KPMG

Building trust in analytics

Breaking the cycle of mistrust in D&A

KPMG International
Data & Analytics

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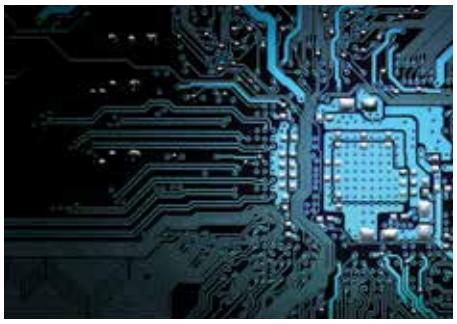
Contents









Foreword

Data and Analytics (D&A) holds the power to unlock untold value. But first you need to trust what it is telling you.

Our report shows that organizations do not fully trust their analytics. Just 38 percent have a high level of confidence in their customer insights. And only a third seem to trust the analytics they generate from their business operations. Yet the vast majority say these insights are critical to their business decision-making.

While trust in D&A is a significant challenge for organizations, few seem to be talking openly about it. That is why we developed this report. We wanted to shine a light on the trust gap that threatens every organization. We wanted to measure and benchmark the current level of trust in the market. And we wanted to understand what leading organizations are doing to improve the trust they have in their data and in their analytics.

We believe this report provides a very unique view into a fundamental challenge facing most organizations today. And we believe it creates a significant opportunity. Indeed, those that are able to overcome the trust gap quickly will be the ones that will be better-placed to make faster decisions, more accurately and with much greater confidence. Those will be the organizations that will win in the future.

I would like to thank the organizations that participated in this research, particularly Elizabeth Keyes of McKesson and Cindy Forbes of Manulife Financial Corp, for the time and insights they have invested into this report. I would also like to thank Imperial College, London and Microsoft for sharing their insights and perspectives.

To learn more about KPMG's perspective on Trusted D&A, I encourage you to contact your local KPMG member firm or any of the contributors listed at the back of this report.

www.kpmg.com/trust

Christian Rast
Global Head of Data & Analytics

About the research

KPMG International commissioned Forrester Consulting to examine the power of trust in data and analytics by exploring organizations' capabilities across four anchors of trust. More than 2,000 organizations from around the world participated in the survey. Leaders from KPMG, clients and alliance partners also contributed analysis and commentary to this study.

This report is part of KPMG's wider Trusted Analytics article series, which can be found online at kpmg.com/trust.

Executive summary

Data and analytics (D&A) increasingly shapes our world. Complex analytics are delivering better, faster decisions and this is driving rapid investment across all business sectors. Today, the impact of analytics goes far beyond organizational boundaries and underpins many of the most important decisions that we make as individuals and societies.

The trust gap

Given the power that it holds, trust in D&A should be a non-negotiable business priority. Yet our survey reveals that this may not be the case. In fact, 60 percent of organizations say they are not very confident in their D&A insights. Only 10 percent believe they excel in managing the quality of D&A. Just 13 percent say they excel in the privacy and ethical use of D&A and only 16 percent believe they perform well in ensuring the accuracy of models they produce.

Despite this clear worry about the trustworthiness of their D&A, 77 percent of organizations still say that their customers trust their organizations' use of D&A. Yet fewer than half are sure that their organizations actually track their customers' views on the use of D&A.

Our study also shows that levels of trust are lowest at the end of the D&A lifecycle, suggesting organizations may be struggling to implement D&A effectively and link it to positive business outcomes. The result is that few organizations understand whether their D&A models are actually achieving what was intended.

Strengthening the anchors of trust

We believe that organizations must think about trusted analytics as a strategic way to bridge the gap between decision-makers, data scientists and customers, and deliver sustainable business results.

In this study, we define four 'anchors of trust' (quality, effectiveness, integrity and resilience) which underpin trusted analytics. And we offer seven key recommendations to help executives improve trust throughout the D&A value chain.

We believe that strengthening the anchors of trust means identifying and closing the gaps in D&A and managing it across the organization. It is not a one-time communication exercise or a compliance tick-box. It is a continuous endeavor that should span the D&A lifecycle from data through to insights and ultimately to generating value.

> Trust (noun) \'trəst\
>
> — assured reliance on the character, ability, strength, or truth of someone or something
>
> *Merriam-Webster*

Building trust in analytics — breaking the cycle of mistrust in D&A

D&A underpins competitive advantage

To know your customers

D&A is integral to understand:

How products are used – **70%**
Existing customers – **69%**
New products and services to develop – **67%**

To streamline existing operations

D&A is integral to understand:

Business performance – **71%**
How to drive process and cost efficiency – **68%**
How to drive strategy and change – **70%**

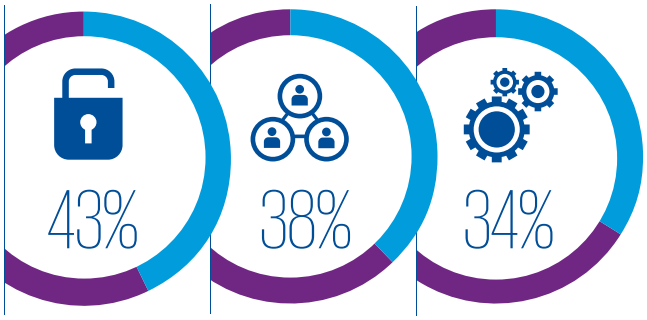
To manage risk and compliance

D&A is integral to understand:

Fraud – **70%**
Business risks – **67%**
Compliance with regulations – **70%**

Trust in D&A is lacking

Few organizations are very confident in their D&A insights



D&A for risk and security

D&A for customer insight

D&A for business operations

Only

51%

of respondents believe their C-suite executives fully support their organization's D&A strategy.

Why D&A trust matters

Making decisions or targeting consumers based on **inaccurate predictions** will quickly **erode**, if not extinguish, **consumer trust** and shake the confidence of those executives who rely on these predictions to make informed decisions.

70%

agree that D&A will expose them to reputational risk.

The four anchors of trusted analytics

Few firms achieve best practice across all anchors of trust:

- Only 10 percent of organizations believe that they excel in quality of data, tools and methodologies.
- Only 13 percent believe they excel in the privacy and ethical use of D&A.
- Less than one-fifth (16 percent) believe they perform well in ensuring the models they produce are accurate.

Base: 2,165 data and analytics decision-makers
Source: a commissioned study conducted by Forrester Consulting on behalf of KPMG, July 2016

Next steps: master trusted analytics

Get the basics of D&A trust right: assess your trust gaps and identify priorities

Purpose: clarify and align goals, measure performance and impact

Raise awareness: increase internal engagement

Expertise: build internal D&A culture and capabilities as your first guardian of trust

Transparency: open the 'black box' to a second set of eyes — and a third

360 degree view: look at ecosystems, portfolios, and communities

Innovation: enable experimentation, build an innovation lab

Perspective:

Trust. Facilitating success for tomorrow's data-driven society.

The view from **Sander Klous**, Partner, KPMG in the Netherlands

We need to find ways to establish societal trust in how organizations operate in the emerging data-driven society. The simple reality is that we are moving quickly into a world in which our behavior and decisions are heavily impacted by systems fueled by data.

The question is: can we trust these systems? Do they really act with our best interests in mind? How can we, as a society, maintain trust in what organizations do with data and analytics? Will we be able to proactively take the necessary measures to avoid a trust crisis?

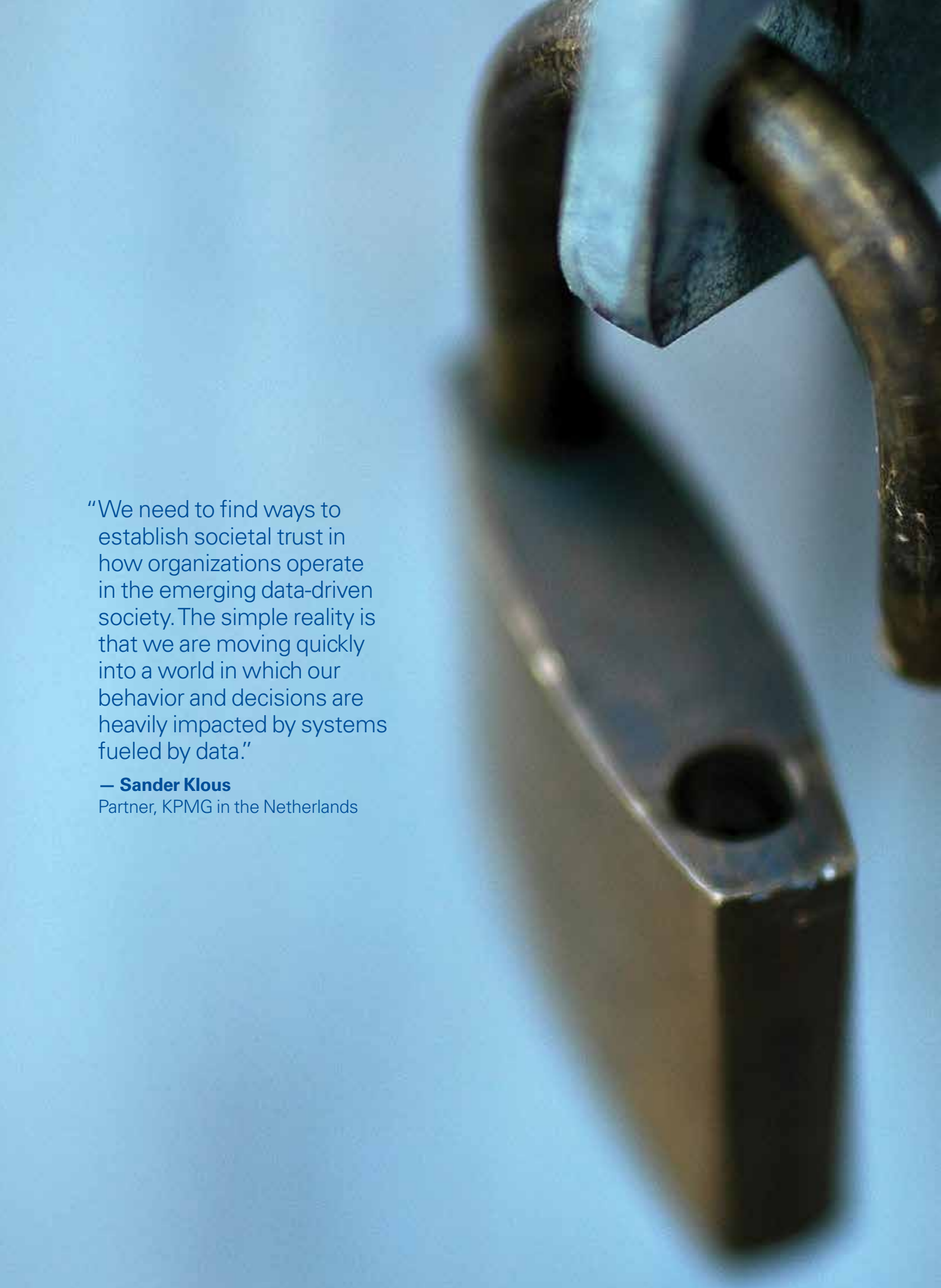
For example, our navigation systems determine how we drive from point A to point B without us questioning the route. In some ways we are being guided by an invisible wire. In fact the wiring is currently not quite invisible. We all get annoyed when our navigation system doesn't know that a road is closed or when we see the same advertisement for our holiday getaway popping up on our screens for months after we get back. These are the moments when the wire becomes visible. It makes us aware that our behavior is impacted in ways we don't appreciate. In time, these moments will disappear. The more such systems learn about us, the better they can predict our needs and make decisions on our behalf. The smarter these systems become, the more we will be guided by algorithms without even noticing it.

The danger we face is that companies may start to lose sight of their customers' best interests and of the societal benefits of their D&A. And this will create significant challenges for those organizations that do lose their way.

In my opinion audit firms could play a key role in creating the oversight and transparency required for trusted analytics, just as they have done in the domain of financial reporting for more than a century. They could become the watchdogs of our increasingly complex D&A ecosystems.

Moving into this role requires vision and guts. We should share our ideas openly with the community, accept constructive feedback and be willing to enter the discussion. The KPMG D&A team has started that journey by publishing our own good practices on D&A under an open source license. These good practices include ideas on transparency, privacy by design and decentralized trust models.

There's no simple, straightforward solution for trusted analytics and it's definitely not an easy road forward. And the stakes are high: we cannot afford to simply wait and see how things play out in a world that is increasingly driven by data. In the Netherlands we have a saying for this: trust comes on foot and leaves on horseback.



"We need to find ways to establish societal trust in how organizations operate in the emerging data-driven society. The simple reality is that we are moving quickly into a world in which our behavior and decisions are heavily impacted by systems fueled by data."

— Sander Klous
Partner, KPMG in the Netherlands

Why we are talking about trusted analytics

Today, complex analytics underpin many important decisions that affect us as individuals, as businesses and as societies. Biased, gut feel and subjective decision-making is being replaced by objective, data-driven insights that allow organizations to better serve customers, drive operational efficiencies and manage risks.

Yet with so much now riding on the output of data and analytics, significant questions are starting to emerge about the trust that we place in the data, the analytics and the controls that underwrite this new way of making decisions. We see four key drivers for this growing interest in trust:

1. **Analytics are becoming increasingly integral to business decisions**

   Our study confirmed that D&A is now central to business decision-making, particularly in areas that drive new growth (such as helping to better understand customers and creating new customer experiences), improve productivity (e.g. streamlining operations) and manage risk, particularly fraud.

To support their decision-making, organizations are adopting a number of types of analytics, from traditional BI to real-time analytics and machine learning. Of the organizations surveyed, 50 percent say they have adopted some form of predictive analytics and 49 percent say they use advanced visualization, beyond traditional static charts and graphics.

"Our overall data and analytics objectives are to partner with the business to enable analytics through people, data and technology that deliver insights that drive value creation and competitive advantage. Ultimately, D&A will become a key source of innovation for McKesson."

— Elizabeth Keyes,
Vice President, mDNA (McKesson Data and Analytics)

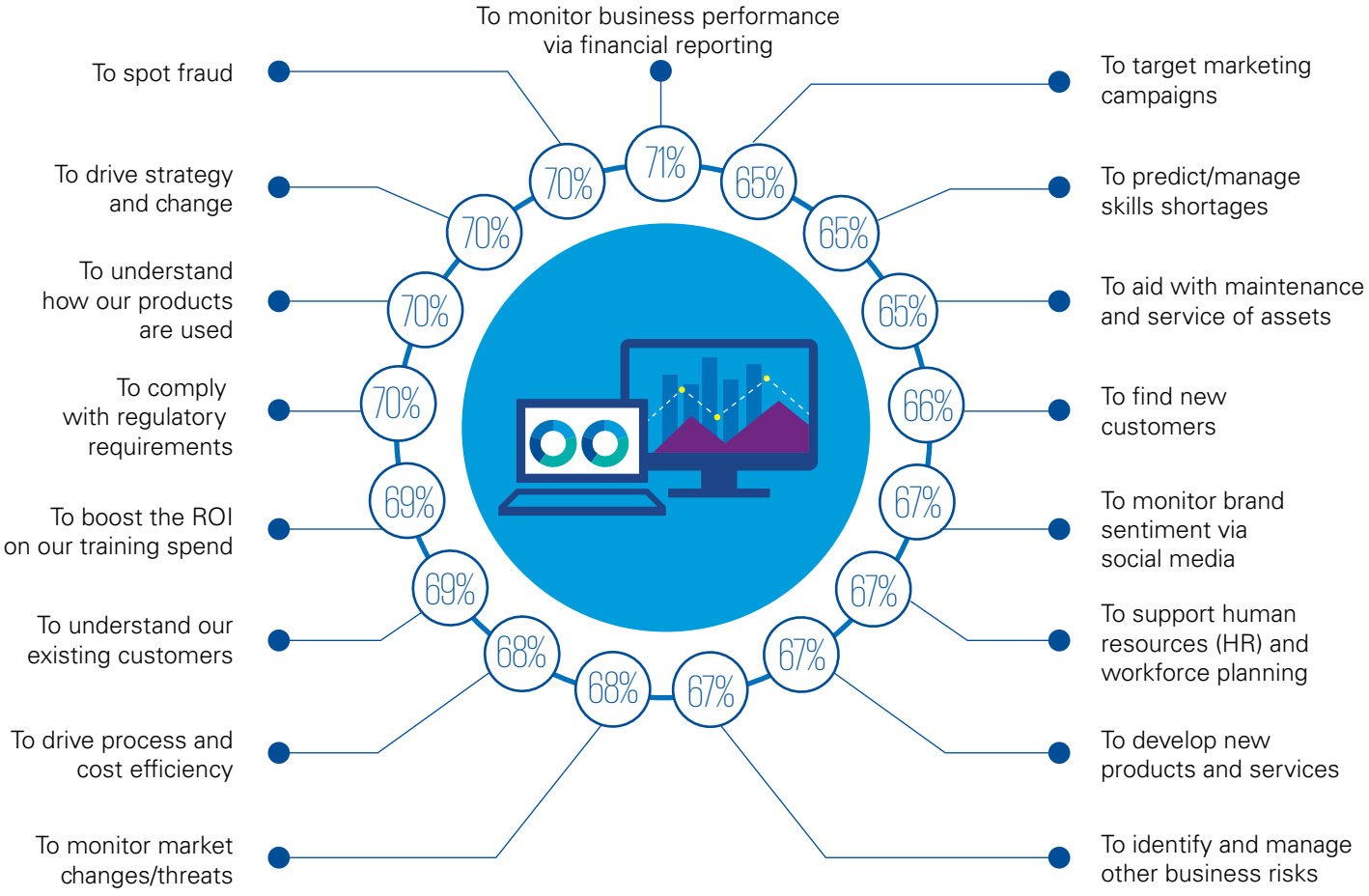
"You have no choice but to use data to drive insights. In large organizations that operate across multiple locations serving different customers, you have to rely on data to make better decisions. There is no other way. With so many different variables, you cannot rely on your gut instinct anymore."

— Analytics and IT director at a US healthcare provider

Figure 1: A growing reliance on data and analytics

How integral are data and analytics in helping your organization to make decisions in the following areas?

Note: Percentage of respondents that answered 'integral to all decision-making'



Base: 2,165 data and analytics decision-makers

Source: a commissioned study conducted by Forrester Consulting on behalf of KPMG, July 2016

"Today, organizations are taking a more holistic and progressive approach to D&A which requires more sophisticated tools. For example, in the financial services sector in China, we are finding that organizations are integrating D&A tools and platforms with their core systems in order to assess more complex areas like financial and operational risk simultaneously."

— Torsten Duwenhorst
Partner, KPMG in China

2. Lives depend on analytics

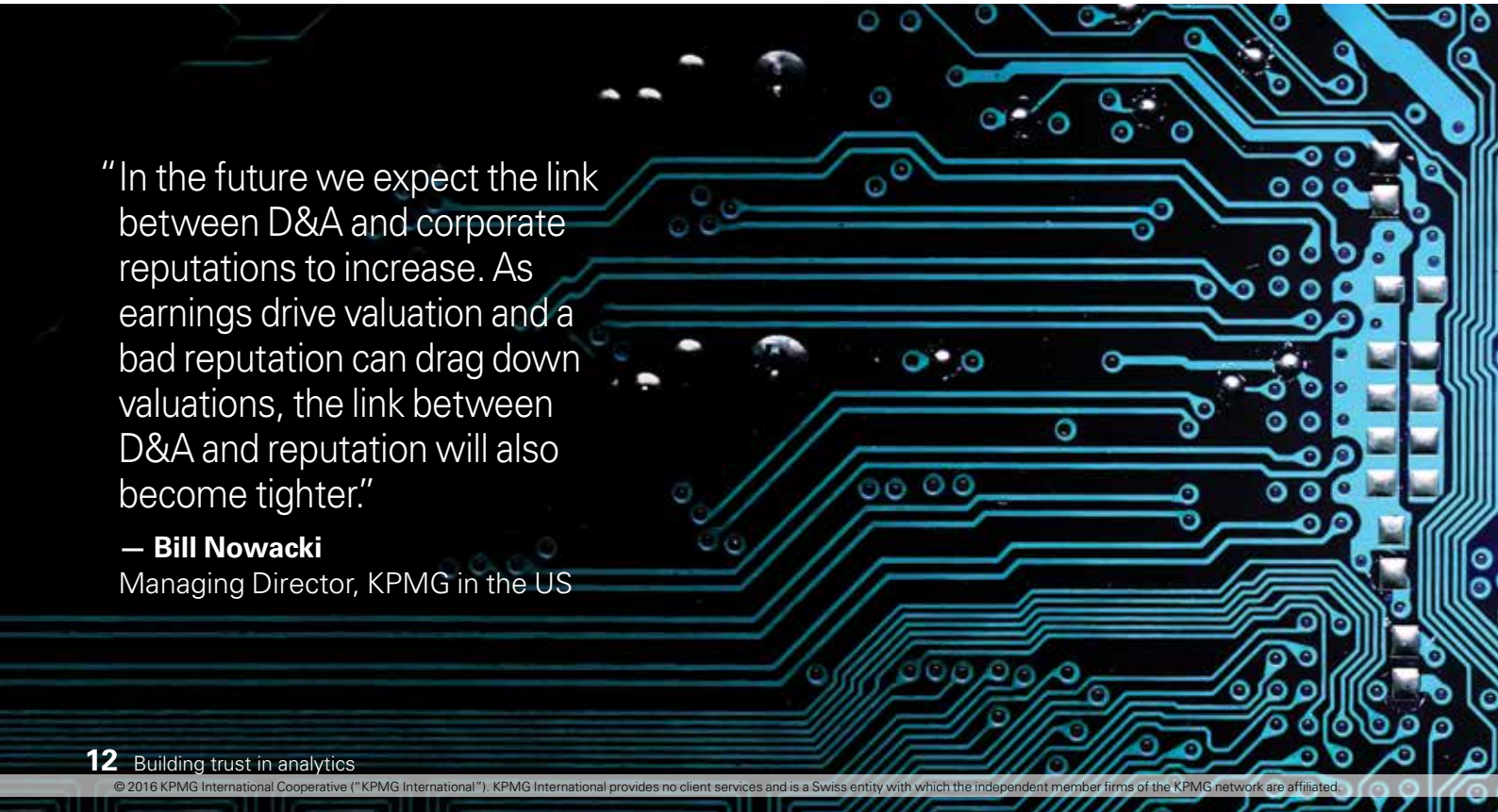
Analytics increasingly influence behaviors, drive decisions and have consequences at an individual level. Algorithms that support critical decision-making in areas such as healthcare, insurance, banking, fraud, autonomous vehicles, national infrastructure and security, for example, could have lifelong consequences for individuals. Not surprisingly, businesses and consumers are increasingly aware of the trust they place in the algorithms that make decisions on their behalf.

Even in relatively low-risk business applications, customers and executives need to trust their analytics. Organizations that target consumers based on inaccurate predictions, for example, will quickly erode (if not extinguish) consumer trust and shake the confidence of those executives who rely on these predictions to make informed decisions.

3. 'Black boxes' are hard to trust

Algorithms are not physical machines you can pull apart. Indeed, the internal workings of algorithms and models are largely hidden. Even within organizations, most analytics are effectively 'black box' systems that are too opaque to be verified by most individuals.

At the same time, the D&A ecosystem is also becoming increasingly complex as more players and third-party providers play a role in the value chain. This lack of transparency can create suspicion, misplaced trust and unseen risks which can have a wider impact on society.



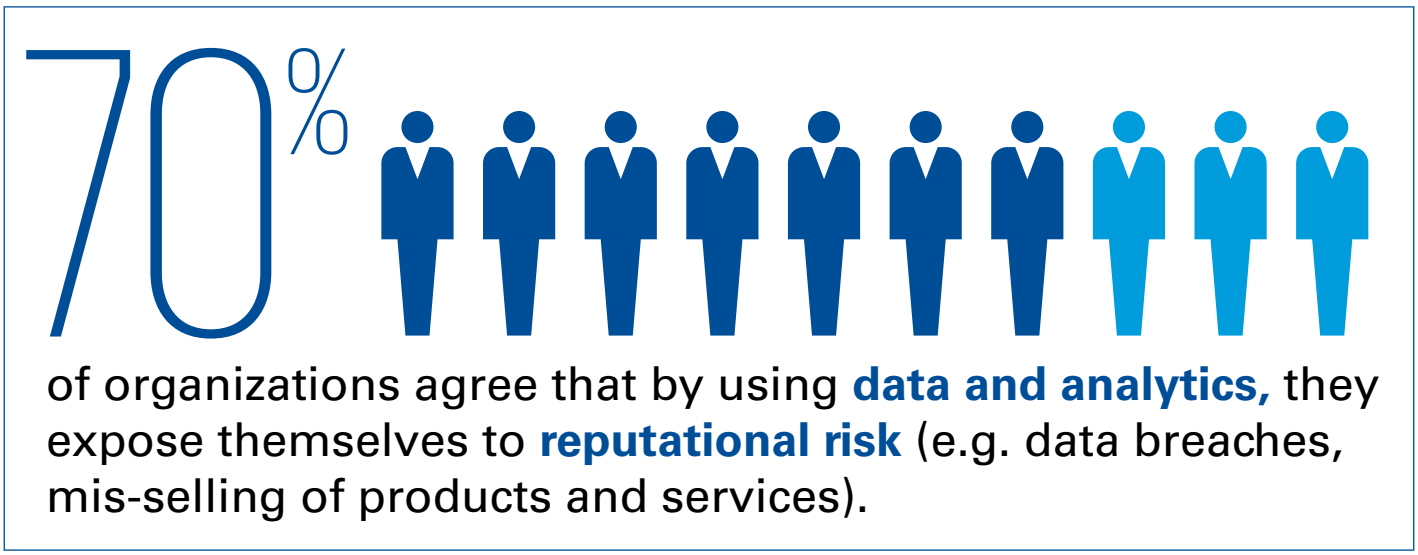
"In the future we expect the link between D&A and corporate reputations to increase. As earnings drive valuation and a bad reputation can drag down valuations, the link between D&A and reputation will also become tighter."

— Bill Nowacki
Managing Director, KPMG in the US

Figure 2: A growing exposure to risk

How strongly do you agree or disagree that by using data and analytics we expose ourselves to reputational risk?

Percentage of respondents who agreed or strongly agreed



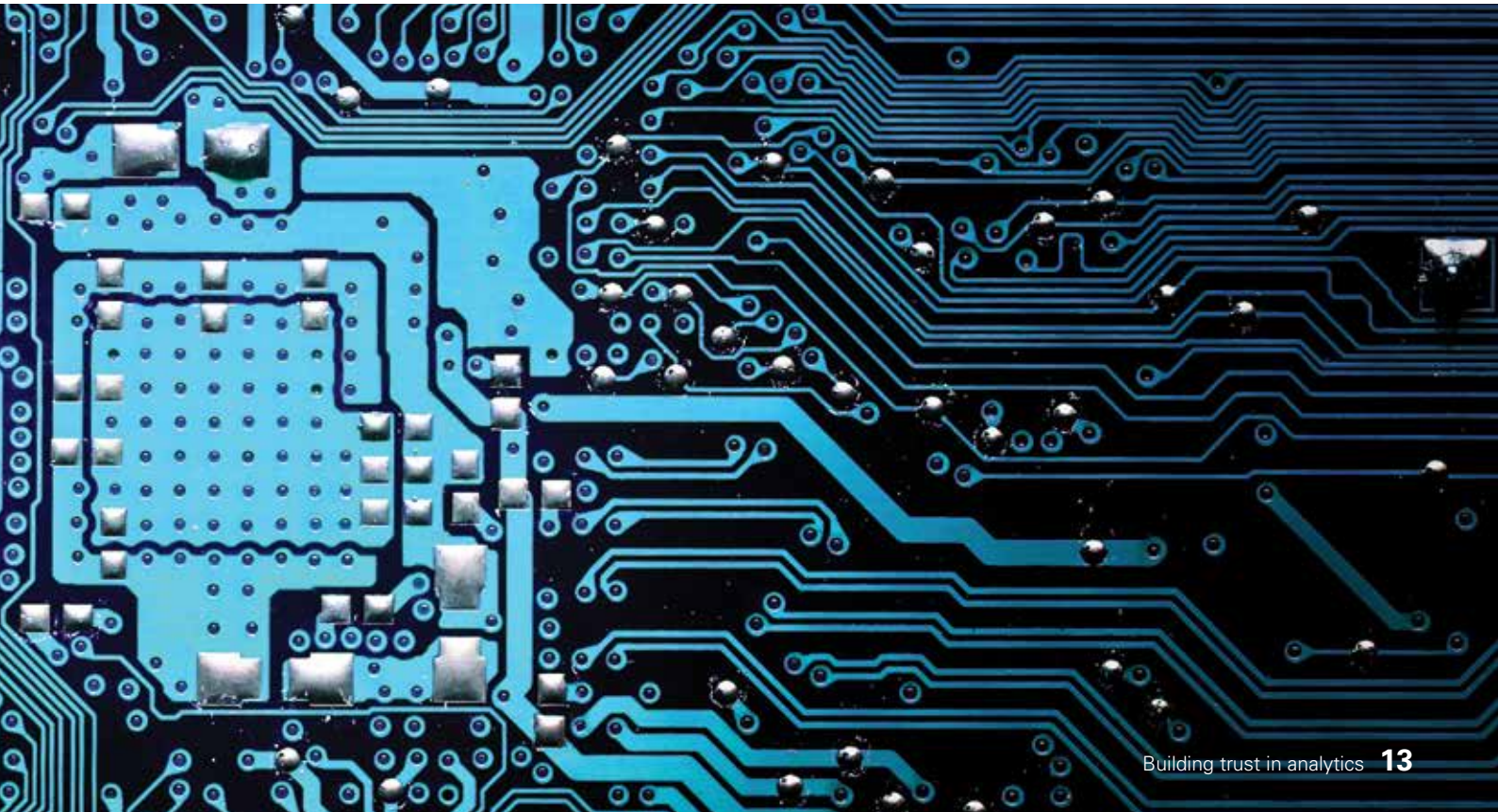
Base: 2,165 data and analytics decision-makers

Source: A commissioned study conducted by Forrester Consulting on behalf of KPMG, July 2016

4. Use of D&A increases reputational risk

Reputational risks are rising as organizations and individuals shift more of their decision-making to algorithms and hidden analytics. There are clear commercial risks if customers, investors or regulators do not believe D&A is being used in a way that is considered valuable or appropriate, for example, by not protecting against data breaches or the miss-selling of products and services.

Organizations recognize the link between their reputations and their use of D&A. In fact, 70 percent of our respondents say that by using data and analytics, they expose themselves to reputational risk.



The trust gap

Despite significant investments in a broad range of D&A tools and techniques, our survey suggests that organizations lack confidence in their ability to infuse analytics into their business processes and customer experiences.

Just 34 percent of respondents say they have a high level of confidence in their operational D&A. Around the same number (38 percent) voice a high level of confidence in the D&A that drives their customer insights. Trust is higher in risk and security-related D&A, yet still only 43 percent voice a high level of confidence in this area.

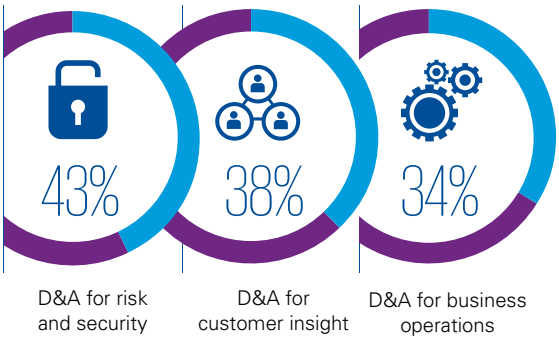
If executives believe that D&A is integral to risk and security, customer insight and business operations, what is driving this lack of confidence?

Our experience suggests that there are likely several drivers. Decision-makers may know that they don't know enough about analytics to feel confident in their use. They may be suspicious of the motives or capabilities of internal or external experts. They may subconsciously feel that their successful decisions in the past justify a continued use of old sources of data and insight, a form of cognitive bias.

Figure 3: Confidence lacking

For each of the functions for which you use data and analytics, how confident are you in the insights gained?

Note: The following shows the percentage of respondents who reported being very confident in their D&A insights.



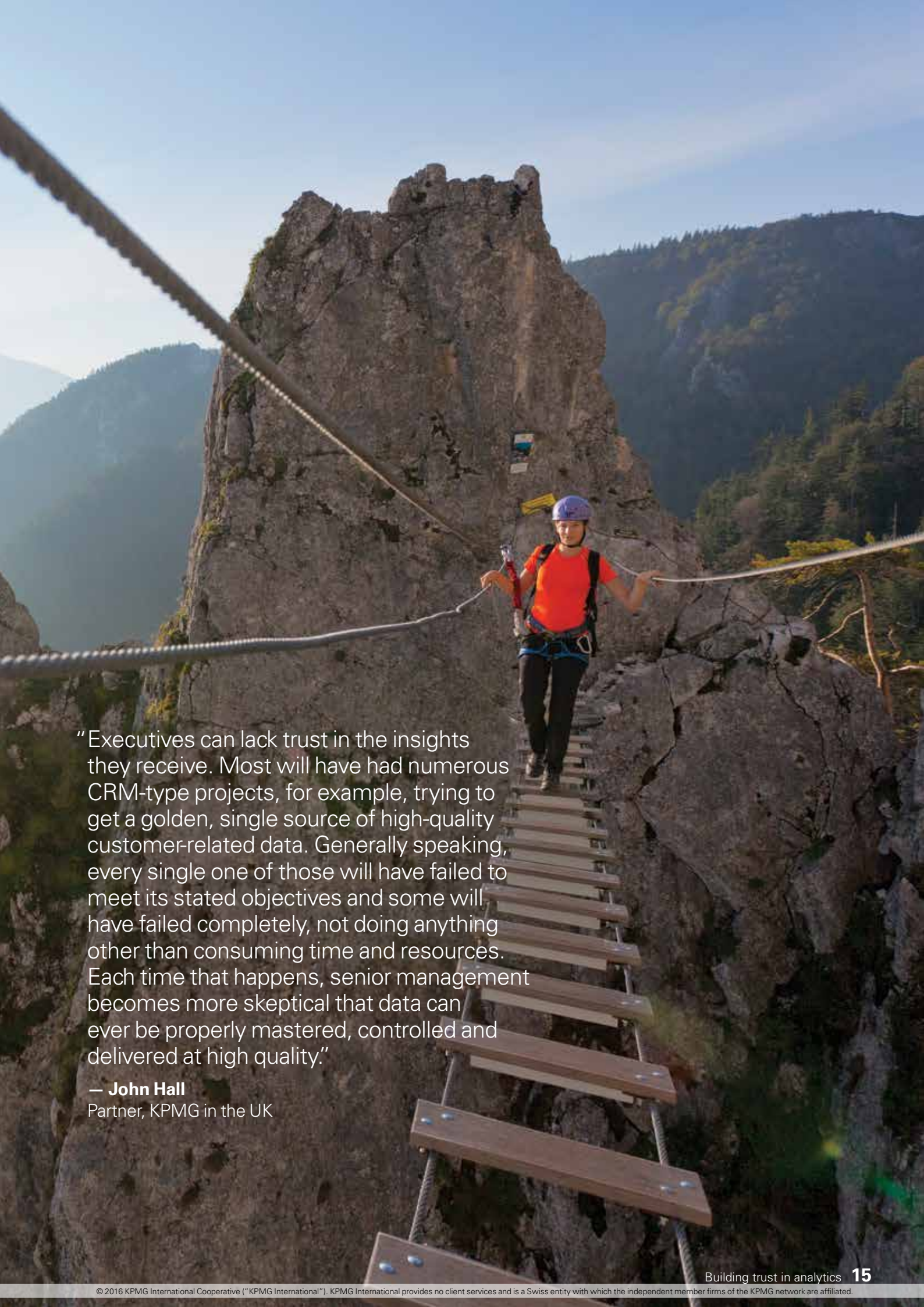
Base: 2,165 data and analytics decision-makers

Source: a commissioned study conducted by Forrester Consulting on behalf of KPMG, July 2016

Bulls and bears: confidence varies across sectors and geographies

US organizations are more confident in their insights than other markets (only half of US respondents voice high levels of confidence across all three areas), while French organizations are least confident overall. No more than a quarter of French organizations say they are very confident across all three areas.

Insurance organizations demonstrate higher levels of confidence for security and risk (47 percent versus 43 percent overall), while retailers demonstrate higher levels of confidence for D&A insight on customers (42 percent versus 38 percent overall).



"Executives can lack trust in the insights they receive. Most will have had numerous CRM-type projects, for example, trying to get a golden, single source of high-quality customer-related data. Generally speaking, every single one of those will have failed to meet its stated objectives and some will have failed completely, not doing anything other than consuming time and resources. Each time that happens, senior management becomes more skeptical that data can ever be properly mastered, controlled and delivered at high quality."

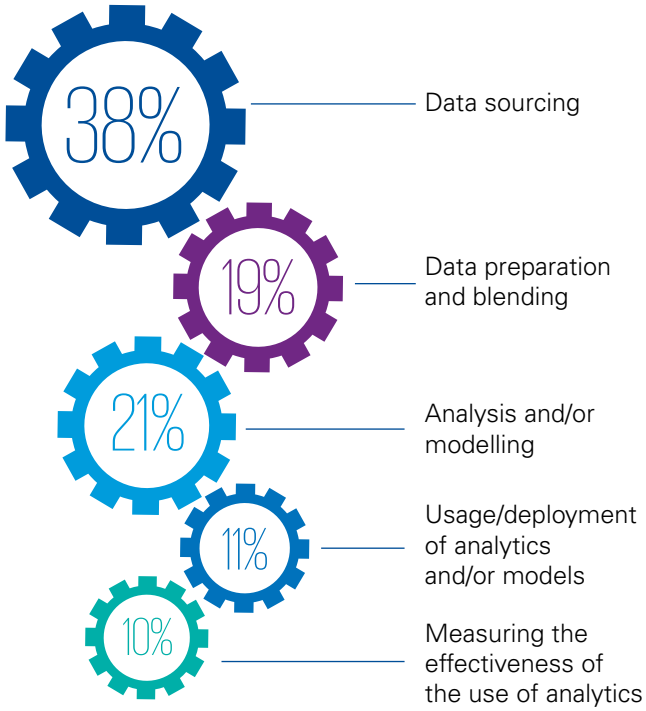
— John Hall
Partner, KPMG in the UK

"One of the reasons executives are reluctant to commit the resources to do all of this is because they don't know if they trust the data. They don't know if they trust the people that are going to do the analysis. It gets really complicated from a governance perspective."

— Dr. Mark Kennedy
Associate Professor of Organizational, Behavior and Strategy, and Director of the KPMG Centre for Business Analytics at Imperial College Business School

Figure 4: Starting strong

In which stage of the analytics lifecycle do you have the most trust?



Base: 2,165 data and analytics decision-makers
Note: responses do not add to 100% due to rounding
Source: a commissioned study conducted by Forrester Consulting on behalf of KPMG, July 2016

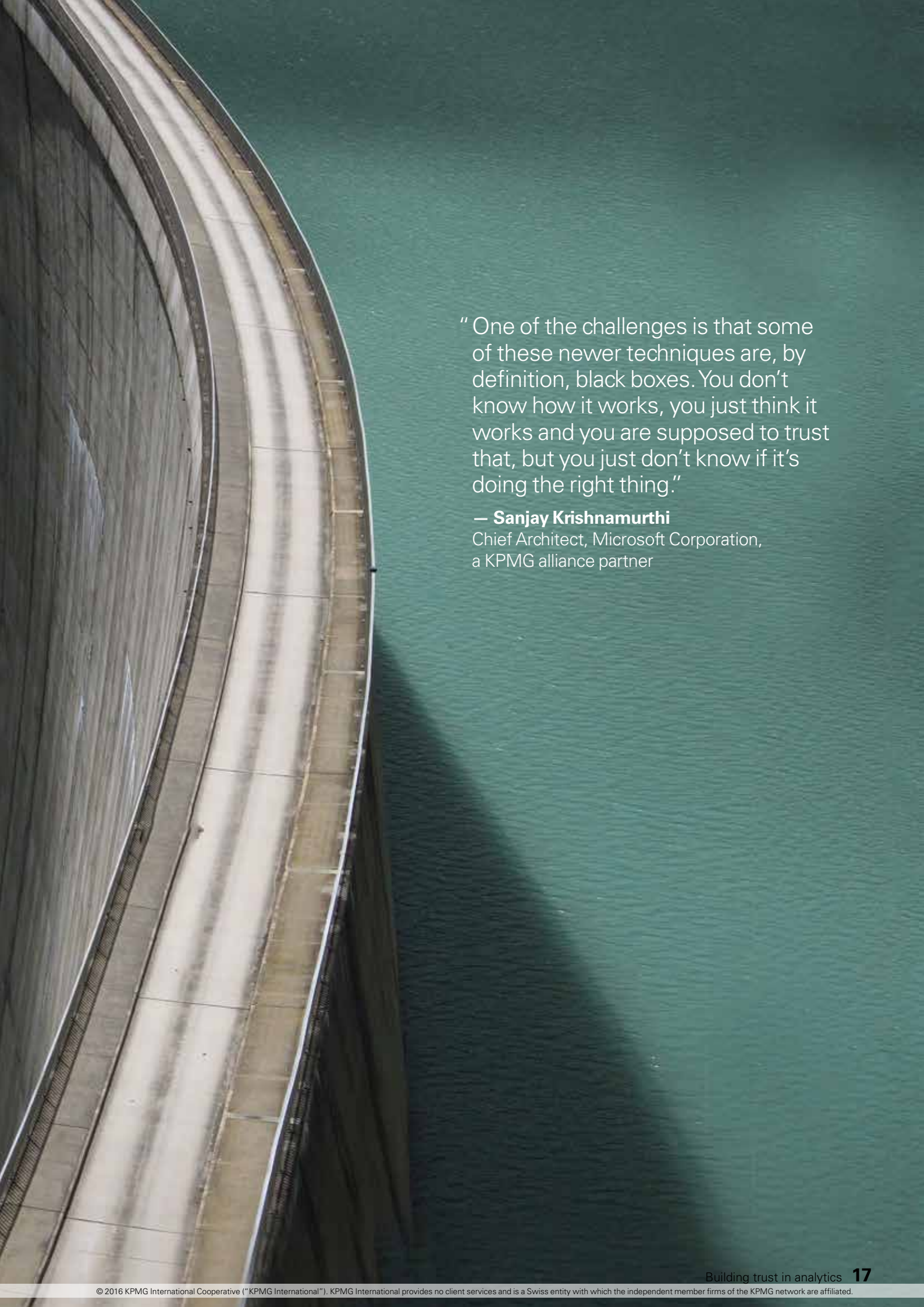
This lack of confidence can start from the top and trickle down into the organization. In fact, our survey shows that only just over half (51 percent) of respondents believe that their C-level executives fully support their organization's D&A strategy.

Our survey also found that trust varies across the D&A lifecycle. Interestingly, trust is strongest at the beginning of the cycle (at the data sourcing stage), but falls apart when it comes to implementation and the measurement of its ultimate effectiveness. This means that organizations are unable to attribute the effectiveness of D&A to business outcomes which, in turn, creates a cycle of mistrust that reverberates down into future analytical investments and their perceived returns.

We also compared organizations with different levels of D&A maturity to investigate whether greater maturity seems to increase trust or indeed whether trust drops when faced with the realities of complex D&A implementation. Despite different levels of investment, our survey suggests that more sophisticated D&A tools do little to enhance trust across the analytics lifecycle. The trust gap cannot be closed by simply investing in better technology.

Insights from KPMG's CEO Outlook Study

Our data decision-makers are aligned with their CEOs' D&A needs. KPMG's 2016 Global CEO Outlook survey revealed that nearly half of CEOs are using D&A to drive process and cost efficiency as well as drive strategy and change.



"One of the challenges is that some of these newer techniques are, by definition, black boxes. You don't know how it works, you just think it works and you are supposed to trust that, but you just don't know if it's doing the right thing."

— Sanjay Krishnamurthi
Chief Architect, Microsoft Corporation,
a KPMG alliance partner

The four anchors of trusted analytics

Most people have a similar instinct for what 'trusted data and analytics' means in both their work and their home lives. They want to know that the data and the outputs are correct. They want to make sure their data is being used in a way they understand, by people they trust, for a purpose they approve and believe is valuable. And they want to know if something is going wrong. But very often, none of these facts are particularly clear and there are no assurances.

Trust in analytics, like trust in products or people, is often driven by a combination of two things: its *perceived* trustworthiness and evidence of its *actual* trustworthiness.

Neither are easily assessed. And while our survey focuses on perceived trustworthiness, we also recognize that trust is ultimately driven by actual trustworthiness, based on performance and impact.

'Trusted analytics' is not a vague concept or theory. At its core are rigorous strategies and processes that aim to maximize trust. Some are well known but challenging, such as improving data quality and protecting data privacy. Others are relatively new and undefined in the D&A sphere, such as ethics and integrity.

"In a data-centric world, perception and reality around trust in data and analytics will start to converge, and customers will gravitate to organizations that can demonstrate trustworthiness in practice."

— Paul Tombleson
Partner, KPMG in the UK

"A firm's first line of defense is to build its own team and its own capability because part of trusting is understanding, and it's going to be hard to have people understand if they don't have the technical capabilities."

— Brad Fisher
Partner, KPMG in the US

We believe that organizations should take a systematic approach to trust that spans the lifecycle of analytics and is founded on four key anchors of trust:

1. **Quality.** Are the fundamental building blocks of D&A good enough? How well do organizations understand the role of quality in developing and managing tools, data and analytics?
2. **Effectiveness.** Do the analytics work as intended? Can organizations determine the accuracy and utility of the outputs?
3. **Integrity.** Is the D&A being used in an acceptable way? How well-aligned is the organization with regulations and ethical principles.
4. **Resilience.** Are long-term operations optimized? How good is the organization at ensuring good governance and security throughout the analytics lifecycle?

We believe that each anchor of trust is relevant throughout the D&A lifecycle, from data sourcing, to data preparation and blending, to analysis and modeling, to usage and deployment and finally through to measuring effectiveness and back to the beginning of the cycle.

In our survey, we asked organizations how they measured against each of the trust anchors. What we found was that almost all organizations need to close several D&A capability gaps.

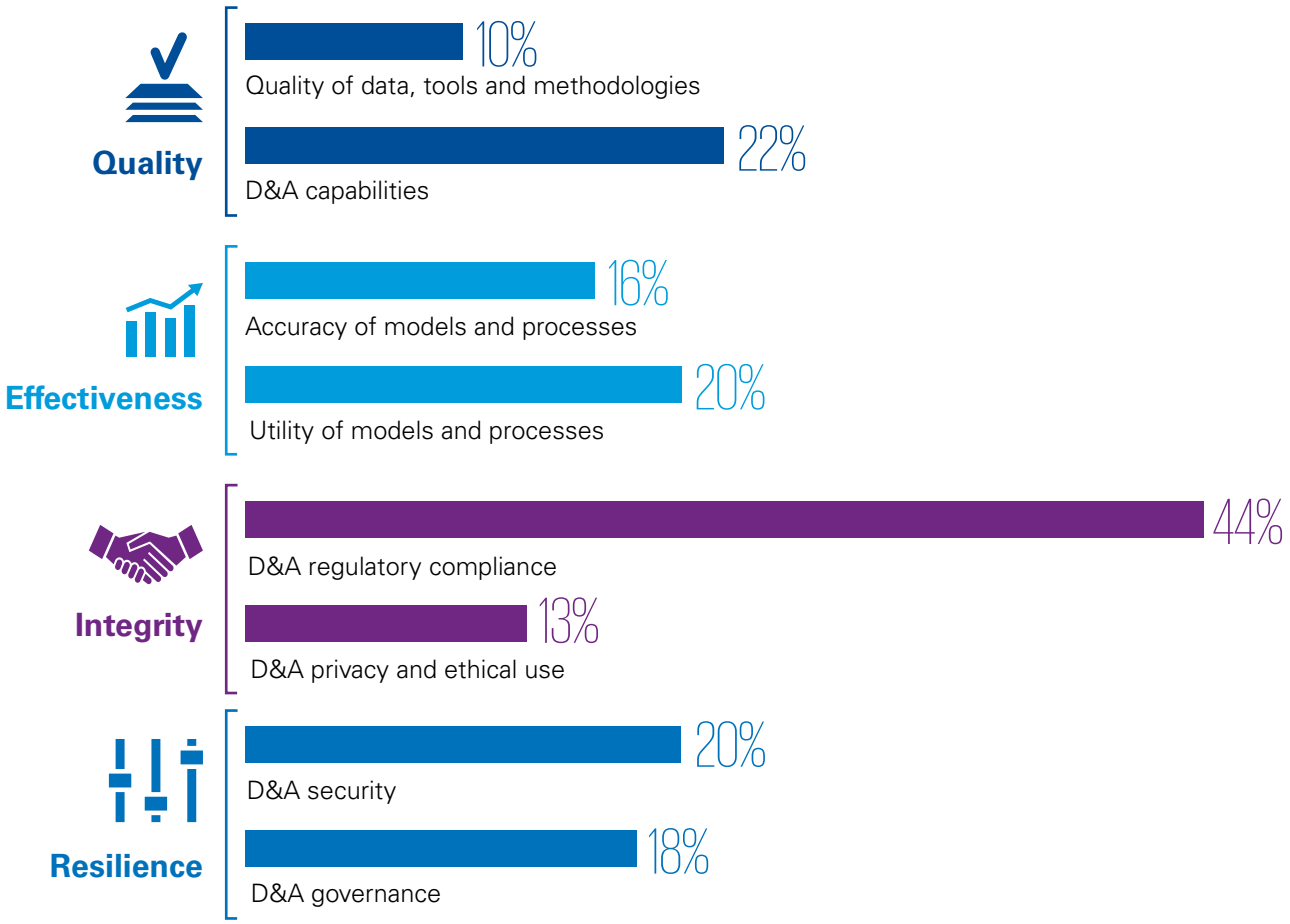
In fact, with the exception of D&A regulatory compliance (where organizations tended to perform strongest), the vast majority struggle to achieve excellence across each of the D&A anchors. Just one in 10 respondents say they excel in developing and managing D&A. Only 13 percent say they excel in the privacy and ethical use of D&A. And less than a fifth (16 percent) think they perform well in ensuring the accuracy of models they produce.

Figure 5: The four anchors of trusted analytics

Figure 6: How strong are your anchors of trust?

How well does your organization align with best practice in each trust anchor?

The following shows the percentage of respondents who selected 'describes our approach exactly' for **all** of the capabilities explored under the D&A trust anchor.



Base: 2,165 data and analytics decision-makers

Source: a commissioned study conducted by Forrester Consulting on behalf of KPMG, July 2016

In the following sections, we explore each of the anchors in more detail, highlighting what 'good' looks like within each of these anchors, as well as identifying where gaps exist today.

Anchored and adrift: capabilities vary around the world

US and Brazilian organizations report the highest capabilities across the four anchors of trust. However, organizations in Canada, China, France and South Africa all struggle with developing and managing D&A (less than 6 percent in each of these markets say they achieve excellence, versus 10 percent globally).

Quality (noun) /\'kwä-lə-tē\

— a high level of value or excellence

Merriam-Webster

Anchor No. 1 Quality

What does D&A quality mean?

Quality is the trust anchor most commonly cited by internal decision-makers. Most organizations understand and struggle with data quality standards for accuracy, completeness and timeliness. As data volumes increase, new uses emerge and regulation grows, the challenge will only increase. Everybody recognizes that at some level, all analytical models are 'wrong' and not a perfect reflection of reality. But where does it matter most?

In order to drive quality in D&A, organizations need to ensure that both the inputs and development processes for D&A meet the quality standards that are appropriate for the context in which the analytics will be used. In many organizations, questions are raised about choice of data sources and data 'lineage' (i.e., where the data originated and what process it took to arrive as input data to a system or decision engine).

Where are the key gaps in D&A quality?

Our survey investigated organizations' confidence in capabilities which underpin quality, including:

- the appropriateness of their data sources
- the quality of their data sources
- the rigor behind their analytics methodologies
- how multiple sources of data are blended together
- the consistency of the D&A processes and practices
- the skills and knowledge of data analysts and data scientists
- their alignment with industry D&A best practices and standards.

"Our biggest challenge is access to data on a timely basis from our legacy systems. We are looking at building an enterprise-wide data platform that would give us easier access to data and a better ability to explore data."

— Cindy Forbes
Executive Vice President & Chief Analytics Officer, Manulife Financial Corporation

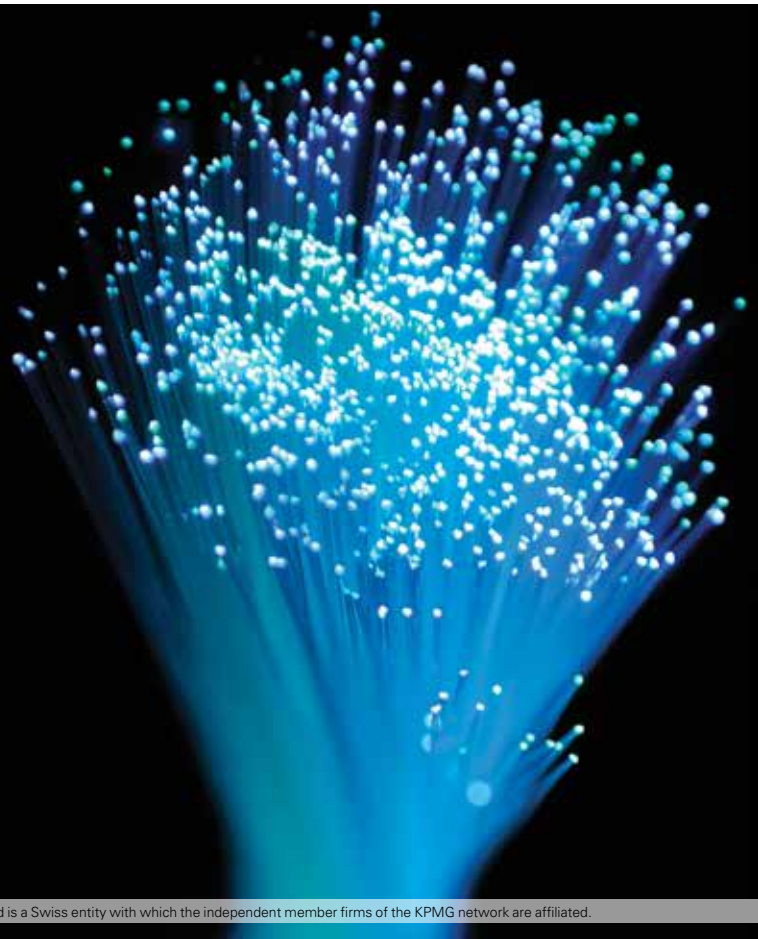
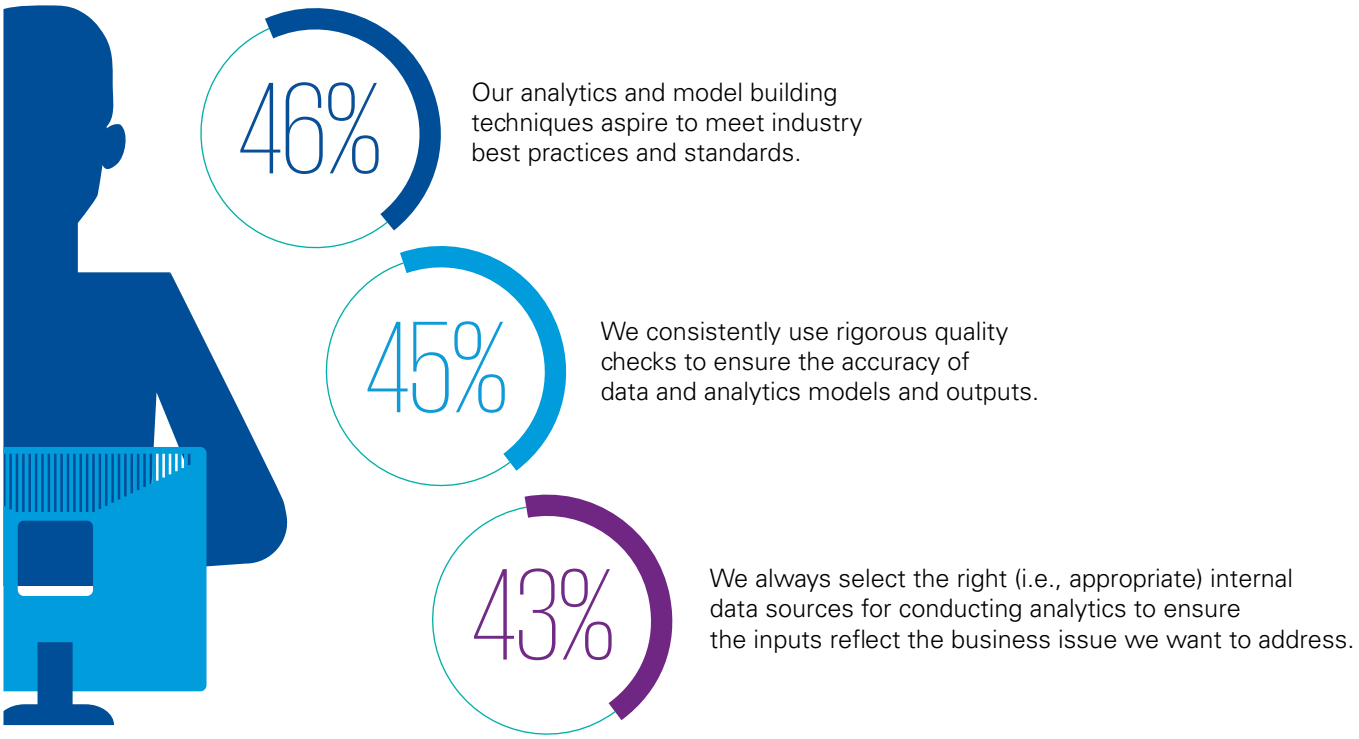


Figure 7: Not up to standard

Please indicate the extent to which the following statements describe your organization's current approach to developing and managing data and analytics.

Note: The following shows the percentage of respondents who selected 'describes our approach exactly'.



Base: 2,165 data and analytics decision-makers
Source: a commissioned study conducted by Forrester Consulting on behalf of KPMG, July 2016

According to our survey, less than 40 percent of analytics teams work with business partners to set objectives up front. This means that many analytics teams may be working in their own silos without truly linking their activities back to business outcomes. We also heard that legacy technologies are holding organizations back.

At the same time, our respondents also note a recognized gap in D&A skills, with just 47 percent of organizations saying their data analysts have the right skills to continuously push forward with D&A. We believe that as new and more sophisticated analytics techniques are deployed, this skills gap will only grow.

Respondents also admitted a number of other potential gaps that influence D&A quality. For example, just 45 percent of organizations say they rigorously check the quality of their data and even fewer believe that they always select the right internal data sources.

"The biggest challenge is probably input quality. Finding information is quite difficult at times. There's so much of it out there and getting access to it isn't as straightforward as it should be. And when we do get access to it, sometimes it has missing data or incomplete data that means we can't use it without having to spend a long time cleaning it first."

— Analytics leader at a large US bank

Leaders and laggards: a closer look at D&A quality

The US again emerged in the lead with 53 percent of respondents saying they validate the models they generate with third parties and more than 60 percent voicing confidence in the capabilities of their data analysts. However, only 37 percent of French organizations and 38 percent of German organizations say they use rigorous quality checks on D&A and less than 40 percent of organizations in Canada, China, France, Germany and South Africa say they always select the right internal data for conducting analytics.

Financial services organizations stood out with 49 percent highlighting that they use third-party experts to validate and audit their models. Fifty-three percent say they have the right D&A skills within their organization (versus 47 percent overall). Telecommunications respondents also stood out in some areas: 45 percent say their analytics teams work with business owners to define specifications clearly and comprehensively upfront, versus 38 percent overall.

How does D&A quality influence trust?

The quality of analytics poses huge potential trust issues. Statistical and algorithm design, model development approaches and quality assurance are becoming critical. In particular, organizations are struggling to assess quality in scenarios in which the impact of low quality can be high or where there is no known right answer with which to compare the output of a new decision engine.

There are many examples of inadvertent quality issues which have had massive knock-on impacts for individuals, organizations, markets and whole economies. And as analytics move into critical areas of society, such as decision engines for drug prescribing, machine learning 'bots' as personal assistants and navigation for autonomous vehicles, it seems clear that D&A quality is now a trust anchor for everyone.

"A key take-away for us was ensuring we had the proper resources. We recently hired a data governance director and it was one of the first hires we made. She works with our team more broadly across our engineers, our scientists, and our platform team, to make sure that we have the right controls in place."

— Elizabeth Keyes
Vice President, mDNA (McKesson Data and Analytics)

Closing the D&A quality gap

In additional to core D&A quality assurance techniques (which remain as important as ever), we see a number of new tactics emerging to help underpin trust. Each of these approaches aims to fundamentally 'open the black box' and shine a light on the quality of D&A.

— **Establishing cross-functional D&A teams.** We consistently heard the need to involve key stakeholders across the organization to ensure business outcomes are reflected in the current projects underway. Organizations should create multidisciplinary project teams, combining D&A leaders with IT and business stakeholders across different departments to create alignment on key business priorities, technology enablers and processes to ensure quality in D&A.

— **Simplifying interconnected analytics.** As the number and complexity of analytical applications increases, organizations should maintain a 'meta-model' — essentially a model of their models — to help visualize and control how different analytical models are interconnected. For example, organizations need to understand how changes in one variable will affect all the models that use that variable, rather than just one individual model. This meta-model can also help ensure consistency in how data is used across different analytical models and can help executives prioritize projects that will deliver the highest value to the business.

— **Adding rigor to algorithm and model design.** There are a number of techniques that use transparency to force open the black box, such as wiki-type, open discussions and data scientist competitions which mandate the release of the winners' analytics for peer review and refinement. Regulators force this approach in some markets (US banks are required to model out certain risk assumptions and limit the complexity of their algorithms) to make sure that every single element is understood, reviewed and re-reviewed because of a potentially critical impact on the world economy.

"Sometimes teams would seek reports and they would be astounded by the numbers they saw because that wouldn't quite make sense from their perspective. The biggest problem was data quality. In many of these operational systems people actually stuff data in without necessarily putting any kind of governance into what went in. Unless you put the governance in the processes that brought the data into the data warehouse, which is downstream from an analytical tool, there was no guarantee what you were seeing was correct."

— Sanjay Krishnamurthi
Chief Architect, Microsoft Corporation
a KPMG alliance partner

Effectiveness (noun) \i-'fek-tivnə-s\

— producing a result that is wanted; having an intended effect

Merriam-Webster

Anchor No. 2 Effectiveness

What does D&A effectiveness mean?

When it comes to D&A, effectiveness is all about real-world performance. It means that the outputs of models work as intended and deliver value to the organization. This is the top concern of those who invest in D&A solutions, both internal and external to the organizations.

The problem is that D&A effectiveness is becoming increasingly difficult to measure. In part, this is because D&A is becoming more complex and therefore the 'distance' between the upstream investment in people and raw data is often far removed from the downstream value to the organization.

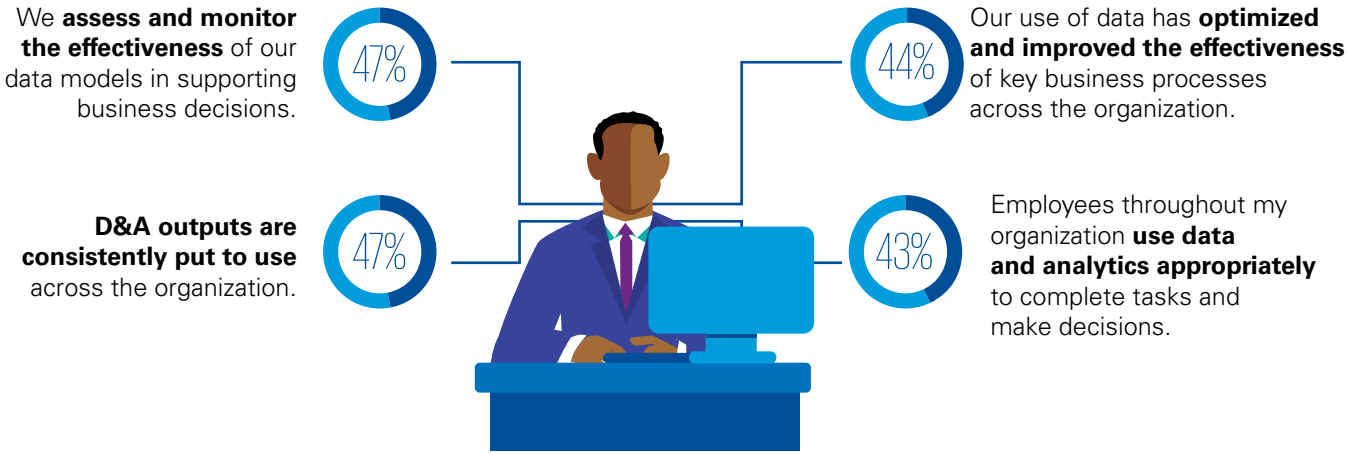
"Return on investment for analytics projects and teams are a hot topic and everyone is struggling to deal with this concept. How do you sensibly measure ROI when you typically are carrying the capex investment of those before you, an innovative culture that says 'safe-to-fail' but want unicorn results every time **and** a drop-dead imperative that you will deliver the value before further investment is made?"

— Anthony Coops
Partner, KPMG in Australia

Figure 8: Making inappropriate decisions

Please indicate the extent to which the following statements describe the utility of your organization's current data and analytics models and processes.

Note: The following shows the percentage of respondents that selected 'describes our approach exactly'.



Base: 2,165 data and analytics decision-makers

Source: a commissioned study conducted by Forrester Consulting on behalf of KPMG, July 2016

Where are the key gaps in D&A effectiveness?

We explored confidence in:

— the effectiveness of D&A in supporting decision-making

— the way D&A is used across the organization

— the accuracy of their models in predicting results

— the appropriate use of D&A by employees to complete task and make decisions.

Our survey suggests that the measurement of ROI and value is an issue for many executives. Less than half of our respondents say they assess and monitor the effectiveness of data models in supporting business decisions. And, as we saw earlier, very few organizations trust their ability to measure effectiveness.

Somewhat worryingly, our data also shows that only 43 percent of organizations believe their employees use D&A appropriately to complete tasks and make decisions. Only 42 percent track and monitor the impact of incorrect/misused analytics on the business.

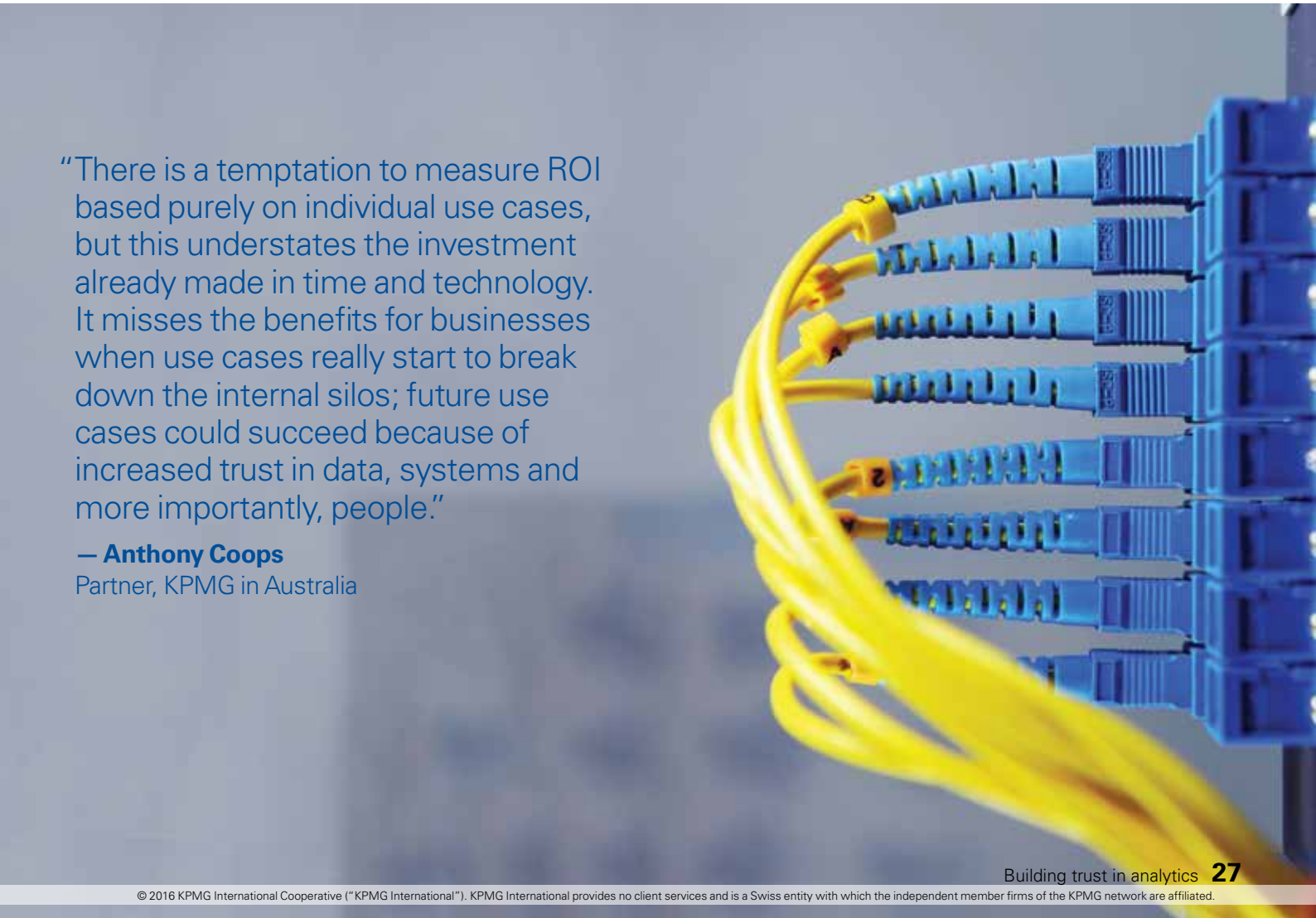
How does D&A effectiveness influence trust?

When organizations are not able to assess and measure the effectiveness of their D&A, it becomes easy for those making decisions to miss the full value of their investments and assume that a large proportion of their D&A projects 'don't work'. This, in turn, erodes trust and limits long term investment and innovation.

Organizations that are able to assess and validate the effectiveness of their analytics in supporting decision-making can have a huge impact on trust at board level. The corollary of this, of course, is that organizations that invest without understanding the effectiveness of D&A may not move the needle on trust or value at all.

"There is a temptation to measure ROI based purely on individual use cases, but this understates the investment already made in time and technology. It misses the benefits for businesses when use cases really start to break down the internal silos; future use cases could succeed because of increased trust in data, systems and more importantly, people."

— Anthony Coops
Partner, KPMG in Australia



"Business stakeholders need to be engaged at the start of the process and throughout the analytics process. They need to be involved as we explore the data and develop insights to ensure that when the modeling is complete, the results make sense from a business perspective."

—Cindy Forbes
Executive Vice President & Chief Analytics Officer
Manulife Financial Corporation

Closing the D&A effectiveness gap

Linking D&A initiatives directly to business outcomes isn't easy. If it was, everyone would be doing it. The value and the impact of D&A is increasingly long-term and widespread, extending beyond specific project objectives. Here are some emerging trends aimed at improving the measurement of D&A effectiveness.

— **Monitoring effectiveness.** For business-critical analytics, organizations will need to monitor every outcome of every action at a level of detail not traditionally done by IT functions. In order to understand if a model is effective, for example, it's not enough to know that the outcome of a recommendation was correct 72 percent of the time. What is important is to understand what happened the other 28 percent of the times, to determine if any model assumptions were wrong and to decide if further development or re-training of the model is required.

— **Assessing value beyond the silo.** Assessments of effectiveness need to consider the organization as a whole, not just a specific silo or individual project. More mature organizations understand how different uses cases tie together. They understand there is a higher chance of deriving value from D&A if you have multiple views across the teams and across stakeholders. Rather than having a series of individual projects, organizations need to take a 'portfolio approach' to their D&A investment.

— **Acting like an investor.** In the longer term, investment in D&A should be considered part of a wider innovation model. Some organizations manage this well, particularly in sectors which are accustomed to a venture capital model of investment with a mix of risk portfolios, such as the life sciences and tech sectors. Such companies expect to 'lose' more often than they 'win' at the early experimentation stage with the view that if they are not failing, they are probably not innovating. But in most companies, this approach is seen as an unaffordable luxury and the cycle of mistrust continues.

— **Establishing data innovation labs.** Data innovation labs allow data scientists and business stakeholders to rapidly test new ideas together. Good ideas — perhaps even disruptive ideas — can be tested quickly and give business decision-makers the confidence to develop the best ideas further.

Measured and managed: a closer look at D&A effectiveness

Two-thirds of US firms regularly validate the accuracy of their models and 60 percent track and monitor the impact of incorrect analytics. But just 31 percent of respondents from China say they use D&A outputs consistently and only 29 percent of South African organizations say they use data to optimize and improve the effectiveness of key business processes.

Financial services organizations again stood out, with 56 percent saying they regularly validate analytics and models to ensure their continued accuracy and effectiveness throughout their life span, compared with 50 percent overall.

Interview: effectiveness and trust

KPMG in the UK and Imperial College London recently launched Imperial Business Analytics, an initiative aimed at leveraging world-class research to solve difficult real-world business problems. This alliance pushes research frontiers needed to develop theories, methods and technologies that yield insights for potentially identifying opportunities, risks and social changes that are relevant to business.

Below is an excerpt from an interview with Dr. Mark Kennedy, Imperial College, London.

The KPMG Data Observatory, the largest of its kind in Europe, features an enveloping circular wall of 64 monitors powered by 32 computers facilitating 313 degrees of surround vision.

Q: Trust in data and analytics seems to be low within the 'effectiveness' anchor. People don't fully believe that improved analytics are going to give them a better answer or greater value. Would you agree?

A: Absolutely. If I don't know enough about what you're doing to judge whether it's truly effective in producing an answer or predicting the future, then unfortunately I'm not going to trust you. It's not because you're not effective, but because I can't clearly evaluate your effectiveness. One of the reasons people are then reluctant to commit resources is their view that says, 'Well I don't know if I trust the data. I don't know if I trust the people to do the analysis'.

Q: Do you have any practical steps to help organizations increase trust?

A: A key consideration affecting trust relates to 'understanding' or what we call 'absorptive capacity' — how much new scientific or technical information an organization or its people can absorb, the ability of an organization to recognize the value of new information, to assimilate it, and then to apply it to commercial ends. That 'capacity' is really important and can lead to a gap in understanding and trust in a new process being undertaken.

Obviously, the person or organization experiencing a knowledge or understanding deficit should correct that by dedicating time and resources to the simple process of learning more about the subject and process.

Of course, the question then becomes how much do you learn? It might not make sense to try to learn everything if you can trust a partner to know it on your behalf. But it will be a very beneficial process for decision-makers who want to add significant value to their organizations.

Q: How do you link the analytics back to a business outcome or commercial success? What advice would you give organizations to help them with that?

A: It makes sense to measure value by traditional measures of what is 'good' for business. Did we increase profit? Did we increase satisfaction in some way that's important? But even when this is done well, many big companies are still dissatisfied by the fact that they're spending a lot of money and don't have enough to show for it.

I often tell executives that if they aren't setting aside enough people and resources to try new things, they're going to be permanently stuck in yesterday. You need to accept a level of risk and conduct the kinds of trials that start to increase learning and build trust.

It's just a different approach to thinking about innovation and investment that is not yet broadly understood. Companies need to give themselves a little running room so that they start generating the experiences that would allow them to say, 'Here's how we can create data and analytics that we trust'.

Integrity (noun) \in-'te-grə-tē\

— the quality of being honest and fair

Merriam-Webster

Anchor No. 3 Integrity

What does D&A integrity mean?

Integrity can be a difficult concept to pin down. In the context of trusted analytics, we use the term to refer to the acceptable use of D&A, from compliance with regulations and laws such as data privacy through to less clear issues surrounding the ethical use of D&A such as profiling. This anchor is typically the top concern of consumers and the public more generally.

Behind this definition is the principle that with power comes responsibility. Algorithms are becoming more powerful, and can have hidden or unintended consequences. How do we decide what is acceptable and what isn't? Where exactly does accountability lie, and how far does it reach?

This is a new, uncertain and rapidly changing anchor of trust with few globally agreed best practices. Individual views vary widely and there is often no right answer. Yet integrity has a high media profile and has potentially enormous implications, not only for internal trust in D&A, but also for public trust in the reputation of any organization that gets it wrong.

Where are the key gaps in D&A integrity?

We explored organizations' confidence in:

— how their D&A aligns with relevant applicable laws

— the transparency of the data collected, stored and used for regulatory purposes

— the level of transparency with customers about what data is held and how it is being used

— an external evaluation of how customers will perceive their use of data

— their alignment to ethical policies and accountabilities.

"Many businesses, particularly in the tech and retail sectors, are very aware that there is a 'creepy line' beyond which an individual deems personalization to be too personal, such as inappropriate manipulation or targeting of individuals. But there is such a fine line between creepy and cool that it can often be difficult to spot exactly where it lies, let alone play safely just alongside it."

— Nadia Zahawi
Director, Global D&A, KPMG in the UK

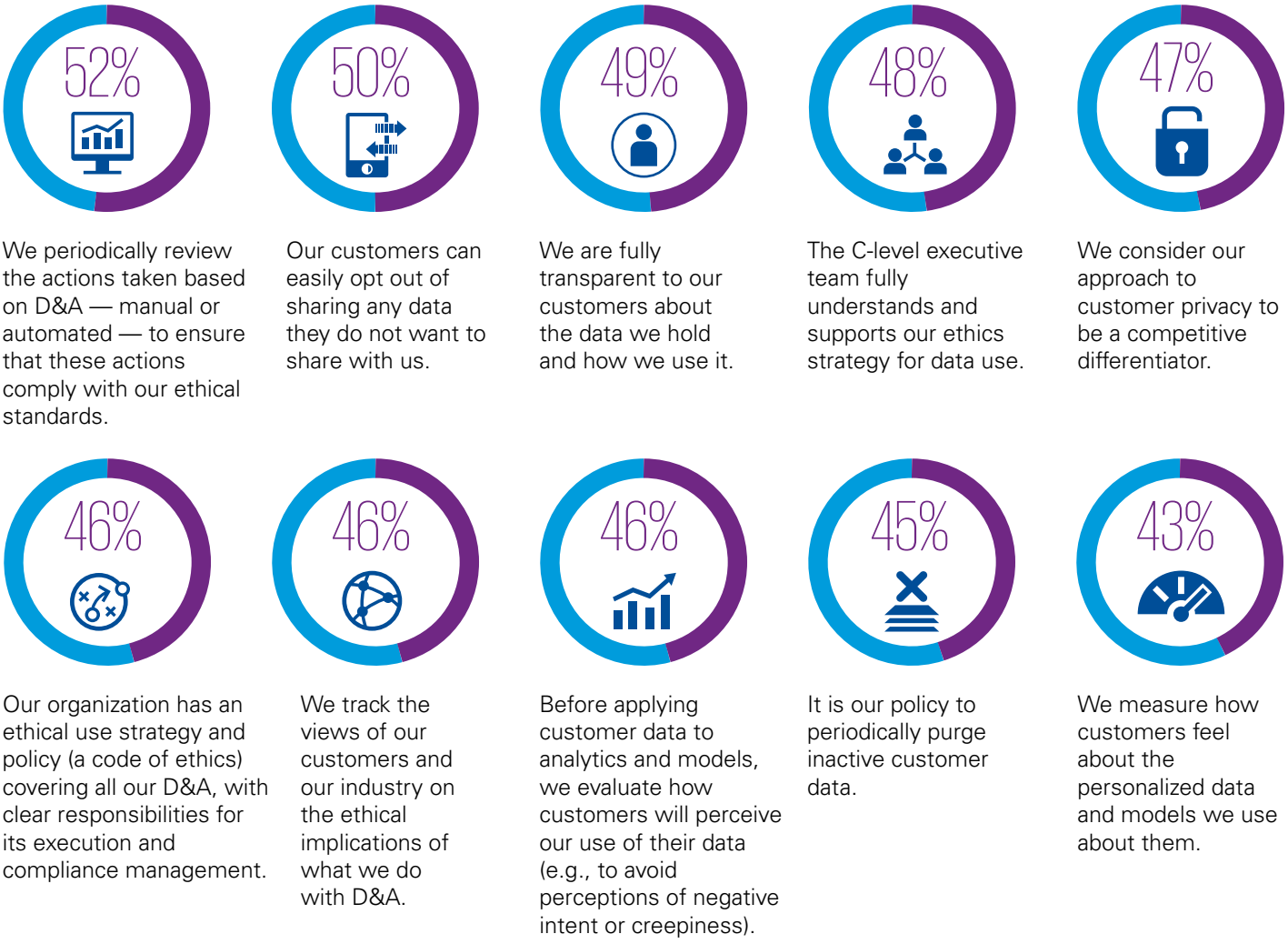
Our study suggests a wide perception gap exists between decision-makers and their customers when it comes to information security and privacy. Seventy-seven percent of organizations in our study believe their customers trust their organization's use of D&A. Yet Forrester data has shown that close to two-thirds of US online adults are very concerned about their privacy online.[1] We know that many customers will not purchase from a company without confirmation that they will protect their privacy and treat their data with sensitivity.

Somewhat surprisingly, our survey also raised significant gaps related to D&A privacy and ethics. For example, fewer than half of our respondents say they are fully transparent with customers about the data they hold and how they use it. And less than half say they have an 'ethical use' strategy and policy.

Figure 9: Lacking transparency

Please indicate the extent to which the following statement describes your organization's current approach to data and analytics privacy and ethical use.

Note: The following shows the percentage of respondents who selected 'describes our approach exactly'.



Base: 2,165 data and analytics decision-makers

Source: a commissioned study conducted by Forrester Consulting on behalf of KPMG, July 2016

[1] Evolving Consumer Attitudes On Privacy: A Q4 2015 Update, 16 November, 2015

Show and tell: a closer look at D&A integrity

Organizations from Brazil and the US are the most likely to say their D&A fully complies with laws and regulations. But organizations from Canada, China, France, Germany and South Africa all lag behind the average in terms of customer transparency. Those from France and Germany are also less likely to have an existing ethical use strategy.

Fifty-four percent of financial services organizations say they are fully transparent with their customers about the data they hold and how they use it, compared with 45 percent of insurers. Telecommunications organizations stood out as most likely to have an ethical use strategy.

How does D&A integrity influence trust?

Integrity goes beyond consumer trust issues. Most organizations understand that D&A offers huge potential benefits by replicating good decisions and limiting human inconsistencies and biases. If algorithms are well 'trained', then race or gender biases, for example, can be removed. It stands to reason, therefore, that an effective combination of human and machine can offer fairer, more trusted decisions.

However, this is not guaranteed. If not well managed throughout the D&A lifecycle, algorithms can also introduce unintentional, hidden biases as a consequence of the data on which they have been trained. Automated decision engines can also make the ethical consequences feel emotionally distant to the humans who are nominally accountable. For example, board members may blame misbehavior on a rogue algorithm or claim they could not possibly understand the detail of complex models, and therefore absolve themselves of responsibility.

Closing the D&A integrity gap

The most significant single theme in D&A integrity is transparency. And rightly so: improved D&A transparency can bring a level of democratic oversight and can encourage debate about acceptable use before potential issues escalate. However, for organizations without high-impact, life-or-death decision engines, transparency can seem uncomfortable and commercially high-risk. A number of trends are emerging that help improve D&A integrity.

— **Aligning goals.** Organizations need to clearly state the reasons they are collecting data and the analytics they will use on that data. The aims and incentives of the D&A developers and 'owners' should align with the goals of its users and with those who could be affected by it. Lack of clarity around purpose and misalignment of D&A goals can create mistrust, reduce ROI and open the door to inadvertent misuse.

— **Identifying win-win opportunities with greater transparency.** In industries with a high impact on individuals (such as financial services and healthcare), greater transparency may be mandated by regulators. In other sectors, consumers or businesses may drive change in ways that add value. Consider, for example, how the use of telematics devices creates a situation where motorists can give up a bit of their privacy in exchange for lower auto insurance premiums.

"With good analytics, banks can know when they have a financially distressed customer. From a profitability point of view, the bank should be looking for a win-win. Analytics can make this easier. It should be the right thing for the customer and make a profit contribution to the bank."

— John Hall
Partner, KPMG in the UK

— **Strengthening the 'guardians of trust'.** While there is a growing sense that organizations should be more accountable to their customers for their use of D&A, the terms of that debate are not yet clear. Some organizations are experimenting with ethics committees and whistleblower processes to encourage transparency and reduce risk. Integrity can also be strengthened through analytics team structures and processes, particularly when people are brought together across functions. This can not only create a better understanding of the use of D&A and a more complete view of the customer, it can also be an effective way of building in trust and higher integrity.

"We work very closely with our privacy compliance and information risk management team. They have to sign off before any model goes into production and they ensure that everything we do is compliant with local privacy requirements."

— Cindy Forbes,
Executive Vice President & Chief Analytics Officer,
Manulife Financial Corporation

Resilience (noun) \ri-ˈzil-yən(t)s\

— An ability to recover from or adjust easily to change

Merriam-Webster

Anchor No. 4 Resilience

What does D&A resilience mean?

Resilience in this context is about optimization for the long term in the face of challenges and changes. Cyber security is the best-known issue here, but resilience is broader than information security. Failure of this trust anchor undermines all the previous three.

Unlike traditional software, applications which apply machine learning and operate in a complex D&A ecosystem with fast-changing data sources are likely to change their function, impact and value throughout their operational lifetime, sometimes quite suddenly.

What are the key gaps in D&A resilience?

Our study explored organizations' confidence in aspects of resilience including:

— their ability to tailor governance policies to specific data use scenarios

— the use of cross-functional governance to ensure analytics models are accurate and appropriate

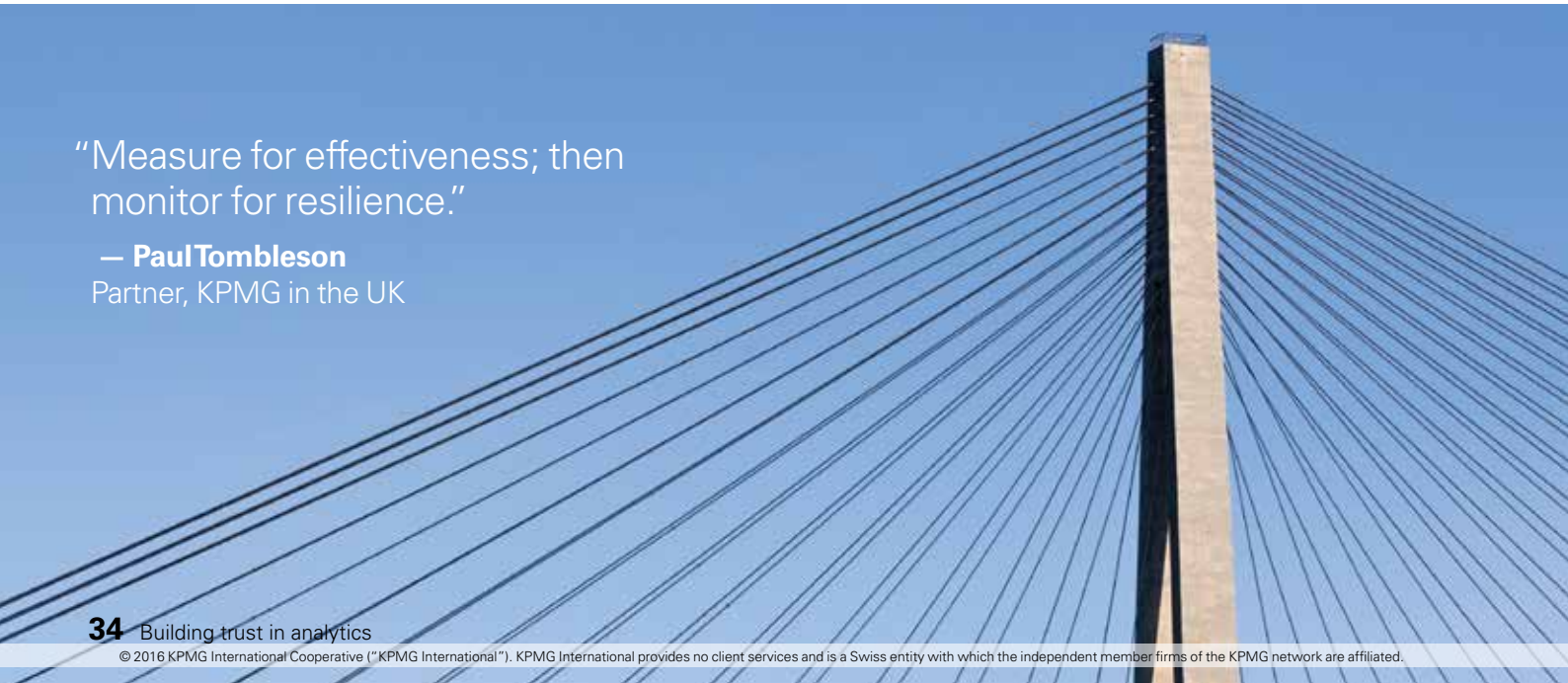
— how they control the authorization to access, use and analyze data

— how changes made to data will be tracked and reviewed

— how cyber assurance will be managed to proactively identify security threats.

"Each of the four anchors of trust is relative and changes over time, sometimes almost instantly. Perhaps a model was as good as it could be at the time of development but some new innovation eclipsed it and made it less useful. This can undermine efficacy and outcomes."

— Bill Nowacki
Managing Director, KPMG in the US



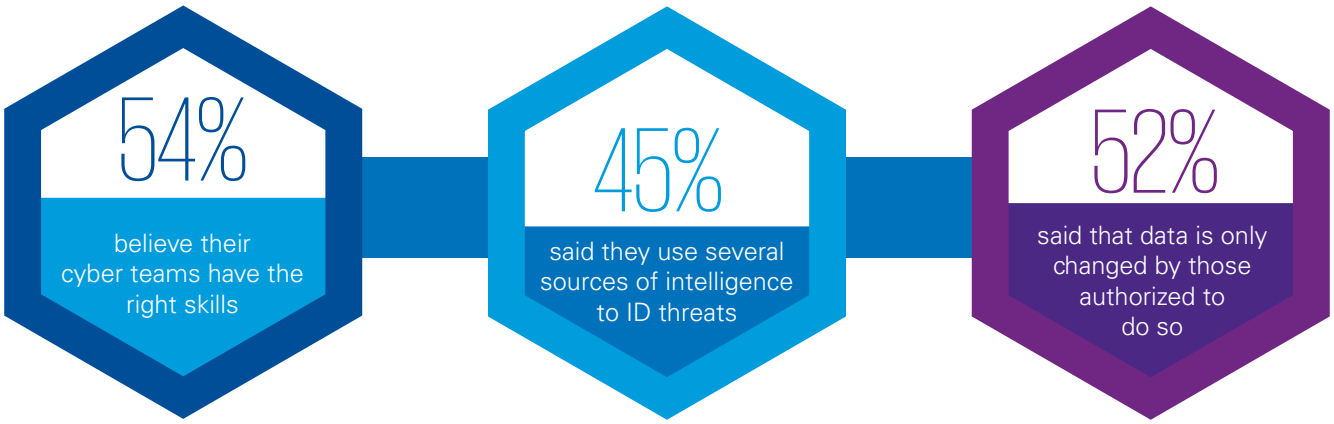
"Measure for effectiveness; then monitor for resilience."

— Paul Tombleson
Partner, KPMG in the UK

Figure 10: room for improvement

Please indicate the extent to which the following statements describe your organization's current approach to data and analytics security.

Note: The following shows the percentage of respondents who selected 'describes our approach exactly'.



Base: 2,165 data and analytics decision-makers

Source: a commissioned study conducted by Forrester Consulting on behalf of KPMG, July 2016

Basic gaps

This study highlighted some basic gaps in D&A governance and policies, such as putting employees at risk of sharing confidential data with unauthorized people, both inside and outside of their organization. Only around half of the organizations in our survey say that data is locked to unauthorized users.

The study also showed significant gaps in organizations' current approaches to D&A security. Only 54 percent believe their cyber teams have the right skills and 45 percent say they use several sources of intelligence (such as vendor threat feeds, shared threat information from peers or government entities and correlated security data from system logs, alerts and events) to proactively identify security threats.

Our survey also highlighted other significant resilience challenges. For example, just 45 percent say they communicate data policies and processes enterprise-wide. Just 45 percent say they have cross-functional teams to review the appropriateness of their analytics models. And only 43 percent believe the business knows how to engage with data analysts.

How does D&A resilience influence trust?

Basic resilience is key to winning customer trust. It only takes one service outage or one data leak for consumers to quickly move to (what they perceive to be) a more secure competitor. It also only takes one big data leak for the regulators to come knocking and for fines to start flying.

Strong governance and control can also help reduce duplication of effort and therefore help improve the value of D&A across the enterprise. KPMG in the UK recently worked with a new chief data officer at a bank who had found over 4,000 in-flight D&A projects across the organization. Further assessment revealed huge amounts of overlap and duplication, which was causing conflicting outcomes and leading to contradictory approaches across different parts of the business.

Release of new data sources by third parties can also have unintended impacts on existing analytics and the art of the possible. In 2009, for example, academics in the US demonstrated that it was possible to predict an individual's social security number with remarkable accuracy using only public data such as the Social Security Administration's Death Master File and other personal data such profiles on social networking sites.[2]

[2] Source: http://www.pnas.org/content/106/27/10975.ful

Closing the D&A resilience gap

Beyond basic good practice in governance and controls, we see the emergence of several common trends that aim to improve long term D&A resilience.

— **Bridging the gap between business leaders and D&A professionals.** Accelerating awareness and improving the understanding of D&A is critical to breaking the cycle of mistrust across all of the trust anchors over the long term. Involving key stakeholders and establishing multidisciplinary project teams, which bring together D&A leaders with IT and business stakeholders across different departments, creates better alignment across key business priorities, technology enablers and processes.

— **Monitoring goals, performance, impact and risks.** D&A is constantly evolving and, over time, the way in which D&A is used, its wider impact and the risks it creates will shift. As such, regular testing needs to become part of the institutional mindset. Some testing techniques are common in the technology sector but not yet applied more widely, such as A/B testing in which two alternative versions of an algorithm are run in parallel to compare effectiveness.

— **Creating a whole-ecosystem view.** Organizations should aim to achieve full visibility of their internal and external D&A initiatives and capabilities, looking beyond the traditional boundaries of systems, organizational silos and business cases to understand the interdependencies and interrelated risks within their wider D&A ecosystem.

Security and controls: a closer look at resilience

Worryingly only 37 percent of French and 42 percent of German respondents said that data can only be changed by individuals who are authorized. The US and Brazil had the strongest controls in place, with over 70 percent aligning to this statement.

Less than 40 percent of organizations in Canada, China, France and South Africa said they use several sources of intelligence proactively identify security threats. The financial services sector was more likely to use several sources of intelligence — 51 percent versus 45 percent overall.

Less than half of organizations in China, France, Germany and South Africa believe their cyber teams have the right skills and knowledge to continuously address cyber threats. Organizations in financial services (59 percent) and telecommunications (57 percent) were more positive about their cyber teams abilities compared with other industries.

Next steps: strengthening the anchors of trust

Trust is not a project. Strengthening the anchors of trust is not a one-time exercise or a compliance tick-box. It is a continuous endeavor that should span your entire enterprise. From the sourcing and preparation of data through to the outcomes and measurement of value, building trust in analytics requires executives to look across their D&A lifecycle, from data through to insights and ultimately to generating value.

There are no roadmaps for driving trust, no software solutions or perfect answers. However, our survey demonstrates that there are best practices and practical examples that all organizations can consider and adopt. Based on our experience, here are seven ideas that should help you create your own approach to building D&A trust.

— **Start with the basics: assess your trust gaps.** Undertake an initial assessment to see where trusted analytics is most critical to your business and then focus on those areas. This study highlights weaknesses in some of the core processes within all of the four anchors of trust, suggesting that organizations will want to start by focusing on many of the areas raised in this report. Remember that key risks can often be reduced with some very straightforward changes, such as the use of simple checklists.

— **Create purpose: clarify and align goals.** Ensure that the purpose for your data collection and the associated analytics is clearly stated. Make D&A performance and impact measurable. The aims and incentives of the D&A 'owners' should align with the goals of its users and with those who could be affected by it. Lack of clarity around purpose and misalignment of D&A goals can create mistrust, dilute ROI and open the door to inadvertent misuse.

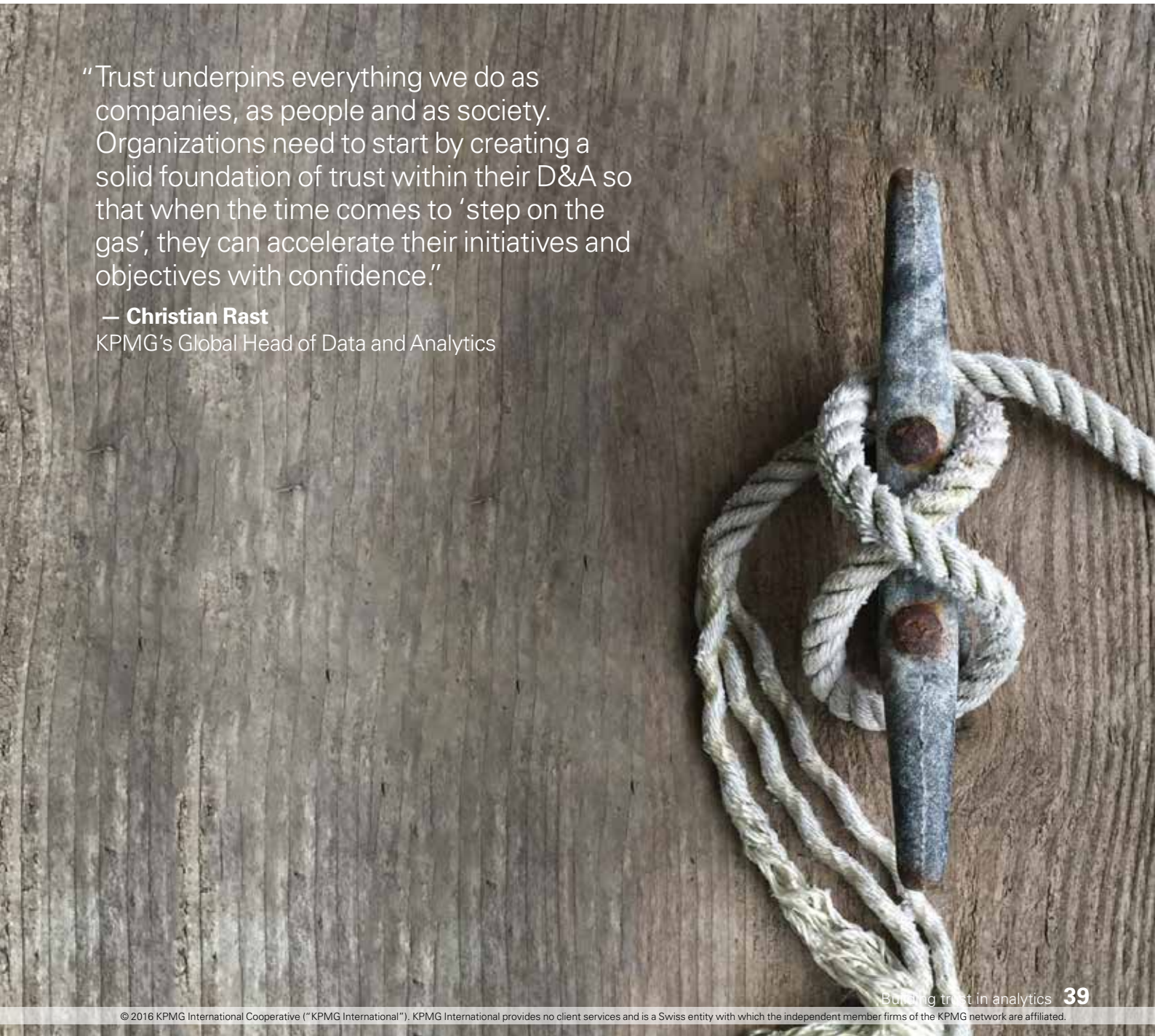
— **Raise awareness: increase internal engagement.** Building awareness and understanding of D&A among business users is critical to breaking the cycle of mistrust. Involve key stakeholders and establish multidisciplinary project teams, combining D&A leaders with IT and business stakeholders across different departments.

— **Build expertise: develop an internal D&A culture and capabilities as your first guardian of trust.** Your D&A people are critical to being able to elevate the wider understanding of D&A across the organization. Identify gaps and opportunities in your current capabilities, governance, structure and processes. Ensure that you have expertise in analytics quality assurance: experimental design, A|B testing and other means of validation. Ultimately, make trust in data and analytics a core company value

— **Encourage transparency: open the 'black box' to a second set of eyes. And a third.** There are many potential actions to help improve D&A transparency. You may want to establish cross-functional teams, third-party assurance and peer reviews, use wiki-style sites, encourage whistleblowers and strengthen QA processes as valuable 'guardians' of trust. Essentially, have every D&A challenge reviewed independently.

— **Take a 360-degree view: build your ecosystems, portfolios and communities.** To drive trust through the organization, you will need to look beyond the traditional boundaries of systems, organizational silos and business cases to see the wider ecosystems. Take a portfolio approach, looking at the value and the risk that D&A brings to the organization as a whole. Create a 'meta-model' and cross functional teams to identify and control dependencies between models.

— **Be innovative: enable experimentation.** We suggest you create a model for D&A innovation. Allow D&A teams to push the boundaries of innovation and try several paths without excessive fear of failure. Build a data innovation lab which allows data scientists and business stakeholders to rapidly test new ideas. Consider ROI beyond the specific performance objectives of the D&A project. Find ways to incentivize employees for innovation and trusted D&A.



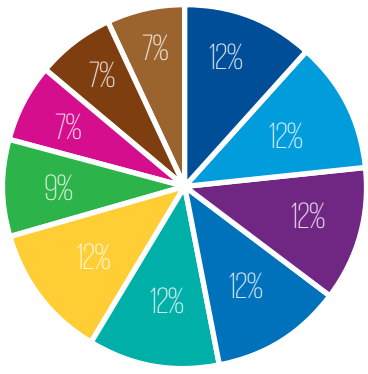
About this research

In 2016, KPMG International commissioned Forrester Consulting to examine the power of trust in data and analytics by exploring organizations' capabilities across four anchors of trust in D&A: 1) quality, 2) effectiveness, 3) integrity and 4) resilience.

Forrester surveyed 2,165 decision-makers responsible for setting strategy for, or management of, business intelligence, data analytics, data warehousing, data management/big data management initiatives. Respondents represented organizations from China, Germany, India, UK, US, Canada, South Africa, France, Brazil and Australia. Respondents represented a wide range of industry groups including banking/financial services, insurance, telecom, healthcare/life sciences and retail. All respondents represented companies with at least 500 employees.

Survey demographics: country and employees

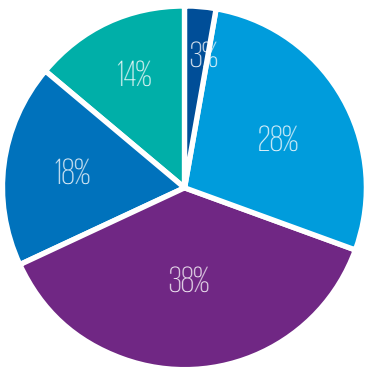
In which country are you located?



Base: 2,165 data and analytics decision-makers

Source: a commissioned study conducted by Forrester Consulting on behalf of KPMG, July 2016

Using your best estimate, how many employees work for your organization worldwide?

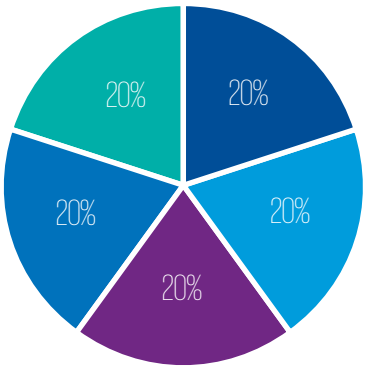


Base: 2,165 data and analytics decision-makers

Source: a commissioned study conducted by Forrester Consulting on behalf of KPMG, July 2016

Survey demographics: industry and title

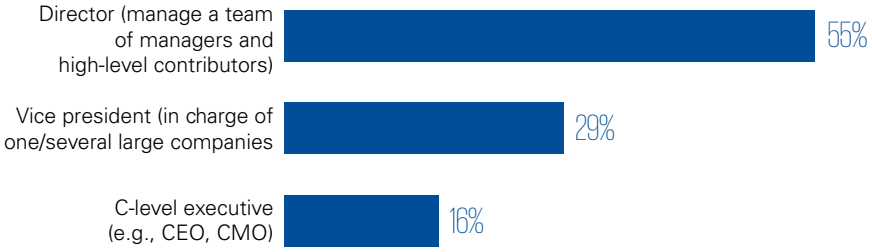
Which of the following best describes the industry to which your company belongs?



- Financial services/ Banking
- Retail
- Healthcare/life sciences
- Telecommunications services
- Insurance

Base: 2,165 data and analytics decision-makers
Source: a commissioned study conducted by Forrester Consulting on behalf of KPMG, July 2016

Which title best describes your position at your organization?



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Leaders from KPMG, KPMG member firm clients and alliance partners also contributed analysis and commentary to this study.

Contacts

Christian Rast
Global Head of Data & Analytics
Partner, KPMG in Germany
E: crast@kpmg.com
Christian leads KPMG's Data & Analytics Strategic Growth Initiative globally. He serves on the board of KPMG Capital and as Chief Solution Officer within the German firm. Christian was the CEO of BrainNet until its acquisition by KPMG in February 2013. Since then, Christian has held leadership roles for KPMG in Germany and globally, most recently as head of KPMG's Global Procurement Advisory Services.

Anthony Coops
Data & Analytics Leader, ASPAC
Partner, KPMG in Australia
E: acoops@kpmg.com.au
Anthony is the leader of D&A for the Asia-Pacific region and head of D&A for the Australian member firm. A partner with KPMG, Anthony has global experience working across multiple countries, where he helps clients address specific needs in areas such as risk, optimization, workforce and customer analytics.

Torsten Duwenhorst
Data & Analytics Leader, China and Hong Kong
Partner, KPMG in China and Hong Kong
E: torsten.duwenhorst@kpmg.com
Torsten leads the D&A team in greater China. As a forensic technology partner, he works with multinational clients on proactive and predictive D&A solutions to detect fraud and compliance-related behavior and patterns. Torsten also works with KPMG partners across all service lines and industries to use D&A to help clients achieve their digital strategy visions and growth targets, mitigate overall risk and increase efficiencies.

Dr. Thomas Erwin
Data & Analytics Leader, Germany
Partner, KPMG in Germany
E: terwin@kpmg.com
As the Global Execution Partner for Data & Analytics and the Managing Partner for Lighthouse Germany, Thomas drives the growth of the global Data & Analytics practice. Since 2002, Thomas has worked with numerous KPMG global clients, helping them find the right Data & Analytics (D&A) approaches and solutions, including the implementation and worldwide roll-out of respective tools and technologies.

Brad Fisher
Data & Analytics Leader, US
Partner, KPMG in the US
E: bfisher@kpmg.com
Brad is the D&A leader for KPMG in the US and a partner with more than three decades of experience providing professional services to clients in a variety of industries. Brad serves as an internal data 'evangelist,' working to leverage KPMG's advanced capabilities in Big Data, predictive analytics, optimization modelling and analytics technologies to enhance the firm's engagements.

John Hall
Data & Analytics Leader, UK
Partner, KPMG in the UK
E: John.Hall@KPMG.co.uk
John has 20 years' experience in information technology with a particular focus on data management and analytics, technology related risk, project and program management. John's areas of expertise are systems implementation and data analytics. John leads the UK Financial Services Data & Analytics practice across Audit, Tax and Advisory.

About Global Data & Analytics at KPMG

In a global environment defined by constant disruption, business leaders need data and analytics they can trust to inform their most important decisions. KPMG's Data & Analytics (D&A) team has earned that trust with an evidence-based, business-first approach that's at our core. For more than 100 years, we have worked across industries to help member firms' clients address their long-term, strategic objectives. And as an internationally regulated accounting and professional services network, our member firms have an unwavering commitment to precision and quality in everything we do.

Sander Klous
Data & Analytics Leader, The Netherlands
KPMG in the Netherlands
E: Klous.Sander@kpmg.nl
Sander is the Managing Director of Big Data Analytics at KPMG in the Netherlands. He is the founder of this team and is responsible for the global advanced analytics technology stack of KPMG. Sander is professor in Big Data Ecosystems at the University of Amsterdam. He holds a PhD in High Energy Physics and worked on a number of projects at CERN, world's largest physics institute in Geneva for 15 years.

Bill Nowacki
Managing Director, Decision Science, The Lighthouse
KPMG in the US
E: wnowacki@kpmg.com
Bill is the Managing Director of KPMG in the US's Decision Science initiative focused on developing Advanced Analytical solutions across industry sectors. Bill focuses on helping consumer-oriented enterprises leverage Big Data and machine learning technology to improve people, product and investment performance. He has worked with 20 of the Global 100 to help architect elements of each company's strategic information architecture.

Wilds Ross
Principle, Data & Analytics
KPMG in the US
E: wildsross@kpmg.com
Wilds is responsible for D&A in Financial Services at KPMG in the US. He holds degrees in both mathematics and physics specializing in signal theory, discrete data analysis and computational methods. He has successfully sourced, analyzed and integrated electronic data from disparate systems for operators across four continents and provides motivation and experience to drive accomplishment in broad scope projects.

Paul Tombleson
Data & Analytics Leader, UK
Partner, KPMG in the UK
E: paul.tombleson@kpmg.co.uk
Paul leads D&A in the UK, where he is a partner. His expertise includes leading technology-driven assignments in the UK and internationally, many of which have involved Big Data challenges, among them, fraud and regulatory investigations, e-discovery, cybersecurity and data analytics engagements.

Nadia Zahawi
Director, Global Data & Analytics
KPMG in the UK
E: nadia.zahawi@kpmg.co.uk
Nadia leads strategy and proposition development work for Global Data & Analytics based in the UK. Nadia works with both client-facing and internal KPMG teams to explore the value of emerging D&A solutions and capabilities. She has 20 years of experience working with leaders across multiple sectors to drive large-scale change, particularly with the UK Government.

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