Big Data in Western Europe Today

A Xerox Study

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Contents

Introductory Note

From transportation to customer care, Xerox data analytics expertise is helping organisations to make their data meaningful.

Every second, everywhere, there's more data to make sense of. All too often it resides in silos that aren't easily accessible, making it harder to turn it into valuable insight. Xerox data analytics research is being applied to provide more meaningful real-time information, understand complex relationships within data sets, and predict future outcomes based on past data. Xerox expertise in consulting and business process management is helping businesses to articulate how such advances in analytics lead to better business outcomes, and how to use innovative analytics-based solutions to transform their businesses.

To better understand how organisations in Europe are using big data and data analytics today, Xerox commissioned Forrester Consulting to conduct this research study in five Western European countries.

The research explores the importance of big data in organisations today; big data challenges such as privacy and data quality; what organisations are looking for in an analytics partner; and the implications of varying levels of big data maturity.

Executive Summary

Stories of exciting new consumer services based on big data analytics are understandably popular in the press, but only a fraction of what organisations are doing with big data hits the headlines. From Rolls-Royce using real-time analysis of engine performance as the basis of a new jet-engine-as-a-service business model, to Hamburg Port Authority deploying a data-gathering sensor platform to optimise traffic flow within the port, organisations everywhere are getting to grips with how big data can give them competitive advantage.

The commissioned research covered by this report, conducted by Forrester Consulting on behalf of Xerox, reveals the breadth of the plans that Western European enterprises have for implementing big data initiatives, developments that will have a transformative effect on how businesses will make decisions and the services they offer in the near future.

Extensive Plans for Big Data in 2015

Senior decision-makers in medium-to-large enterprises have extensive plans this year for big data — their top-ranked ICT priority for 2015.

Of more than 15 big data use cases that we asked about — including customer experience optimisation, document analytics, product development, and risk & compliance management — each has more than half of respondents already using big data technology for it, or planning to in the next 12 months. On average, each business is already implementing six use cases, with the most mature respondents — those we call the Datarati[1] – ahead of the pack with an average of eight use cases.

As they actively exploit big data in these ways, medium-to-large businesses expect their big data initiatives to show returns quickly: within 12 months of implementation for almost three quarters of respondents. From the wide range of use cases it's clear that businesses are actively using big data to improve operational efficiency and manage risk more effectively. They're also clear about where the real potential lies: more than half of those surveyed believe that the organisations emerging as leaders in the next three years will be those that can use analytics to provide truly novel services (39%) or to disrupt the competition with a new business model (24%).

Almost three-quarters of respondents believe that big data insights improve competitive advantage, and this is even more strongly the case for those with the most experience of big data implementations – the Datarati. More than 80% of the Datarati respondents believe so, compared to 74% of the group we call Data-explorers, and 62% of the least mature group, the Data-laggards. This suggests that as companies gain more experience in deploying big data they appreciate and value its benefits ever more highly. The value curve doesn't drop off with increased big data implementation, it gets steeper.

[1] We define these in the 'Introduction and Methodology' section.

A Maturing Field

It's easy to get swept away by hype, but the survey suggests that senior decision-makers fully appreciate the challenges of exploiting big data successfully, and that even those with the most mature processes in place recognise that they still have a long way to go. For example:

- More than half of respondents (and even 45% of the Datarati) say they currently lack strong enough processes to ensure data quality.

- Today, gut instinct and past experience are trusted as much as big data analysis when making executive decisions — though this is expected to change in the next 12 months, in favour of decision-making based on quantitative information and analysis.

The head of the Xerox Analytics Resource Center explains in this report why he finds it encouraging that respondents recognise a wide range of significant challenges in implementing their big data strategies. He sees a maturing field that takes big data seriously as a fundamental business practice. It is challenging because it has profound implications for every part of the business, calling for silos to be broken to act on new opportunities.

As big data grows in importance, and understanding of the challenges deepens, it's natural for businesses to seek help, and the survey shows that this is increasingly the case. Almost a quarter of respondents are already using a third-party systems integrator or consultant for big data projects, and a further 30% will be doing so in the next 12 months. Only 12% of respondents have no interest at all in considering third-party support.

Data Privacy: both Challenge and Opportunity

Although it doesn't jump out strongly from other challenges, data security & privacy is, as expected, at the top of the challenge pile. With cautionary tales abounding and new European data protection legislation on the horizon, we asked a Xerox expert to contribute to this report his views on what businesses should be doing about data privacy. The good news is that this is a classic example of a significant challenge hiding a major opportunity. Those that are quick to meet growing public concerns with innovative new privacy models stand a good chance of deriving strong competitive advantage.

Data-laggards Risk Falling (Further) Behind

It's still relatively early days for many firms when it comes to exploiting big data, and there are some key indicators that companies with less developed big data approaches need to move quickly to improve their big data capabilities.

The Data-laggards in our survey indicate that they are struggling more than others with big data fundamentals such as data quality. Of equal concern, their top business challenge is perceived to be competition between different lines of business rather than the threat from competitors or the challenge of creating customer and business insight to drive decision-making. In contrast, the Datarati are strongly focused on dealing with new and existing competitors, and on using big data to improve decision-making and business planning.

The majority of respondents agree that leadership lies in using analytics to provide truly novel services or to disrupt the competition through a new business model. Data-laggards, therefore, need to move quickly to develop more sophisticated big data capabilities that will let them shift their focus. If they don't, they risk discovering that while they've been dealing with internal competition, their more advanced competitors have developed innovative new services using the insights of big data analytics, and pulled even further ahead of them.

Introduction and Methodology

Big data – what's happening on the ground? 'Big data' has been evangelised as a critical area of data analytics for many years now, with the potential to revolutionise customer insight, underpin completely new services based on real-time data analytics, improve risk management, and generally provide powerful new insights in a multitude of ways. The news is full of examples, from the now-familiar 'recommendations' pioneered by Amazon, to 'smart city' solutions around the world. But away from the headlines, are businesses acting on the promise of big data? What are they doing, what are their implementation challenges, and are they seeing the benefit?

The survey. To address these questions, Xerox commissioned Forrester Consulting in January 2015 to conduct an online survey of more than 300 senior decision-makers — only C-level executives and heads of departments — at medium-to-large organisations (defined as those with 500 employees or more). They represent a range of departments: the executive team, strategic planning, IT, marketing or advertising, analytics, product development, finance, and human resources. Their companies are located in Belgium, France, Germany, the Netherlands and the UK, and operate in one of four sectors: high tech and communications, retail and consumer, financial services, and industrials. For the full participant breakdown, see the Appendix.

Survey results. The survey reveals the priority that firms are giving to big data projects relative to their other ICT initiatives. It shows whether or not big data initiatives are proving to be a good investment, explores what respondents have been doing with big data and their plans for the next 12 months, and reveals what barriers they are encountering in getting to grips with big data. Finally, the survey enables us to identify how companies with more advanced strategies differ from those with less well-developed approaches to big data.

5
countries

Defining Big Data

The survey defined big data as a set of methodologies, processes, architectures, and technologies, **where specific hardware, algorithms, knowledge or processes beyond the standard techniques** used in data analytics are required to deal with data of **large volume, velocity or variety** in order to obtain value.

Aware that many people use 'big data' as a synonym for 'analytics' (in fact, we asked the survey respondents and 65% agreed that they use the terms interchangeably), the survey took pains at various points to remind respondents of the intended meaning of the term.

Big Data Maturity. In this report we refer (where relevant) to 'data maturity' groups: the Datarati, Data-explorers and Data-laggards. These groups have been determined by scoring the survey respondents on the level of agreement they gave to a set of statements about their big data and analytics capabilities, such as: 'we measure the effectiveness of our analytical applications', 'we have formal processes surrounding our big data programme, such as governance, planning, change management', and 'we make a clear distinction between our big data strategy and our analytics strategy'. Forrester scored respondents based on their level of agreement (1 for 'strongly disagree' up to 5 for 'strongly agree') and calculated their average score across nine such statements, then grouped them as follows:

330
respondents

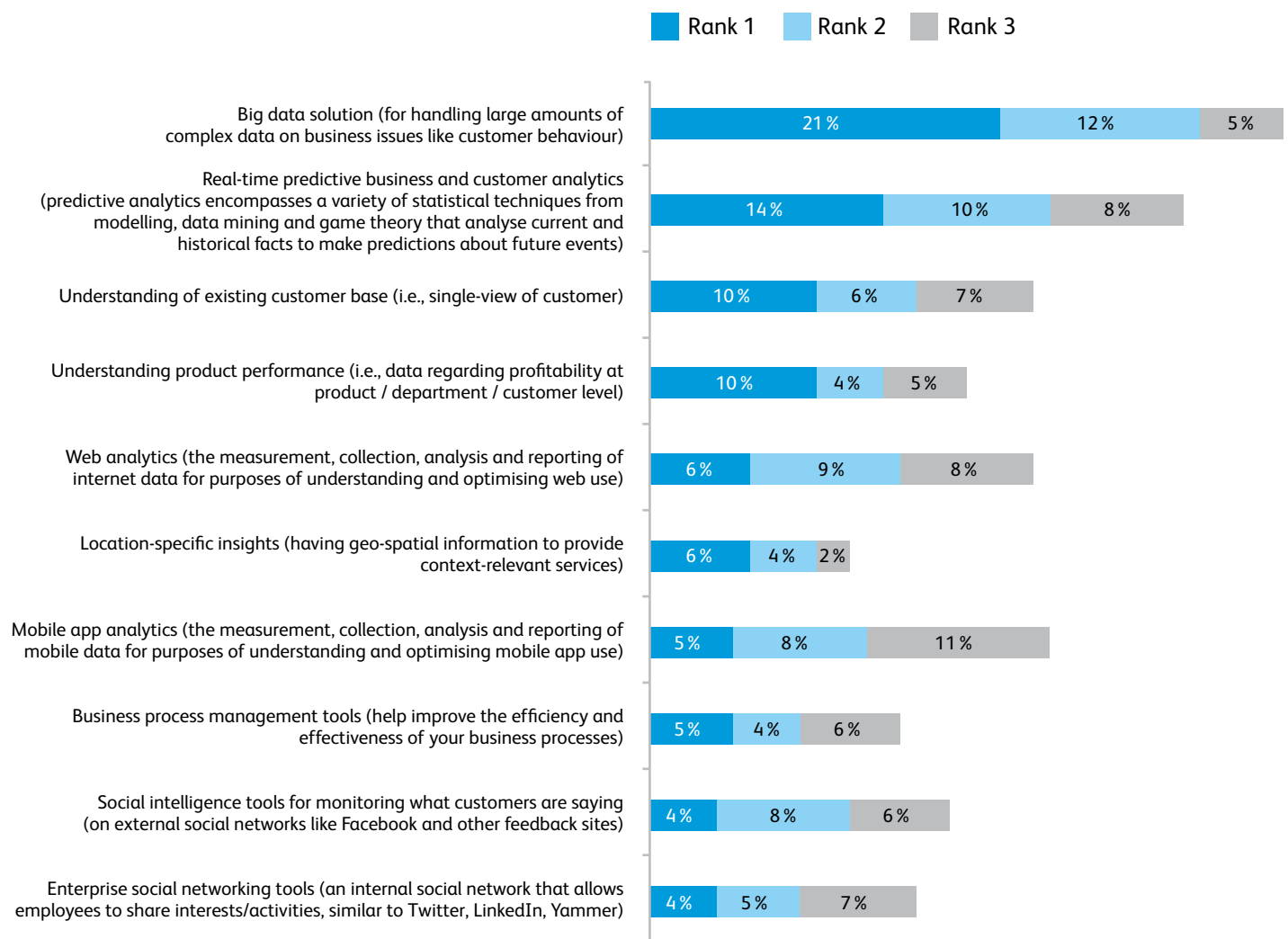| Maturity group	Score	% in this group	Description
Datarati	>4.25	20%	Strong competence in big data approach
Data-explorers	3.5-4.25	49%	Some competence in big data approach
Data-laggards	<3.5	31%	Behind the others in big data approach

How Important is Big Data?

Big data: the top ICT priority for 2015. Out of a list of 17 ICT initiatives, ranging from the familiar ('business process management' and 'content management', for example) to the new ('enterprise social networking' and 'enterprise marketing platforms', for example), respondents rank big data solutions as their top ICT priority for 2015. The second place of 'real-time predictive business and customer analytics' and the high positioning of several other areas of analytics and business intelligence suggests a high level of focus on data and the insight it provides. Clearly it's not just the media that is focusing on the power of data-driven intelligence.

39%

of respondents believe that the organisations that will emerge as leaders in the next 1–3 years will be those that provide truly novel services through analytics.

Figure 1. Top 10 ICT priorities for 2015

Legend: ■ Rank 1　■ Rank 2　■ Rank 3

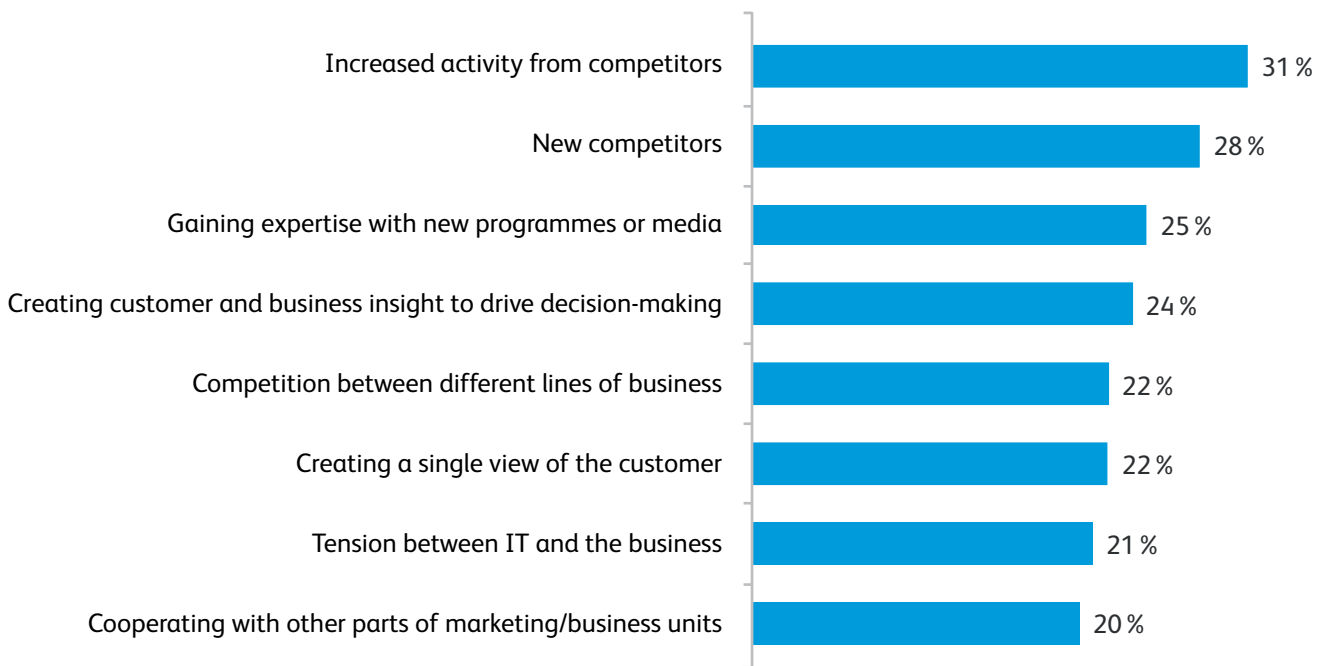| Priority	Rank 1	Rank 2	Rank 3
Big data solution (for handling large amounts of complex data on business issues like customer behaviour)	21%	12%	5%
Real-time predictive business and customer analytics (predictive analytics encompasses a variety of statistical techniques from modelling, data mining and game theory that analyse current and historical facts to make predictions about future events)	14%	10%	8%
Understanding of existing customer base (i.e., single-view of customer)	10%	6%	7%
Understanding product performance (i.e., data regarding profitability at product / department / customer level)	10%	4%	5%
Web analytics (the measurement, collection, analysis and reporting of internet data for purposes of understanding and optimising web use)	6%	9%	8%
Location-specific insights (having geo-spatial information to provide context-relevant services)	6%	4%	2%
Mobile app analytics (the measurement, collection, analysis and reporting of mobile data for purposes of understanding and optimising mobile app use)	5%	8%	11%
Business process management tools (help improve the efficiency and effectiveness of your business processes)	5%	4%	6%
Social intelligence tools for monitoring what customers are saying (on external social networks like Facebook and other feedback sites)	4%	8%	6%
Enterprise social networking tools (an internal social network that allows employees to share interests/activities, similar to Twitter, LinkedIn, Yammer)	4%	5%	7%

Data from a January 2015 commissioned survey conducted by Forrester Consulting on behalf of Xerox.

Why big data? Survey respondents believe strongly that big data insights improve competitiveness, and we see a preoccupation with competitiveness when we look at their biggest challenges to accomplishing their 2015 business priorities (see figure 2). We can see that three of their top four business challenges directly relate to competitiveness and business decision-making, and are therefore addressable by the insight that big data initiatives are designed to deliver. When asked how they expect big data to transform their business in the near term, the top answers are through closer engagement with customers, by gathering better business information, and through better employee productivity and collaboration (see figure 3).

72%

of respondents agree or strongly agree that 'big data insights improve our competitive advantage'. For Datarati, it's 81%.

Figure 2. **The biggest challenges in accomplishing 2015 business priorities**

Challenge	Percentage
Increased activity from competitors	31%
New competitors	28%
Gaining expertise with new programmes or media	25%
Creating customer and business insight to drive decision-making	24%
Competition between different lines of business	22%
Creating a single view of the customer	22%
Tension between IT and the business	21%
Cooperating with other parts of marketing/business units	20%

Data from a January 2015 commissioned survey conducted by Forrester Consulting on behalf of Xerox.

Country variations

- **Germany** and the **UK** agree that competition — both 'increased activity from competitors' (39% and 29%, respectively) and 'new competitors' (29% and 34%) — is the main business challenge.

- In the **Netherlands**, 'cooperating with other parts of marketing/business units' (33%) and 'competition between different lines of business' (29%) top the list.

- In **Belgium** and **France**, the top challenge is 'gaining expertise with new programmes or media' (30% and 35%, respectively), followed by 'increased activity from competitors' (27% and 34%).

Figure 3. How big data will transform business over the next 12 months

Category	Value
Empower closer engagement with customers	55%
Gather better business information	54%
Support overall employee productivity	54%
Empower closer engagement between internal teams	54%
Allow more effective and targeted selling	52%

Data from a January 2015 commissioned survey conducted by Forrester Consulting on behalf of Xerox.

Country variations

Across the countries there are slightly different beliefs about where big data will make the biggest difference:

- For **German** respondents the standout transformation is 'support for overall employee productivity' (64%).
- In the **UK**, helping to 'gather better business information' tops the list (60%).
- In **Belgium** most respondents choose 'allow more effective and targeted selling' (55%).
- For the **Netherlands** there's a tie at the top: 'allowi more effective and targeted selling' and 'empower closer engagement with customers' (both at 55%).
- For firms in **France** it's 'empower closer engagement with customers' (64%).

Big data drivers. Given respondents' focus on competitiveness and on data-driven insight and decision-making, we were struck by their response to the question: 'What do you consider the main benefits/drivers of big data'? The two highest ranked responses were 'better decision-making & improved business planning' and 'improved data quality & consistency'. The first answer was expected, the second less so.

The big data journey. Looking at these responses through the filter of big data maturity, it becomes clear why two such different drivers might emerge at the top. Better decision-making and planning is the priority for the Datarati, the most mature respondents (and to a lesser extent the Data-explorers). Data quality is the preoccupation of the Data-laggards (and to a lesser extent the Data-explorers); clearly they recognise that, because data quality is a pre-requisite for deriving true insight from big data, it is an important outcome of the early stages of big data planning. This result is a nice illustration of the journey that businesses must take in order to realise the benefits of big data. Before being able to get serious about the promised business benefits, they need to make sure that they have everything in place on which success depends, and these become important initial drivers and outcomes. On page 18, Craig Saunders, Director of the Xerox Analytics Resource Center, takes a closer look at some of the implications of the big data journey.

56%

of respondents are already seeing at least some business benefits from big data.

Big data per industry

Figure 3 shows respondents' intentions for big data at a general level, but the survey also asked respondents in each sector to tell us about their plans in the context of more industry-specific business purposes for which big data analytics can be used. We found that:

- The **high tech and communications** sector has primarily been leveraging big data analytics to identify and resolve network infrastructure bottlenecks (43% already doing this; 40% to do so in the next 12 months). In the next 12 months the sector's biggest new push will be in the area of reducing the level of human customer service interactions by increasing the use of online and automated support mechanisms (27% already doing this; 51% to do so in the next 12 months).

- The **retail and consumer** sector has been using big data analytics primarily to deliver better in-store (49%) and online (46%) shopping experiences and to increase customer loyalty and satisfaction (47%). Delivering a better online experience remains a strong focus (41% in the next 12 months), but the biggest plans for the next 12 months are in improving customer engagement through better contact centre experience (53%) and better matching of merchandise for different channels (51%).

- The **financial services** sector has been focusing mainly on using big data analytics to ensure compliance with financial regulations (54%) and to prevent, predict, identify, investigate, report and monitor attempts at fraud (44%). Fraud becomes the biggest focus over the next 12 months, with a new focus on analysing historical customer data to identify fraudulent customer behaviour (48%).

- The **industrial** sector's biggest business focus for big data analytics to date has been to improve the safety of products and services (43%), achieve regulatory compliance (39%) and optimise the supply chain (38%). In the next 12 months there will be a greater focus on supporting predictive maintenance (52%).
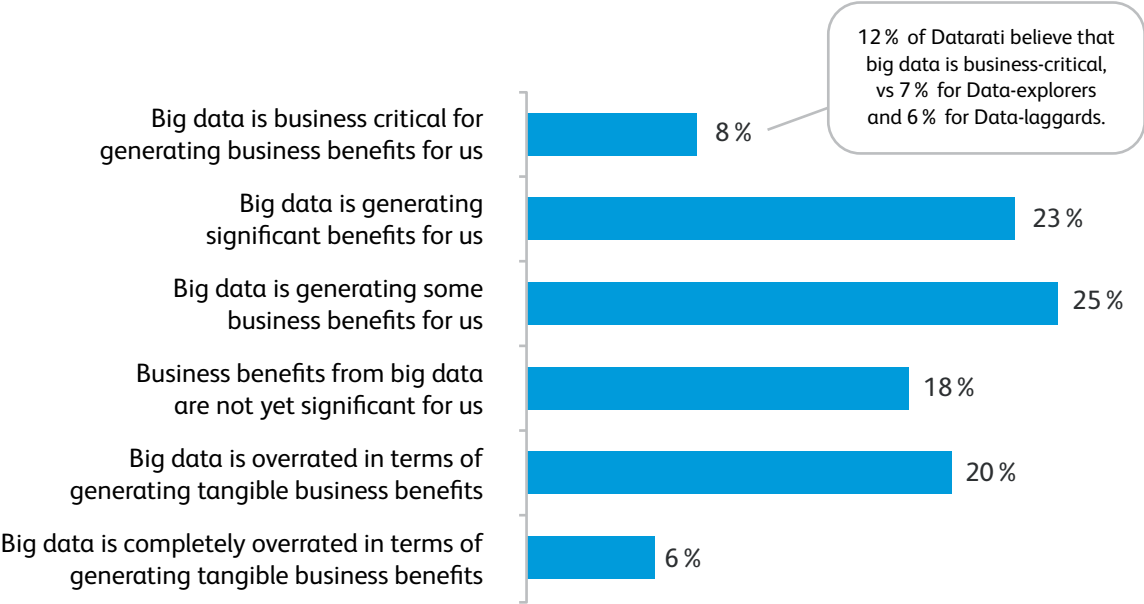
Positive Returns

Companies are already seeing the benefits. Over half of the firms surveyed indicate that they are already seeing business benefits from big data (see figure 4), and almost three-quarters expect to see a positive return on investment from their big data initiatives within 12 months of implementation. To ensure success they expect to recruit across a range of data roles — predominantly data engineers, data governance developers and managers, and data scientists — as well as looking to external support for big data projects (see 'What Organisations Look For in an External Analytics Partner' on page 17). As a result, over the next 12 months respondents expect their firms to make a greater proportion of their business decisions based on quantitative information and analysis, as opposed to qualitative factors such as experience, gut feeling or opinion (see figure 5).

74%

of respondents expect to see a positive return on big data initiatives within 12 months of implementation.

Figure 4. Overall opinion about big data

> 12 % of Datarati believe that big data is business-critical, vs 7 % for Data-explorers and 6 % for Data-laggards.

Big data is business critical for generating business benefits for us	8 %
Big data is generating significant benefits for us	23 %
Big data is generating some business benefits for us	25 %
Business benefits from big data are not yet significant for us	18 %
Big data is overrated in terms of generating tangible business benefits	20 %
Big data is completely overrated in terms of generating tangible business benefits	6 %

Data from a January 2015 commissioned survey conducted by Forrester Consulting on behalf of Xerox.

Figure 5. Business decisions based on quantitative information and analysis, compared with more qualitative decision factors

Today	48 %
12 months from now	61 %

Data from a January 2015 commissioned survey conducted by Forrester Consulting on behalf of Xerox.

Big Data Challenges

No single challenge really stands out. Figure 6 shows the results when respondents were asked to select their biggest challenges to implementing their big data strategy, today and for the immediate future. They were able to select as many as they wanted from a list of 19, presented in random order. Unsurprisingly, 'data security & privacy' comes out on top, but what is striking is that it doesn't really stand out to any significant degree, and nor do any other challenges. Comparing today with the next two years, almost every area of challenge seems to loom larger in the future, with concern over a lack of skills — for data engineering and for carrying out ROI/business case analysis — showing a particularly big increase. Firms seem to be battling on a multitude of fronts in implementing their big data strategies.
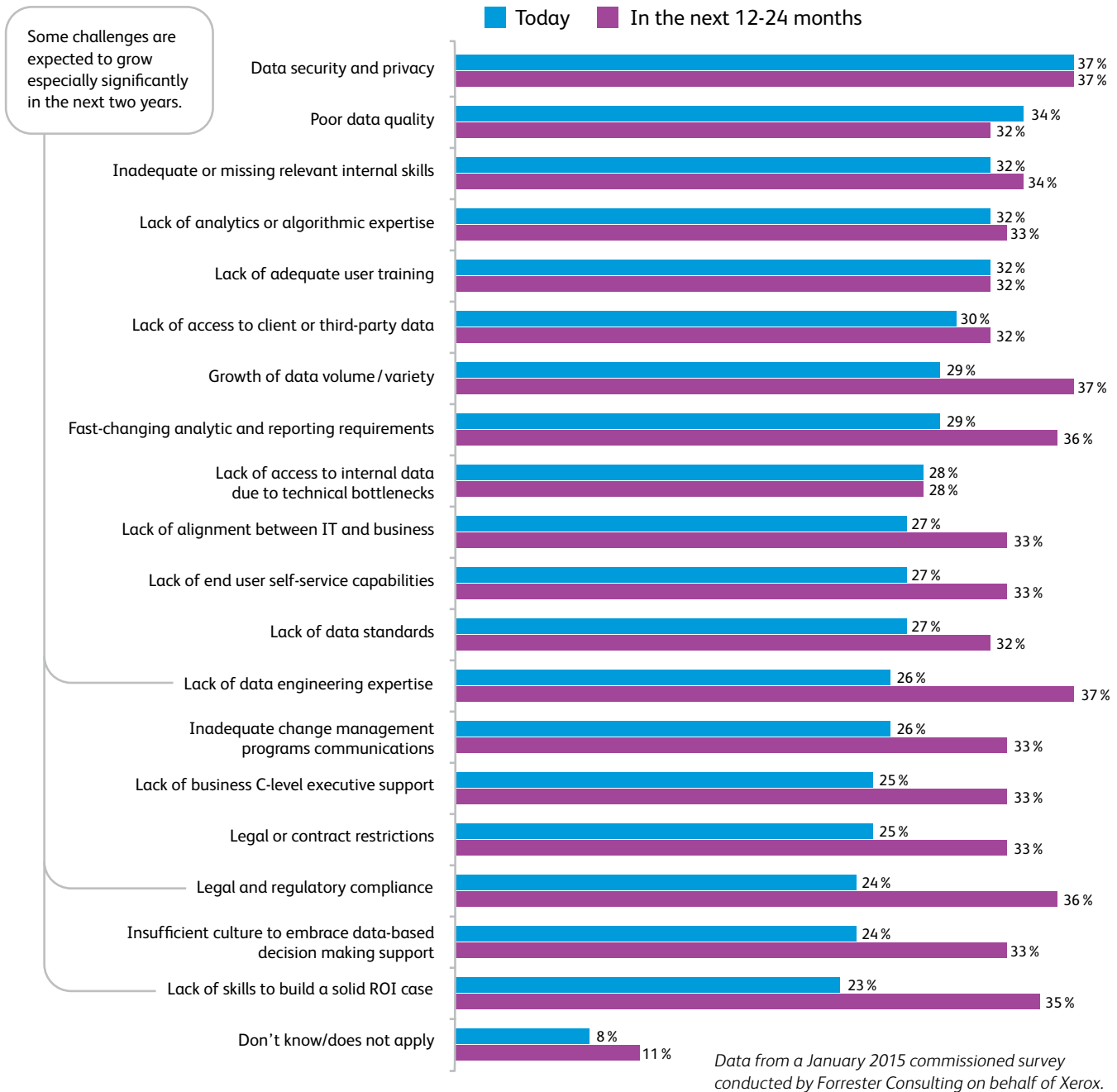
Does maturity have a bearing? We might expect the picture to look different for Datarati, Data-explorers and Data-laggards, but although there are some subtle differences, broadly speaking the challenges seems to be the same for our three groups. 'Lack of adequate user training' edges out data security for the Datarati. They are also considerably less concerned than the other two groups about change management and somewhat less concerned about lack of C-level support and a decision-making culture. Data-laggards worry somewhat less about legal, regulatory and contract issues. But overall, all three groups recognise a broad range of challenges rather than a handful of major barriers.

What does this mean? What seems at first a potentially puzzling picture may not be at all. Craig Saunders, Director of the Xerox Analytics Resource Center, gives insights into why on page 18.

The Growing Importance of Data Privacy

Data Privacy law in Europe is set to become more stringent, as the new General Data Protection Regulation (GDPR) is expected to become law in 2015 and come into effect in 2017. But this isn't the only, or even the primary, reason to take data privacy seriously in the age of big data. Xerox privacy expert Thierry Jacquin explains why on page 20.

Figure 6. The biggest challenges firms face when implementing their big data strategies

Legend: ■ Today ■ In the next 12-24 months

> Some challenges are expected to grow especially significantly in the next two years.

Challenge	Today	In the next 12-24 months
Data security and privacy	37 %	37 %
Poor data quality	34 %	32 %
Inadequate or missing relevant internal skills	32 %	34 %
Lack of analytics or algorithmic expertise	32 %	33 %
Lack of adequate user training	32 %	32 %
Lack of access to client or third-party data	30 %	32 %
Growth of data volume / variety	29 %	37 %
Fast-changing analytic and reporting requirements	29 %	36 %
Lack of access to internal data due to technical bottlenecks	28 %	28 %
Lack of alignment between IT and business	27 %	33 %
Lack of end user self-service capabilities	27 %	33 %
Lack of data standards	27 %	32 %
Lack of data engineering expertise	26 %	37 %
Inadequate change management programs communications	26 %	33 %
Lack of business C-level executive support	25 %	33 %
Legal or contract restrictions	25 %	33 %
Legal and regulatory compliance	24 %	36 %
Insufficient culture to embrace data-based decision making support	24 %	33 %
Lack of skills to build a solid ROI case	23 %	35 %
Don't know/does not apply	8 %	11 %

Data from a January 2015 commissioned survey conducted by Forrester Consulting on behalf of Xerox.

Country variations

- **Germany** is considerably more concerned about data quality (48%) and data security & privacy (47%) than the average.

- **Belgium** is more concerned about lack of user training (39%) and C-level support (36%).

- The **UK** also has lack of user training as a top concern (36%).

- **France** is most concerned about lack of access to client / third-party data (39%).

- In the **Netherlands**, lack of access to internal data (due to technical bottlenecks) is the top challenge (36%).
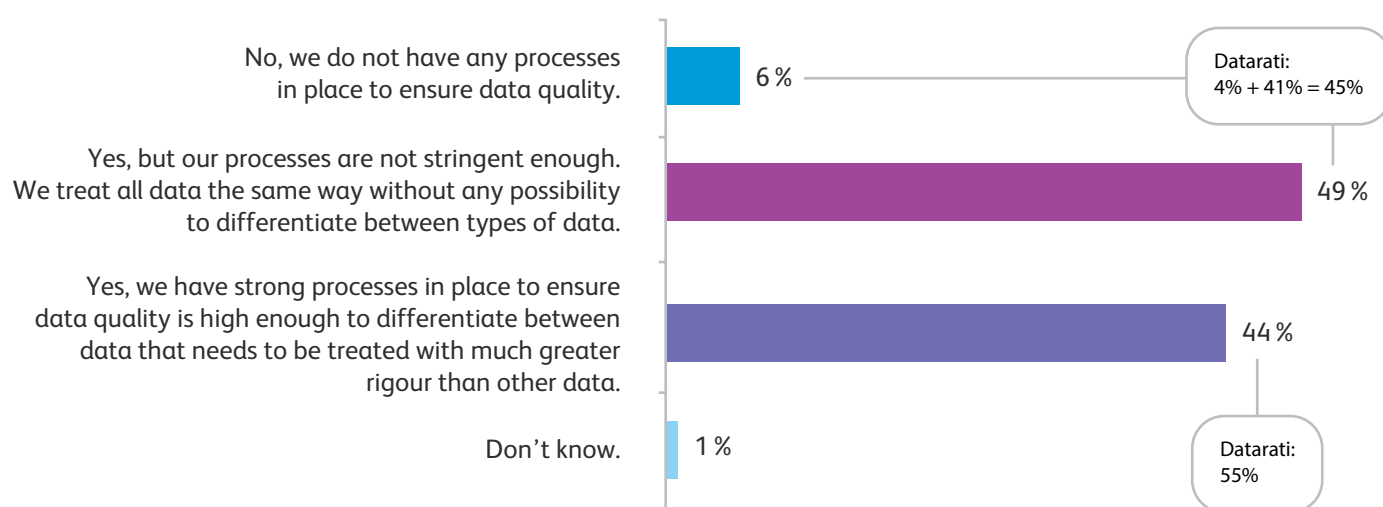
The issue of data quality. With data quality being perceived as a significant driver of big data initiatives and a notable challenge for all three of our maturity groups, it's worth taking a closer look at it.

Data quality: a perennial concern. A considerable minority of respondents (44%) believe that they have strong enough processes in place to ensure that data quality is high when it needs to be (see figure 7), and this is presumably why data quality does not jump out as a challenge above other challenges. But that still leaves more than half of respondents (55%) acknowledging that their processes are not stringent enough (or that they have no processes) to ensure data quality. Even among the Datarati, only a small majority (55%) believe that their processes to ensure data quality are strong enough, and this would explain why data quality is still an acknowledged challenge even for them. Data quality will probably remain a perennial concern for data-driven companies, given its fundamental importance to the value of data-driven insight and the fact that businesses increasingly depend on third-party data sources and real-time data.

55%

of respondents lack strong enough processes to ensure data quality. Even for the Datarati it's 45%.

Figure 7. Firms that have processes in place to ensure data quality

No, we do not have any processes in place to ensure data quality. — 6 %

Datarati:
4% + 41% = 45%

Yes, but our processes are not stringent enough. We treat all data the same way without any possibility to differentiate between types of data. — 49 %

Yes, we have strong processes in place to ensure data quality is high enough to differentiate between data that needs to be treated with much greater rigour than other data. — 44 %

Don't know. — 1 %

Datarati:
55%

Data from a January 2015 commissioned survey conducted by Forrester Consulting on behalf of Xerox.
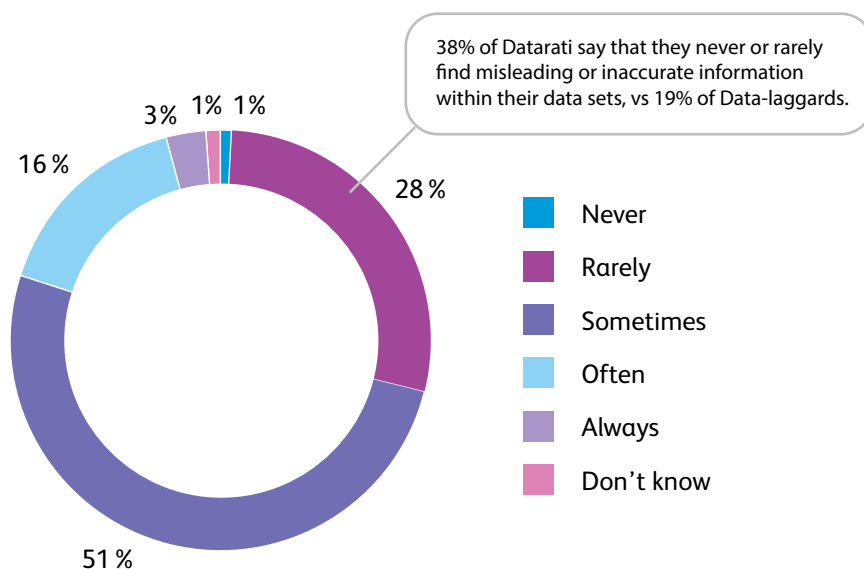
Country variations

- Firms in the **UK** (53%) and **France** (48%) are ahead of those in **Belgium** (33%), the **Netherlands** (33%) and **Germany** (39%) in having strong enough processes in place to ensure data quality when necessary.

The impact of poor data quality. Less than a third of respondents state that they rarely or never find misleading or inaccurate information in their data sets; the majority find inaccurate information at least sometimes (see figure 8), and almost half of the firms surveyed (46%) indicate that the presence of incorrect data has serious consequences for use, either being completely unusable or requiring rework. There's a big difference between Datarati and Data-laggards in their existing data quality: while 38% of Datarati say that they never or rarely find misleading or inaccurate information within their data sets, only 19% of Data-laggards are that confident.

46%

of respondents believe that incorrect data leads to data inconsistencies that require recalculation – or to completely unusable data.

Figure 8. Occurrence of misleading or inaccurate information within data sets

38% of Datarati say that they never or rarely find misleading or inaccurate information within their data sets, vs 19% of Data-laggards.

3% 1% 1%
16%
28%
51%

Never
Rarely
Sometimes
Often
Always
Don't know

Data from a January 2015 commissioned survey conducted by Forrester Consulting on behalf of Xerox.

A further impact of poor data quality. The survey shows that, despite the majority view that big data is already delivering business benefits, respondents are still sceptical about its value in executive decision-making, trusting past experience and gut instinct at least as much (see figure 9). This is surely a reflection of mistrust in the quality of the data, although it's conceivable that the mistrust lies in the quality of the analysis or reporting, rather than the basic data quality. As with data quality, there's a marked difference between Datarati and Data-laggards here: 33% of Datarati have complete trust in big data analysis when making executive decisions, compared with only 17% of Data-laggards.

Figure 9. To what extent do you trust these approaches when making executive decisions?

Past experience related to the decision being made
- Complete trust: 32%
- Some trust: 52%
- Little trust: 14%
- No trust: 2%

My own gut instinct
- Complete trust: 33%
- Some trust: 51%
- Little trust: 14%
- No trust: 2%

Big data analysis related to the decision being made
- Complete trust: 27% (Datarati 33% Data-laggards 17%)
- Some trust: 52%
- Little trust: 19%
- No trust: 2%

Legend:
- Complete trust
- Some trust
- Little trust
- No trust

Data from a January 2015 commissioned survey conducted by Forrester Consulting on behalf of Xerox.

What Organisations Look For in an External Partner

Respondents have a clear idea of what they are looking for when seeking external support for a complex service that includes analytics:

- 59% would choose to contract with two suppliers working in partnership; a provider of wider IT capabilities with deep industry knowledge, partnering with an analytics provider that specialises either in the relevant industry or in the business function for which analytics is required. However, only 9% are interested in such a partnership approach where the analytics provider lacks specialist knowledge.

- 29% would look for a single provider that can provide a combination of depth and experience in industry-specific solutions, deep technical knowledge and a breadth of analytics applications.

- Hardly any respondents would choose a pure-play analytics provider on its own, ie one where analytics is its core or only business.

- When choosing a supplier the top four things looked for by decision-makers are proven results (47%), a strong brand (43%), industry-specific experience (41%) and technical expertise (36%).

37% of respondents expect that lack of data engineering expertise will be a problem over the next 12 months.

33% of respondents plan to hire more data engineers over the next 12–24 months. 30% will also be looking to hire data governance developer and data scientist roles.

53% of respondents either currently use a third-party systems integrator or consultant to help with big data projects, or expect to look for external support over the next 12 months.

Understanding and Addressing Big Data Challenges

By Craig Saunders,

Director — Analytics Resource Center, Xerox Consulting and Analytics

When asking about challenges in applying and using big data to improve business, one might expect that certain challenges would stand out above the others, and that those that do would depend on your level of analytics maturity. For example, data quality may be seen as a challenge as you start to embrace big data analytics, but as you mature, perhaps strategic and cultural elements top the list.

So when we see a long list of challenges, *all* of which have been picked by roughly a quarter to a third of survey respondents as their largest big data challenges (see figure 6, page 14), it's natural to question why that would be so. It's possible that this 'flatness' is the result of an averaging effect across a variety of sector and role differences. While we do see slight differences in a few sectors and roles, overall the differences are small and the distribution of concerns remains relatively flat for all.

If the flatness is not due primarily to an averaging effect, the natural instinct may be to interpret it as a lack of focus or planning in getting to grips with the large range of challenges that big data initiatives involve: perhaps respondents are simply overwhelmed by the magnitude of the task. But I don't believe in general that this is the case.

The Mature View of Challenges

As an organisation starts out on the big data path, everything may indeed seem equally challenging. Then, as experience is gained with particular big-data-driven services or capabilities, usually specific challenges emerge as being of particular importance or urgency, and these are addressed as they arise. In succeeding with individual projects, organisations recognise the top issues relevant to their business and arrive at a deeper level of understanding and control of them.

With this understanding and control comes an appreciation of the complexity of the big data journey, and a recognition that no challenge is ever really 'solved'. The market moves very quickly, with technologies and services continually evolving, resulting in new challenges — or new aspects of familiar challenges — constantly appearing. This shifting landscape means that, where past experience has shown an issue to be significant, it tends to remain of concern. Mature organisations understand how important it is to be able to recognise, even anticipate, these changes in order to act promptly and appropriately. This is why maturity, rather than creating a less flat picture of challenges, can reinforce the flatness —

reflecting a journey that starts with equal weighting of challenges stemming from uncertainty, then ultimately arriving at an equal weighting of challenges stemming from a deeper level of control and understanding.

Many Silos to be Broken

Along with this deeper level of control and understanding comes enterprise recognition that successful exploitation of big data calls for silos to be broken, and that this is a major task. Customers are demanding a **single view of services**, with interaction mechanisms and information flows on their terms, personalised to their needs. On the flip side, organisations are understanding that to respond effectively to this demand, they need to have a **single view of the customer**.

While integrated and personalised services are emerging at a fast pace, the reality often is that the joined-up view presented by businesses to customers tends to hide a mess of distinct legacy structures, processes and technologies that are complex to bridge. When it comes to data, it can sometimes take large organisations weeks, even months, to pick apart a complex process and figure out who owns the relevant data sets, and which internal and external partners touch or affect each process element.

Make no mistake, silo-breaking is a huge task requiring significant investment and changes in attitude and working culture. While this is particularly true for 'non-digital' organisations, 'digital natives' are not completely immune to the problem of silos — especially if their business has grown rapidly. A fast rate of expansion may have led to the creation of silos if there have not been clear and rigorous processes from the start to prevent this.

The sheer size of the task, together with the rapid pace of change within the field of big data, makes it challenging for large enterprises to have a wholesale, top-down strategy for enterprise-wide integration of the kind that would really simplify the exploitation of big data. The risk and return of such a strategy is often difficult to quantify, and successful implementation requires time and a methodical and consistent approach — which is not easy in a fast-moving environment. There is a tension between the wish to rationalise, integrate and centralise, and the wish to encourage agility by letting everyone get on and move fast to capture more business opportunity.

There are options, however, to maintain both consistency and agility. Many organisations are starting to successfully use a hybrid approach: a clear top-down strategy, with enforceable guidelines, that encourages silo-breaking at a pace that suits the stakeholders in different areas of the business. People on the ground often recognise the need to break silos to capture opportunities, and those empowered to do so will achieve results. In other words, where silo-breaking is happening in a piecemeal fashion, it is not necessarily a negative sign.

Be Encouraged

I actually find it encouraging that our survey shows solid recognition among decision-makers that big data throws up so many challenges on so many fronts. It shows that the real challenge is awareness, understanding and planning, not the individual issues themselves. For all the attention it's receiving, big data analytics is no different from any other technology, market opportunity or strategic constraint. The basic business rules of understanding the landscape, having the right strategy, hiring the right talent and making use of the right strategic partners still apply.

Another way in which big data analytics is no different from other technology-centric innovations, is that the challenges are at least as much about culture and people as about technology. We see this in figure 6 on page 14, where challenges relating to skills/training, changing (business) requirements, change management and IT/business alignment feature alongside challenges relating to data. Successful strategies — yours and those of your partners — will focus as much on people, processes, and what you are trying to achieve for your customers, as on data warehousing and analytics techniques.

Whether you are just starting on the journey or already well on the way, if you feel in any way overwhelmed by the magnitude of the task, I would simply say: be encouraged and get help. It's readily available at every level; you don't have to go through expensive learning curves when others have been there before you. Few are 'going it alone' in the big data world, there's an ever-growing ecosystem of companies coming together to use data in various ways to serve clients better.

Craig Saunders

Craig leads the Analytics Resource Center, part of Xerox Consulting and Analytics Services and a focal organization for analytics across Xerox Services. Craig uses both his deep technical background in machine learning and data science, plus his consultancy experience across a range of industries, to ensure that client problems are understood in context, allowing the right analytics tools to be applied as part of a joined-up solution. Located in Grenoble France, he works with Xerox business, delivery and research teams across the globe to dig into data and processes and bring real value to clients and their customers.

Why and How to Make Data Privacy a Business Priority

By Thierry Jacquin,

Senior Research Engineer in Enterprise Architecture, Xerox Research Centre Europe

Data privacy is not by any stretch of the imagination a new issue, but it has a new force and urgency nowadays, in the era of information and big data. The value of personal data can hardly be exaggerated, as businesses seek to improve competitiveness through customer insight, or create novel services and business models that respond in real time to customer data. The challenge for businesses that want to collect and use personal data is that people are increasingly wary of handing their data over. They worry about giving up control over how their data is used and by whom, and what it means for their right to privacy.

'Organic' or Not?

I like to compare the undeniable rise in public concern over data privacy to what has happened in agriculture, where health and environmental concerns over food have spurred a rapid growth in organic farming. Just as farmers must choose whether to be organic or not, I believe that businesses must make a fundamental strategic choice about what kind of business they want to be when it comes to data privacy.

Those that make the 'organic' choice, and do so early, will be in a prime position to take competitive advantage of the data-driven world we now live in. They will be able to earn the trust of those whose data they seek to use, because they will be contributing to, and benefiting from, the equivalent of the 'organic' label: the principle of 'privacy by design and default'.

Besides building trust, this approach tends to have a significant knock-on benefit in improving data quality, because one of the most common protective actions when there is lack of trust in digital services is to give inaccurate information; whereas trust engenders a willingness to provide accurate information, and more of it.

Establishing Principles of Privacy

Here's an example of an initiative taking privacy by design and default to heart. MOBiNET (http://www.mobinet.eu/) — the Internet of (Transport and) Mobility — is a project co-funded by a European Commission grant. Its aim is to give travellers a single gateway through which to access information, plan journeys and buy tickets for every means of transport across Europe (instead of having to go to a separate website or download a separate app for every service in every country).

Clearly such a platform faces significant data privacy issues, as it depends on collecting data from transport users and sharing it among systems belonging to a multitude of service and content providers. The platform needs a workable privacy framework, and when our Xerox research group joined MOBiNET in 2012 we found ourselves taking up the challenge of developing one.

We decided to base it on the spirit and principles of the new General Data Protection Regulation (GDPR) that will soon become EU law. This regulation is at the centre of a heated battle between the US and Europe, due to its potential influence on international commerce and diplomatic stakes. Despite the unpredictable outcome, we considered that, whatever the ultimate form and force of the GDPR, its rationale matched what we wanted to achieve: to protect privacy in the online world to the same extent as in the offline world.

The GDPR recognises that doing so requires data owners, who are usually also the data subjects, to have more control over the use of their data than is provided for by the current EU Data Protection Directive. It makes data processors much more accountable for the collection, use and storage of personal data. It is more specific about requirements for obtaining consent from data subjects for the use of their data, and makes more explicit provision for data subjects to withdraw consent once given, and to petition for data erasure ('the right to be forgotten').

We wanted to build all of these principles into the MOBiNET privacy framework and make this clear to platform users in the control that we gave them. We wanted to announce very clearly: 'you own your data, and we will respect that'. This, we believe, is how you create a service that people will trust, and therefore use.

Taking Up the Technical Challenge

This is easier said than done, of course, but we've gone a long way to proving that it can be done.

The privacy-by-default framework that we've built provides for an architecture that is relatively straightforward for data processors to use. It lets them express the exact nature of the data they need to collect and the precise purpose for which it will be used, and link this meaningfully to their service code. The immediate result of this expression is the generation of

a privacy manager that ensures extended, state-of-the art security of any sensitive records that are collected. Sensitive information can be secured using techniques such as anonymisation, encryption and distribution, and can only be made useful and used if consent is given.

We've also developed a language for such consent that is practical for a service user to understand and work with, though this still has to be seriously put to the test and can surely be improved.

The basic idea is that users can specify, at a very granular level, what they are consenting to. They can say things such as: "I accept that my location can be made visible to [name or type of service, organisation or actor] for [X] purpose, but only for [Y] length of time, and not for any other purpose."

It's also possible for data subjects to change their consent at any time, which means that the framework needs to respond accordingly. One of the challenges in our approach to privacy is that, although the concept of 'privacy by design' may suggest something built in as a core and unchanging element of the platform foundations, the kind of dynamic privacy management that we're developing must happen at the level of service deployment on the platform. Our framework aims at automating the development of a privacy manager that will supplement service code as necessary to act on changes in the consent choices of individual service users.

The piece that has proven the most challenging is building in enforcement and accountability cost-effectively. In other words, how do we easily and affordably apply checks and balances at the IT processing level, to ensure that data

subjects' choices are properly acted on by the relevant systems and organisations? We are currently refining a novel approach to achieve this, which doesn't require any re-engineering of the third-party service under deployment, and which ensures that the data abides by the rules of any 'organic' platform charter. (For the techies among you, it's an Xtext-based model bridging code introspection and aspect-oriented programming.)

Early Days: Challenge and Opportunity

It's very early days for everyone working on making data privacy a reality in our world of ubiquitous connectivity, social networking, cloud computing and big data analytics. Xerox is certainly not the only organisation actively working to address it. Others are doing so, whether from a technology, security, software engineering, societal or business point of view. We do believe that the Xerox Privacy Framework approach is special in the way that it balances business, technology and societal needs, providing the level of control that users want at a reasonable cost of enforcement.

Because it's such early days, it's not easy for businesses that want to get serious about data privacy to do so; you're unlikely to have in-house data privacy architecture experts on hand. The reality is that, if you want to build competitive advantage through data privacy, you'll probably need to partner with a service provider that is actively working on agile privacy management. Given the opportunity to get ahead of legislation as well as achieve early advantage in giving data owners what they want, we expect demand for data privacy services to rise sharply in the coming years.
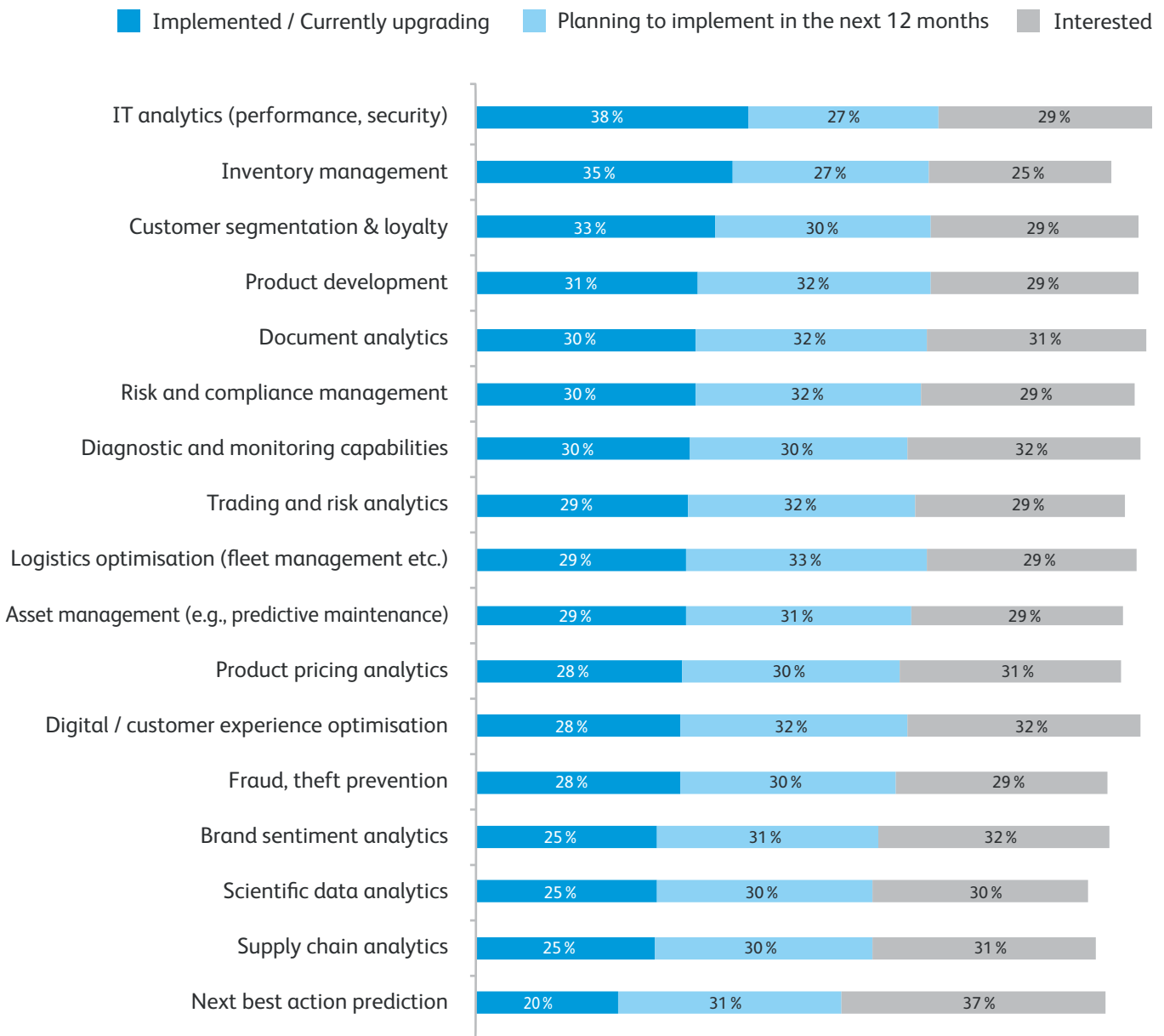
Thierry Jacquin

Thierry Jacquin is a senior research engineer and enterprise architect whose main focus is domain-specific engineering. He started as a software engineer in operating systems, then in the '90s moved to early research in mash-up environments and service-oriented architecture. He has spent the last 10 years exploring new business avenues promised by model-driven architecture, refining an agile research methodology based on domain-specific languages. He has immersed himself in several disciplines to finetune his research approach and produced a number of operational assets, including a document collection processing toolkit, a co-design network and, most recently, a privacy engineering framework that is still under development.

Big Data Use Cases

Extensive plans for big data. Over 90% of the companies surveyed have implemented, plan to implement or state that they are interested in implementing big data technology across a wide range of different use cases. This suggests a breadth of expectation and ambition in relation to the use of big data, in line with the high expectations that respondents have for big data initiatives. On average, each business is already implementing six of the use cases, with the Datarati ahead of the pack with an average of eight.

Figure 10. Firms are using big data technology across a wide range of use cases

	Implemented / Currently upgrading	Planning to implement in the next 12 months	Interested
IT analytics (performance, security)	38%	27%	29%
Inventory management	35%	27%	25%
Customer segmentation & loyalty	33%	30%	29%
Product development	31%	32%	29%
Document analytics	30%	32%	31%
Risk and compliance management	30%	32%	29%
Diagnostic and monitoring capabilities	30%	30%	32%
Trading and risk analytics	29%	32%	29%
Logistics optimisation (fleet management etc.)	29%	33%	29%
Asset management (e.g., predictive maintenance)	29%	31%	29%
Product pricing analytics	28%	30%	31%
Digital / customer experience optimisation	28%	32%	32%
Fraud, theft prevention	28%	30%	29%
Brand sentiment analytics	25%	31%	32%
Scientific data analytics	25%	30%	30%
Supply chain analytics	25%	30%	31%
Next best action prediction	20%	31%	37%

Data from a January 2015 commissioned survey conducted by Forrester Consulting on behalf of Xerox.

Sector variations. Overall, what is most striking across the sectors surveyed in this report is how many firms in all four sectors have either already implemented, or plan to implement in the next 12 months, big data technology across the full range of use cases shown above. There are few standout use cases in any sector. The pattern is, rather, of plans for comprehensive deployment across the board with some slight differences of emphasis between the sectors. These variations are summarised in Table 1 — but note that underneath these small differences the underlying picture is of a broadly similar range of deployments.

Retail and consumer sector. The top four use cases for big data to date in this sector are logistics optimisation (44%), inventory management (43%), IT analytics (41%) and asset management (39%). Different use cases become the main focus for the next 12 months (examples include fraud and theft prevention, brand sentiment analytics, and customer segmentation and loyalty), but not enough to overturn the sector's overall focus. Adding existing investment to new investment over the next 12 months, the top four user cases in the sector will be: logistics optimisation (70%), inventory management (66%), asset management (64%) and one new entry, product development (64%).

Financial services sector. In this sector, firms have principally invested in big data for IT analytics (40%), fraud/theft prevention (39%), document analytics (36%) and risk & compliance management (34%). In the next 12 months, bigger investments in other uses cases will be enough to raise trading & risk analytics and product pricing analytics into the top 4 (at 65% and 64% respectively), with IT analytics keeping the top spot (71%) and document analytics holding its place (65%).

Industrials sector. The use cases that have seen the most investment to date — inventory management (43%), IT analytics (40%), customer segmentation & loyalty (40%) — remain at the top in 12 months time. New investment in digital/customer experience (along with other new areas of focus) sees it enter the top 4 over the next 12 months, with the final standings being: inventory management (68%), IT analytics (66%), customer segmentation & loyalty (66%), digital/customer experience (64%).

High tech and communications sector. This sector is behind in the others in terms of the number of firms with big data implementations to date; the top use cases are customer segmentation & loyalty (29%), IT analytics (29%), asset management (28%) and inventory management (28%). But respondents indicate plans for many new big data deployments over the next 12 months, and the sector will catch up this year. In 12 months time the top use cases will be quite different: product development (64%), logistics optimisation (62%), inventory management (62%) and document analytics (61%).

Table 1. Sector variations in use cases

● Top use case investments so far

1-4 Overall top 4 use cases in 12 months time

	Retail and consumer	Financial services	Industrials	High tech and communications
Asset management	● 3			●
Brand sentiment analytics				
Customer segmentation & loyalty			● 3	●
Digital/customer experience optimisation			4	
Diagnostic & monitoring capabilities				
Document analytics		● 3		4
Fraud/theft prevention		●		
Inventory management	● 2		● 1	● 3
IT analytics	●	● 1	● 2	●
Logistics optimisation	● 1			2
'Next best action' prediction				
Product development	4			1
Product pricing analytics		4		
Risk & compliance management		●		
Scientific data analysis				
Supply chain analytics				
Trading & risk analytics		2		

Data from a January 2015 commissioned survey conducted by Forrester Consulting on behalf of Xerox.

Conclusions about Big Data Maturity

Datarati are most optimistic about the opportunities. All of the respondents surveyed in this report are well aware that there is still much to learn. But the Datarati, as well as being (by definition) more mature in their big data approaches, have more experience with big data deployments (see 'Big Data Use Cases' on page 23), and this gives them greater confidence in the value of big data initiatives. More than 80% of the Datarati believe that big data insights are delivering competitive advantage, compared to 74% of the Data-explorers and 62% of the Data-laggards. The Datarati are more likely to regard big data as business-critical, and they are able to focus more on using big data to improve decision-making and business planning than to improve data quality.

Business focus. We also see that the Datarati have a distinctly more outward-looking business focus than the Data-laggards:

Datarati

see their biggest business challenges by some way as dealing with both new and existing competitor activity, followed by improving cooperation between business units, measuring programme results, and creating a single view of their customers.

Average current number of big data use cases: 8.

Data-explorers

lie in between the two extremes, focusing on the competition and on using insight to drive decision-making, but also on gaining expertise with new programmes or media and managing competition between different lines of business.

Average current number of big data use cases: 6.

Data-laggards

seem to be worrying equally about a wide range of business challenges, many internally focused such as competition between different lines of business, gaining expertise with new programmes or media, and getting executive support for business priorities, all of which edge out increased activity from competitors and creating insight to drive decision-making.

Average current number of big data use cases: 5.

Data-laggards risk falling behind. The Data-laggards (as the name suggests) are lagging behind both the Datarati and the Data-explorers. Their big data initiatives are still driven more by a focus on improving data quality than decision-making, presumably because they find misleading or inaccurate information in their data sets much more frequently and, consequently, trust big data analyses much less than Datarati. In the future they still expect to be grappling with the growth of data volume and variety, while more advanced companies have moved on to using big data to improve their decision making. If the Data-laggards don't get to grips with the basics soon, they risk falling even further behind as their more data-powered competitors reap the benefits of their more mature approaches.

Appendix: Survey Respondents
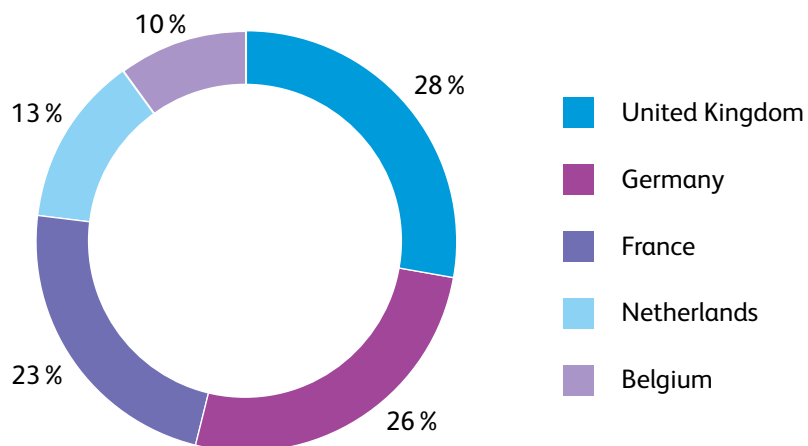
Figure 11. Respondents by country

- United Kingdom — 28 %
- Germany — 26 %
- France — 23 %
- Netherlands — 13 %
- Belgium — 10 %

Figure 12. Respondents by sector

- Financial services — 27 %
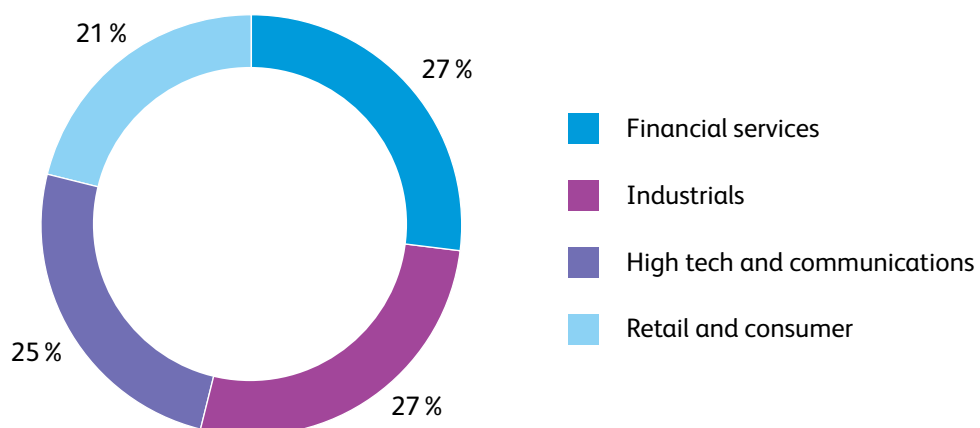- Industrials — 27 %
- High tech and communications — 25 %
- Retail and consumer — 21 %

Figure 13. Respondents by department

- IT — 29 %
- Executive team and strategic planning — 25 %
- Marketing or advertising, analytics and product development — 19 %
- Finance — 14 %
- HR — 13 %

Data from a January 2015 commissioned survey conducted by Forrester Consulting on behalf of Xerox.