

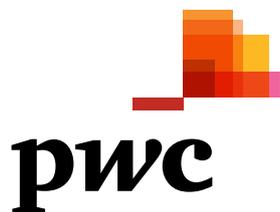
Written by

The
Economist

Intelligence
Unit

Capitalising on the art & science in decision making: *Exploring the agenda for big decisions in 2014-15 and the process that business leaders will go through in making these decisions.*

Gut & gigabytes



www.pwc.com/bigdecisions

About the report

Gut & gigabytes: Capitalising on the art & science in decision making is an Economist Intelligence Unit report, sponsored by PwC¹. It is intended to explore the agenda for big decisions in 2014-15 and the process that business leaders will go through in making these decisions.

With the exception of the PwC foreword and perspectives, the findings and views expressed here are those of The Economist Intelligence Unit alone and do not necessarily reflect those of PwC.

Definitions

We have used the following definitions for this report.

Big decisions: the most significant decisions about the strategic direction of the business (i.e., not concerned with day-to-day operations).

Big data: the recent wave of electronic information produced in greater volume by a growing number of sources (i.e., not just data collected by a particular organisation in the course of normal business).

Data analysis: the use of analytical techniques to generate new insights from data.

PwC wishes to thank its partners and staff who contributed to the development of this survey and report: Cristina Ampil, Paul Blase, Yann Bonduelle, Florian Buschbacher, Emily Church, Natalie Dickter, Dan DiFilippo, Oliver Halter, Andy Hawkins, Dee Hildy, James Larmer, Tom Lewis, Scott Likens, Sarah McQuaid, Anand Rao, Denyse Skipper, John Studley, John Sviokla, Rachel Zhang.

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In May 2014, the EIU surveyed **1,135** senior executives, over half (54%) of whom are C-level executives or board members. This sample also includes 50 senior representatives from government and the public sector.

Respondents come from across the world, with 28% based in **Europe**, 35% in **North America**, 24% in **Asia-Pacific**, and the remaining 13% from **Latin America**, the **Middle East** and **Africa**, although most (72%) companies in the sample operate in more than one region.

A total of **18 industries** are represented in the survey. Around 10% of respondents come from each of the following industries: banking & capital markets; technology; and energy, utilities & mining.

The majority (74%) of companies reported annual revenues last year of at least \$1bn, and no company had annual revenue below US\$250m. The ownership of companies in the sample is evenly split between publicly-listed companies and private, family-owned or state-owned enterprises.

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

Alongside the survey, the EIU conducted a series of in-depth interviews with the following senior executives and experts (listed alphabetically by organisation):

- **Martijn van der Zee**, SVP e-commerce, AirFrance-KLM
- **Tom Davenport**, professor of IT and management, Babson College
- **Klaus Wowereit**, governing mayor, Berlin
- **Keith Gray**, manager, high performance computing centre, BP

- **Tom Reilly**, CEO, Cloudera
- **Kelly Bayer Rosmarin**, group executive, institutional banking and markets, Commonwealth Bank of Australia
- **Charles Brewer**, managing director, DHL Express sub-Saharan Africa
- **Richard Reeves**, head of strategy, EE
- **Rodrigo Gassaneo**, executive briefing centre manager, EMC
- **Joe Peppard**, professor of information systems, European School of Management and Technology
- **He Cao and Jiang Nan**, Chairman and CFO, Frashion Properties
- **Dr Rudolf Seiters**, President, German Red Cross (Deutsche Rote Kreuz)
- **Honbo Zhou**, director, Haier
- **Colin Mahony**, vice president and general manager, HP Vertica
- **Blaise Judja-Sato**, executive manager of the Telecom Secretariat, International Telecommunication Union (ITU)
- **Alan Gilchrist**, lecturer in marketing, Lancaster University
- **Nicholas O'Brien**, chief of staff, Mayor's Office of Data Analytics, New York City
- **Michael Rosenblatt**, chief medical officer, Merck & Co.
- **Jim Karkanias**, GM, data platform group, Microsoft
- **Andrew Kasarskis**, co-director, Icahn Institute for Genomics and Multiscale Biology,

- Mount Sinai Hospital
- **Blake Cahill**, chief digital officer, Philips
- **John McGagh**, head of innovation, Rio Tinto
- **Maria DePanfilis**, head of analytics & optimisation, Rosetta
- **Jon Oringer**, founder and CEO, Shutterstock
- **Paul Waddell**, founder, Synthicity
- **David Thompson**, chief information officer at Western Union, and
- **Diane Scott** chief marketing officer, Western Union

The report was written by Clint Witchalls and edited by James Chambers. We would like to thank all interviewees and survey respondents for their time and insight.

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Capitalising on the art & science in decision making



Dan DiFilippo
PwC's Global & US Data
and Analytics Leader



Paul Blase
PwC's US Advisory Data
and Analytics Leader

Data and analytics have made deep inroads on business. There isn't a decision being made in boardrooms today that hasn't been shaped at some stage by the data.

Yet there remains a fundamental skepticism about the practical use of data to drive the business. The explosion of data, new analytics techniques and derivative business models are confounding the issue: Are we working with the wrong data? Are we thinking the right way about using it to compete?

Confronting these challenges matters. Big decisions have big impact on future profitability, with nearly 1 in 3 executives valuing those decisions at least at \$1 billion. And breakthroughs are coming to those who can act on the opportunities our connected world provides. Who would have guessed that a driverless car would process all the tiny decisions needed to navigate traffic, apparently better than we can.

To think as expansively as technology makes possible means a combination of analytics and instinct will be increasingly necessary to improve decision making. This is the intersection that interested us. Big decisions may feel like a one-off event, but they are being made frequently, revisited often and demand new levels of speed and sophistication to compete in fast-changing markets.

We're more convinced this is the time for the C-suite to upgrade the art as well as the science behind their decision making. You'll see that highly data-driven companies are more likely to report improvement in big decision making, yet most executives don't believe their organisations are at that level. What barriers are in their way?

We're excited to share the findings with you, and are thankful for the over 1,100 executives whose insights form the backbone of this report. There are pragmatic approaches to improving your ability to compete with decisions. Please find more of our perspectives on how to do this at www.pwc.com/bigdecisions.

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Executive summary

Big decision making is changing. Many business leaders now have an enriched set of information to draw upon before making a choice about the direction in which to take their company. This report considers the agenda for big decisions over the next 12 months and examines the role that big data and enhanced data analysis are set to play in guiding the decision making process. The report draws on a global survey of 1,135 senior executives and in-depth interviews with more than 25 senior executives, consultants and academics. The key findings are listed below.

Big decisions are frequent, but only a minority happen on schedule.

Most executives make big decisions on at least a quarterly basis, but only a few are deliberately timed to fit in with their overall strategy. Over half of executives describe the specific timing of their most important big decision as either opportunistic or delayed, which suggests that they have little control over the precise timing of the agenda.

Growth is top of the executive agenda – everywhere except North America.

The most important big decision during the next 12 months will be about how to grow the business. North America, however, bucks the global trend – the primary focus of business leaders in that region will be on shrinking an existing business. This comes in response to structural changes in their industry. Thus, the reshaping of businesses triggered by the global recession is not yet over.

Collaboration between rival companies is on the rise.

The most common big decision during the next 12 months will be to collaborate with a competitor. Business leaders across industries – not just in well-known sectors such as pharmaceuticals – are being motivated to look for opportunities to combine or share resources by continuing cost and margin pressures. However, the decision is unlikely to be easy, since it is likely to be put off.

Data and analysis should enhance intuition and experience.

Most companies have already changed or plan to change the big decision making process because of big data and analysis. For instance, using data to test different scenarios before making a decision is becoming increasingly common. Nonetheless, management intuition and experience will remain critical for interpreting the results. Now, the challenge for companies is to integrate these two factors.

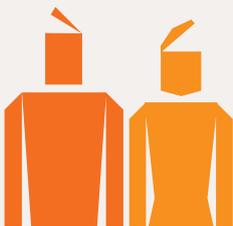
More people are involved in decision making – alongside more data. The number of people involved in decision making has increased in the last two years. This can guard against bias and encourage debate. Yet decision rights need to be clearly defined to minimise delays and increase accountability. Similarly, the volume of data now being collected can make it difficult for executives to find useful insights. Greater discipline is required in both cases.

The volume, veracity and speed of data all need to be improved. The biggest hurdle to using more data and analysis in decision making varies by end user. Overall, the quality, accuracy or completeness of the underlying data is the biggest hurdle. Meanwhile, in emerging markets, it is the lack of data that needs to be overcome. Just among C-suite executives, big data is perceived to have a limited direct benefit to their role. Improving the timeliness of data – making it available when needed – would alter this perception.

Leveraging a strong pool of data scientists requires stronger C-level skills. Few companies report a shortage of data scientists to analyse big data. Such confidence could prove false. Still, for now, companies should make sure that executives possess the skills to make use of the resulting insights. Over half of C-suite respondents admit to discounting data analysis that they do not understand, while one in four lack the expertise to make greater use of it.

Five steps to consider before your next big decision

1



Keep an open mind. Data analysis is not limited to recurring decisions. Some executives already rely on it for one-off decisions, such as identifying a potential mergers and acquisitions target.

2



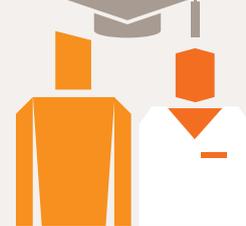
Unlock existing insights. Data do not have to be “big” to be useful. Analysing databases previously mothballed or kept in silos can lead to fresh insights.

3



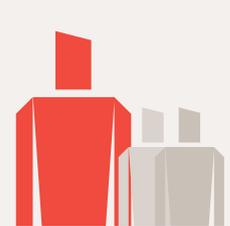
Understand inherent bias. Important decisions have already taken place before data analysis is presented to senior executives. Get to know what lies behind your dashboard.

4



Invest in talent. Before recruiting new data scientists to staff your data-insights teams, consider training existing employees with a foundation in data analysis.

5



Take the lead on accountability. Being clear about who has decision making rights can improve outcomes. Opening up access to data and analysis can allow decisions to be challenged.

Introduction



Jack Welch, the iconic former chief executive officer of GE, said that good decisions are made “straight from the gut”. Since Mr Welch’s retirement in 2001, an era of big data and advanced analysis has been ushered in. Most companies now have lots of data available to them and, increasingly, this big data is being used to provide new insights. So should executives still cleave to Mr Welch’s advice, or has big data changed big decision making into a more scientific process?

Over the next 12 months Mr Welch’s corporate heirs – big business leaders from across the globe – will be making a host of major decisions. Some will be growing the business, others will be shrinking it. Collaboration is commonplace, as will be corporate financing. This report maps out the agenda for big decision making during this period, paying particular attention to the role that big data and analysis are playing in the process of reaching these high-stakes decisions.

Decision time

Business leaders are preparing for frequent big decisions

Most executives make a big decision every three months

Opportunities determine timing of decisions more than executive agendas

Making the most of opportunity: PwC perspective

Decision making can feel forced or reactive. And when executives do take a more thoughtful approach they tend to dive in to the data, techniques, and technology that make up an analytics strategy. Instead, step back *and* look forward, starting with the decision that will not only shape your company today but position it for whatever future changes come your way.

Dan DiFilippo
Global & US Data and Analytics Leader, PwC



Big decisions are a regular fixture for senior executives. Our survey of global business leaders conducted for this report indicates virtually every respondent in the survey will be making a big decision in the next 12 months. The single largest group (44%) of executives expects to make a big decision at least once a month, while a further 35% will do so on a quarterly basis (see Figure 1).

Nonetheless, the specific timing of each big decision is largely beyond the control of executives, or at least does not follow a specific timetable: executives believe that decisions are more likely to be delayed, or the result of taking advantage of a particular opportunity, rather than being deliberately timed. The only big decision described by executives as truly deliberate is that of choosing to grow the business.

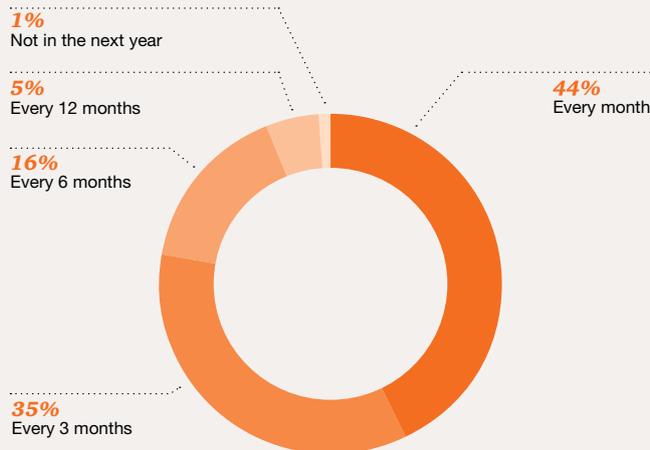
A decision to enter a new market tends to be opportunistic. This suggests that the global recovery will create openings for business leaders that they cannot ignore. Yet, the effects of the financial downturn are still being felt. Companies are most likely to delay implementing decisions to do with corporate financing, such as equity offers or debt refinancing, which depend heavily on market conditions.

Figure 1

Snapshot of a big decision

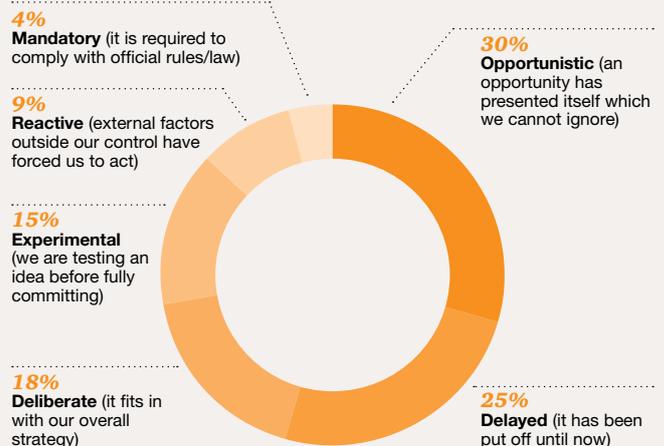
Frequency

How often will you make a big decision this year?



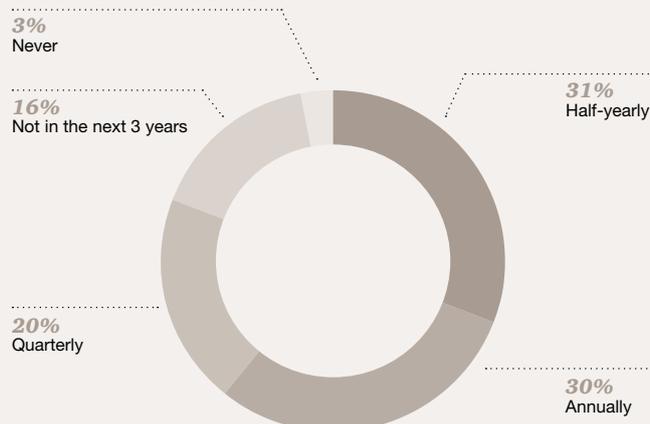
Timing

How would you describe the timing of your most important big decision this year?



Review

Once the decision is made, when do you expect to revisit the decision?



Top 3 changes to big decision making during the last two years

1. Number of people involved in making a decision
2. Use of externally sourced data
3. Use of internally sourced data

Source: Economist Intelligence Unit survey, May 2014

Common sense

The overall timeline of a decision, from inception to implementation and evaluation, depends heavily on specific corporate cultures. For businesses operating in multiple locations, the direction set by head office can, in turn, be shaped or adapted to suit local needs.

Operating in dynamic emerging markets such as Nigeria, Charles Brewer, managing director, DHL Express sub-Saharan Africa, describes the culture as entrepreneurial (see *DHL's big decision*). Being first to market is important, so decisions are made as locally as possible, where managers are encouraged to take risks. "Our management ethos is to ask for forgiveness, not permission," says Mr Brewer.

DHL's big decision

Industry: Logistics

Company profile: DHL Express has been operating in Africa since 1978. Most of its Africa business comes from small and medium-sized enterprises (SMEs), the majority of which are located outside the metropolitan areas

Executive: Charles Brewer, managing director, sub-Saharan Africa

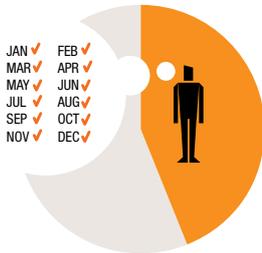
Big decision: Forming strategic partnerships

Africa is a very fluid and dynamic market. Management often has to second-guess where the next growth area will be, as there is scant reliable information to base projections on. "We try and drive decision making as local as possible," says Mr Brewer. "We support and encourage experimentation. We want people to take the chance, take the opportunity, and operate with their heart and their guts as much as their head."

When Mr Brewer became managing director, DHL had 350 outlets to service a population of 900m. Two months into the job, after a walk around downtown Nairobi, Kenya, Mr Brewer realised that it could take around three hours – through notoriously bad traffic – for an SME to reach the DHL terminal in Kenya's capital city. He took the decision to form partnerships with local shop owners, enabling them to resell the company's services. This decision increased the company's footprint in Africa from 350 to 2,500 service points, boosting growth in the SMEs business from low single digits to high double digits.



The survey shows that this aspect of big decision making (increasing the number of people involved) has changed the most in the past two years, across a number of industries



44% of executives expect to make a big decision at least once a month

At the Commonwealth Bank of Australia, Kelly Bayer Rosmarin describes their big decision making process as analytical and inclusive (see *Commonwealth Bank of Australia's big decision*). “We talk about the Socratic method, the dialogue, the debate, and we have a very collaborative culture,” says Ms Bayer Rosmarin. “We involve a lot of parties and different viewpoints.”

During her career, Ms Bayer Rosmarin has observed a trend in banking to move away from highly autocratic decision making to being more inclusive. Moreover, this development is by no means unique to the banking sector. The survey shows that this aspect of big decision making (increasing the number of people involved) has changed the most in the past two years, across a number of industries, including the public sector.

A benefit of having more people involved in decision making is that it can weed out individual biases, both conscious and unconscious (see *Beware bias & bad data*, page 31). The drawbacks are that it can take longer to make a decision and it may dilute accountability. Gerd Gigerenzer, director of the Centre for Adaptive Behaviour and Cognition at the Max Planck Institute for Human Development in Berlin calls this trend “defensive decision making”.

Defensive decisions are overly cautious decisions that no one will get into trouble for making. Mr Gigerenzer’s research has shown that defensive decision making is common in the business world – accounting for between one-third and one-half of all decisions – as executives seek protection from personal criticisms. Unfortunately, it usually leads to sub-optimal outcomes. In a risk-averse culture, no one wants to stick their head above the parapet, but without risk, there is no innovation.

Having clear accountability is only worthwhile if the outcome of the decision is evaluated at some point in the future.

The buck stops here

With the trend towards more inclusive decision making, executives should ensure that ultimate responsibility for a decision is maintained. This challenge is currently being addressed at the Commonwealth Bank of Australia. “We are trying to get a fine balance between consulting very widely and having clear accountability for the decision sitting somewhere,” says Ms Bayer Rosmarin. However, having clear accountability is only worthwhile if the outcome of the decision is evaluated at some point in the future.

Most big decisions are revisited every six months or annually, according to our survey, although it does depend on the type of decision. Of the three most important big decisions on the corporate agenda (explored in the next chapter), growing the business is most likely to be revisited quarterly; shrinking the business every six months; while collaborating with competitors tends to be revisited annually.





Commonwealth Bank Of Australia's big decision

Industry: Banking & capital markets

Company profile: Commonwealth Bank of Australia is Australia's largest bank. By its own estimates, it is involved in 40% of all domestic transactions

Executive: Kelly Bayer Rosmarin, chief executive officer, Institutional Banking and Markets

Big decision: Choosing which business lines to grow or shrink

Ms Bayer Rosmarin became division head at the end of 2013. Her first big decision – similar to that of many international competitors – was to take some “tough decisions” about which of her business lines to “emphasise or de-emphasise”. Her focus has been on areas where the bank is a market leader and can offer its corporate customers unique insights, such as project finance or trade finance.

The first step, prompted by flux in the global banking industry, involved the leadership team reaching a “decision to decide”. Once this intention was formed, the data gathering and analysis process began – drawing upon historical business performance and projections, competitive intelligence, as well as global trends. Next came the “human element” of talking to major customers and canvassing the opinions of potential customers who had chosen a competitor. Finally, all of this information was synthesised until the leadership team had honed in on a few key decisions that needed to be made.

Taking the right direction

The way forward for businesses is split multiple ways

Global focus on growth tempered by the desire to “shrink” business

Collaboration between competitors to be commonplace



Competing in the data age: PwC perspective

When CEOs today decide how to grow, how to reconfigure their business or how to collaborate, the way they frame their vision or the problem really matters. Now is the time to think as expansively as technology makes possible.

Tom Lewis
UK Data and Analytics Leader, PwC

Having successfully made the last round of big decisions, executives generally feel prepared for the next round of big decision making.

Recent big decisions have mainly had positive outcomes. The vast majority of executives say that the impact of their last big decision either met or exceeded expectations. Having successfully made the last round of big decisions, executives generally feel prepared for the next round – although much depends on the type of big decision that they are intending to take (see Figure 2).

Growth is once again top of the corporate agenda. Global business leaders will be prioritising mergers & acquisitions (M&As), entering new markets, and launching new products, to drive profitability and revenue. Growth is particularly high on the agenda for technology companies (see Cloudera’s big decision), already evidenced by the recent spate of large acquisitions: Facebook bought Whatsapp for an estimated US\$19bn; Apple purchased Beats Electronics for US\$3bn, while Google acquired the home automation company, Nest Labs, for US\$3bn.

The chief motivation for business leaders in this industry is keeping up with technology-driven changes. In this vein, Google’s acquisition of Nest marked its first significant investment in the so-called “Internet of Things”. The fitting of sensors to almost everything – from cars to cows and clothes – is set to generate unseen amounts of new data and business models.

Figure 2

The big decisions agenda

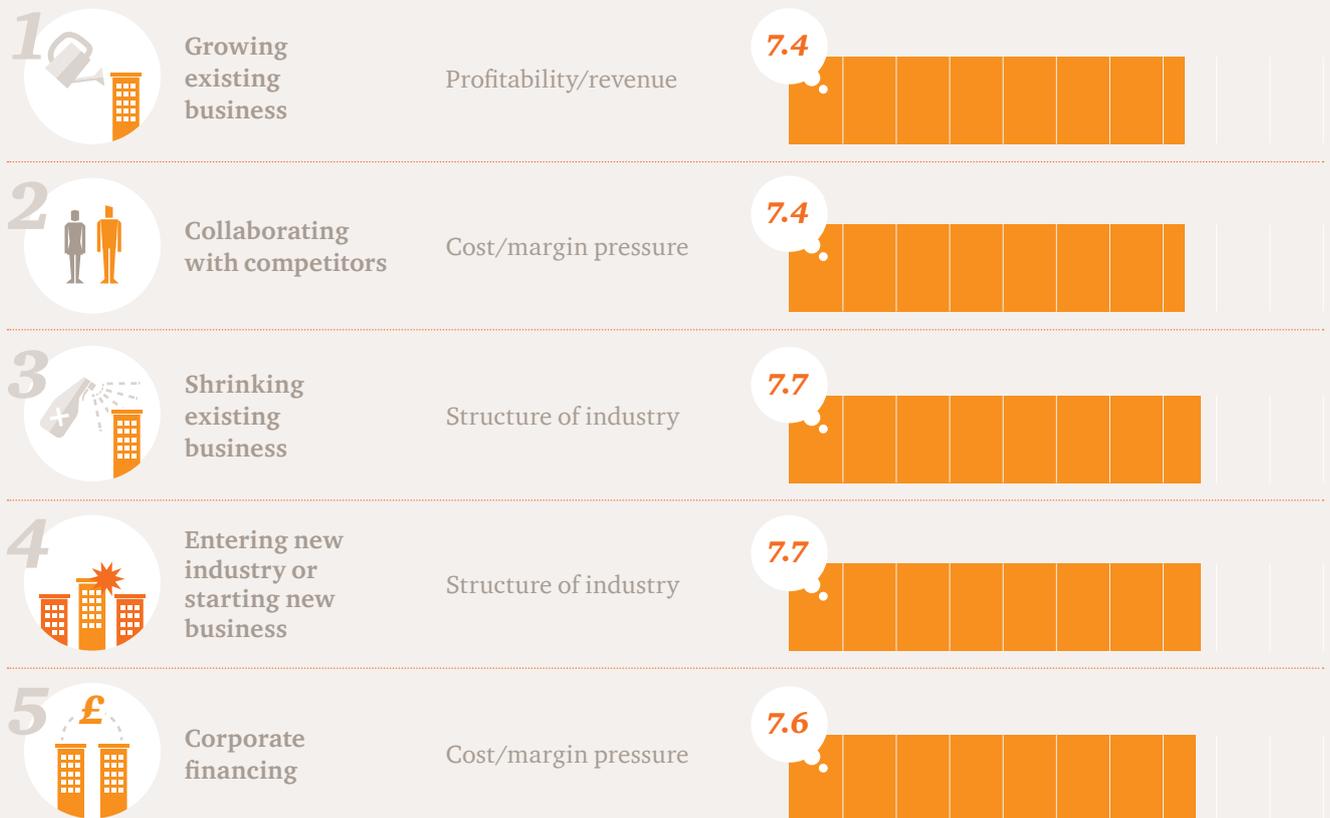
Top 5 big decisions in next 12 months

(1 = most important)

Most likely strategic motivation for big decision

Level of preparedness to make big decision

(on a scale of 1 to 10, where 1 is completely unprepared and 10 is fully prepared)



Source: Economist Intelligence Unit survey, May 2014

Besides growth, two other big decisions will feature prominently in the next 12 months: collaborating with competitors and shrinking an existing business. This suggests that, as companies look to pool their resources, share costs, sell assets and exit markets, the reshaping of businesses brought about by the global recession is far from over, although regional differences are significant (see page 20).

Cloudera's big decision

Industry: Technology

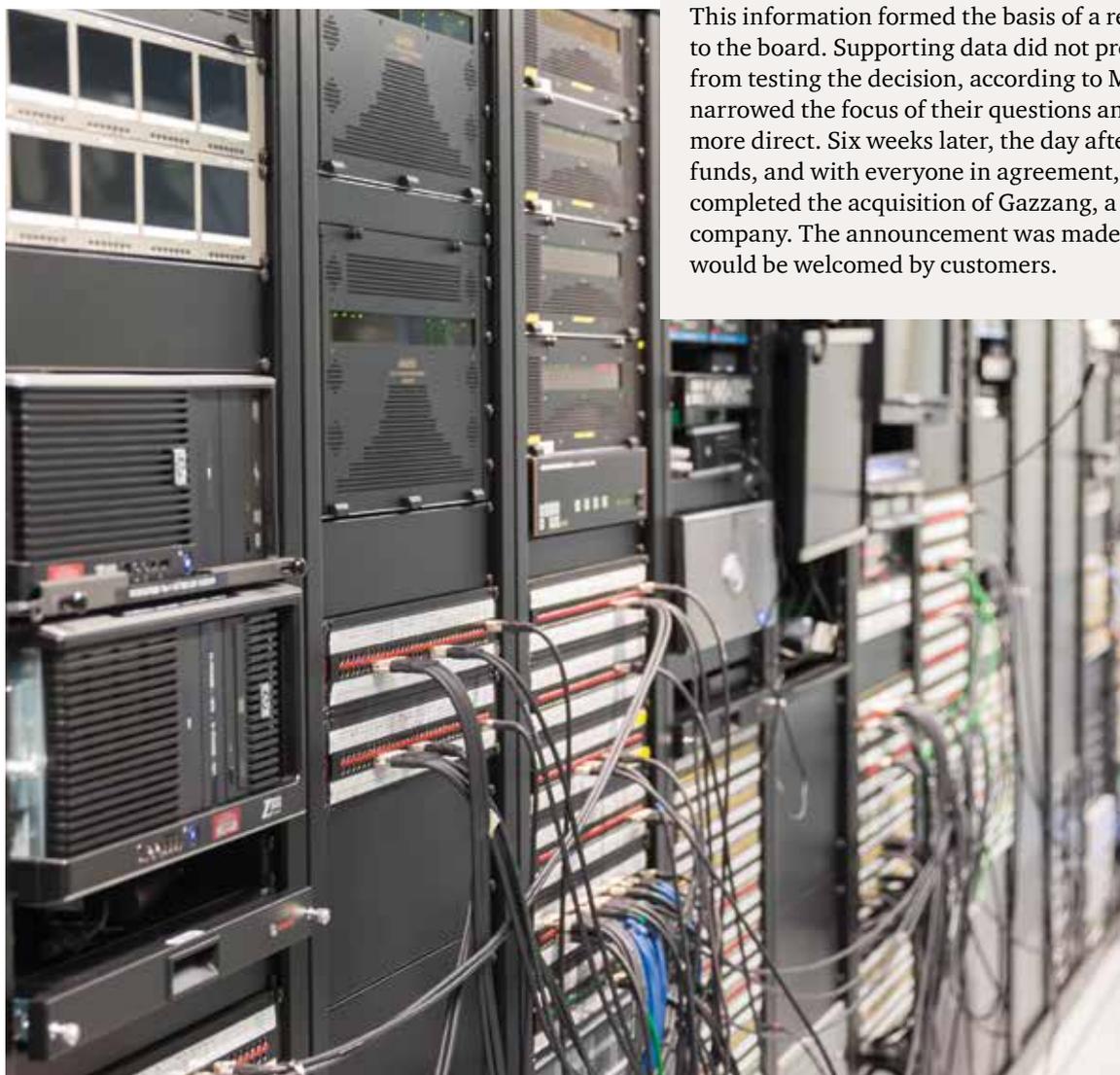
Company profile: Cloudera is a Californian enterprise software company. Earlier this year, it completed a new financing round worth US\$900m, attracting investment from Intel and T. Rowe Price, among others

Executive: Tom Reilly, chief executive officer

Big decision: Finding a target company to acquire

Knowing that the company would soon be receiving fresh capital, Mr Reilly instigated a process to establish where the company could most benefit from an acquisition. For this, he turned to the customer data his company collects. Analysis revealed that data security and data privacy were the two standout concerns holding customers back from greater use of his company's products.

This information formed the basis of a report presented to the board. Supporting data did not preclude the board from testing the decision, according to Mr Reilly, but it narrowed the focus of their questions and made them more direct. Six weeks later, the day after receiving the funds, and with everyone in agreement, the company completed the acquisition of Gazzang, a data-security company. The announcement was made knowing that it would be welcomed by customers.



Besides growth, two other big decisions will feature prominently in the next 12 months: collaborating with competitors and shrinking the business.



Collaborating with competitors is on the agenda for more than one in three (36%) global businesses.

Sharing the pain... and the opportunity

Collaborating with competitors is on the agenda for more than one in three (36%) global businesses. For companies in the pharmaceuticals and healthcare sectors, it is the top priority. These formerly secretive sectors are embracing collaboration in an effort to cut costs and expand drug portfolios, notwithstanding a strong showing in global M&A deals this year. A recent example is AstraZeneca's collaboration with biotech firm, Synairgen, to develop a new asthma drug.²

However, collaboration in the pharmaceuticals sector is not limited to tie-ups between big drug firms and smaller biotech companies. In April 2014 a number of large pharmaceutical companies, including AstraZeneca, Bayer, Johnson & Johnson, Pfizer and Sanofi US, agreed to share clinical trial data (phase III oncology trials) in a collaboration known as Project Data Sphere (PDS).³

“No single segment, no matter how strong – be it industry, government or academia – can, in isolation, address the complex challenges we face in healthcare,” says Michael Rosenblatt, executive vice-president and chief medical officer at Merck. “It is clear we must go beyond the confines of our labs and offices to re-imagine innovation as a vast web of collaboration – both inside and outside the healthcare industry.”

Indeed, outsiders are being drawn to the growth opportunities in the healthcare sector. Microsoft set up its health solutions group to expand the technology company into information management for hospitals. But slow progress, caused by underestimating the complex economic barriers to disrupting the entrenched systems, led management to seek a partnership with a more experienced healthcare competitor. Caradigm was set up in 2012 as a joint venture with GE Healthcare.

² Andrew Ward (2014), *AstraZeneca in \$232m asthma drug deal*; FT.

³ Peter Mansell (2014), *Project Data Sphere data-sharing platform launched*. PharmaTimes.

Nonetheless, the trend towards greater collaboration goes far wider than healthcare and pharmaceuticals – spanning the developed and developing world. In July 2014 Dairy Crest in the UK and Fonterra in New Zealand announced a five-year strategic partnership, tapping into soaring Chinese demand for foreign-branded baby formula milk.

Bigger is not always better

As most of the world prioritises growth, North American executives are primarily focused on shrinking an existing business. Although this big decision ranks third on the global agenda for the next 12 months, the overall ranking is heavily skewed by the North American figures, where it is the number-one priority (see Figure 3).

North American executives are motivated by changes to the structure of their industry and continued pressure on operating costs and margins. An example of this strategy came in March this year, when American Express announced that it was selling off 50% of its business travel division to a group of outside investors in exchange for an investment of US\$900m.

Revenue at the business unit, which employs over 14,000 people and handles US\$19bn in corporate travel expenditure across 139 countries, is being squeezed by changing customer habits, as digital technology allows companies to make their own bookings and rely less on corporate travel agents. The new joint venture is predicted to see global headcount reduced by more than one-third.

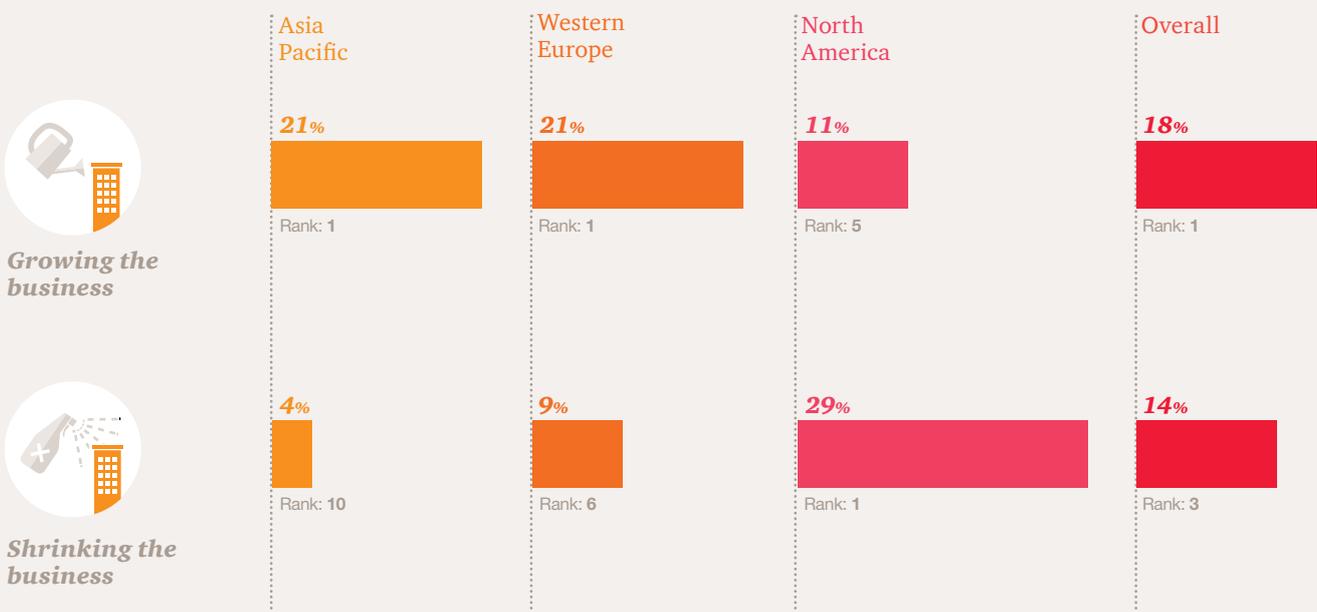
Executives elsewhere should be mindful of this renewed focus on the core business. Since the financial crisis, GE has been reducing the size of its financial services business, which at one point accounted for close to half of the conglomerate’s total profits. Returning to its core base as an industrial manufacturer, the company recently beat German rival Siemens to acquire large parts of Alstom, a French multinational company.

Figure 3

US and them

Most important big decision

Percentage of respondents (rank)



Source: Economist Intelligence Unit survey, May 2014

Shrinking the business is expected to have the biggest impact on profitability.

Measuring the impact of big decisions

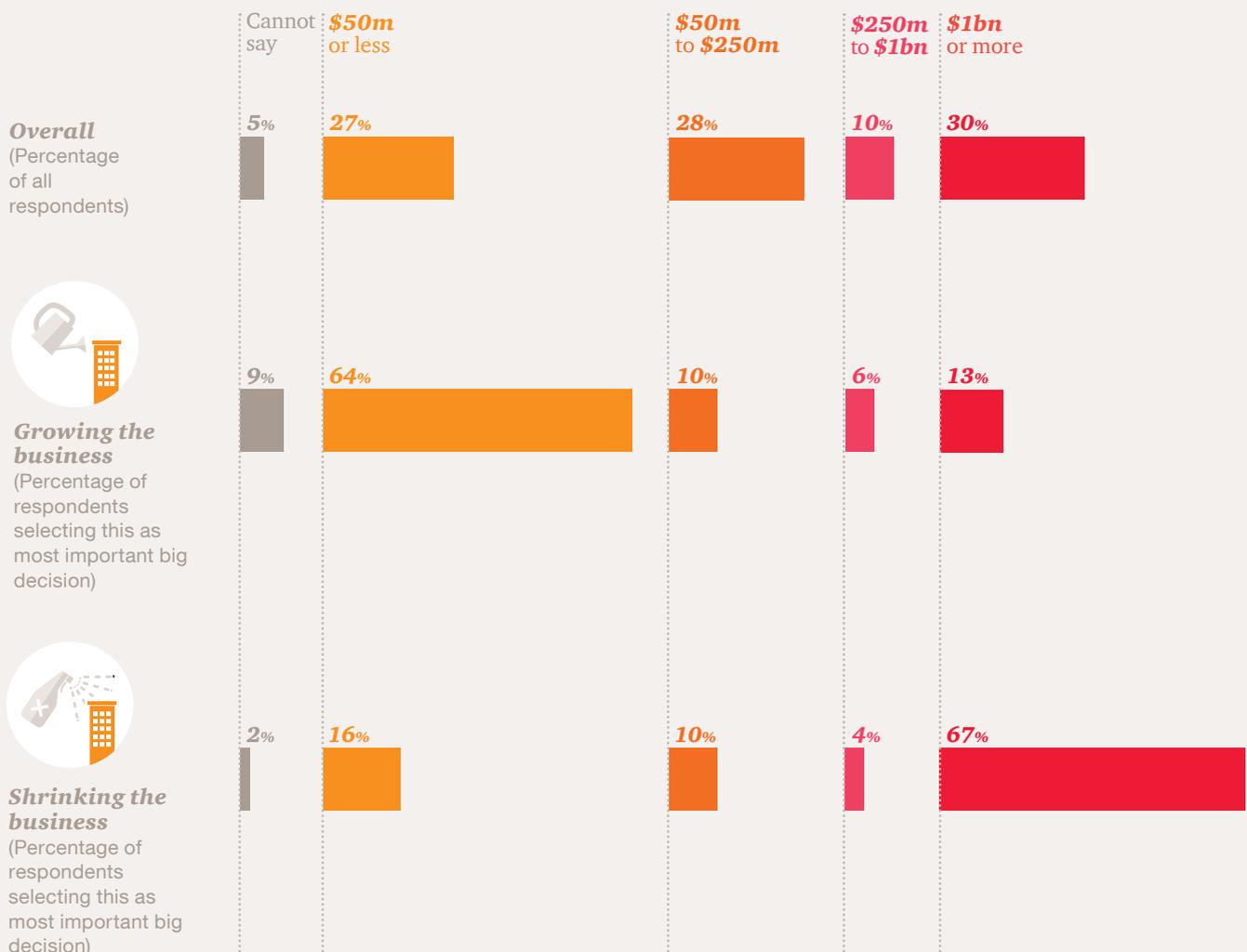
Some big decisions could have a significant impact on future profitability, others may not. When asked in our survey to predict the likely impact of their most important decision, executives gave estimates ranging from under US\$1m to over US\$10bn.

Shrinking the business is expected to have the biggest impact on profitability, while growth-minded executives have far more modest profit expectations (see Figure 4). Nearly one in five executives expecting to make a big decision about growth estimates a boost to profits of only US\$1m or less.

These differences are borne out by the regions. Executives in North America, with their focus on shrinking the business, are much more likely to expect a profit boost of over US\$1bn (65% expect this) than firms in Asia-Pacific (11%) or western Europe (17%), where the focus is more on growth.

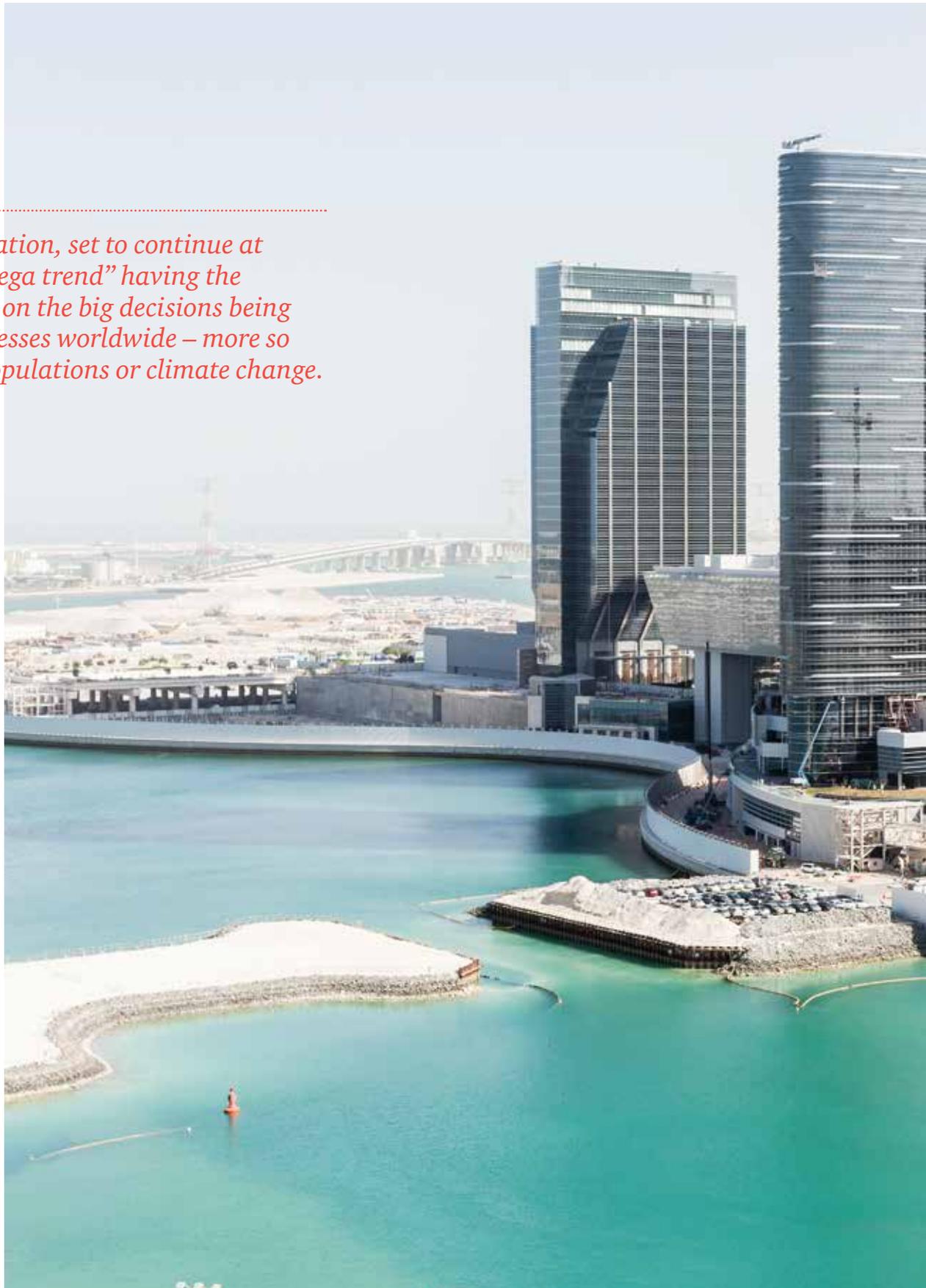
Figure 4

What is the value of the big decision in terms of your organisation's future profitability?



Source: Economist Intelligence Unit survey, May 2014

Rapid urbanisation, set to continue at pace, is the “mega trend” having the biggest impact on the big decisions being made by businesses worldwide – more so than ageing populations or climate change.





Bright lights, big cities

Rapid urbanisation is driving the agenda from the boardroom to city hall

Roughly 2% of the global population lived in cities before the industrial revolution; now the figure is closer to 50%. This rapid urbanisation, set to continue at pace, is the “mega trend” having the biggest impact on the big decisions being made by businesses worldwide – more so than ageing populations or climate change.

Rio Tinto, an Anglo-Australian mining company, supplies raw materials, such as iron ore and copper. “We are living through the greatest urbanisation in human history and without minerals you don’t build cities,” says John McGagh, head of innovation at Rio Tinto.

Mr McGagh claims that the average copper grade during the industrial revolution was about 17%. Today, the average copper grade is about 1%. Consequently, mining companies have to dig, haul and process a lot more rock than they did two centuries ago. This is driving requirements for more sophisticated technology, higher levels of efficiency and a significantly lower cost structure.

Rio Tinto works closely with its partners to achieve this. For example, it has been working with Komatsu – a Japanese multinational that manufactures construction and mining equipment – since 1996 to develop the 60 autonomous trucks that it has so far used to transport over 200m tonnes of iron ore around its mines.

From mining iron ore to data mining

Of course, the challenges of urbanisation are acutely felt by the cities themselves. The population of Berlin, Germany, has grown by 50,000 each year. This growth is both exciting and problematic, according to the governing mayor, Klaus Wowereit. “We have to create affordable housing, expand the infrastructure, and at the same time preserve the social balance: Berlin must continue to be a livable and affordable city for everyone.”

Just as with companies, this is driving unprecedented collaboration between local authorities in many of the world’s cities. The Mayor’s Office of Data Analytics (MODA) in New York City collaborates with multiple local government agencies to overcome some of the challenges of urbanisation, such as overcrowding, road fatalities, and pollution.

In New York, local authorities tend to collect data for their own use and store them in a way that makes sense for their requirements. Integrating data from these disparate “information silos” is no mean feat. Data are streamed into MODA from 17 different agencies. MODA’s chief of staff, Nicholas O’Brien, estimates that his department sees at least 100m records pass through its systems daily.

But, having brought all of this valuable big data together for the first time, MODA is not content simply to use it in-house. “We are moving very aggressively on the open-data front,” says Mr O’Brien. “We want to make lot of the city data available to the general public, to the business community, so that they can use it and build businesses on the back of it.”

Yet the data available need not be big. Linking existing data intelligently can be just as effective. A new scheme in Berlin, for instance, requires the compulsory registration of companies wishing to dig up a road. This facilitates the co-ordination of construction dates, saving costs and limiting interruption to inhabitants.

Augmented reality

Data-led analysis is enhancing experience and intuition

Data-driven executives report “significant” improvement in decision making

Quality and quantity concerns restrict greater use of data and analysis

Where the breakthroughs will come from: PwC perspective

Your data does not always have to be squeaky clean – nor must it belong to you – to provide the insights necessary to drive good decisions. More important than data accuracy or proprietary algorithms, in fact, is a data model that can accommodate unknowns or data that does not look exactly the same.

Paul Blase

US Advisory Data and Analytics Leader, PwC



The availability of data is not a new thing. There are just far more available than there once were. Moreover, the volume is set to increase further, as the majority of businesses across industries are actively looking at the Internet of Things, gradually undermining the sizeable group of executives who believe that it is difficult to generate data insights from their company's products or services.

Given the proliferation of data in nearly every sector, most firms (64%) have already changed the way that they make big decisions (see Figure 5). The majority of these did so more than two years ago – led by companies in North America. A further 25% – spread across the global sample – are planning to do so in the next two years.

For those who have already made these changes, the most popular initiatives are to make greater use of specialised analytical tools and techniques; employing a dedicated data insights team to inform strategic decisions; and relying on enhanced data analysis, each of which have been instigated by over one-half of these companies.

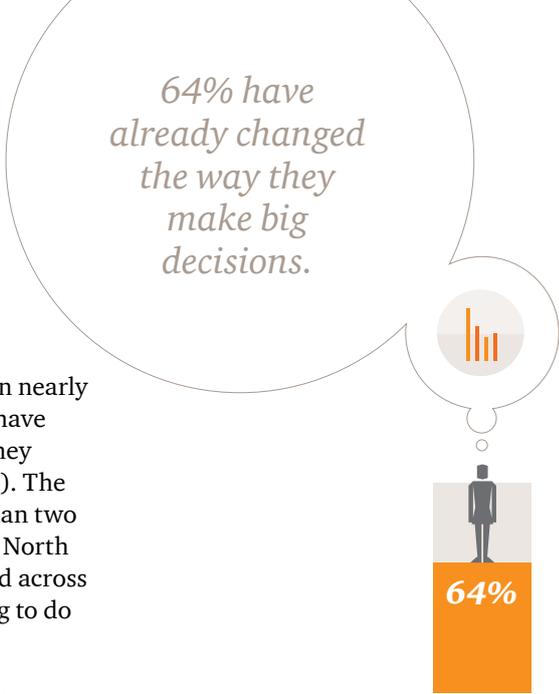
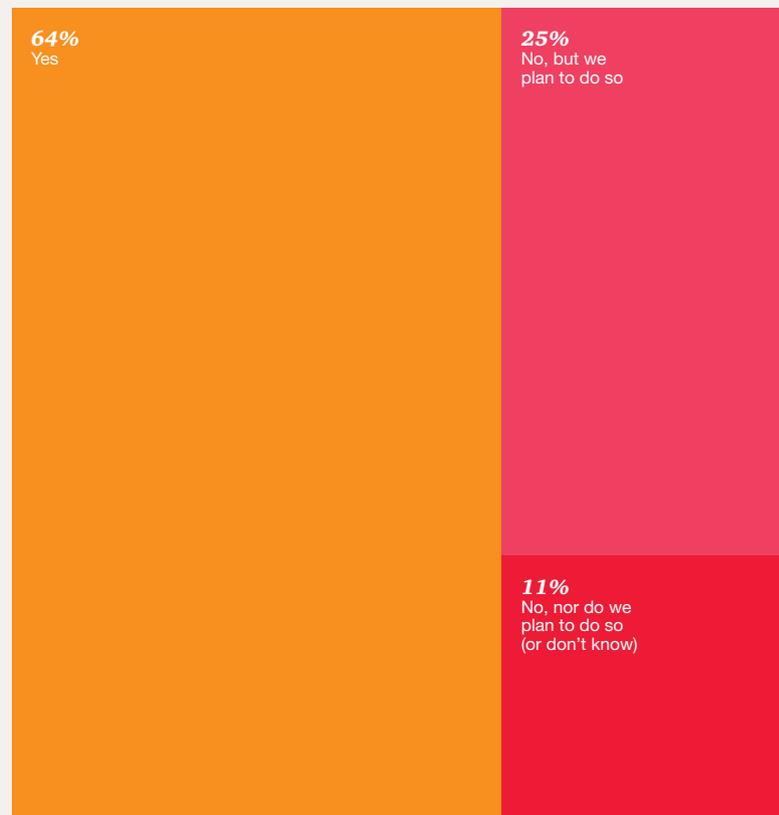


Figure 5
A change of mind

Has big data changed decision making at your organisation?
Percentage of all respondents



Top 3 changes to big decision making

1. Greater use of specialised analytic tools and techniques
2. Employing a dedicated data insights team to inform strategic decisions
3. Relying on enhanced data analysis

Source: Economist Intelligence Unit survey, May 2014



26% of big decisions are around brand positioning

At present, close to one in three executives (32%) describe big decision making at their company as “highly” data driven. These executives tend to make more frequent big decisions and they are twice as likely to revisit a decisions on a quarterly basis. They are also three times as likely to report “significant” improvements in big decision making in the past two years when compared with peers who are not highly data driven.

Try before you decide

So in what ways can big data and advanced analysis help companies to make better decisions? The survey reveals that the majority use data and analysis to optimise a range of variables, including the choice of channels to distribute products and services, as well as the types and prices of these.

In recent years, a technique called A/B testing (a statistical hypothesis test) has become a popular way for firms to perfect these sorts of variables. Overall, 15% of big decisions are described as experimental, involving an element of testing, rising to 26% for decisions about brand positioning.

‘Some of the biggest improvements in the business have come from making changes to the product based on certain types of A/B testing that we do’.

“We use data to drive everything we do,” says Jon Oringer, founder and chief executive officer at Shutterstock, an online marketplace for stock photography. “Some of the biggest improvements in the business have come from making changes to the product based on certain types of A/B testing that we do.” Mr Oringer says that they are often surprised by the results of the tests. “Some things that we think really will work turn out to have different effects on the business that we didn’t know were going to happen,” he says. “And if we didn’t measure them, we would end up losing money.”

Western Union, a financial services firm, also uses A/B testing on large datasets to make decisions about pricing – finding the optimal price that generates the most customer satisfaction and shareholder value.

“We test certain combinations of fee and foreign exchange and see if it has an effect on volume and customer satisfaction,” says David Thompson, the firm’s chief information officer. “That’s something that would have been difficult to do in the past and it was time consuming. We are now able to get responses back from the technologies much quicker, and over a large dataset.”

32% describe big decision making at their company as “highly” data driven.



32%

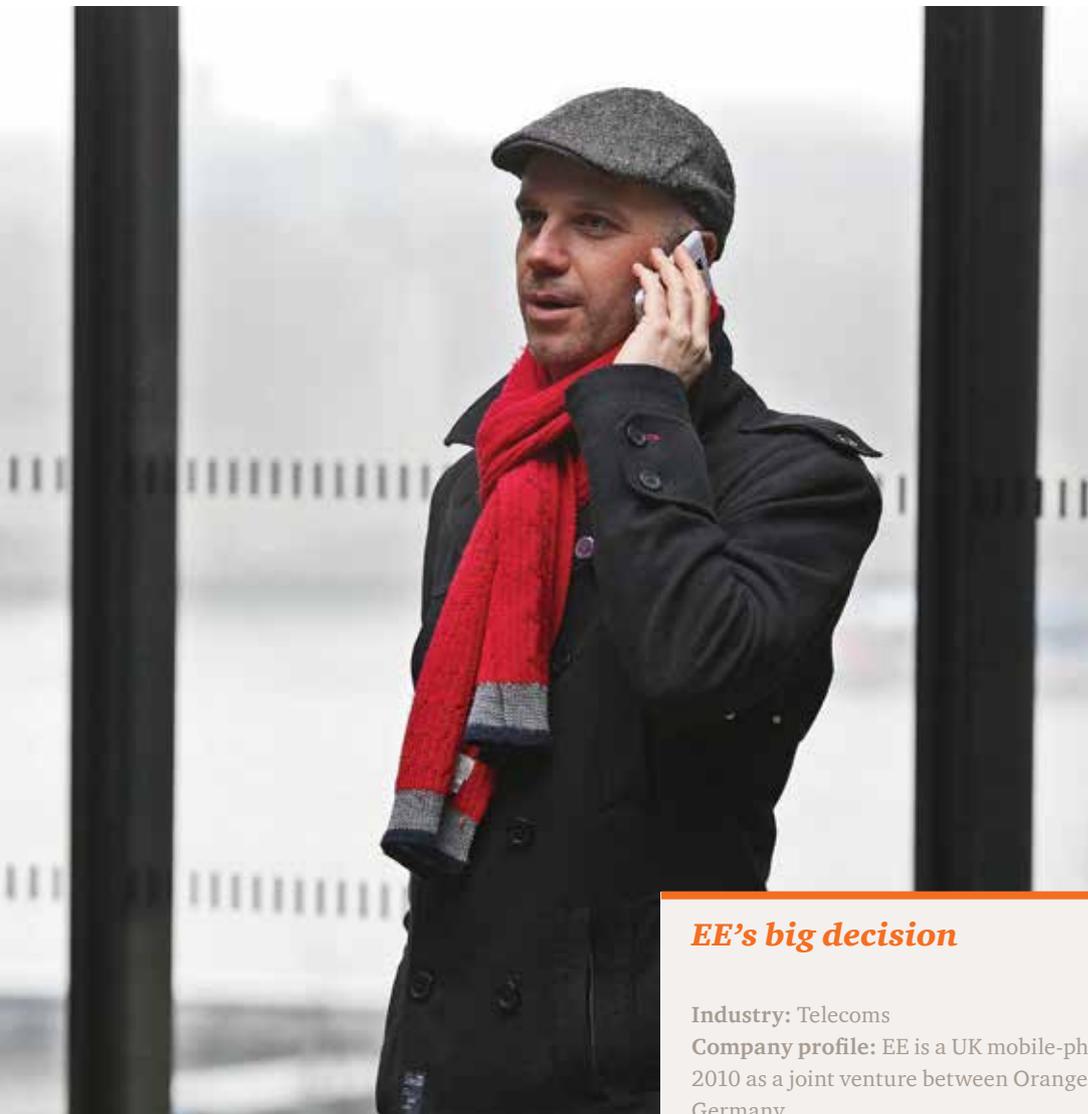
Too much information

Across the sample, the main impediment to making greater use of this asset for decision making is the quality, accuracy, or completeness of data, although this is more prevalent in the developing world than the developed world. In the survey, over 40% of executives in Africa, Latin America, eastern Europe and the Middle East list it as one of their biggest barriers, making it the top concern in each of those regions.

For DHL Express, operating in sub-Saharan Africa, incomplete or simply unavailable data are big issues. “If we are deciding whether we should fly a 747 plane between Dubai and Johannesburg or a 737 to Zambia, it certainly draws a lot of questions, and quite often the data you would really want – how much cargo is flown between the two points and the total market – are not readily available,” says Mr Brewer. A lack of historical data present a similar problem in China’s immature but fast-moving property sector (see *Franshion Properties’ big decision*, page 37).

Another high-ranking barrier to using data for decision making is the difficulty of assessing what data is truly useful. This is considered the top barrier in western Europe and Asia-Pacific. For many companies the volume of big data is simply too much. In order to avoid being overwhelmed by data, business leaders need to take what Richard Reeves, director of corporate strategy at EE (see *EE’s big decision*, page 28), calls a “solution-centric approach”. Companies that mine data in the hope of finding interesting patterns and correlations may find themselves suffering from “analysis paralysis”. It is important to be clear about the question before delving into the data.

To ease the burden of data overload, a level of discrimination also needs to be introduced – or reintroduced. It may be inexpensive to store massive amounts of big data, but that does not make it useful. “Big data is a natural resource so people think you have to take advantage of it,” says Honbo Zhou, a director at Haier, the world’s largest manufacturer of white goods. “But, if big data is consumed inappropriately or generated randomly, or kept for no reason, it will create a lot of virtual garbage.” Mr Zhou thinks this will be a particular problem over the next couple of years as the Internet of Things takes off.



EE's big decision

Industry: Telecoms

Company profile: EE is a UK mobile-phone operator. It was formed in 2010 as a joint venture between Orange of France and Deutsche Telekom of Germany

Executive: Richard Reeves, director of corporate strategy

Big decision: Where to deploy capital expenditure

Every year, EE invests around £600m (US\$1bn) in its network, drawing on data from its 25m customers to direct these decisions. In 2014, the company decided to focus the extension of its 4G network along key transport routes, aiming to enhance customer satisfaction – and retention – by minimising the number of calls it had observed being dropped during rail and car journeys.

One of the biggest benefits of big data, according to Mr Reeves, is being able to test multiple hypotheses quickly, and “validate the way forward” very rapidly. Although there are only a “few key decision makers” at EE, big data and analytics have led to healthy, adversarial decision making. “Some information and insights around analytics are available to a broad selection of the EE management team and it allows them to come up with their own hypothesis and potential challenges to the activity that is being undertaken.”

In reality, experience and intuition and data and analysis are not mutually exclusive. The challenge for business is how best to marry the two.

Street smarts

When the time comes to make big decisions, an executive's intuition and experience remains the biggest decider – but only just (see Figure 6). As big decision making evolves to take account of newly available data and analysis, almost half (49%) of executives globally – and 66% in North America – agree that data analysis is undermining the credibility of intuition or experience, compared with 21% who disagree.

In reality, however, experience and intuition, and data and analysis, are not mutually exclusive. The challenge for business is how best to marry the two. A “gut instinct” nowadays is likely to be based on increasingly large amounts of data, while even the largest data set cannot be relied upon to make an effective big decision without human involvement (see *Beware bias and bad data*, page 31).

Western Union processes 700m transactions a year across 200 countries, denominated in 120 foreign currencies. Notwithstanding that all these valuable data are changing decision making at the company, it still relies on the intuition and experience of local managers when it comes to setting prices – (known as “street corner pricing”).

“Much of that can be done with data and trends and history, but another part is management intuition based on market insight, feet on the street, which the data may not tell you,” says Mr Thompson. “It takes a combination of management experience, management insight into the market, in addition to the data, and I don't see that going away any time soon.”

Figure 6

Which of the following inputs did you place the most reliance on for your last big decision?

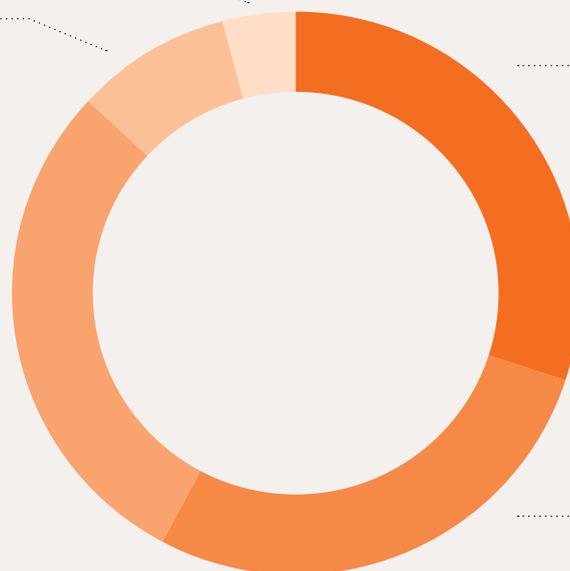
4%
Other (e.g. consultants)

9%
Financial indicators

29%
Data & analysis
(internal or external)

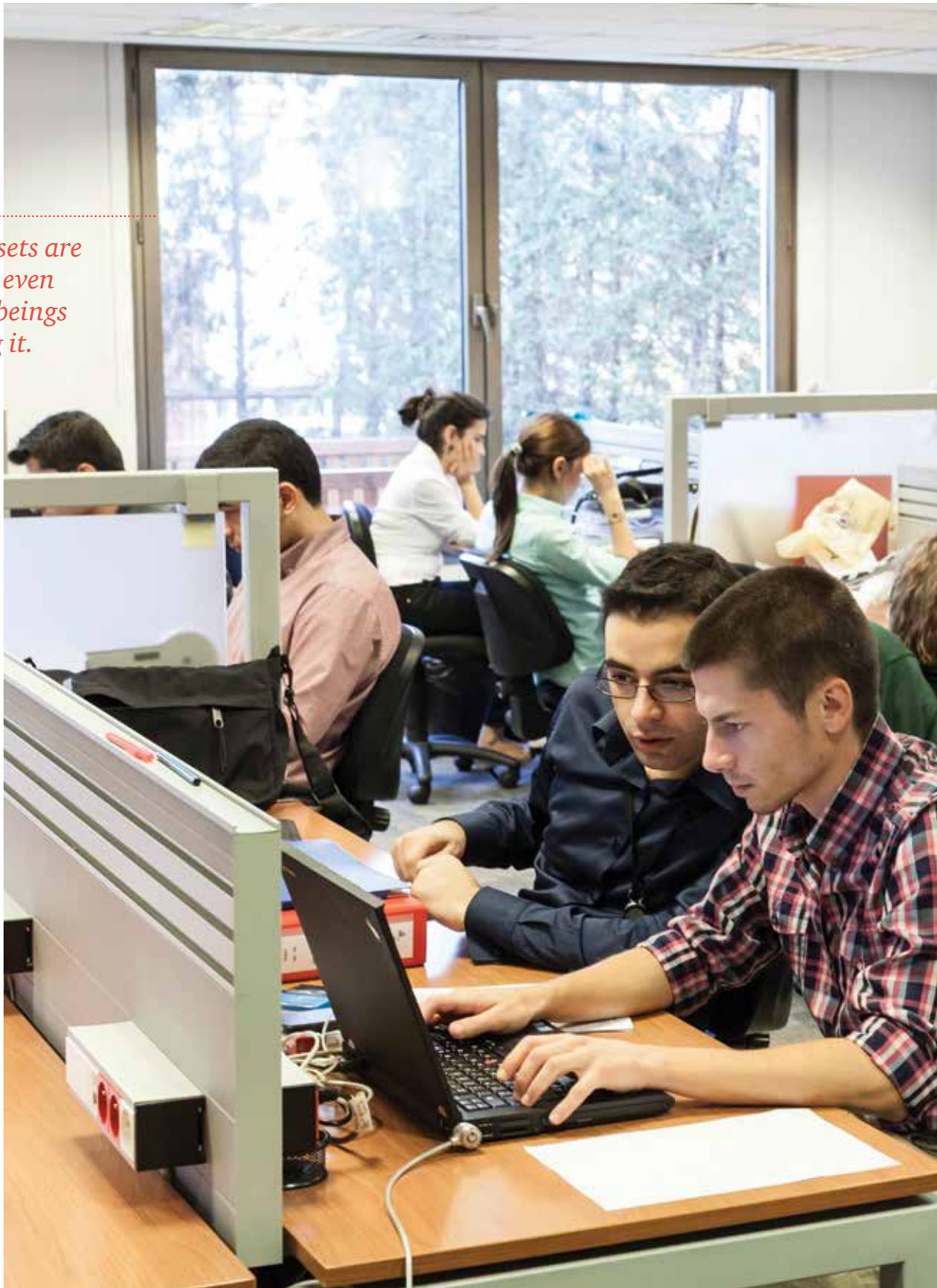
30%
Own intuition or
experience

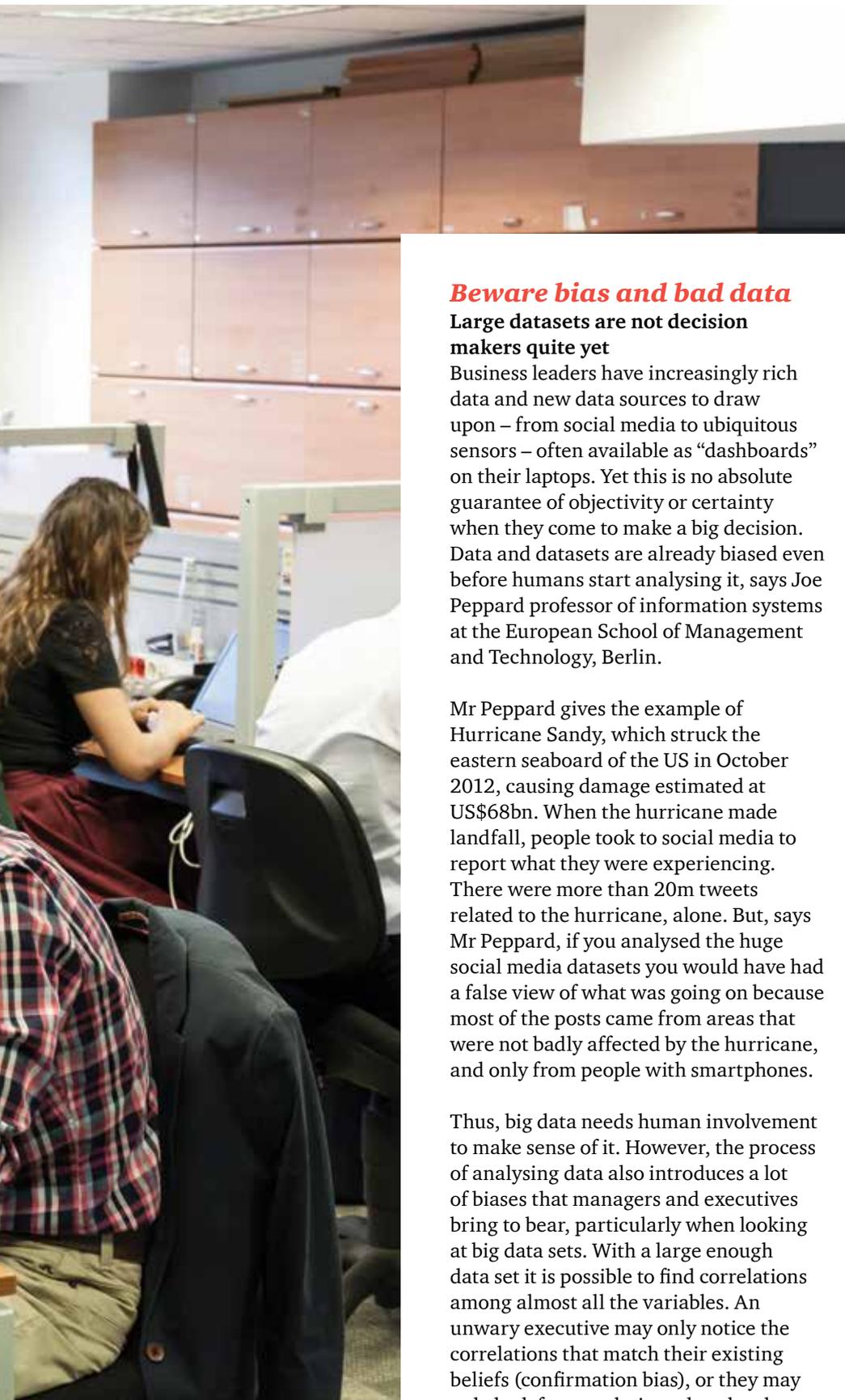
28%
Advice or
experience of others
internally



Source: Economist Intelligence Unit survey, May 2014

Data and datasets are already biased even before human beings start analysing it.





Beware bias and bad data

Large datasets are not decision makers quite yet

Business leaders have increasingly rich data and new data sources to draw upon – from social media to ubiquitous sensors – often available as “dashboards” on their laptops. Yet this is no absolute guarantee of objectivity or certainty when they come to make a big decision. Data and datasets are already biased even before humans start analysing it, says Joe Peppard professor of information systems at the European School of Management and Technology, Berlin.

Mr Peppard gives the example of Hurricane Sandy, which struck the eastern seaboard of the US in October 2012, causing damage estimated at US\$68bn. When the hurricane made landfall, people took to social media to report what they were experiencing. There were more than 20m tweets related to the hurricane, alone. But, says Mr Peppard, if you analysed the huge social media datasets you would have had a false view of what was going on because most of the posts came from areas that were not badly affected by the hurricane, and only from people with smartphones.

Thus, big data needs human involvement to make sense of it. However, the process of analysing data also introduces a lot of biases that managers and executives bring to bear, particularly when looking at big data sets. With a large enough data set it is possible to find correlations among almost all the variables. An unwary executive may only notice the correlations that match their existing beliefs (confirmation bias), or they may only look for correlations that they have seen recently or many times before (availability bias).

Even before these biases are applied, the design of a dashboard will undoubtedly rely on a judgement made by someone else, lower down in the company, about the relationships between data. This is not wrong, but users relying on this pre-packaged data should know what assumptions have been made, when they were made, and why.

Sometimes data simply need to be ignored. The limits of projections based on past data are something that the city planners of Berlin experienced first-hand. All the population projections for Berlin in the mid-1980s indicated falling numbers. Within five years, however, Berlin had transformed from a dying city into a metropolis with a population of 6m inhabitants. Luckily the city planners ignored the population projections. Their intuition told them to plan for a city that was about to grow.

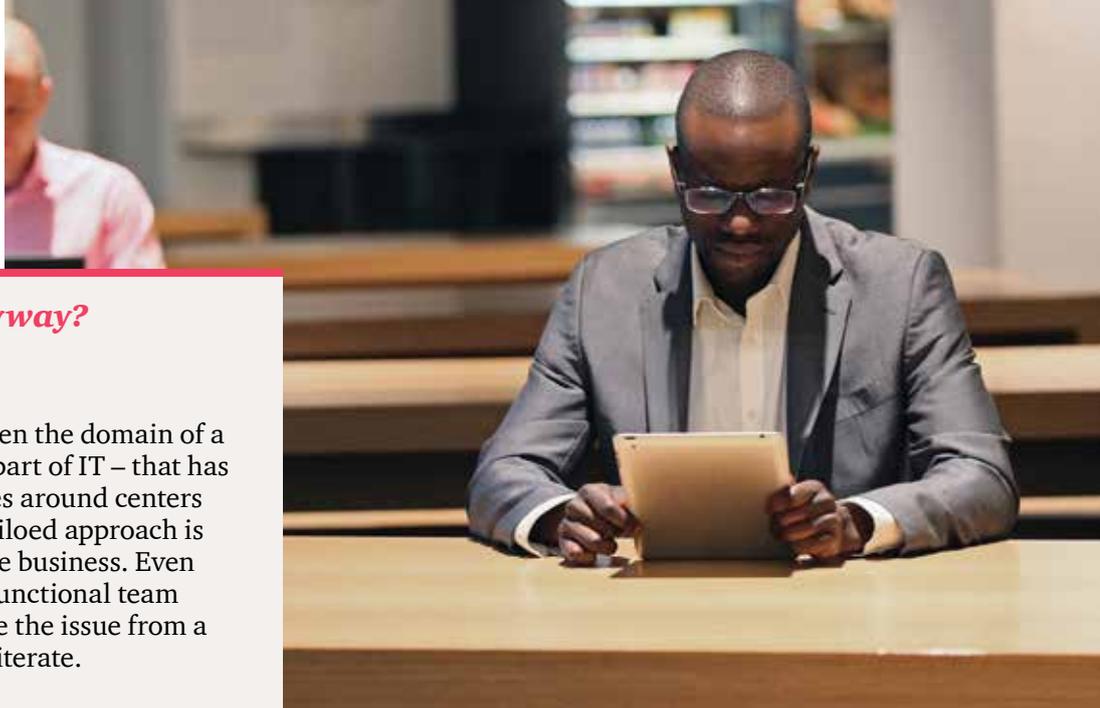
Ultimately, all data are historical so even big data is no predictor of the future. Half of C-level executives agree that relying on data analysis has been detrimental to their business in the past. For Maria DePanfilis, head of analytics and optimisation at Rosetta, a marketing agency, intuition is absolutely critical for big decision making – even if it comes with an element of bias. “It is a truism that data tell you what happened,” she says. “What happened is very useful, but what will happen is much more useful.”

Connecting the C-suite

Strategic decision makers must be given the tools to use data insights

Battle to recruit talented data scientists is being won

Senior management may be biggest blockage in data pipeline



Who's the data for anyway?

PwC perspective

Big Data and analytics are often the domain of a dedicated function – usually part of IT – that has built up its skills and resources around centers of excellence. However, this siloed approach is sometimes out of step with the business. Even better is to assemble a cross-functional team at the start, which can explore the issue from a variety of angles and quickly iterate.

Scott Likens

China Data and Analytics Leader, PwC

52% of CEOs have previously discounted data they don't understand.



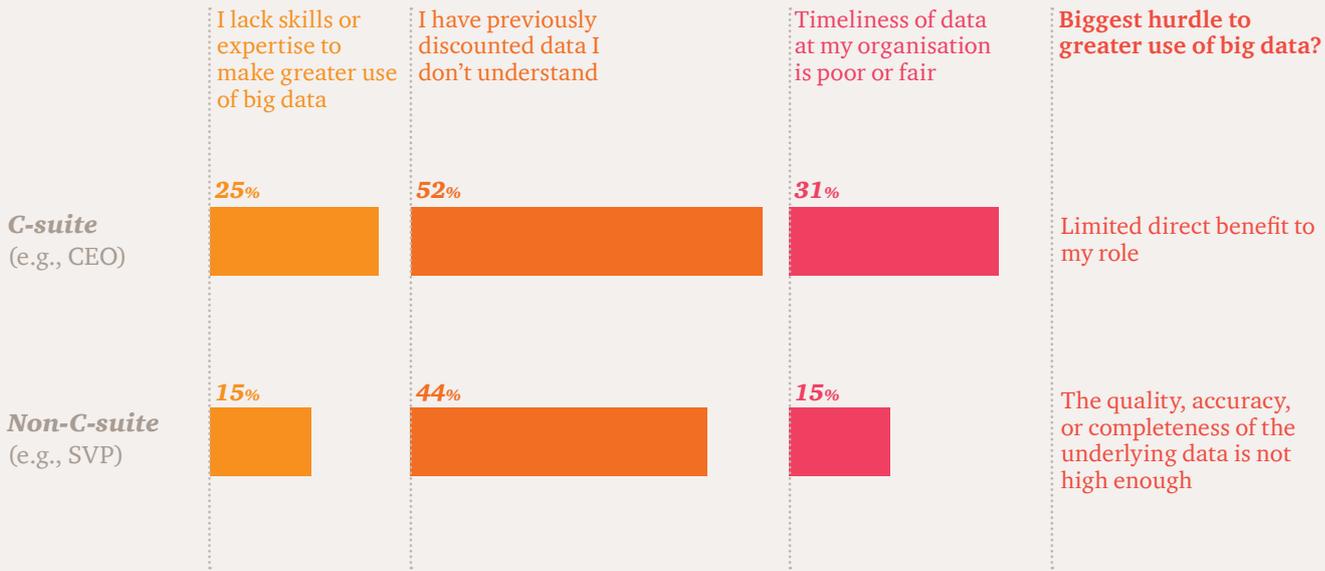
Oil and gas companies like BP are collecting large quantities of data from the ocean floor to create 3D images of rock formations below the seabed. Analysis of this information will inform decisions made by senior management about where to develop a multi-billion dollar oil field in Angola or the Gulf of Mexico. The evolution of this practice can be traced back almost two decades. However, not all senior managers in other industries are convinced that big data and its analysis are relevant to them – particularly at the top of the organisation. Among board-level and C-suite respondents, the biggest barrier to making greater use of data and data analysis for big decision making is that it has limited direct benefit to their role (see Figure 7).

“Companies and governments are making strategic decisions to use big data, rather than using big data to make strategic decisions,” observes Mr Zhou of Haier. Fitting sensors to fridges is allowing companies like his to improve products and processes, but it is yet fundamentally to change the way senior managers take a major decision.

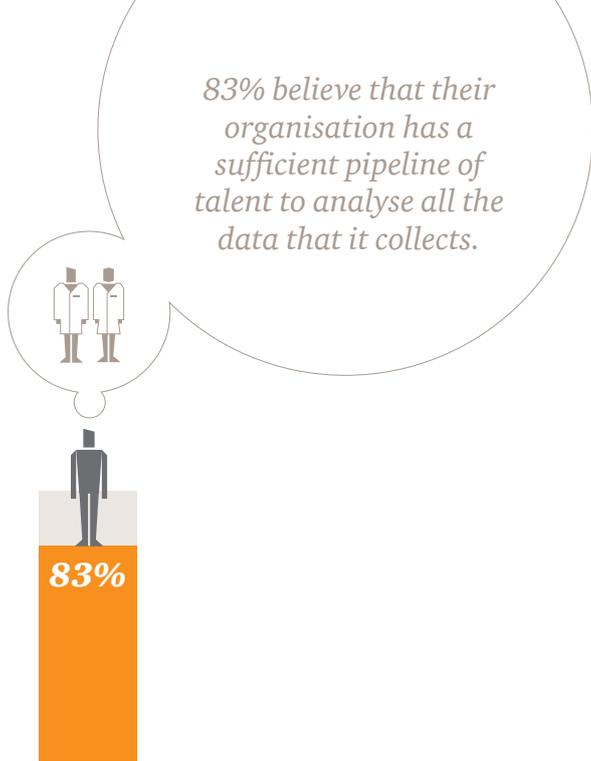
Figure 7

View from the top

Percentage of respondents



Source: Economist Intelligence Unit survey, May 2014



C-suite respondents are twice as likely as their more junior colleagues to rate the timeliness of data at their company as poor or fair.

Others share his view. Joe Peppard from the European School of Management and Technology conducts workshops with executives about data. He has seen no change at the C-suite level in how these executives make decisions and use data. There are several reasons why this may be the case. One is the nature of the strategic decisions being made by the management board. These typically one-off decisions, often made under time pressure, make it difficult – or just not possible – to build the systems, processes, and analytics to support them, particularly given the limited data available.

The timeliness of data may well be an issue. According to our survey, C-suite respondents are twice as likely as their more junior colleagues to rate the timeliness of data at their company as poor or fair. The contrast is most striking in North America, where more than half (54%) of C-suite executives give data timeliness a below-average rating, compared with just over one-fifth (22%) of non-C-suite respondents.

This suggests that data insights are often not on hand when the C-suite need to make a decision. “What will slow the use of big data for strategic decision making most significantly could be the inability of people to extrapolate insights at the same rate that the data are being collected – using them in a timely manner to make real-time decisions,” says Blake Cahill, chief digital officer of Philips, a Dutch electronics company.

War stories

One potential solution here – to recruit more data scientists – may not be the right one. Contrary to popular belief, the vast majority of executives (83%) believe that their organisation has a sufficient pipeline of talent to analyse all the data that it collects – spanning a low of 71% in the Middle East to a high of 86% in North America. This suggests that the battle to recruit talented data scientists is either inflated or being won.

Andrew Kasarskis, co-director of the Icahn Institute for Genomics and Multiscale Biology at Mount Sinai hospital health system in New York, says he has recruited a “critical mass” of data scientists. “Once you’ve got a critical mass, it’s easy to get more,” says Mr Kasarskis.

BP is beginning to use its own data scientists, who are experienced in analysing big data as it applies to seismic research, to test solutions to other problems across the business.

This healthy supply of talent is also evident in the public sector. The Mayor’s Office of Data Analytics in New York City does not have much difficulty attracting top data scientists. “We do not pay as well as the private sector, but we have the ability to get very close to problems that affect people’s lives and the capacity to do good and help people very quickly,” explains Nicholas O’Brien, the organisation’s chief of staff. “That’s very attractive to some people.”

Some industry experts acknowledge the existence of a talent war, but disagree about the stage it is moving towards. On the one side, Mr Reilly of Cloudera believes that having a sufficient supply of data scientists is a challenge that is being overcome pretty quickly – and not just through graduates coming out of universities. Part of Cloudera’s business is putting traditional business analysts, already adept at using data software such as Microsoft Excel, through a training programme on how to manage big data sets and extract fresh insights.

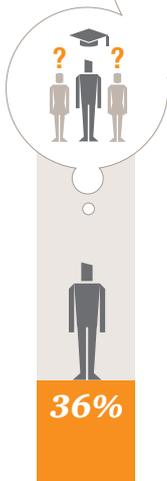
On the other side, Colin Mahony, vice-president and general manager of HP Vertica, believes that there will be a skills shortage – once businesses realise what they have been missing out on. “One of the challenges is that organisations don’t really know that they need these big data and analytical skills until there is a project where they see the benefits,” says Mr Mahony.

Head in the cloud

Ultimately, the biggest skills gaps could be at the top of the organisation. There is no reason, in principle, why data and analysis could not inform one-off decisions, such as a strategically significant M&A transaction (see *Cloudera’s big decision*, page 18). This, though, requires executives to know what questions they should ask of the data – and to have the inclination to do so.

Board or C-suite respondents to the survey were more likely to admit to lacking the sufficient skills or expertise to use big data for decision making than non-C-suite respondents (25% compared with 15%). In North America, this number reaches a regional high of more than one in three (36%) C-level respondents – double the figure (17%) for management one level down. An even larger grouping of North American C-suite (43%) executives believe their senior management colleagues lack sufficient skills or expertise – making it the biggest hurdle to overcome in that region.

36% of North American C-suite executives admit to lacking the sufficient skills to use big data for decision making.



The C-suite cohort is more likely to admit to having previously discounted data analysis that they did not understand than their non-C-suite colleagues.

“If you think about the demographics of the C-suite – apart from modern start-ups – their children understand the technology behind big data better than they do,” says Alan Gilchrist, lecturer in marketing, Lancaster University. “There is an issue here about nuancing the language and the ability to communicate internally to those in power about what we are really finding here. What are the marketing insights, what is the intelligence pointing to? There needs to be some work done on this.”

This view is supported by our survey. The C-suite cohort is more likely than their non-C-suite colleagues to admit to having previously discounted data analysis that they did not understand. Yet investment in executive training on interpreting data and data analysis techniques is not yet at the top of the corporate change agenda – even for companies that have changed big decision making to incorporate data and analysis.

Looking ahead, there is at least recognition that the skills required of management are changing: nearly three-quarters (72%) of the current C-suite believe that familiarity with data-driven decision making is a prerequisite for senior management. “The big data epoch is coming,” says He Cao, chairman of Franshion Properties. “We need to increase the amount of data that we collect, we need to discover the potential value of that big data, and we need to use it as a reference for big decisions.” Indeed, for many executives, the data era has already dawned.



Predicting impact of decisions: PwC perspective

Successful organisations don't just hire a small band of data scientists, they find smarter ways to connect their analytic fire-power to the front line. They find ways to rapidly predict the likely impact of their decisions at all levels.

John Studley
Australia Data and Analytics Leader, PwC

Franshion Properties' big decision

Industry: Property development

Company profile: Franshion properties is the real estate arm of Sinochem Group, a Chinese state-owned enterprise

Executive: He Cao, chairman

Big decision: Diversifying the business

Franshion is developing a formal procedure to optimise the “punctuality, accuracy and scientific basis” of its major decisions. This involves using data from various sources, including its customers. But the company has limited data to draw upon because of China’s relatively immature property market. “Data cannot satisfy the demands of the company to use it for big decisions,” says Mr He. “On the whole, the usefulness and timing of the data are obstacles to decision making.”

Sometimes, then, the chairman simply has to rely on his own experience. As a hedge against changing customer demands, made even more unpredictable by US and Chinese government moves to curtail cheap credit, Mr He decided to diversify the company’s business. Instead of just being a company investing purely in high-end projects, such as the 88-story Jin Mao Tower in Shanghai, it now develops water, gas and other infrastructure on greenfield land acquired from the government, which it then sells on to traditional property developers.



Jin Mao Tower, Shanghai

Executives know the right questions to ask. Now they need to know how to get the right answers from the data (and have the desire to do so).

Conclusion

Senior executives will be making a suite of big decisions over the next 12 months. Growth may be the focus, but the decisions with the highest value will be about shrinking existing businesses. Meanwhile, there will be a notable rise in collaboration between competitors as costs continue to be a top concern.

As a result, the reshaping of businesses kicked off by the global recession is set to continue. This should offer up plenty of opportunities, but these decisions will be taken in an uncertain economic environment – often as a reaction to changes beyond the decision maker's control.

The way these decisions will be made has changed over the last two years. More people have become involved, and a majority of firms have incorporated data and analysis in their decision making process. This has mostly been for the better, however potential pitfalls remain. Establishing clear decision rights and accountability is crucial. Similar discipline must be applied to the amount and type of data being collected and analysed to avoid overload.

Looking ahead, a sizeable number of companies plan to change decision making because of big data. For those businesses in industries that struggle to derive data insights from their products or services, or in regions where availability is an obstacle, technology developments such as the Internet of Things will counteract some of these impediments.

The hardest battle may be to convince senior executives at the top of an organisation that data and analysis can be a benefit to their role. Investments in the teams, tools and techniques needed to make use and sense of all the data together should lead to improvements here, including in the quality and timeliness of data, although a full complement of data scientists may not be enough. The analysis needs to be presented in a way that is accessible to business leaders – otherwise it runs the risk of simply being ignored.

Executives know the right questions to ask. Now they need to know how to get the right answers from the data (and have the desire to do so). Those who do not should consider learning how. Those who resist doing so will gradually be replaced, as the next generation of data-savvy executives and future senior managers come through. By the time this happens, most executives should be using big data to make strategic decisions – rather than the other way around.

The art of decision making, powered by science

Companies are using newly accessible data and analytic techniques to increase their decision making speed and sophistication. Here are four approaches that can turn decision making into a competitive advantage for your organisation.

1

Map decisions to shareholder value...

By pinpointing decisions that have the biggest impact on your future. Understand how data analytics can give you a competitive edge.

2

Link the strategic alternatives to the business impacts...

By simulating how mega trends, industry trends and your strategic alternatives affect your business and operating model.

3

Apply a value & results lens...

By quantifying the expected improvement in metrics associated with improving decision making.

4

Adopt a structured test & learn approach...

By specifying changes to the organisation, process, technology and culture that are needed to improve decision making. Pilot first, learn quickly and then scale.

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