywhere in central London within 90 minutes of a booking being made on a mobile app. Prices for the service, which already boasts more than 5,000 users, start at £120 for a 25-minute weekday consultation, rising to £150 at the weekend.

GPDQ is part of a wave of "mobile health" companies on both sides of the Atlantic that aim to transform how patients obtain medical advice while offering doctors new ways to market their services. Some, such as Babylon, Push Doctor and Dr Now in the UK, are dispensing with face-to-face consultations in favour of virtual care provided by doctors on the phone or video link.

Others, including ValueDoc in the US and Doctify in the UK, are connecting people with doctors in an online market that lets patients rate their experience much as tourists do on TripAdvisor.

Investors are buying into the idea. In January, Babylon raised \$25m from backers including Kinnevik, a Swedish investment company. In the same month Push Doctor raised \$8.2m.

These companies, and others like them, are part of a broader rise in mobile care, or "m-health", as digital technology opens new ways for patients to monitor their own health and communicate with medics through apps measuring physical activity and vital signs such as pulse rate, temperature, respiration and blood pressure.

Ron Gutman, founder and chief executive of HealthTap, a US virtual care company, says the trend is still in its infancy. "We have seen fantastic consumer engagement [through mobile communications] in areas such as entertainment and media but not as much in the most important area of all: health and wellbeing."

His company is one of the most promising early pioneers in the sector, with its network of 100,000 licensed doctors across the US available to offer professional medical advice 24 hours a day via video, voice or text messaging. The service costs \$2.99 a minute or \$99 for a

monthly subscription. But while enthusiasts see a way to avoid taking time off work to visit a clinic, critics worry about the severing of the face-to-face relationship between doctors and patients.

A study this year, led by researchers at the University of California, monitored the experience of 67 volunteers using eight virtual healthcare companies to diagnose common conditions. About one in four received either the wrong diagnosis or no diagnosis at all.

HealthTap was not among the companies included in the study and Mr Gutman believes that – subject to high quality standards – the advantages of m-health outweigh any risks. Virtual consultations can be particularly valuable for people in remote areas or poor communities that have no medics, he says. They can also help to reduce stress on existing health infrastructure by cutting the number of people demanding appointments.

Another study by the University of California San Francisco and Stanford University estimated that 40-50 per cent of primary care visits could be converted into virtual appointments, leading to savings of \$11bn in the US alone.

Mr Gutman says mobile technology can improve health outcomes by replacing sporadic visits to a doctor with a more regular dialogue with patients. As well as selling its services to individuals and families, HealthTap is in demand from large employers keen to reduce healthcare costs and absenteeism.

Flex, a supply chain management group, has a deal to provide all 200,000 of its employees around the world with access to US doctors via HealthTap. When many of Flex's Indian employees

Sceptics fear online services do little more than profit from the 'worried well'

were affected by severe floods in Chennai last year, HealthTap provided advice on how to avoid waterborne infections.

"Employees are embracing the technology because it benefits them," says Mr Gutman. "But the result is that it saves money and increases productivity for the employer."

Sceptics fear that "doc-in-the-pocket" services often do little more than profit from the hypochondria of the "worried well". However, Mr Gutman says that the long-term trend towards greater use of mobile technology in healthcare is clear. "At the moment patients are too often left alone to deal with stuff," he says. "Outcomes are dramatically different when patients are engaged in their own care."