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Agent of change

The future of technology disruption in business

A report from the Economist Intelligence Unit

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About this report

Agent of change: The future of technology disruption in business is an Economist Intelligence Unit white paper, sponsored by Ricoh. It reviews the impact that technology developments will have over the next decade on various aspects of business, including organisational structures, jobs and the workplace, customer interactions, and business models themselves. The Economist Intelligence Unit bears sole responsibility for the content of this report. The findings do not necessarily reflect those of the sponsor.

The report draws on two main research inputs for its findings:

- A global survey of 567 executives, conducted in September and October 2011, on their expectations of the impact that technology will have on business between now and 2020. All respondents were at senior management level, with nearly one-half (46%) from the board or C-suite. Respondents hailed from a wide range of industries, with financial services, government and the public sector (including healthcare), education, professional services, technology, and manufacturing especially prominent. Of the firms polled, 43% had annual revenue of US$500m or more.

- A series of in-depth interviews with leading technology and business thinkers, as well as senior executives in different sectors. These are listed below.

Our thanks are due to all survey respondents, in addition to the following for providing their time and insights:

- Jack Bergstrand, founder, Brand Velocity
- Clayton Christensen, Kim B. Clark professor of business administration, Harvard Business School
- Claire Enders, founder and analyst, Enders Analysis
- Benedict Evans, analyst, Enders Analysis
- Lynda Gratton, professor of management practice, London Business School and founder, Hot Spots Movement
- Pegram Harrison, fellow in entrepreneurship, Saïd Business School, University of Oxford
- Matthias Kaiserswerth, director, IBM Research - Zurich
- Bill Limond, chief information officer, City of London
- Robert Madelin, director-general, information society and media, European Commission
- Andrew McAfee, principal research scientist, Center for Digital Business, MIT Sloan School of Management
- Gavin Michael, chief technology innovation officer, Accenture
- Brian Millar, strategy director, Sense Worldwide
- Ian Pearson, futurologist, Futurizon
- Kim Polese, chairman, Clearstreet
- David Rupert, senior manager, engineering, Timberland
- Gerald Schotman, chief technology officer, Shell

- Michael Shearwood, chief executive, Aurora Fashions
- Yaacov Silberman, co-founder and director of operations, Rimon Law Group
- Carsten Sørensen, senior lecturer, information systems and innovation, London School of Economics
- Tom Standage, digital editor, *The Economist*
- Hans-Bernd Veltmaat, senior vice-president, manufacturing and quality, AGCO
- Alberto Vilalta, executive vice-president for corporate systems and channels, Banco Santander
- Wilson Wong, senior researcher, The Work Foundation

James Watson is the author of this report and Denis McCauley is the editor. Kim Thomas and Sarah Fister Gale assisted with interviews.

Executive summary

If one were to ask corporate leaders to list the "megatrends" that are shaping the business world of tomorrow, three are likely to top most lists. One is the accelerating shift in economic power from West to East. Another is financial-market instability and recession, at least for those in the world's more developed economies. The third is technological progress. Of these three, the last is likely to have the most direct impact on how businesses operate and how they are organised.

As difficult as the task is, business leaders and their teams must deploy their crystal balls and think ahead about the types of changes that may be wrought by technology-led innovation. The past two decades are littered with examples of businesses that have guessed wrong about a technology—and the uses to which it can be put—and have paid the price with reduced market performance or, in many cases, disappearance from the scene altogether.

This report aims to assist management teams in this process by synthesising different views of how technology changes will impact on organisations in the period between now and 2020. It is based on in-depth discussions conducted with several prominent business and technology thinkers as well as other senior business leaders from across different industries. The Economist Intelligence Unit also canvassed a group of over 500 senior executives and other managers from across the world on their expectations of technology-led change in the years ahead.

The opinions expressed by this eminent group are certainly not unanimous, as is to be expected. But there is a large degree of consensus on several of the major implications of technology development for the business world.

Foremost among them is the view that technology disruption will continue, and is likely to accelerate, in the decade ahead, confounding the beliefs of some that innovation and disruption are slowing. New business models will emerge on the back of technology advances, and organisational structures and the nature of many jobs will change. Not all will prosper, however: nearly four in ten survey respondents worry that their organisations will not keep pace with technology change and will lose their competitive edge.

Other predictions put forward by our experts and practitioners include the following:

- **Few industries will remain unchanged by technology disruption.** Six out of ten business

leaders agree that their main vertical market will bear little resemblance in 2020 to how it looks today. Media and entertainment, banking and telecommunications top the list of industries thought most likely to converge with another in the next decade. One in ten respondents fear that their organisation will disappear altogether.

- **For those who can master it, "big data" will become a business of its own.** Firms already collect vastly more data than they did a decade ago, and new sources—from smart meters to smartphones—will add much more data to this flow. New or more advanced business models based on specialist analytics services are likely to emerge as a result. The European Commission estimates that government data alone could add some €40bn (US$55bn) a year to the European economy by stimulating the growth of new information services.

- **Mid-size companies will be less common in 2020, not least as micro-entrepreneurs proliferate.** Technology advances will support a rise in micro-entrepreneurs in the decade ahead, and will enable these tiny businesses to act like far larger ones. This has direct implications for mid-size companies, which will increasingly need to choose whether to become larger to compete on scale, or smaller to compete on speed. Many will face this decision in the years ahead.

- **The importance of middle managers, too, will diminish.** Meanwhile, greater analytics capabilities and other technologies will enable organisations to devolve far more decision-making authority to managers and employees at the periphery. Notwithstanding challenges relating to compliance and other areas, nearly two-thirds (63%) of those polled see this happening, which in turn will allow many to say goodbye to the generalist middle manager of old. This will be part of a wider shift towards flatter, more meritocratic corporate structures, egged on by the spread of younger generations in the workforce.

- **Job growth may be increasingly decoupled from economic growth owing to automation.** At the very least, it is becoming clearer that the productivity gains from technology are allowing firms to create more output from less input, as some experts argue. This is a triumph for business, but will create a stark challenge for job creation. Indeed, the technology advancement to come will place a wider range of jobs than ever under the threat of displacement. The very same trends, however, will also create numerous new occupations that do not exist today.

- **As transactions are automated and collaboration becomes more virtual, the purpose of physical stores and offices will change.** Just as banking transactions are now largely automated, with bank branches becoming more consultative spaces, so too will many other customer-facing physical premises. For knowledge workers, meanwhile, a hybrid working pattern will deepen, with more working from home, while offices instead evolve into spaces for networking and meeting.

- **Thanks to powerful personalisation technologies, customer "co-creation" will become a major source of innovation.** Indeed, one of the most striking findings of this survey is the sharp rise in the role of the customer in generating new ideas. By 2020, customers are expected to overtake in-house research and development (R&D) as the primary source of new product and service ideas. Respondents also believe that customers will by then be nearly as important a source of ideas for business process improvement as their own employees.

- **The organisation of 2020 will be more transparent than ever before.** Firms will find it increasingly hard to hide poor service, high pricing or unpopular practices, as technology makes them more visible to end-consumers. Just as social media aided political protests around the world in 2011, so too will it allow consumers to put firms in the spotlight. In the austere decade that lies ahead, firms will need to behave better than ever, or risk a consumer backlash.

Although the next decade will be marked by extensive technology-led change, two constants will remain. One is that technologies by themselves will not bring about improvements in models or operations; for this, the business processes being powered by technology must also undergo change. The other is that new technologies and processes will only be as effective as the people who use them. Failure to appreciate the cultural obstacles to technology-led change will remain a recipe for falling behind.

Introduction

> "Remote shopping, while entirely feasible, will flop—because women like to get out of the house, like to handle merchandise, like to be able to change their minds."
> – *Time* Magazine, 1966

> "There is no reason anyone would want a computer in their home."
> - Ken Olson, Digital Equipment Corp, 1977

A decade of disruption

History is littered with unfortunate technology forecasts, making the task of any study on the future impact of technology fraught with risk. One unlucky forecaster in 2004 argued that the challenges of developing a driverless car would prove too difficult for the foreseeable future[1]; by 2011, Google had already filed a patent and started lobbying to change the law in the US to allow for such vehicles[2].

Despite seemingly rapid advances in specific areas of technology, there is an argument that wide-ranging innovation and scientific discovery have stalled in the past decade. Tyler Cowen, an economics professor at George Mason University in the US, argues that most of the major breakthrough technologies—the microprocessor and the Internet, for example—arrived in the past century, with little in the way of major new technologies on the horizon[3].

But for the business executives polled for this report, there is clear agreement that technology innovation is likely to continue apace in the decade ahead. Only a minority believe, for example, that the positive impact of technology on enterprise productivity has plateaued. Many think that the pace of efficiency improvement will accelerate. "The world will face more disruptive technologies in [shorter] time frames," notes one. Technology development is expected to be rapid enough that nearly four in ten of our surveyed executives are worried that their organisations will not be able to keep up and will therefore lose their competitive edge. Technology will undoubtedly remain disruptive in the business world.

[1] Brynjolfsson, Erik and McAfee, Andrew. *Race against the machine: How the digital revolution is accelerating innovation, driving productivity, and irreversibly transforming employment and the economy*, Digital Frontier Press, 2011.

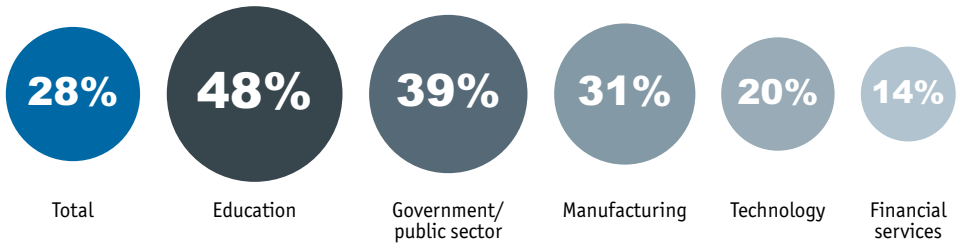
[2] Markoff, John. "Google lobbies Nevada to allow self-driving cars", *The New York Times*, May 10th 2011

[3] Cowen, Tyler. *The great stagnation: How America ate all the low-hanging fruit of modern history, got sick, and will (eventually) feel better*, Dutton Books, 2011

Chart 1

Q **Do you agree or disagree? "When it comes to improving operating efficiency, enterprise technology has reached a plateau—there is not much more room for achieving efficiency gains."**

(% responding "strongly agree" or "agree")



Overall, executives see technology advances as being the third most powerful macro trend changing how business will operate in the coming decade, after the rebalancing of the world economy to emerging markets and the ongoing instability of financial markets. One accelerant will be an expanding flow of innovative technology ideas from emerging markets, especially India and China, ensuring the continued emergence of potentially disruptive technologies.

Andrew McAfee, a principal research scientist at the MIT Sloan School of Management (US), believes that major advances are still coming. "The kinds of developments we're seeing now are no longer the stuff of science fiction," he says. "We have never before had computers that could reliably recognise speech as we're talking, process it and give answers back to us in real time. We have never before seen a computer that could beat the all-time best human being in a TV quiz show. And we have certainly never seen cars that could drive themselves on roads in traffic. These are all very new developments."

The known knowns

Whether or not there are major new breakthroughs, the development of existing technologies will continue to influence business models and practices over the next decade. Inventorying these technologies is not an objective of this report, but a few general assumptions can be made.

The first is that there will be an abundance of computing power, storage and bandwidth, at an ever-decreasing cost, available via the "cloud" model. Matthias Kaiserswerth, director of IBM Research's Zurich Lab, terms these combined capabilities as "Watson in your pocket", after his firm's high-end computer of that name. Cloud computing will be especially powerful in combination with pervasive mobile connectivity. "This abundance represents a profound change," says Gavin Michael, the chief technology innovation officer at Accenture, a consultancy. "It allows you to undertake problems that you could not before because they were too computationally or storage intense."

A second assumption is that organisations will continue to amass increasing volumes of data, from a growing variety of sources and at accelerating speeds—the trend known as "big data". As the numbers of smart devices and sensors expand across supply chains, stores, transport fleets and products, data volumes will surge anew, as will their possibilities. "Big data will be very disruptive," affirms Mr Kaiserswerth. Our surveyed executives agree, citing data analytics and smart systems among their three most impactful technologies of the next decade.

A third assumption holds that increasingly immersive video-based communication, social media and other tools will all become far more pervasive in business. These will change how teams and organisations are structured, not least by decreasing transaction costs both inside organisations and externally. These will also change the way that many people work.

Finally, the consumer sector will solidify its ascendancy as the major source of technology innovation. Businesses will need to look to the consumer world for major advances, from mobile devices to the complex collaborative worlds of the gaming industry. Tom Standage, digital editor of *The Economist*, calls this the "reversal of polarity", where the innovation and pace of change is being dictated by the consumer sector.

Acknowledging the unknowns

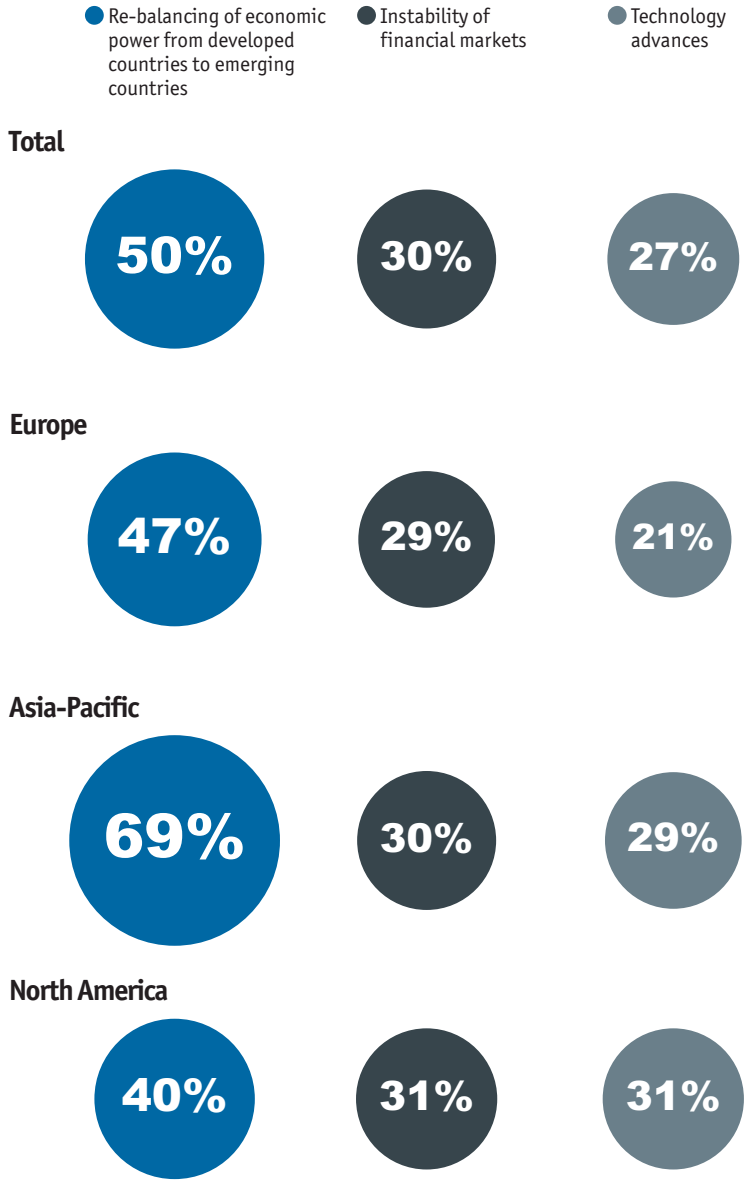
These technology developments alone will do much to change how the business world operates in 2020. As yet unknown advances—and the new and improved processes that businesses will create, or modify, on the back of these technologies—will very possibly do more. Several survey respondents wisely warned us that there is no way of divining what types of disruption are to come—that technology is disruptive precisely because its effects are so difficult to predict.

Whether they are known or unknown, the technology changes ahead are certain to have major implications for business models, organisational structures, the nature of jobs, the workplace and how companies interact with their customers. This report considers each of these areas in turn. In doing so, it enlists the help of several prominent technology and business thinkers as well as a large number of senior executives across different industries. Rather than a single definitive forecast, the result is a collection of expert views on the different ways in which technology advances may impact on organisations over the next decade.

Chart 2

Q **Which of the following technologies or technology-related trends will do most to change how businesses operate over the next decade?**

(top responses; % respondents)



Disruptors

Our interviewees and survey respondents were canvassed for predictions of the technologies and related trends that they expect to disrupt businesses the most by 2020. Their favourites include the following:

- Cheap smartphones for all
- Business-oriented social networks
- Data mining for behavioural insight
- Cloud computing, providing cheap and nearly limitless processing power and storage
- Immersive or holographic 3D (three-dimensional) video conferencing
- Augmented reality interfaces, which converge the virtual and the physical worlds
- Adoption of visual, tactile and voice interfaces in primary computing devices
- Artificial intelligence—computers that learn by themselves

1 Technology and business models in 2020

Contrary to the perceptions of many, technology in itself is rarely the source of a major new business disruption. Rather, it is companies combining changing technology and new business models to outperform rivals. Take the examples of eBay or Facebook (both of the US): neither firm developed a unique technology to capture a leading position in its market, but instead created a new model from existing technology.

Although a revolutionary technology may emerge, it is more likely that disruption will be caused by a technology that is already in existence and that is applied in new ways, whether to radically improve business processes themselves or to develop more innovative means of interacting with customers. "The change will be more about the business model, and how technology is used to change an organisation and its interaction with customers, rather than some major technology change on its own," argues Jack Bergstrand, the founder of Brand Velocity, a consultancy, and the former chief information officer (CIO) of Coca-Cola.

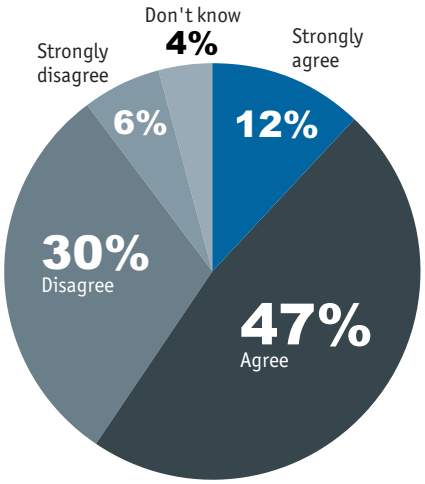
Indeed, innovation in processes and methods is arguably more vital to business model change than innovation in technology. An example can be found in the automotive sector, where vehicle telematics have existed for decades, often as in-car diagnostics that alert drivers of the need for a service. But falling technology costs and increased connectivity are prompting carmakers to rethink their existing processes and offerings to build new businesses on the back of these, such as in-car entertainment or navigation services. In the technology industry itself, the introduction of Apple's online App Store in 2008 did not result from introduction of a wholly new technology, but rather from the development of a more efficient platform and set of processes for marketing and distributing software.

Seen through this lens, it is clear that many industries will continue to be disrupted by technology. Nearly six in ten executives polled for this report believe that the market in which their organisation operates will bear little resemblance in 2020 to how it looks today. More than one in ten fear that their organisation will disappear altogether.

Not surprisingly, media and entertainment top the list of vertical markets that are viewed as most susceptible to disruption over the next decade. Somewhat less expected, given its heavily regulated nature, is a belief that the banking industry is also in for restructuring. Respondents from the financial services industry itself hold this conviction: 70% believe that significant convergence with organisations from

Chart 3

Do you agree or disagree? "The vertical market in which my organisation operates will bear little resemblance in 2020 to how it looks today."
(% respondents)



other industries is on the cards, compared with 45% of respondents in the overall sample. "We are seeing the disintermediation of money from banks, and this will become more sophisticated with the growth of such things as peer-to-peer lending," says Brian Millar, the strategy director for Sense Worldwide, a strategy consultancy.

Ian Pearson, a futurologist at Futurizon, a consultancy, expects the further collapse of High Street retailing. "The recession is accelerating the shift to the web, and this is severely affecting retail," he says, arguing that technologies such as in-store augmented reality will prove more disruptive. Beyond retail, Mr Bergstrand argues that the classic professional services business model will also change, not least as the web and social media alter the way in which teams are put together to solve problems. This will challenge many established services firms to rethink their business processes, not least as they seek to compete with smaller virtual companies capable of rapidly bringing together ad hoc teams of specialists from around the world to solve particular challenges.

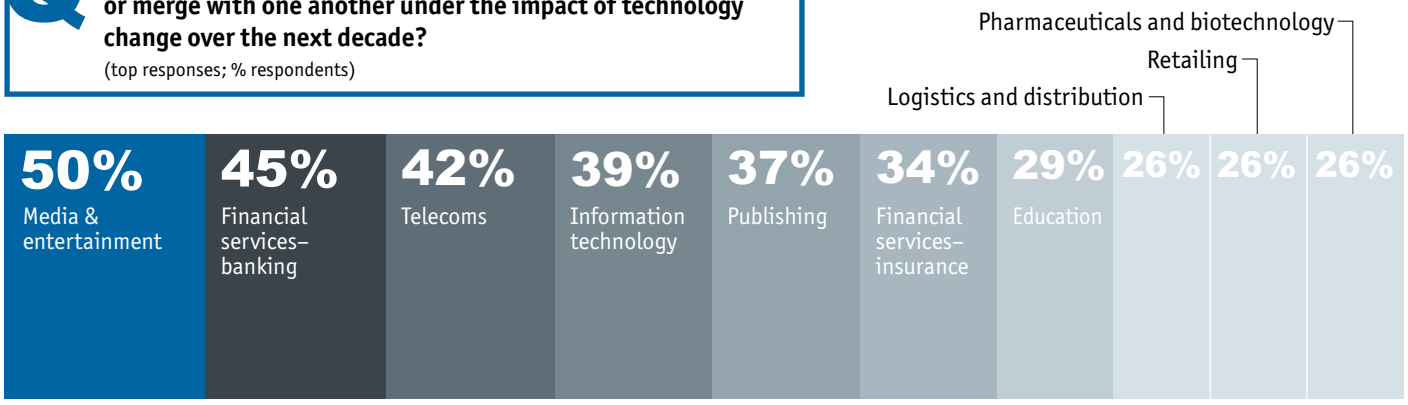
The business of data

Beyond individual vertical markets, many business models will change as "big data" gets even bigger. In some areas, the masses of data generated within firms will have the potential to become a product of their own. Cash-strapped governments are already eyeing such possibilities: Neelie Kroes, the EU's digital agenda commissioner, recently estimated that Europe's public-sector data alone could be used to create growth of around €40bn (US$55bn) a year for the region's economy, along with many new jobs[4].For example, open access to data about

[4] European Commission, "Digital agenda: Turning government data into gold", December 12th 2011

Chart 4

Of the following vertical markets, which are likely to converge or merge with one another under the impact of technology change over the next decade?
(top responses; % respondents)



public transport has helped to stimulate a small industry of application developers that provide information services, such as train-scheduling apps. Other potential services include real-time traffic data, maps, price-comparison tools and more.

In order to help other organisations to cope with information overload and to mine better their own customer data, new kinds of analytics services will emerge. "Some companies have been very good at building new models around this data, or maintaining the effectiveness of their existing model," notes Mr Standage. One example is the telecommunications industry, which analyses data from its customers to work out which ones are most likely to churn, and then tries to pre-empt that. "We are going to see that sort of thing applied in many other areas," he says.

However, big data will not be an easy game to win. Mr Millar highlights the challenge of interpreting information, for example. It is one matter to collect vast amounts of data on a customer's spending habits, but the real need is to understand what this says about the customer's behaviour. At a technological level, organisations will need to adapt their underlying data architectures and processes to cope with new kinds of data inputs, whether from smart meter readings or social media feeds.

Expert view

Clayton Christensen on innovation and disruption

Clayton Christensen is a professor of business administration at Harvard Business School and the bestselling author of The Innovator's Dilemma, *among other titles. He is one of the world's leading authorities on disruptive innovation.*

Q: In your view, will technology-related disruption continue as before, slow or accelerate in the coming decade?

It will continue as before, but there is a concern about a possible imbalance between the three key types of innovation. One of these is "growth innovation", which is disruptive. It involves making what is currently an expensive and complex technology that is accessible to only a few people far simpler and far more affordable. All growth in jobs in the US has come from such innovations. The next is "sustaining innovation", which improves good products' functionality or expands their capacity. Most innovations fall into this category; on average they do not create new growth, but they are nonetheless important to the economy, keeping firms sharp. Finally, there is "efficiency innovation", which is low-end disruption. These are also important, but they destroy jobs in the economy. When Walmart comes to town, for example, they hire people but their model is so much more efficient that they also put many retail shopkeepers out of business.

Looking ahead, growth innovation must outstrip the ability of the other two to take jobs out of the economy. But in the US and parts of Europe, businesses are investing less and less in these kinds of innovation, while engaging in more efficiency innovation.

Q: In our survey, many firms cited customers as a major source of innovation in the coming decade, ahead of more traditional ones. What challenges does that hold?

As a general rule, if you listen to your customers and follow their lead, they help you with the sustaining innovations. But for the innovations that create real growth, customers are not very articulate at what those things need to be. If you just listen to them or follow them, they will misguide more than guide you. However, if you do not listen to what they say but rather look carefully at what they really want to get done in their lives, and how, and you can create a product or service that does it better, at lower cost, then you can learn a lot from customers.

Meanwhile, at a broader level, people's cognitive and decision-making abilities may lag what the data actually tell them, argues Mr Kaiserswerth. "Many people's decision-making is a form of first choosing and then justifying, so this will be an interesting conflict to watch." He cites the example of one firm whose predictive systems accurately forecasted a sharp dip in sales, but whose managers refused to believe it. "They didn't want to see it," he notes. Merely implementing new systems to collect and analyse data is one step, but firms will also have to make changes to underlying processes in order to take full advantage of new data inputs.

Reducing barriers to entry

Some industries will be harder to disrupt than others. During the past decade, for example, a number of new rivals entered the automotive industry with hopes of jump-starting a new generation of electric vehicles. But as many have discovered, overturning hundreds of billions of US dollars of deployed capital in the form of factories, supply chains and fuelling stations is difficult. "Some firms require a lot of physical infrastructure, whether a car plant, a drug factory or mining. These do not change much," according to Mr Pearson. The enormous amounts of capital required to get off the ground will remain a major barrier to entry for challengers.

Nevertheless, technology will have a heavy impact on the manufacturing sector, partly through the enabling of new offerings thanks to personalisation and automation—manifested, for example, in built-to-order cars. On a smaller scale, the development of 3D printing will allow new niche manufacturers to emerge with the ability to digitally design and "print" items on demand. As this technology falls in cost and increases in capability, more such firms will spring up.

In industries with lower barriers to entry, technology is driving bigger changes. Over the past decade persistent reductions in technology costs have made new business models feasible; this trend will continue, with companies competing far less on capital deployed and far more on the strength of their ideas. "The hurdle is lower than ever," says Accenture's Mr Michael. "Where it was once a matter of capital to compete, it's not anymore."

This is boosted by the ongoing development of platform technologies, such as oDesk or Alibaba for labour, various app stores for software, or social networks for all manner of services. All these have hugely curtailed the need to invest in raising awareness among customers. "To set up your own global dominating company has never been easier," believes Carsten Sørensen, a senior lecturer in information systems at the London School of Economics (LSE). One clear implication is an increase in micro-entrepreneurs, as limited capital needs and accessible markets will propel ever more people to launch their own business.

This is not to lose sight of some of the challenges to small firms resulting from technology's rapid development. One is the need to comply with the growing number of regulations and requirements regarding people's digital privacy and security, governing such things as how to collect and store customer data appropriately. There is a risk for many firms, especially smaller ones, that such requirements become so onerous as to discourage new applications. Just over half (52%) of executives express the view that compliance requirements could become so extensive that some firms would give up on implementing certain new technologies. A similar proportion also worry that technology change will make operational risk management and governance far more difficult than it is today.

Case study

Bridging the online-physical divide

High Street fashion stores have so far remained largely unaffected by the growth of online shopping. "There is much talk about whether online [shopping] would decimate the sector, but we're in a better position having brick-and-mortar stores to support a digital offering," says Mike Shearwood, the chief executive officer (CEO) of Aurora Fashions, a global chain of brands that includes Coast, Oasis and Warehouse, with nearly 1,300 stores in 33 countries. But his firm is now using technology to develop what he calls "omni-channel" retailing—providing a joined-up customer experience through all channels, from mobile and online to physical stores.

Delivering on this requires a rethink of the organisation itself. For example, rather than having separate stock pools for all of its outlets, the company's entire store network now shares one inventory, made possible by real-time visibility of availability and stock levels. "This means that we can open up our entire stock pool to the customer," says Mr Shearwood. Aurora makes all of its stores part of the online and mobile shopping experience, enabling a range of delivery options: click and collect or deliver to home, for example, arriving within five days or on the same day, and even within 90 minutes.

This in turn has implications for its physical stores. "Most people buy online and then return the product to a store, which means stores have historically seen the web as competition," says Mr Shearwood. To overcome this, orders fulfilled from Aurora's stores are now included when measuring store performance. "Suddenly managers love e-commerce: they come in and see anything from ten to 200 orders waiting to be fulfilled. Anyone coming in with a return from an online purchase is welcomed as an opportunity to upsell." With the help of recently introduced in-shop iPads, customers in smaller stores can browse a fuller range of styles than was previously possible. The iPads also double as additional till points to shorten queues.

"All this is just the start of the journey," affirms Mr Shearwood. "Technology penetration of the retail environment is going to increase exponentially."

2 Rethinking the organisation

The classic 20th century corporation remains the dominant way in which businesses are structured. The theoretical rationale for this is simple: as companies grow, they rely more on a hierarchical organisational structure to delegate tasks effectively. But this core structure—from the org chart to how people collaborate to its optimal size—is changing as a result of technology.

The most obvious shift is around how people collaborate. Although email has been a vital enabling tool, it has also brought significant inefficiencies. In the coming decade this will start to give way to a range of other communications tools, with users selecting those that are best fit for purpose. Atos, a technology company, is the most recent example of a firm that is seeking to change, with a stated aim of banning internal email within three years[5].

Email will surely exist in 2020, but a large amount of email traffic will, thankfully, shift elsewhere. Video interaction is likely to become commonplace, as the technology becomes more immersive and cost-effective. Some also believe that corporate social networking tools will rapidly expand to mop up much of what was previously email traffic. Kim Polese, a technology innovator in Silicon Valley and the current chairman of Clearstreet, a finance firm, talks of the "amplification effect" of one employee being able to connect to thousands of others and in turn find experts and colleagues around the world.

There is an inherent cultural challenge, however: technology may provide the means for new kinds of collaboration, but prodding people and organisations to take it up is often far more difficult. "We don't really know what the implications are for an organisation that becomes wholly or mostly dispersed through the agency of technology, and what management challenges that brings, from the measurement of performance and productivity to dealing with greater uncertainty from flatter structures," notes Pegram Harrison, a fellow in entrepreneurship at the University of Oxford's Saïd Business School.

"Barbie-shaped" business

Advances in collaboration will do more than change the way that teams interact; they will also reshape the structure of organisations. IBM's Mr Kaiserswerth believes that better collaboration tools will make many firms smaller, by making it more efficient to deal with specialist external partners for various non-core functions. "The rationale for a large firm is that the internal transaction costs are lower than the

[5] "Atos Origin sets out its ambition to be a zero email company within three years", company press release, February 7th 2011

external ones," he believes. "But the Internet has made external transaction costs lower, so the enterprise can become much smaller."

One obvious area of shrinkage is the back office. A reason why small companies scale up into mid-size ones is the need to bring in a range of supporting functions—such as book-keepers, marketers and secretaries—and then middle managers to look after such functions. Over the past decade technology has been steadily digitising these roles. In the next ten years much of this will either be automated or else simply handled by external specialists, as firms embrace process innovation to create significantly leaner and more efficient organisations. "In the back office, there are a number of functions that are disappearing. Parts of the business process will be sourced externally, and parts will just be eliminated altogether through process

Expert view

Tom Standage on the future impact of social networking

Tom Standage is the digital editor of The Economist *and the author of several books on the history of technology. He is currently working on a new book on the history of the idea of social media, from Roman times to the Internet.*

Q: What technology do you think will have the biggest impact on business in the coming decade?

The really big one is the impact of social networking on the enterprise. This has been entirely a consumer phenomenon, but we're now seeing start-ups like Yammer and Chatter. They are taking the benefits and the approach of social media and applying them in companies. I think that's going to be a very big change.

Q: Why will social networks be so important for companies?

People who are entering the workforce now think that this is how software works. Some managers talk about Facebook and other [social] networks as being time wasters, but in fact the opposite is true. This is the way that software is increasingly going to look, and that will impact on the way companies are run, because when you have a general discussion about things on a Facebook "wall", you tend to get much less email and much less wasted time.

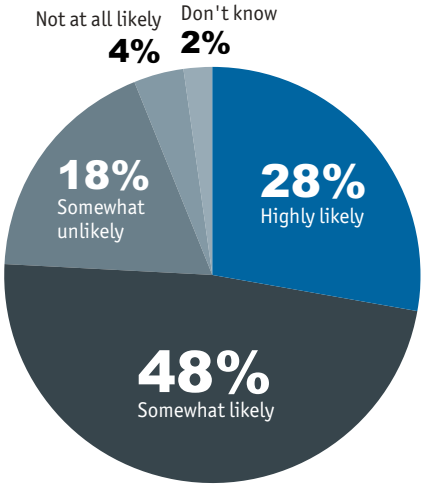
It also becomes much easier to find experts on particular subjects, to expose expertise within your company. Very often people turn out to be very good at something even though it's not part of their job description. When you ask a general question, such as "Does anyone know if we've ever done a contract on this?", the people who reply basically self-organise. You can see who the useful people are, and people within the company start to be perceived according to their willingness to co-operate and their utility to others. That matters much more than what their job description is.

Q: What about outside the company?

The missing link is the use of social media by companies to deal with their suppliers and customers. This will take a while, but the opportunity for people to engage with their suppliers and their customers in this way will be enormous. You can imagine how companies will be able to collaborate much more effectively. We've seen a few small examples of specific collaboration spaces—for a particular project, for instance—whose participants come from all sorts of different companies. We will start to see more of this type of thing.

Chart 5

Thinking forward to 2020, how likely is it that most of the organisation's IT services will be provided by external parties?
(% respondents)



automation," says Mr Michael of Accenture. Mr Sørensen of the LSE cites the example of two low-cost airlines, EasyJet and Ryanair: "They don't employ many less staff on their flights than the old incumbents, but they do employ a vast amount less in the back office."

One major back-office role that will shrink in many firms is the information technology (IT) function: 76% of executives think that it is either highly or somewhat likely to be handled by external partners in the coming decade. Cloud computing is likely to play a role here too, as many traditional IT tools migrate to simple online services, with a diminished need for in-house IT staff.

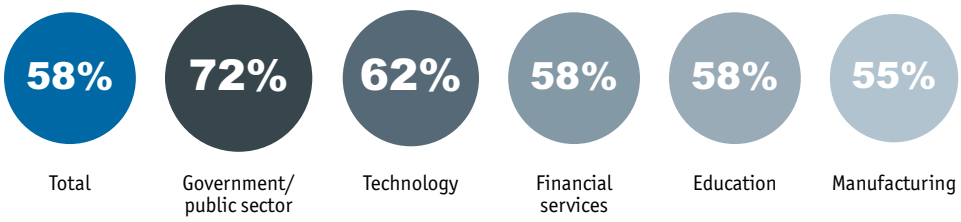
Mr Pearson of Futurizon talks of an "IT renaissance" in the coming decade, where firms scrap unnecessary back-office processes altogether. "If you start on the web with a small business, you can do the same job as one three times bigger by getting rid of all the pointless stuff and creating new systems with very lean and mean business models."

Advances in collaboration will allow organisations to go further than this, enabling individuals to team up as needed to solve problems of all kinds. For example, firms can tap into specialist contractors and networks, such as Kaggle or TopCoder, to help them to do anything from building a mobile app to developing a new algorithm for routing freight. "The nature of work will be such that a lot of the work currently done inside the walls [of the business] can be done outside the walls. People will link up for a project, and then disband again. Open collaboration is the new business model," says Mr Kaiserswerth.

These industry-specific online exchanges allow individuals or small teams to build effective public profiles, so that unknown third parties are willing to collaborate with them, and to identify immediately the most highly rated

Chart 6

Do you agree or disagree? "On a daily basis, most employees will interact more with people outside the organisation than with colleagues inside the organisation."
(% responding "strongly agree" or "agree")



people to work with. Nearly nine in ten (86%) executives surveyed agree that project teams in 2020 will typically include members from outside their organisation, whether they are suppliers, customers or otherwise. "You will see virtual firms assemble in many different ways, with ad-hoc networks using LinkedIn and other social networks. People will assemble virtual firms on the fly to tackle market opportunities," according to Mr Pearson.

Given these shifts, the traditional mid-size company may become less common in the decade ahead. Instead, most firms will either seek to grow into "mega-sized multinationals" and take advantage of the scale that affords them, or else shift towards "micro-sized hyper-specialists", as Lynda Gratton, a professor of management practice at London Business School (LBS), puts it[6]. *The Economist*'s Mr Standage dubs this the "Barbie-shaped" economy, with many large companies and several small firms, but relatively few in-between.

Naturally, the evolution towards a more virtual business will not come without new kinds of challenges and risks to business owners. For one thing, the more an organisation relies on a flatter organisational structure and ad hoc outsourcing partners, the more difficult it can be to codify and share knowledge. Whereas previously, the internal experts on a given issue—from finance, production or elsewhere—could meet to share insights, virtual businesses will have to develop effective practices for documenting and sharing organisational knowledge, whether through collaborative social media or other processes.

Compliance is another challenge. One trend within many multinational firms, for example, has been to consolidate specific back-office functions into a single regional centre, such as logistics or finance and tax, in order to cut costs and improve efficiency. But this in turn can raise new compliance issues: in-country tax filings are more easily missed, for example, or other local rule or tariff changes may be overlooked.

There are also risks relating to business continuity: a tiny but global virtual business can be hugely efficient, but it is also exposed to the risk of blackouts, data loss, network failures and hackers.

For larger firms, there is the challenge of effectively adapting to new styles of management that are more suited to a virtual world, where little is yet known about what works best. Some companies may move too quickly to a wholly virtual model, and thus encounter a loss of staff engagement; others may move too slowly, and find themselves outmanoeuvred by nimbler rivals.

The end of middle management?

Technology will also reform the org chart of old, with one victim possibly being the "middle manager" role. According to Ms Gratton, technology itself has become the "great general manager", not least by enabling teams to become increasingly self-managed[7]. This will be part of a general flattening of hierarchies within business. Individuals will be increasingly empowered to make decisions thanks to mobile technology and advanced analytics, within a framework set by upper management.

Nearly two-thirds (63%) of those polled agree that technology will enable a far-reaching devolution of business decision-making to the periphery. All this will be good for some, but will also bring new stresses. "Flatter structures are more uncertain," notes Mr Harrison of the Saïd Business School. "Those people who are able to deal with that uncertainty, either in terms of their personality or ability to adapt, will have a good time. Those who are not, who like clocking in and knowing who's the boss, will suffer."

A more profound shift in many organisations will be that from hierarchies to meritocracies. The underlying notion here is simple: when an individual's contribution is measured by their ability to input meaningfully in order to solve a problem, they become visibly valuable within

[6] Gratton, Lynda. *The shift: The future of work is already here*, Collins, 2011

[7] Gratton, Lynda. "The end of the middle manager", *Harvard Business Review*, January 2011

the organisation. A specific example might be a law firm, where someone posts a client problem on an internal collaborative tool, enabling anyone to contribute ideas and offer help. In this world, traditional measures, such as age or the prestige of qualifications, become less relevant in determining an employee's worth.

Case study

Shell: new platforms for collaboration

Among the pressing challenges that the energy sector faces in the decade ahead is that demand for its product is surging with the expansion of the global middle class, just as oil and gas are getting technically more challenging to find and extract. This in turn raises enormous engineering challenges. For Shell, an energy company, this includes a recent commitment to building a floating liquefied natural gas facility with the length of four football fields, as well the building of its Draguen platform in the Norwegian sea—effectively a building the size of the Coliseum in Rome, resting on a single column taller than the Eiffel Tower.

According to Gerald Schotman, Shell's chief technology officer, being able to deliver on such engineering challenges requires an innovation process that is both rapid and that taps into the best ideas from all parts of the world. "Much of our technology development is driven by the fact that speed, and access to completely new and different ideas, are of the essence," he says. "I always say that innovation is a contact sport. It requires a lot of people to quickly engage with each other. That's how you create new ideas and pick up new links," says Mr Schotman.

To deliver on that, the company draws on talent from around the globe—including research capabilities in America, Europe and Asia—aided by steadily improving collaborative tools and platforms. Such applications continue to evolve as younger generations join its 100,000-strong workforce. Shell has experimented for several years with a variety of social networking tools, for example. It sees these as a different way of digitising informal but important information flows within the business, while helping to establish connections more quickly and effectively.

One recent trial has been with Yammer, which it sees as a "Twitter for the enterprise". The tool has helped to boost participation in many of its internal online communities—not least by the ability to connect the firm's knowledge centres in Europe or the US with operations, for instance, on a rig in the South China sea or deep in a desert. Many other firms are following suit: Yammer alone already has more than 3m enterprise users, with about 85% of Fortune 500 companies, including Shell, using it.

3 Jobs in 2020

Technology is impacting not just on business models and organisations, but the nature of people's jobs as well. Some impacts are empowering and exciting: one executive tells a moving story of a disabled worker reaching her full potential through virtual collaboration from home. The same holds true for workplace equality and diversity. "Technology allows us to tap into the wasted potential in almost any population," affirms Mr Harrison. And technology will remove the drudgery of some jobs, freeing people to focus on the more meaningful and inspiring work.

But other technology effects will challenge society. One of the most powerful is the possibility that economic expansion is steadily becoming decoupled from job growth. The core of this argument is that technology advancements are displacing jobs at a growing speed[8]. This report's opening example of driverless cars might well displace millions of truck and taxi drivers, for example, just as driverless trains are doing in public transport. Economic pressures will also weigh in here. "Technology is becoming smarter, more ubiquitous and cheaper, and so organisations will ask which jobs can be standardised and how much head count they can lose," warns Wilson Wong, a senior researcher at The Work Foundation, a think-tank. Claire Enders, the founder of Enders Analysis, a research firm, puts it more bluntly: "Many professions will be decimated by technology."

Many professional occupations, not just low-end jobs, will come under threat for the first time, not least as existing business processes are retooled to take advantage of technology. One example comes from the legal industry, where pattern-matching tasks such as document discovery occupy an enormous amount of lawyer time. Automating such processes would free up time for more intellectual work, but would also mean that fewer people are required. In medicine, highly specialised roles such as radiology diagnosis, which requires over a decade of training, is ideally suited to machine analysis[9].

A gloomy view might be that technological advances will eliminate highly specialised roles. A more optimistic view is that such automation will improve the output of radiologists and other workers, enabling them to focus on more specialised tasks. "Software is not going to replace doctors and lawyers, but it is going to challenge a lot of the people who support those professionals," argues Mr Standage.

Indeed, concerns over the job-culling effect of automation have often been overplayed in the past. The rise of the Internet since the 1990s has

[8] Brynjolfsson and McAfee. *Race against the machine*, 2011

[9] Ford, Martin. *The lights in the tunnel: Automation, accelerating technology and the economy of the future*, Createspace, 2009

Expert view

Andrew McAfee — Man versus machine

Andrew McAfee is a principle research scientist at the Center for Digital Business at the MIT Sloan School of Management and a fellow at Harvard University's Berkman Center for Internet and Society. He is the co-author of Race against the machine*, which argues that technology is increasingly displacing a wide range of jobs.*

Q: Decades of technological development have been beneficial for job creation. What has changed that you are now seeing workers fall behind?

There will be some very powerful technologies entering the economy over the next ten years. When I look back at the kind of things computers have been doing, my strongest impression is, "We ain't seen nothing yet." Many people in jobs ranging from customer service to various types of diagnosis to driving vehicles are going to be confronted by those technologies, and some will be displaced. And the rate of displacement will increase because technology improves at an exponential rate. It feels like we have recently crossed a tipping point.

Q: You used the word "diagnosis". Are we also talking about highly skilled people such as doctors and lawyers?

Classic theory has it that technology is bad news for those further down the skills or education ladder. That will begin to change, at least slightly. Diagnostics is a good example. This is a large part of what doctors do, and one of the most advanced types of diagnosis is pattern-matching. What astonishes me is that computers have recently demonstrated pattern-matching abilities that make a mockery of everything that has come before. We have not seen such displacement of higher-wage, higher-skilled professions yet, but we are going to see more.

Q: Automation has historically been a positive phenomenon, freeing up people to do new things. What is different about it now?

We are insufficiently focused on the fact that employment growth is becoming decoupled from economic growth. The prescription we hear for joblessness in the economy is economic growth. I like economic growth, and it will put people back to work, but I am seeing considerable evidence that the number of jobs created per unit of economic growth is smaller than it used to be. I believe that technology is a big part of that story.

surely displaced some jobs, but it also continues to provide a plethora of new ones: from website designers and programmers to professional bloggers, search engine optimisation specialists, email marketers, and countless app developers, to name a few. It is likely that a more virtual and automated world will also demand new kinds of roles. These may include such occupations such as avatar designers and managers, waste data handlers, data privacy managers, augmented reality architects and many others[10].

In a 2011 study, McKinsey argued that for every job destroyed in small and mid-size firms by the Internet, an average of 2.6 new jobs have been created[11].The same ratio may not be sustained with future technological development, but new job opportunities will undoubtedly emerge.

Competing in a global job market

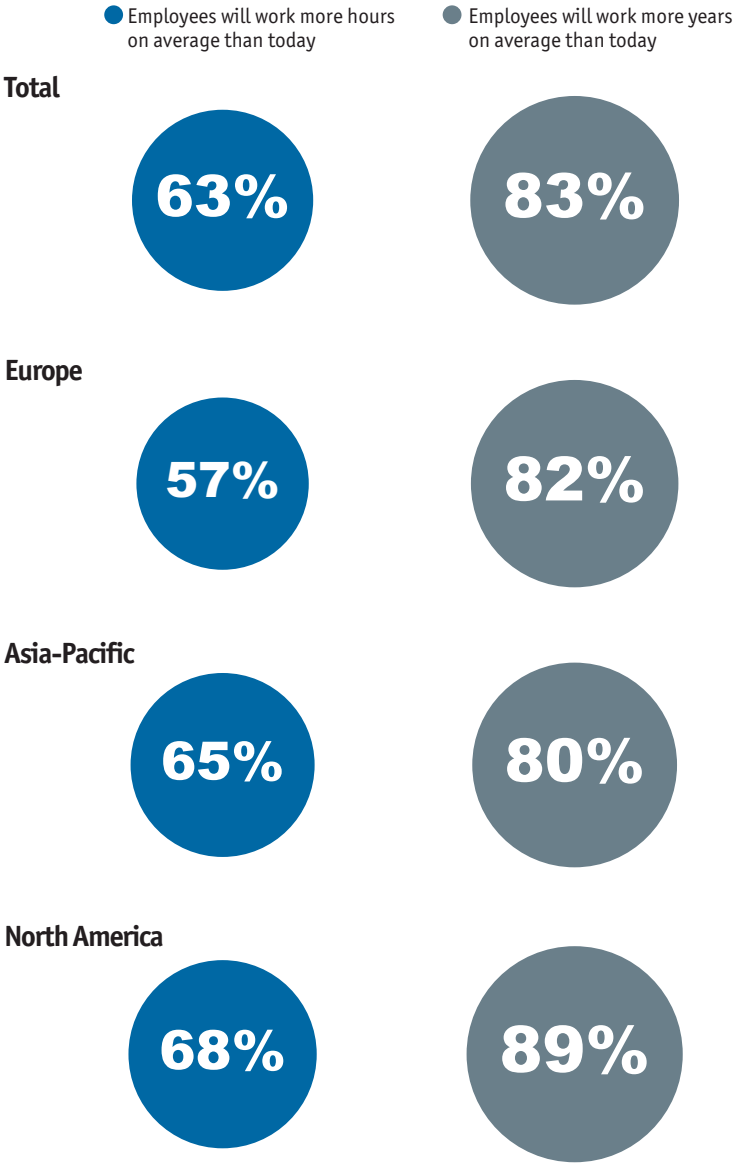
From a jobs perspective, Clearstreet's Ms Polese argues that the real challenge lies in creating a workforce that is better adapted to a more digital world, and both governments and companies will have to think more carefully about this. She and Ms Gratton agree that individuals will need to do more to reskill themselves, and will have to constantly do so over time. Other factors in addition to technological change will require this, such as increased longevity—along with financial stress—that will keep many working for longer

[10] See, for example, Thomas Frey, *55 jobs of the future*, FuturistSpeaker.com; Rohit Talwar and Tim Hancock, *The shape of jobs to come*, Fast Future Research, 2010; Cynthia Wagner, "Emerging careers and how to create them", *The Futurist*, January-February 2011.

[11] *Internet matters: The Net's sweeping impact on growth, jobs, and prosperity*, McKinsey Global Institute, 2011

Chart 7

Q **Do you agree or disagree with the following statements about work in 2020?**
(% responding "strongly agree" or "agree")



regardless. Over eight in ten of our surveyed executives believe that the employees of 2020 will look ahead to a longer working life than those of today. Similarly, around two-thirds (63%) believe that employees will work longer hours.

The spread of collaboration networks, as discussed earlier, also means that fewer people are likely to have fixed contracts, with many becoming freelance contractors. As one executive polled for this report puts it: "It's the end of the employment model as it is today. More and more people will have to be entrepreneurs selling their skills to large organisations." Mr Wong says that other factors will also drive this trend: "Decentralisation will continue because of cost pressures, but also because many developed economies are allowing for flexible working. This is not only because it is packaged as a perk to employees, but because it also offers the organisation cost and space savings."

The category of occupations coming under greater pressure may be termed global jobs, encompassing accountants, programmers, marketers and other knowledge workers. These are not overly location-dependent, and these individuals often work as independent contractors. The good news is that this global workforce is more accessible to more people than ever before in history. However, individuals will need to compete actively in a global marketplace, rather than only with the skills pool in the region where they choose to live. Ms Polese argues that workers in this group will need to take much greater responsibility for themselves: "You are your own start-up," as she puts it.

Dealing with overload

Technology is also a two-edged sword at an individual level. On the one hand, it has freed people from their desks, allowing them to work more flexibly. On the other hand, it is more difficult than ever to disconnect in an always-on world. "The people who work in full-time employment appear to never disengage anymore," observes Ms Enders. "This 24/7 culture is a very important social change, where home is no longer a refuge."

A similar challenge is coping in an environment that is constantly interrupted by messages and voluminous information flows, making it more difficult for many to perform cognitive tasks. Survey respondents expect that two of the

most negative effects of technology change on organisations will be paralysis from data overload and a deterioration of employees' work/life balance, as people become unable to escape or switch off. (For those in the education and manufacturing sectors, these ills come top of the list.)

Workers will therefore need to choose how engaged they wish to be. Evolving social norms and individual choices will help people to decide whether the jobs of 2020 are the most stressful yet, or potentially the most challenging and fulfilling, according to Ms Gratton. But here, too, technology can help. The launch in 2011 of "Siri"—a voice-enabled "assistant" for the iPhone—portends the rise of the cognitive assistant, a potentially important means of helping individuals to cope with information and communication overload. Mr Sørensen of the LSE calls Siri "a beacon of the future".

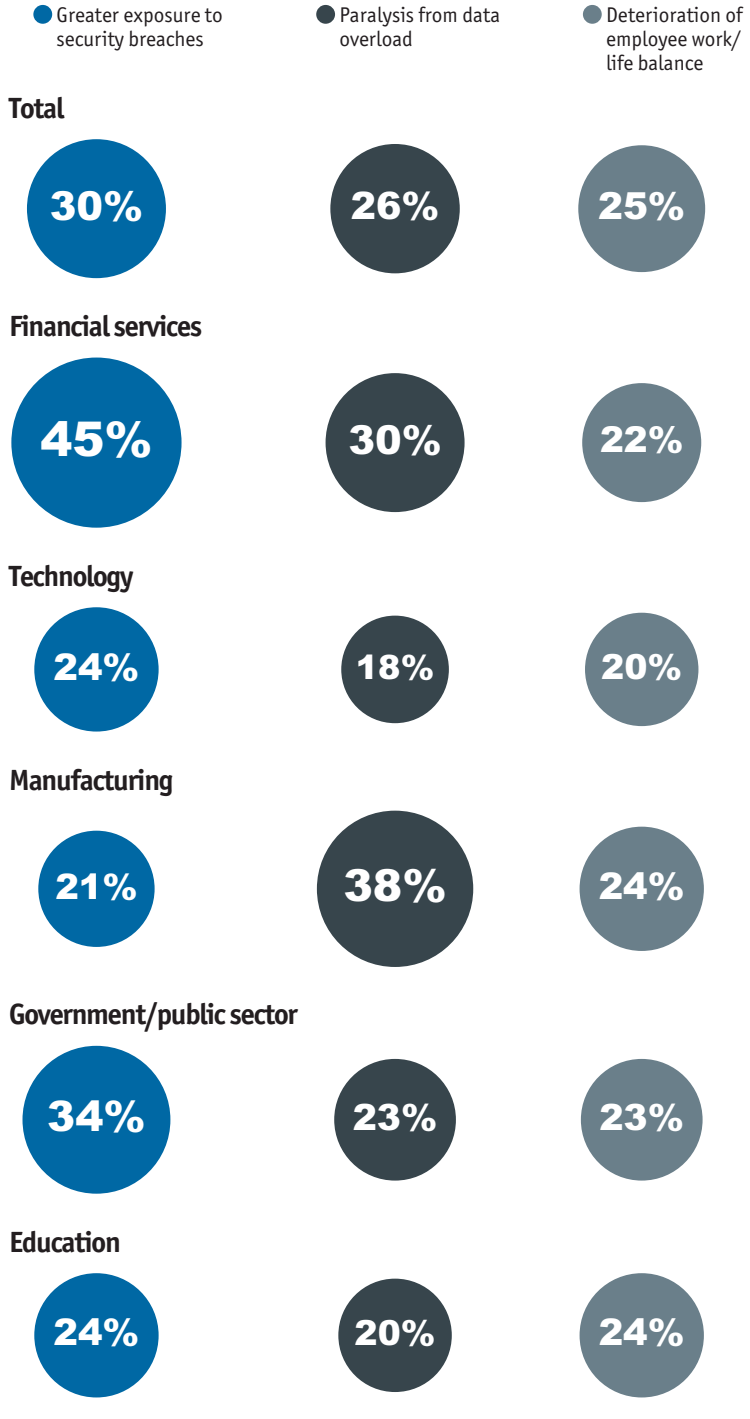
Ms Gratton argues that these and newer tools will be aimed at helping humans to process information flows better and to deal with routine discussions. "This is the holy grail for many tech firms, in terms of helping people to cope with so much information in a very raw space," says Ms Gratton. "Technology created this problem, but it can also solve it."

Indeed, technology can play a powerful role in helping cut through the noise and enable individuals to focus on specific tasks. One small example is the growth of so-called "smart buildings", where remote sensors might alert facilities teams of any small anomalies in an office block's heating or cooling system, while analytics tools hide or prioritise those that require an engineer's attention or intervention. In the coming decade, numerous new opportunities for such innovation will emerge, as technology helps to streamline or automate certain functions to alleviate the need for human intervention.

Chart 8

Q What will be the most negative impacts of technology change on organisations over the next decade?

(top responses; % of respondents)



Case study

A new model for the law firm

Many experts believe that the legal industry is especially ripe for innovation. Rimon Law Group is one example of a legal partnership that is experimenting with a range of alternative practices to create a smaller, nimbler organisation using technology to network a disparate team of legal specialists.

At traditional law firms, senior partners are the "rainmakers" who focus on bringing in new clients, while much of the legal work is executed by junior associates. Rimon has instead built up a network of partners, each with specialist areas of focus, who directly handle clients and related projects. The firm is also trying to move away from the open-ended hourly billing that defines much of corporate law, and towards more fixed costs. "We're doing what we can to make pricing more predictable, accessible, and tie our incentives together with those of our clients," says Yaacov Silberman, the firm's co-founder.

Technology underpins the model that Rimon is striving to craft. Its partners are largely mobile workers who use a range of cloud-based tools to collaborate. Clients can access partners when needed via phone, email, instant messaging, video or in person. When the firm hires sufficient partners in a geographic area, it then opens a physical office to serve as a point for networking and client meetings. "We're trying to balance this dichotomy between virtual and bricks and mortar to find the right place to exist in that spectrum, as there are benefits to both models," explains Mr Silberman. "People don't want virtual lawyers, they want real lawyers. But virtual tools are useful."

Looking ahead, he agrees that much of the low-end work of the legal industry will be automated by technology, or simply outsourced to niche specialists, such as basic contract work and document discovery. Although this will inevitably lead to a loss of some types of jobs, it will also mean a return to law as a genuinely intellectual pursuit. "Lawyers will be hired for more complex matters, such as tax structuring, rather than routine things such as forming a company," predicts Mr Silberman.

4 The workplace of tomorrow

What might technology trends mean for the workplace of the future? For one thing, the physical environment in which people work may change. Take factories and production lines, for instance, where the increased use of robotics is likely to make a difference (see case study: Robotics on the rise). Developments such as improved artificial intelligence are likely to accelerate this shift. Foxconn, a major Chinese manufacturer of electronic goods, plans to implement 1m robots by 2013, as just one example[12].

Increased automation of business processes will also be apparent in other environments, including banks. Ten years ago many pundits forecasted the demise of the physical bank branch, with cash machines, online banking and other types of automation providing the substitute. Instead, bank branches today are increasingly being transformed into consultative spaces. Customers do indeed handle most transactions online, via their mobile phone or using a cash machine, but many come to the branch to discuss more complex transactions with a bank representative. Today, the physical look and feel of many branches is more akin to a high-end coffee shop.

Alberto Vilalta, the executive vice-president for corporate systems and channels at Banco Santander, holds a slightly nuanced vision of the branch's future role. Brick-and-mortar branches will remain, he believes, but in fewer numbers and largely in urban hotspots. Customers will video conference with advisers located in an off-site, centralised location, which will be most cost-effective and easier to ensure that regulatory requirements are met, especially in a more scrutinised banking world. Customers will manage most transactions themselves, however, with the help of mobile and other online interfaces.

Similar trends are evident in other customer-facing sectors. Retail stores are giving customers more ability to serve themselves, either through kiosks, mobile devices or self-service checkouts, while staff instead focus on providing advice.

Goodbye to the office?

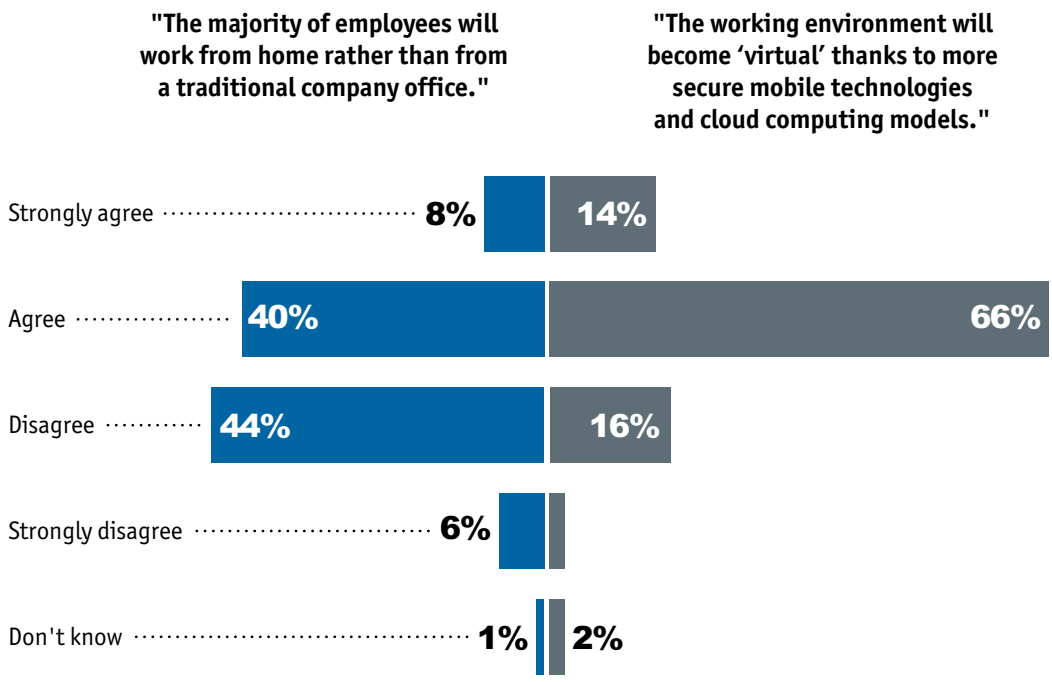
Survey respondents are split on the long-held notion that the traditional office will give way in the future to working from home. As technology develops, however, it seems increasingly likely that the 20th-century construct of people trooping across a city to sit next to each other simply to do their job will come increasingly under question, as more flexible approaches emerge.

As such, eight in ten executives agree that the working environment will become "virtual"

[12] "Foxconn: Robots don't complain", *The Economist*, August 6th 2011

Chart 9

Do you agree or disagree with the following statements about work in 2020?
(% respondents)



thanks to more secure mobile technologies and cloud computing. In addition, many of the staples of today's offices will also disappear, in the view of our respondents. At the top of the list is the fixed-line telephone, followed by desktop personal computers (PCs). Their subterranean peers in the server room will not be far behind.

Whether or not home-working is finally in the ascendant, the office is likely to become a hybrid—a meeting point and a place to exchange ideas, used to converse with customers or other team members, both in person and via video technologies such as telepresence. (3D holographic video conferencing, no longer a distant prospect, may also help to overcome the challenge of distance.) Rather than dedicated desks, offices will provide a cluster of hot-desking options, which can be used on an ad-hoc basis, or booked online beforehand.

Few of these ideas are novel, but the prospect of several lean years of global economic growth ahead means that pressure on companies to cut office cuts will rise. As technology costs continue to fall, the economic logic of the hybrid office may become irresistible.

However, not everyone will be happy there. Ms Gratton highlights the issue of physical isolation. Management from a distance is tougher than on-site, and, predictably, ineffective management often leads to less productive workers. These are some of the challenges that are still to be resolved. But on a wider level, cultural acceptance of home-working will continue to grow, not least as it becomes more common and management structures evolve. Between 2001 and 2010 in the UK, for example, the proportion of people working mainly from home rose by 21%, to cover 12.9% of the workforce—or some 3.7m people[13].

In some companies there is increased interest

[13] Labour Force Survey, Office of National Statistics, 2010

in the "work hub"—small office hubs at the periphery of cities where local workers can drop in as needed, either to join a telepresence meeting or else simply to work in the company of others for a few hours. "The complex tacit knowledge that employees hold tends to erode if they are not spending enough time with others, so intermediary hubs can help to address this," says Ms Gratton, adding that coffee shops are already being used in this way at present. "You will see more of these being set up to bring employees together in a more informal way."

Expert view

Lynda Gratton on learning from gaming

Lynda Gratton is a professor of management practice at London Business School and the founder of the Hot Spots Movement, an innovation-focused research and consulting firm. She is considered one of the world's foremost authorities on people in organisations. Her most recent book, The Shift, *examines the future of work.*

Q: Which technology developments do you think will do the most to change the working environment of the future?

One development is the spread of platform technologies, such as oDesk. These give micro-entrepreneurs better opportunity to set up a business and go global, despite being tiny in size. Another is that of collective-intelligence technologies, such as collaborative corporate jams, which encourage deep conversations both within organisations and with their suppliers. Increased mobility and flexibility are a third trend. We [at Hot Spots] see a big rise in both home-based working and in virtual working.

Q: What are the implications of a more virtual working environment for teams and organisational structures?

Virtual teaming poses a risk for many companies, as they don't know how to do it yet. There remain many difficult questions about how to manage teams when you don't see them. This also applies to the technologies to use for this. For example, employees of many firms acknowledge that they use more sophisticated technologies at home than at work, whether it's Facebook, online games or others. Companies are quite far behind in terms of connecting people. Take a simulation like World of Warcraft, which is an incredibly complex, team-based environment. Most companies do not have anything remotely like it.

Q: What kinds of insights can firms take from gaming environments like that, or other collaboration tools?

It is worth understanding that this is not just a technology phenomenon, but also a Gen-Y phenomenon. Individuals manage [virtual teams] because of their knowledge, not because of their position in the company. One marvellous example comes from an executive we work with, whose husband plays World of Warcraft. It turns out that there is a General whom he and many others follow in the game, due to this person's skill and mastery of strategy. It also turns out that the General is a 14-year-old Turkish girl. This kind of thing can change the dynamics of the organisation.

Case study

Robotics on the rise

Robots are hardly new to manufacturing. By the end of 2010 over 1m industrial robots had been installed globally. Ongoing improvements in artificial intelligence, as well as faster and cheaper computing, are all helping to drive new advances. The automotive sector has long been the biggest source of robotics demand, but as robots have become cheaper and more sophisticated, other industries are starting to adopt them.

Timberland, an apparel company, is one example. It is building a new distribution warehouse in the Netherlands, which is being outfitted with robots from Kiva Systems, an automation-technology firm. David Rupert, Timberland's senior manager of engineering, believes that this will change the nature of the job for workers who prepare and pack boxes for delivery, whether for online orders from its website or simply distribution to its retail stores. Rather than workers having to move around the warehouse to fetch items, robots will bring goods to them, in the most efficient order for packing, before then returning any unneeded items to their shelves. This is enabling the firm to improve order fulfilment cycle times as well as to improve tracking of stock and achieve greater customisation in orders, says Mr Rupert.

For low-volume, build-to-order manufacturers such as AGCO, which produces agricultural equipment, robotics will do more than just improve efficiency. Hans-Bernd Veltmaat, the senior vice-president for manufacturing and quality at AGCO, reports that over the past three years robotics have already helped to boost efficiency in the workflow process by bringing parts to operators as needed. In the coming years, however, he expects a much greater impact on flexibility and customisation. "What is difficult to automate in our world is the assembly itself, given that we build to order," he says. "It will take time, but we expect that with better technologies in the next five years, we will get robot assembly that gives us much more flexibility than we have today."

5 The personalisation decade

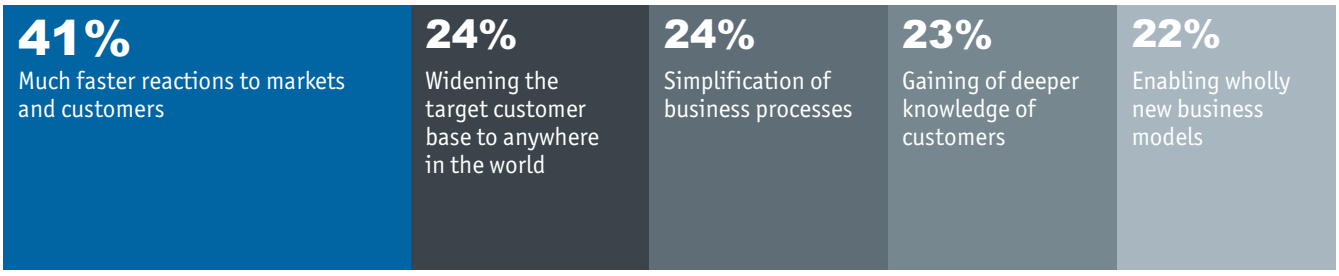
In many industries, technology is playing an extraordinary role in how organisations interact with their customers, be the latter individuals or organisations. From augmented reality that brings products to life in both physical and virtual stores, to location-based services enabled by smartphones, customers in the coming decade will regularly be accorded new ways to interact with both businesses and governments.

Experts agree that the period to 2020 will see a deepening trend towards personalisation. The LSE's Mr Sørensen argues that growing demands for self-service will combine with increased automation to create "incredibly powerful individualised services". Big data will also fuel this trend by enabling a much better understanding of customer habits. "Interaction with consumers will get a lot more individualised," says Mr Kaiserswerth of IBM. "Computers will let firms know the clients better than they know themselves."

Surveyed executives believe that technology will have its most positive impact on organisations in enabling them to react much faster to markets and customers. Similarly, they single out customer service above all other functions as the area of operation where the most technology-enabled change will occur.

Chart 10

Q **What will be the most positive impacts of technology change on organisations over the next decade?**
(% respondents)



This is not only a consumer-oriented phenomenon; it is directly relevant for business-to-business (B2B) environments as well. The rapid growth of smart systems and devices will play an important role in this context. Rolls Royce's aircraft engines and AGCO's tractors, for example, incorporate sensors into their products. These today enable the firms to proactively advise customers of the need for maintenance before anything actually breaks down. In the decade ahead, they will also increasingly be used to create new, highly individualised services. One agricultural example cited by Accenture is the ability to link existing sensors on a tractor with back-end analytics about the chemical composition of the soil, expected weather and other factors, to provide farmers with targeted advice about when to plant or harvest crops.

Personalisation will also make great strides in the field of medicine, as outlined earlier. The same trends will also take root elsewhere, although there will be limits even in consumer-facing industries. Santander's Mr Vilalta warns that personalisation can only go so far in retail banking. "The limit is complexity," he says. "We can keep personalising and essentially reach a segmentation of one customer. But then we

Expert view

Robert Madelin on protecting the digital consumer of 2020

Robert Madelin is the director-general for information society and media at the European Commission. His directorate-general deals with policy, research and regulation relating to communications technology and media, including data privacy.

Q: What technologies do you think will have a major impact on the way that businesses operate by 2020?

The successors to today's Web 2.0 technologies will transform how businesses interact with customers; understanding how to market, sell and manage customer relationships online is going to be a crucial skill. It is not just a question of learning about marketing in a new medium; it is also about mastering issues around data privacy. A second change I see coming is the availability of big sets of open data and the cheapness of computing power necessary to process it, meaning that you can learn new things, build and mine data, create new apps, and add value in ways that were not conceivable a short time ago.

Q: What does this data-management challenge mean for how firms interact with their customers?

If you get big data, you can mine and manipulate it, learn more and learn it more quickly. This is not about the individual customer experience; rather it's about the ability of firms to understand what the totality of their target market is doing and thinking, how they are picking up the product and relating to it.

Q: Europe has data protection laws that the rest of the world does not. How will data protection be managed at a time when companies like Google and Facebook hold personal data on servers around the world?

We believe that our data protection regime must be improved to, among other things, be relevant in a borderless, cloud-enabled space. There are different ways of addressing this. One is simply to say that there is a demand for regulation and Europe will have high-quality, consumer-friendly data protection, and as a result companies around the world will use us as the benchmark. The second level at which it works is to say that we will have a possibility to give type approval for corporate data management, so that company X can come to us and get a bill of health for a model which allows the custody, according to European standards, of European personal data, irrespective of where in the world that company manipulates and stores the data.

Chart 11

What is the main source of new product and service ideas today, and what will it be in 2020?
(top responses; % respondents)

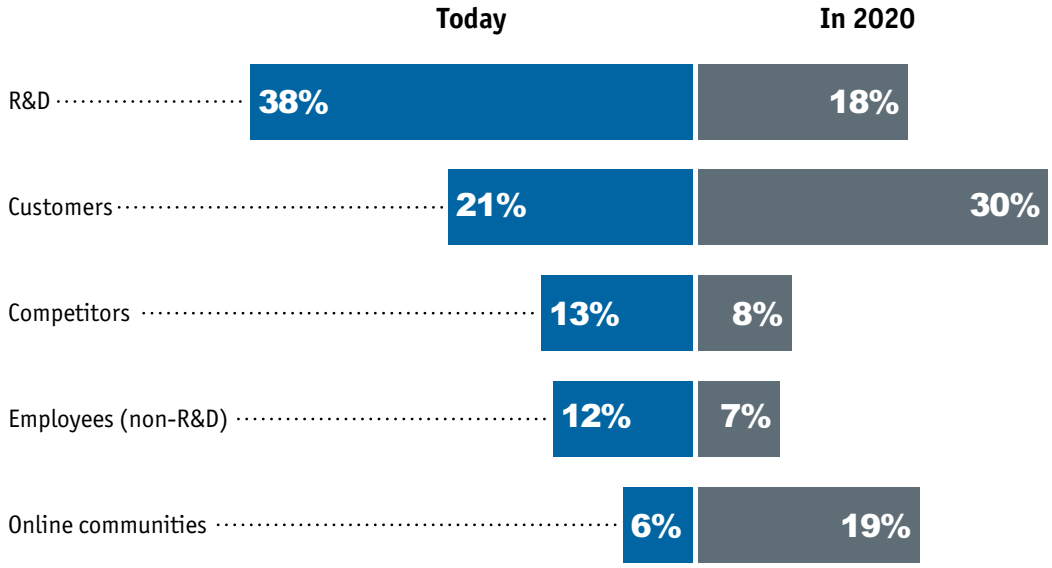
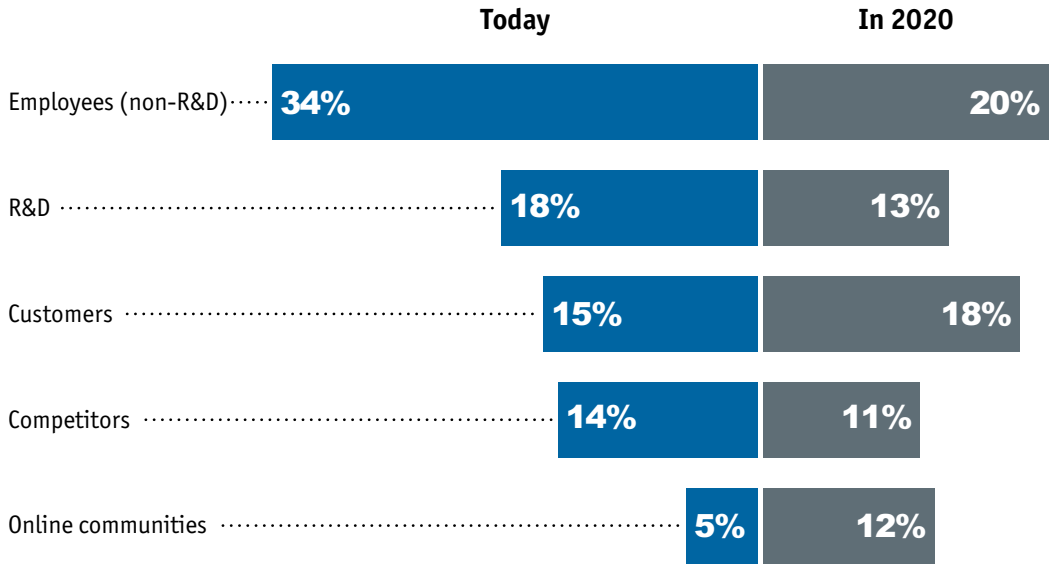


Chart 12

What is the main source of new ideas for improvement of business processes today, and what will it be in 2020?
(top responses; % respondents)



need to ask if we can cope with 100m different customer propositions," one for each of the bank's 100m customers.

Many firms will nevertheless use technology to allow customers to develop their own product or service, a trend known as "co-creation". As Mr Millar of Sense Worldwide explains it, "People will buy into blank canvasses which they can then populate themselves." Many examples of this exist today. Lego, a Danish toy producer, allows customers to download a tool and design their own toy, which the company then builds for them. Prospective buyers of a BMW car can extensively customise the model they wish to purchase online before clicking the order button.

Other firms tap their customers' knowledge in collaborative online platforms, such as MyStarbucks or Dell's IdeaStorm, often revising their product line on the back of such feedback. One of the most striking findings of our survey is the expectation that customers and online communities will supplant in-house R&D as the primary source of new product and service ideas by 2020. Respondents also believe that customers will by then be nearly as important a source of ideas for business process improvement as their own employees.

Getting co-creation right, however, will be difficult. For example, Levi's, an apparel brand, has experimented with mass customisation of its jeans, but has since pulled back after limited demand. A further challenge lies in coping with the raw mass of ideas generated without letting contributors feel ignored. "Someone has to go through the ideas and feedback fast to maintain momentum," says Mr Millar. "The actual number of terrific ideas is not very high, so the absolutely open crowd-sourcing model has its limits."

A further challenge lies with the limits of cultural acceptance to greater corporate awareness of our personal lives. "It's a scary thing, even though it has [its] benefits," says Mr Kaiserswerth. "The older generation has a different concept of privacy. So it's not clear what the new social norms on privacy will be." Working out the right rules to protect people will also challenge regulators (see expert view: Robert Madelin), not least in terms of avoiding overly onerous rules. As mentioned earlier, a majority of survey respondents fear that overly extensive compliance requirements could discourage firms from implementing some technologies.

Nowhere to hide

A flip side of privacy loss is greater transparency thanks to much greater access to information. Customers will benefit from this and gain increasing power over some suppliers as a result. Online price-comparison and service-rating tools are already putting pressure on uncompetitive organisations. "Customers (and competitors) can find out everything so fast; there will be no secrets. This will increase competitiveness and reduce profitability," notes one executive polled for the report. Another agrees that there will be "nowhere to hide for ridiculous mark-ups and prices".

This will also affect professionals, such as doctors and lawyers. "They do not like to be compared and rated, but it will just happen," affirms Mr Kaiserswerth, "and it will improve the quality of their services." In a B2B environment, such concerns are also apparent: whereas before a global service and support function from a supplier would be difficult to assess prior to selection, far more insights can be gained via online forums, social media and other tools.

Quite simply, it will be increasingly difficult to hide bad behaviour, high prices or poor service when customers have a means of broadcasting this to the world instantly and at zero cost, thanks to increasingly pervasive social media. Overall, the 2010s will be a good decade to be a customer.

Case study

Technology and the urban citizen

The immense popularity of smartphone apps has not only helped to create better interaction between businesses and their customers, but also between cities and their citizens. One example comes from the UK capital, London, with the launch in 2011 of a "Love Clean London" app, which the mayor, Boris Johnson, hopes will help to clean up the city's streets and parks. Residents can snap a photo of an offending item of litter, graffiti or vandalism; the app files it and records the exact location.

The benefits of this are twofold: it makes it easier for citizens to become engaged, while at the same time cutting costs for local councils. Since it was launched by the local council for a south London borough, Lewisham, the council's spending on street-cleaning has been held at 2003-04 levels, complaints have fallen by 30% and there has been an 87% improvement in the time it takes to respond. "It is enabling quicker feedback about problems on the street, which improves our ability to respond," explains Bill Limond, CIO of the City of London. It also creates greater transparency about work that is under way, with the service giving live statistics about the number of reports filed and how many complaints have already been addressed.

Looking ahead, Mr Limond sees cloud computing, social networking and mobile technology as all playing an important role in city-level government. "A large number of our citizens will be expecting to get information fast and on the move, and we must be able to cater for these demands," he says. Related to this will be increasing access to civic data and information, making government more transparent and giving people greater awareness of services, such as updates on the status of public transport. All this will be good news for citizens, but it may well be even more important for city administrations themselves: streamlining and automating processes, and facilitating greater self-service, will all be crucial means of coping with the tough budgetary pressures ahead.

Conclusion

Businesses, then, will have nowhere to hide over the next decade from the disrupting yet energising effects of technology change. Some organisations, and their employees, may find such change threatening, particularly if their processes, structures and culture are not flexible enough to adjust. In our view, however, many more will find technology-led change invigorating and laden with opportunity. The research suggests that some firms and even entire industries are likely to fall by the wayside by 2020 thanks to technology disruption; others, however, will almost certainly emerge in their place. An expanding scope for automation will displace jobs in a growing number of categories; but entirely new occupations are also likely to be created. Some managers and employees may find the more virtual working environments of the future less settled and conducive to team-building than today's; most, however, are likely to find that the greater flexibility, independence and empowerment they gain will more than compensate.

To act on the opportunities created by technology, however, business processes and structures will also need to change, and only people will be able to bring this off. In the debate about whether technology-led innovation in business will slow or accelerate, we have come down decidedly in favour of the latter. But if anything will slow the pace of change, it will more likely be people themselves rather than any limitations of technology. Cultural acceptance is one of technology's greatest barriers. "Change takes time," Ms Gratton reminds us. "This is a frustration for the technologically adept, because culture changes more slowly than technology."

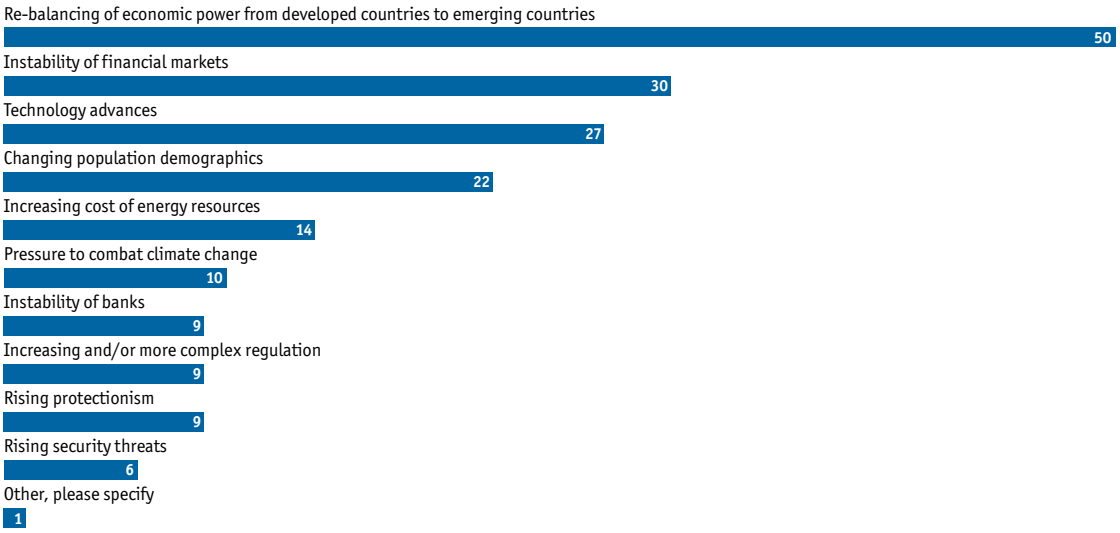
Cultural resistance is likely to slow many advances, from the speed at which traditional offices evolve into networking environments with virtual teams, to the rate at which new collaboration tools flatten corporate hierarchies. Some will curse this just as others will celebrate it—a perennial theme for technology-led change. Business leaders who ignore or underrate the people aspects of technology change are likely to find their firms being wrong-footed in the coming decade of disruption. Those who put people at the centre of it are more likely to emerge all the stronger.

Appendix: Survey results

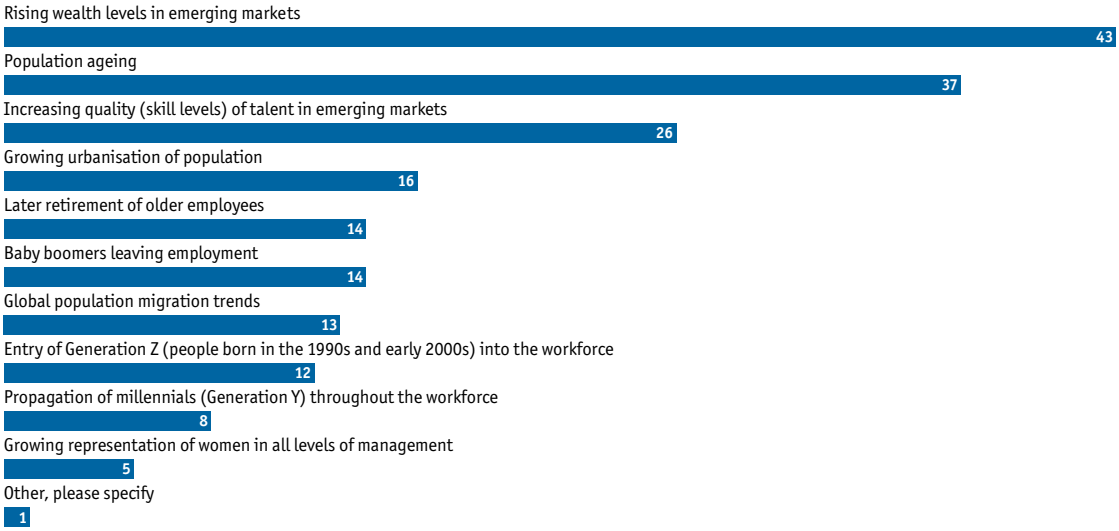
The Economist Intelligence Unit conducted a global survey of 567 executives in September and October 2011. Our sincere thanks go to all those who took part in the survey.

Please note that not all answers add up to 100%, either owing to rounding or because respondents were able to provide multiple answers to some questions.

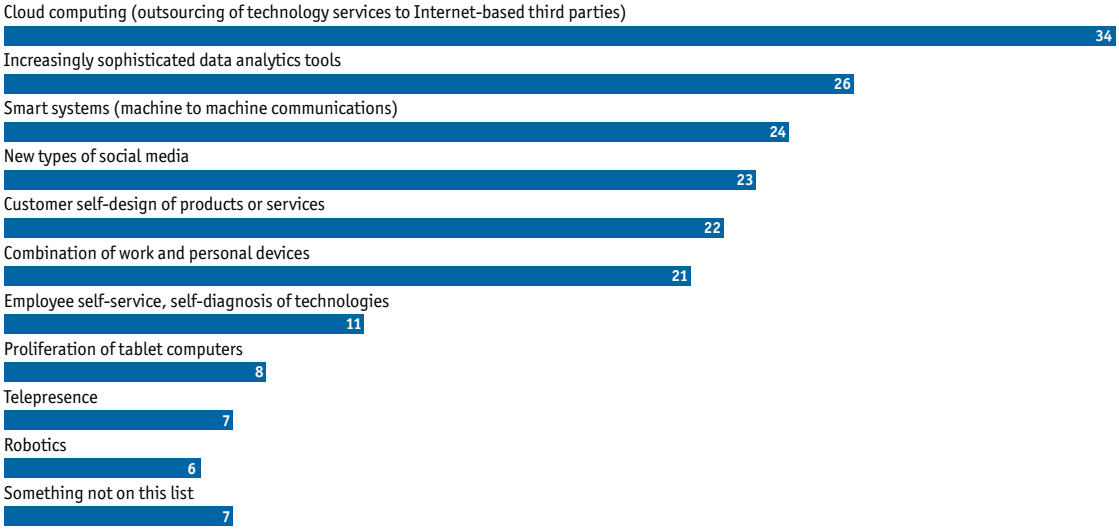
Which of the following macro trends will do most to change how businesses operate over the next decade? Select up to two.
(% respondents)



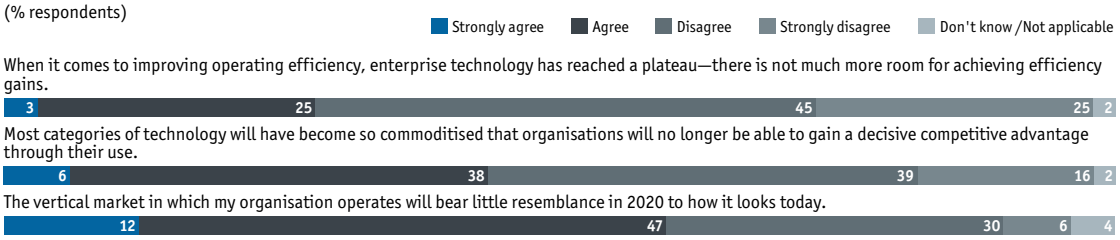
Which of the following social and demographic trends will do most to change how businesses operate over the next decade? Select up to two.
(% respondents)



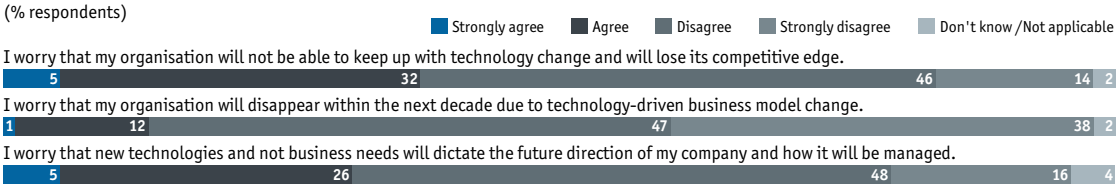
Which of the following technologies or technology-related trends will do most to change how businesses operate over the next decade? Select up to two.
(% respondents)



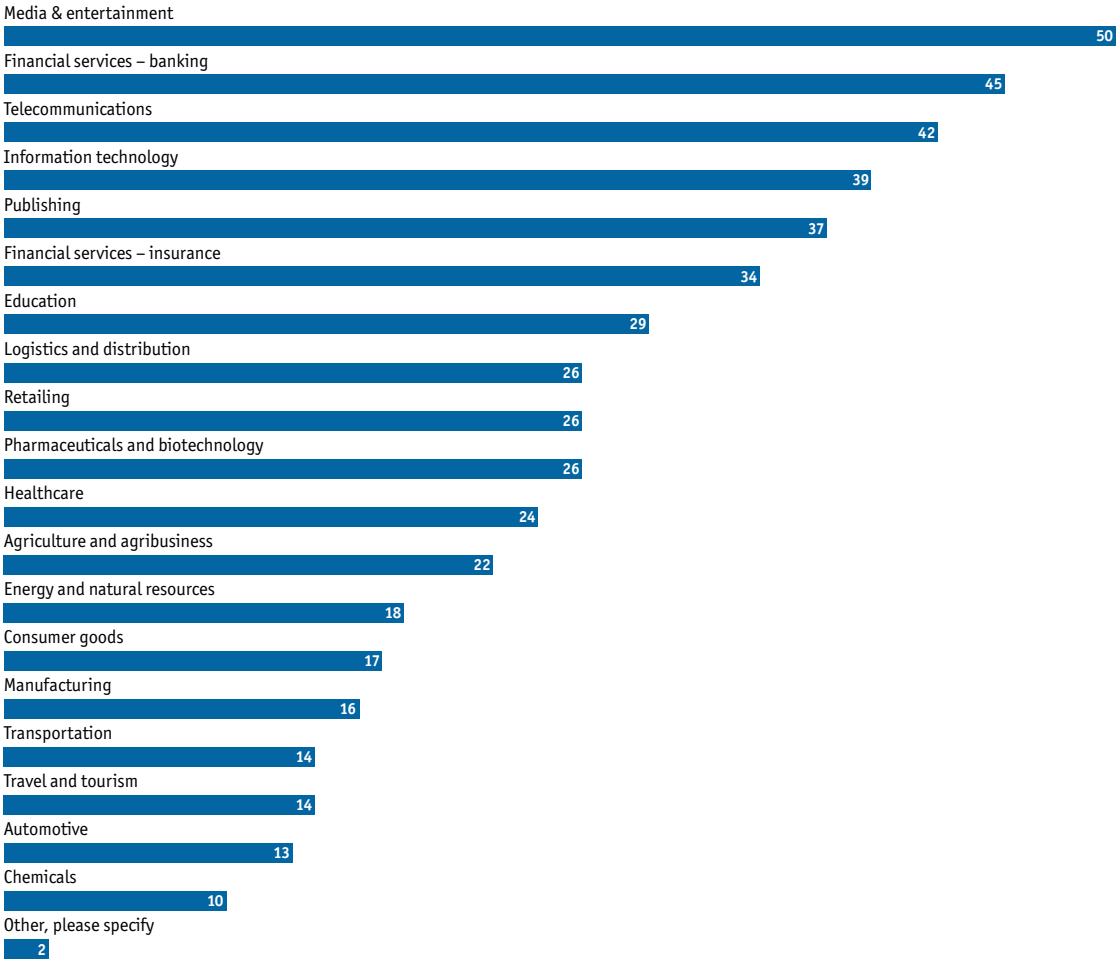
Do you agree or disagree with the following statements?
(% respondents)



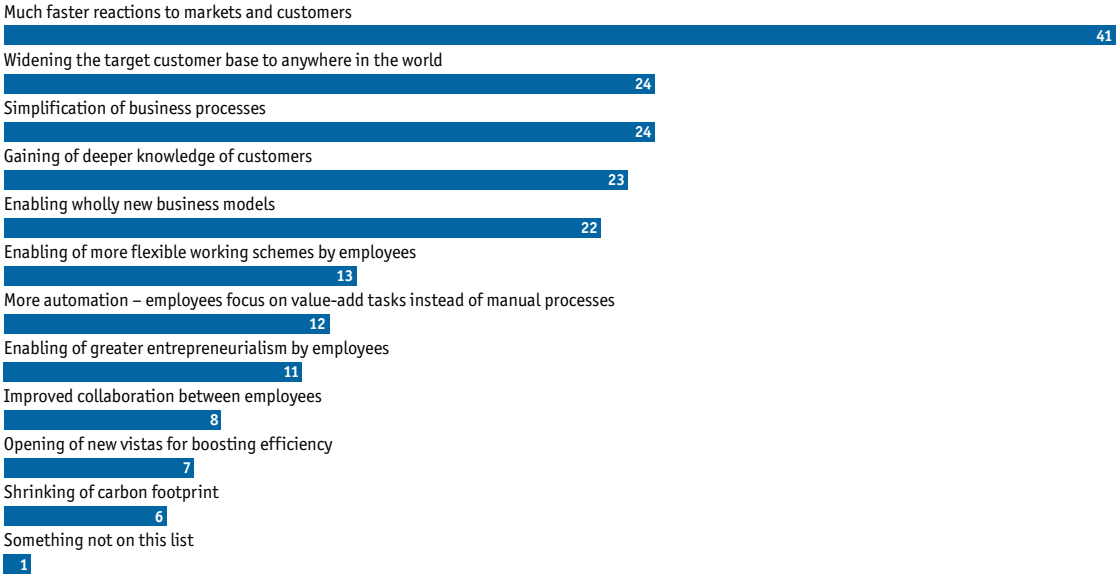
Do you agree or disagree with the following statements?
(% respondents)



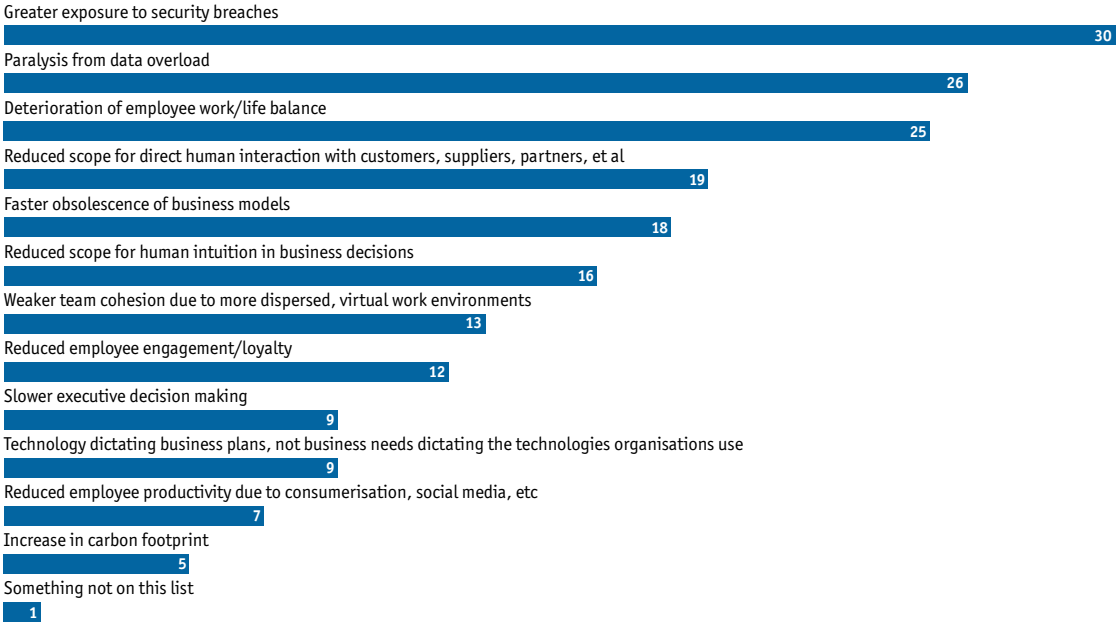
Of the following vertical markets, which are likely to converge or merge with another one under the impact of technology change over the next decade? Select all that apply.
(% respondents)



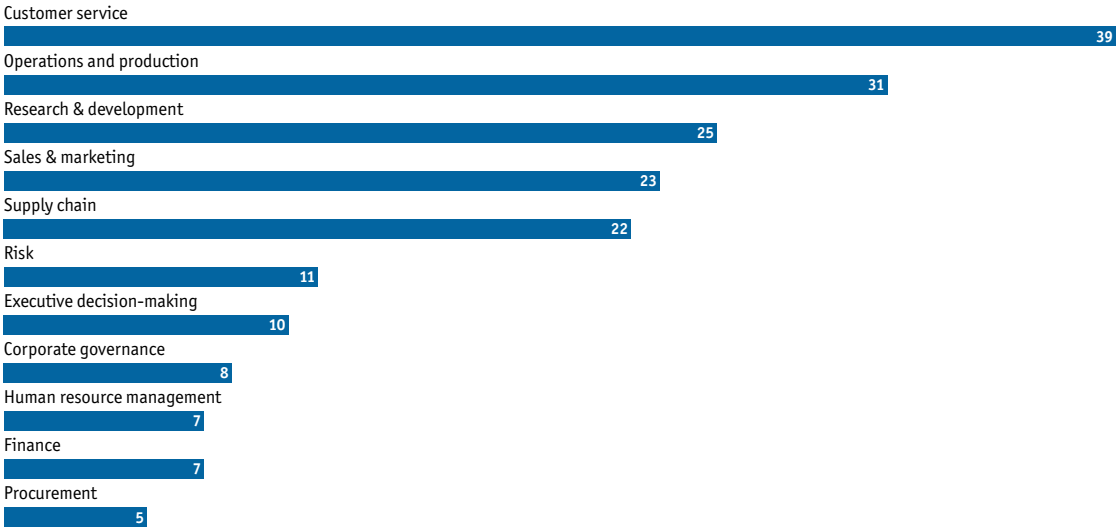
What will be the most positive impacts of technology change on organisations over the next decade? Select up to two.
(% respondents)



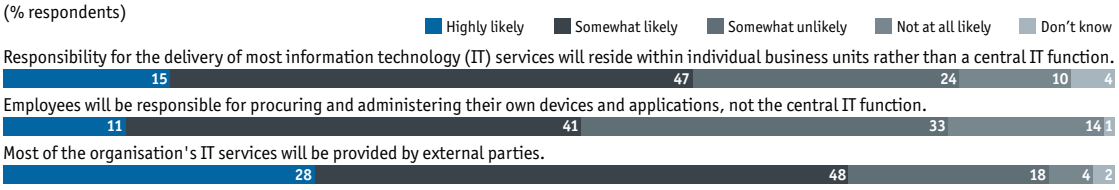
What will be the most negative impacts of technology change on organisations over the next decade? Select up to two.
(% respondents)



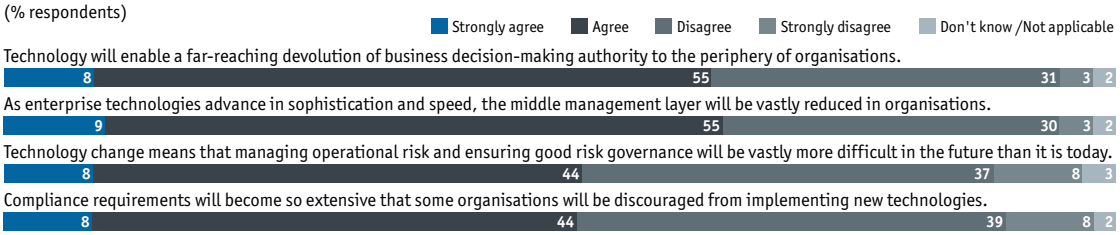
In which areas of operation will technology cause the greatest change in business practices over the next decade?
Select up to two.
(% respondents)



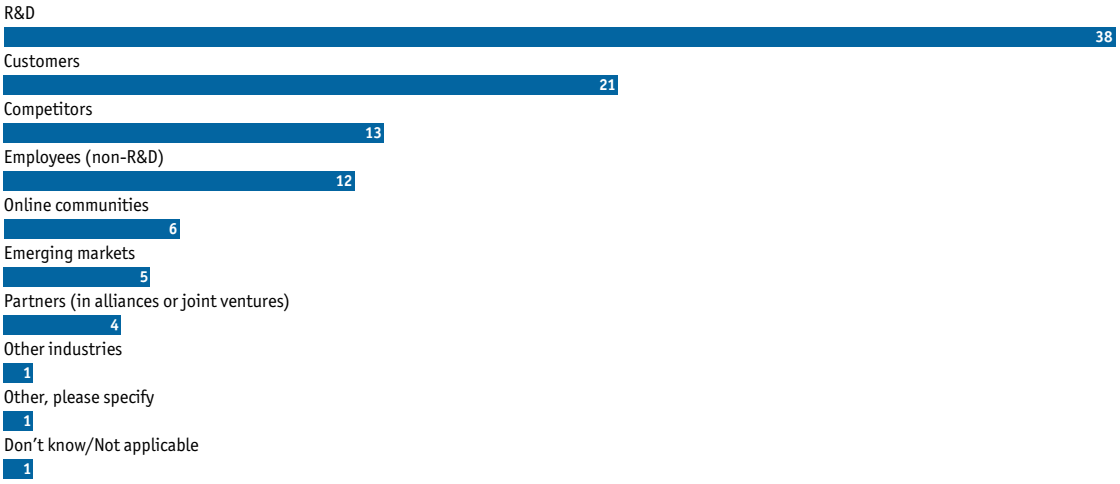
Thinking forward to the year 2020, how likely are the following scenarios for technology management in the organisation?
(% respondents)



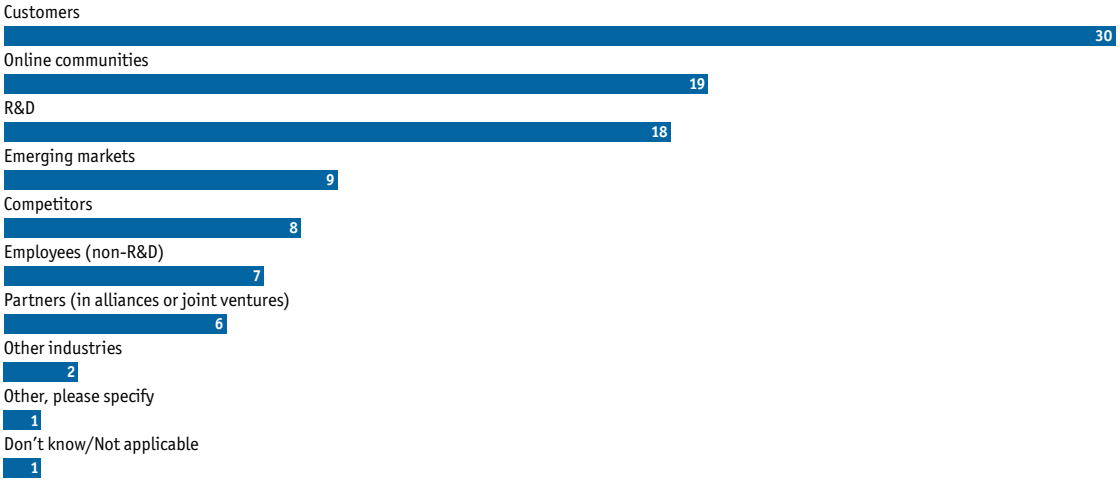
Do you agree or disagree with the following statements?
(% respondents)



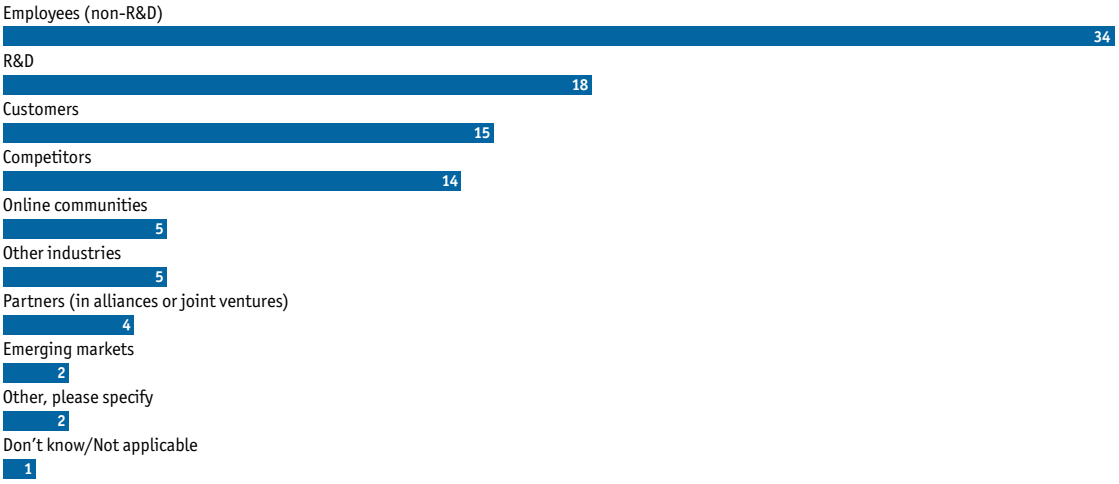
What is the main source of new product or service ideas today?
(% respondents)



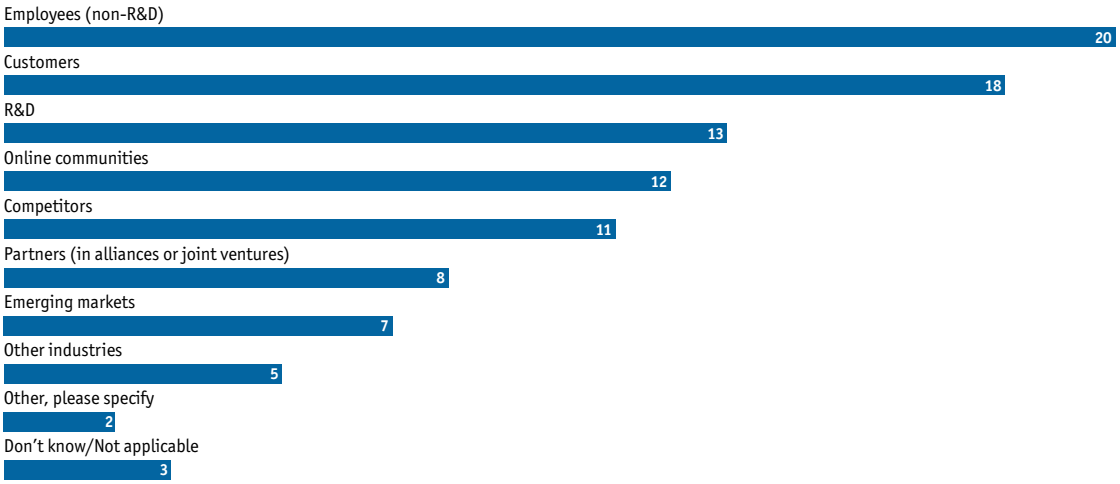
What do you think will be the main source of new product or service ideas in 2020?
(% respondents)



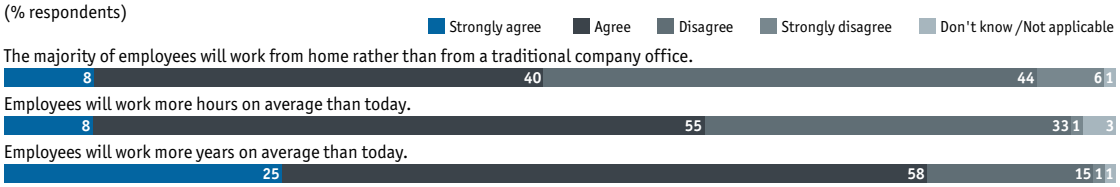
What is the main source of new ideas for improvement of business processes today?
(% respondents)



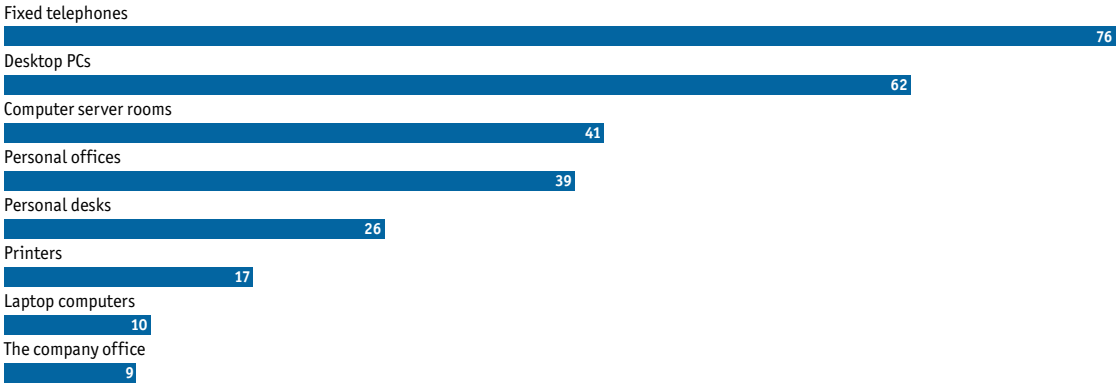
What will be the main source of new ideas for improvement of business processes in 2020?
(% respondents)



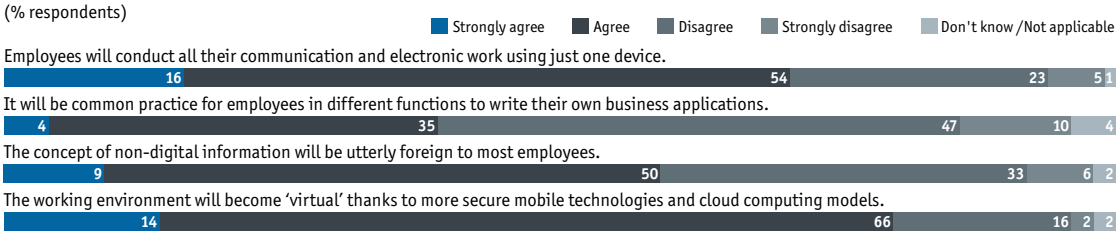
Do you agree or disagree with the following predictions for business and work in 2020?
(% respondents)



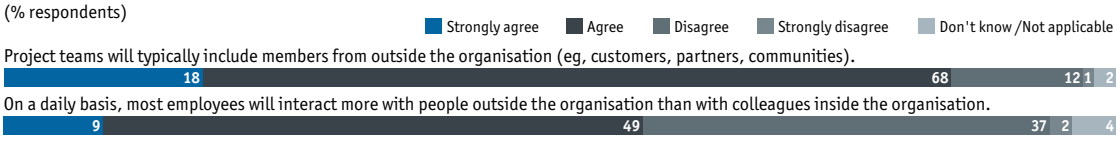
Which of the following features of today's work environment will have largely disappeared by 2020? Select all that apply.
(% respondents)



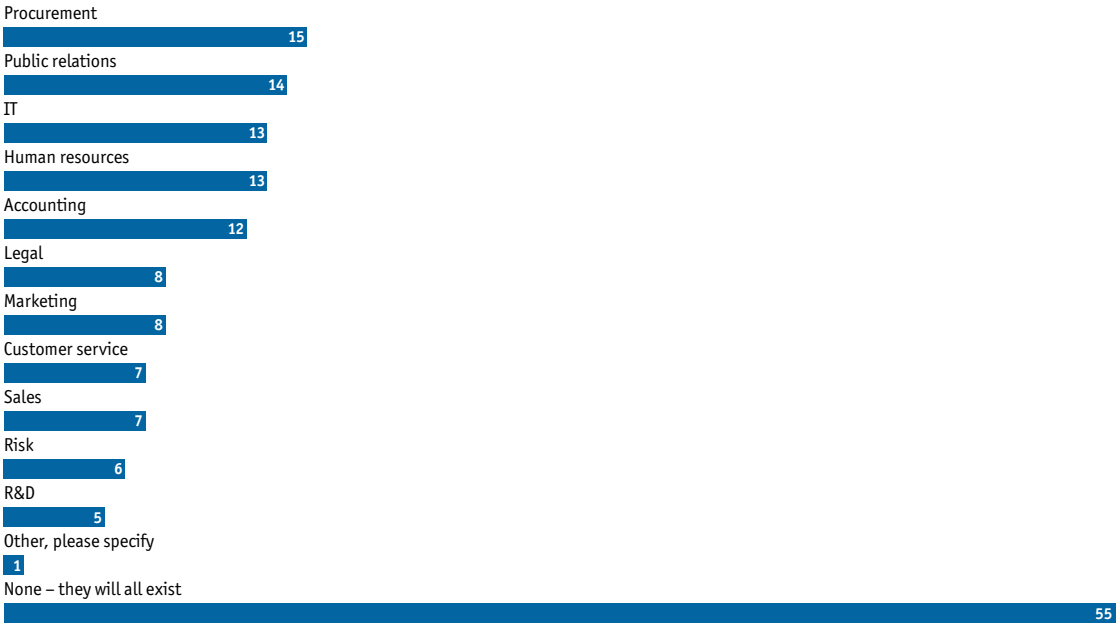
Do you agree or disagree with the following statements about how we will work in 2020?
(% respondents)



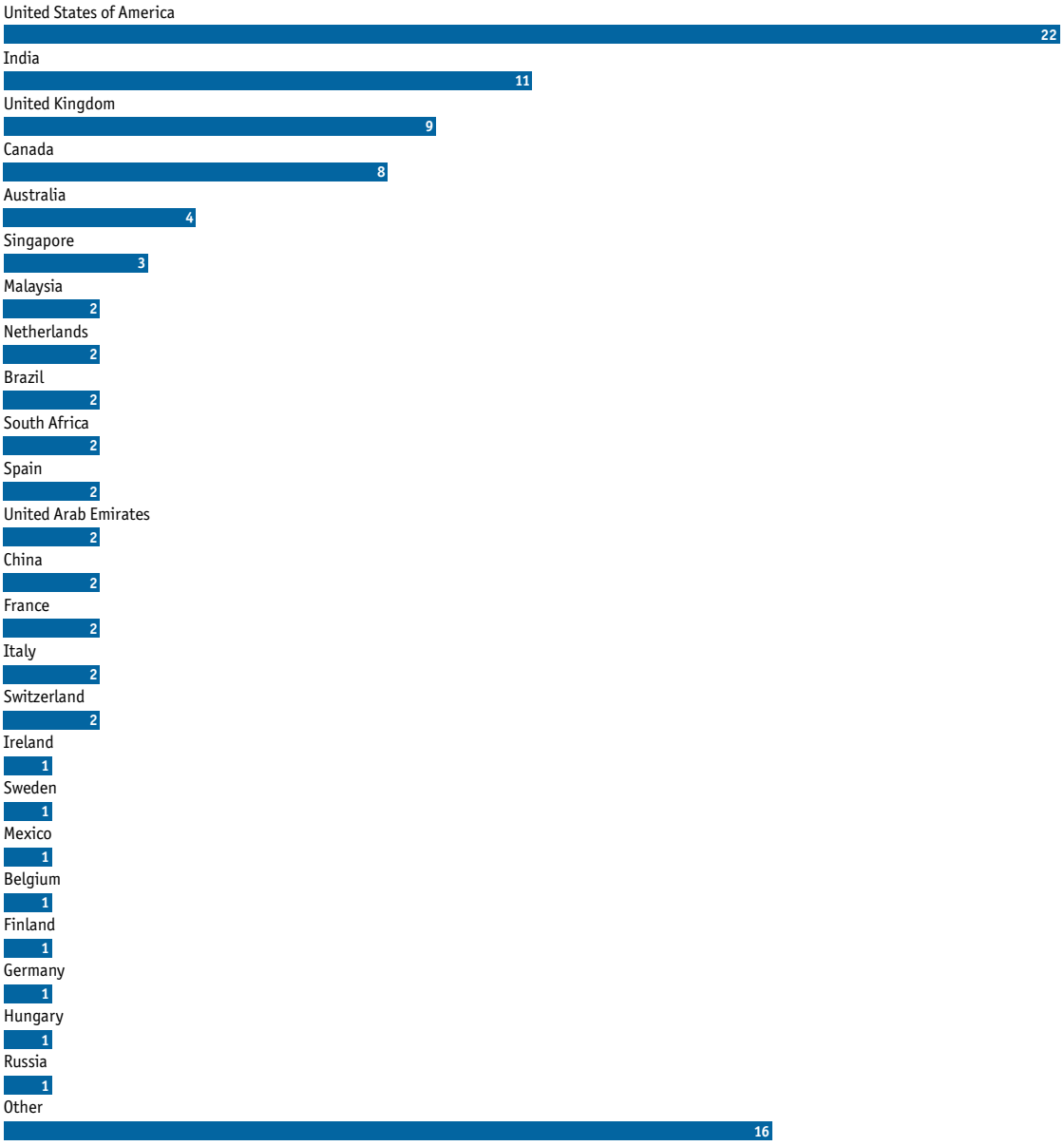
Do you agree or disagree with the following predictions for organisational structures and collaboration in 2020?
(% respondents)



Which of the following departments/functions are unlikely to exist in 2020? Select all that apply.
(% respondents)

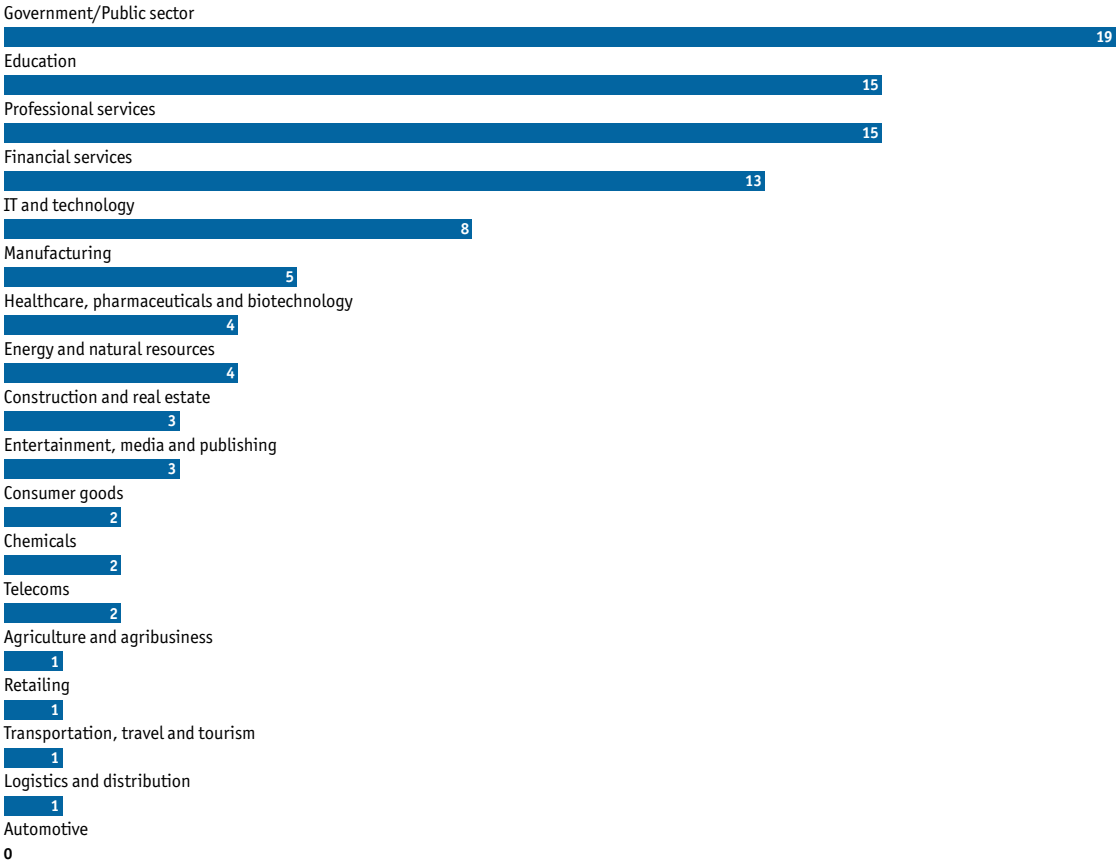


In which country are you personally based?
(% respondents)



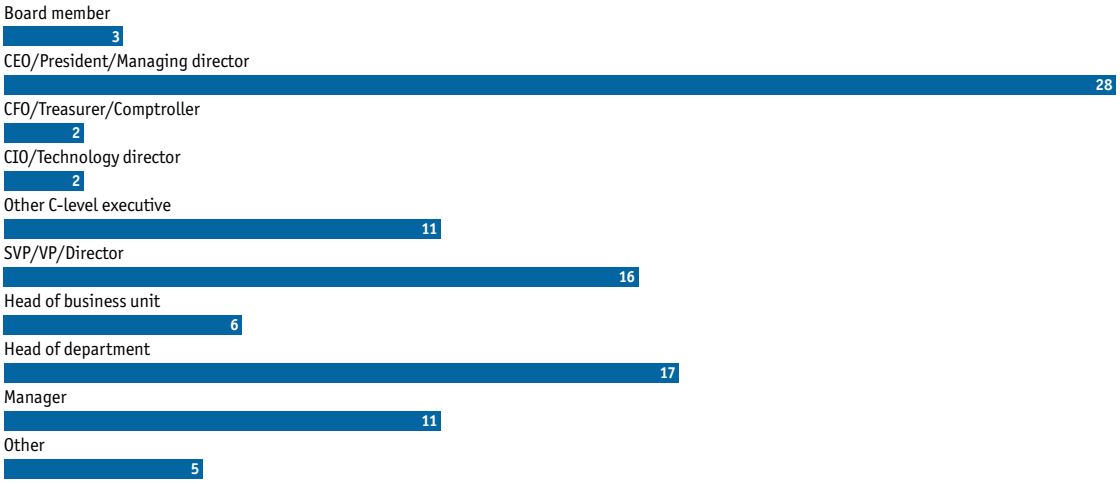
In which region are you personally based?
(% respondents)

What is your primary industry?
(% respondents)

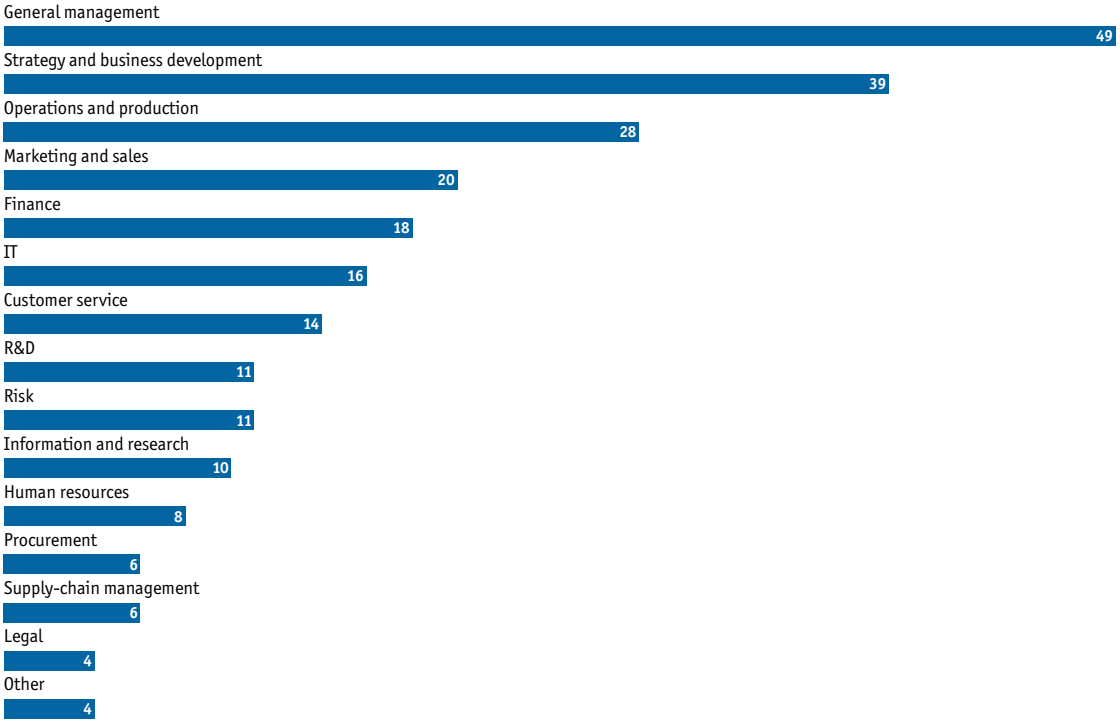


What are your company's annual global revenues in US dollars?
(% respondents)

Which of the following best describes your job title?
(% respondents)



What are your main functional roles? Select all that apply.
(% respondents)



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