

Big Data Analytics

Towards a Data-Driven Economy

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BARC Research Study

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Foreword: Big data 2014 – Specific application scenarios move to the foreground

Big data has arrived in the public domain, with opinions in both the business press and mass media ranging from enthusiastic welcomes to skeptical critiques. While big data presents new possibilities, it also heralds the end of privacy: “Big Opportunity” meets “Big Brother”. However, regardless of the light in which it is viewed, critics acknowledge big data’s potential for revolutionizing how we think, live and do business.

With global enterprises such as Google, Amazon and Facebook to some extent underpinning their business models with big data, it’s not hard to see that, in order to keep up with the competition, businesses need to secure decisive competitive advantage with intelligent analytics and better use of internal and external data. The increasing availability of data and advanced analytical methodologies is exerting noticeable pressure for change on established business structures and cultures. In this respect, intuition and experience-based decision making is being supplanted by data and statistics-based decision making logic. Users acting on data updated daily or hourly are increasingly being supplemented or replaced by information systems capable of “real-time” decision making.

From a business perspective the value-add of big data is not just about amassing but analyzing data and the associated ability to draw timely, sound answers and informed recommendations for action which drive improvement of business processes and models. The impact of big data is far reaching, with the upward development of entire economies being intensively driven and underpinned by data.

While discussion in the IT and business press was for a long time based on a more technical level reserved for a select audience, the emphasis has shifted towards more specific application examples and the analytical and operational value added by big data. Being able to combine highly complex analytical methods with massive amounts of data and draw valuable insights from them is evolving into a skill that will determine an enterprise’s success.

There is a host of individual examples of how organizations are utilizing big data to improve business functions. However, there is a recognizable absence of a quantitative survey of the DACH countries (Germany, Austria and Switzerland) that focuses on application scenarios – a crucial gap that this study fills. Among the key questions this study answers are:

- What is the level of implementation of big data initiatives in the DACH region?

- Who and what drives them?
- How do enterprises use big data and what problems do they see with it?
- Which specific big data application scenarios are being implemented right now and which are in the planning stage?
- Which technologies are organizations currently using and which are they planning to implement for big data?

This study focuses on best-in-class and intensely data-driven organizations that report good analytics capabilities and intensively utilize data in their business processes.

BARC is solely responsible for the contents of this independently prepared study and it is available free of charge thanks to the generosity of software vendors Blue Yonder, Comma Soft, Empolis Information Management, EXASOL, Hewlett Packard, Pentaho, Platfora, SAS, Tableau Software and Teradata.

BARC would also like to thank all those who took part in this survey. Your valuable insights allow us to continue to make a crucial contribution, based on empirical data, to the ongoing debate regarding big data.

Würzburg, May 22, 2014

Dr. Carsten Bange, Nikolai Janoschek

Management Summary

The big data revolution is gathering momentum with data rapidly becoming as important, if not more so, than land, capital and labor. This is driving changes to business processes and models, boosting transparency, quality, efficiency and effectiveness.

This study focuses on specific application scenarios for big data analytics in the DACH region. With a survey sample of more than 370 participants across a diverse range of industries located in Germany, Austria and Switzerland, “Big Data Analytics 2014” ranks among the largest surveys specifically focusing on the subject of big data analytics. Key findings from this study are summarized as four Hot Spots highlighting the progress of big data in the business environment.

Hot spot #1: Big data: The tide is turning

“30 percent of businesses already have big data initiatives.”

Big data has well and truly arrived in the business world. 12 percent of survey participants have big data initiatives permanently integrated within their business processes and a further 18 percent have initiatives in pilot project status. While nearly a third of organizations will have implemented a big data initiative in the near future, just 22 percent of survey participants do not see any applications for big data.

“74 percent of businesses want to achieve new and better analytical options for their data through big data initiatives.”

The push for implementation of big data applications is not solely influenced by external forces such as the mass of data generated by social media, or even improved analytical capabilities through technology. Need is equally driven from the perspective of business users and requirements. 58 percent of participants recognize the problem of managing increasing amounts of data while 54 percent identify variously structured data sources as the greatest challenge calling for big data initiatives. However, the hottest topic is the demand of business users for new and improved capabilities (74 percent) with big data regarded as the remedy for large deficits in this area.

Hot spot #2: Big data analytics is more useful than expected, but bottlenecks in knowledge slow implementation

“Big data analytics exceeded by far the added value expected prior to its introduction.”

Organizations participating in our previous study had great expectations when asked about big data’s presumed advantages, and this year’s study reveals that organizations with big data deployments in place achieved even more added value than predicted the year before. In our previous study, 50 percent of participants stated that they saw an advantage in faster analyses, 41 percent in more detailed analyses, as well as 51 percent in better operational process control.

“Three-quarters of businesses attain faster, more detailed analytical capabilities through big data analytics; more than two-thirds of companies succeed in controlling their operational processes better.”

The actual realized values determined by this study were considerably higher than expected values stated the year before at 78 percent (faster analysis), 75 percent (more detailed analyses), and 68 percent (better control of operational processes).

“Thanks to big data analytics, 45 percent of businesses are able to reduce their process costs.”

The survey reveals that enterprises substantially underestimate the direct cost advantage they will derive from big data analytics. 28 percent of those surveyed the year before cited cost reduction as an expected benefit, but in 2013 45 percent of companies with big data initiatives reported reduced process costs. In ‘intensely data-driven’ enterprises, the corresponding figure was an impressive 72 percent.

“Inadequate analytical and technical know-how together with data privacy are the biggest challenges in big data projects.”

Building a knowledge base continues to present the biggest obstacle to organizations with 55 percent of survey participants acknowledging a lack of analytical know-how and 47 percent reporting a deficiency in technical know-how.

The past year has also seen the issue of data privacy moving up the list of problems from 25 percent to 53 percent. The marked escalation in public discussion on this

subject in recent months has clearly made itself felt in this year's survey. Interestingly data security is considered a major issue by a far higher proportion of organizations with big data initiatives (58 percent) than by those who do not have big data initiatives (33 percent).

Hot spot #3: Dual objectives – transparency and improved forecasting

“Big data analytics are deployed in all areas of the enterprise.”

Big data analytics can be deployed in a variety of specific application scenarios. The survey revealed a fairly even spread of big data implementations across sales (20 percent), finance & controlling (18 percent), marketing (16 percent) and IT (16 percent) departments. Additionally, these same departments report a healthy level of planned big data implementations, revealing the key business areas upon which organizations are focused.

“The number one objective of big data analytics is heightened transparency.”

Improved transparency in order to aid better decision making and increased efficiency of operating processes is a prime objective of big data implementations. 29 percent of participants currently using - or planning to use - big data analytics for controlling carry out more detailed analysis of data.

“Data visualization is the most frequently used big data analytics technique, followed by real-time reporting and dashboards.”

A focus on transparency is also evident in the survey data regarding analytical methods, with data visualization (36 percent) being the most frequently used. 26 percent of participants use real-time reporting and dashboards while data mining for descriptive and prescriptive analysis (23 percent) follows closely behind.

“The future potential of big data analytics is heavily focused on improving forecasts (predictive analysis).”

In terms of planned application scenarios, use cases dedicated to forecasting and innovation were the most cited. For example, 65 percent of participants using or

planning to use big data analysis in marketing and sales are intending to use big data techniques for predicting customer behavior.

“As yet, there are few implemented big data analytics projects, but for many different application scenarios 50 to 70 percent of companies have plans to implement in the near future.”

The survey shows current rates of adoption for big data applications are low, indicating that many organizations may still be evaluating or are in the early stages of big data implementations. However, with between 50 and 70 percent of respondents planning to implement various big data applications, it is clear that big data has enormous potential.

Hot spot #4: The Business Intelligence (BI) landscape is changing: Big data applications complement standard solutions

“Standard BI and data management tools are augmented by specialized big data management and big data analytics solutions.”

Organizations increasingly face the challenge of managing additional data sources, masses and structures while also delivering effective access. This calls for highly scalable, flexible data architectures. The study found a prevalence of standard tools employed within big data initiatives: 62 percent of those surveyed, for whom a big data initiative is at least conceivable, use a standard relational database and 55 percent use standard BI tools. Additional application scenarios appear to create a demand for specialized big data tools with, depending on the technology, 20 to 40 percent of those surveyed revealing plans to implement.

“Analytical databases and predictive analytics chalk up the most ambitious investment plans.”

Analytical databases rank high on the list of ‘must-haves’: 27 percent of respondents for whom a big data initiative is at least conceivable already use analytical databases, and 41 percent are planning a future deployment. With indications that supplementary analytics platforms are being used with increasing frequency, radical change lies ahead for organizations and their IT landscapes with additions to - and

modifications of - their data management and business intelligence architectures. Furthermore, the Hadoop ecosystem registered a similarly high budgeted figure with 29 percent of participants for whom big data is relevant planning a Hadoop deployment.

“71 percent of participants want to implement predictive analytics methods for data analysis in the future.”

Data mining and predictive analytics functionalities are high on the list of planned data analysis deployments with 71 percent of survey participants planning an implementation. 32 percent propose to expand their IT landscapes with relevant technologies.

Methodology and demographics

This survey was conducted online in the DACH region from September to December 2013 and was promoted via BARC's own channels. Participants were recruited via social networks, relevant websites, various newsletters and conferences. A total of 373 participants took part. It should be noted that answers to some questions were optional so the total sample per question may differ from the total number of survey participants.

The survey sample came from a broad range of industries (see Figure 1) with the manufacturing/processing industry most heavily represented (24 percent), followed by the service industry (21 percent) and the IT sector (14 percent). The "other" category includes industries such as construction, real estate and publishing.

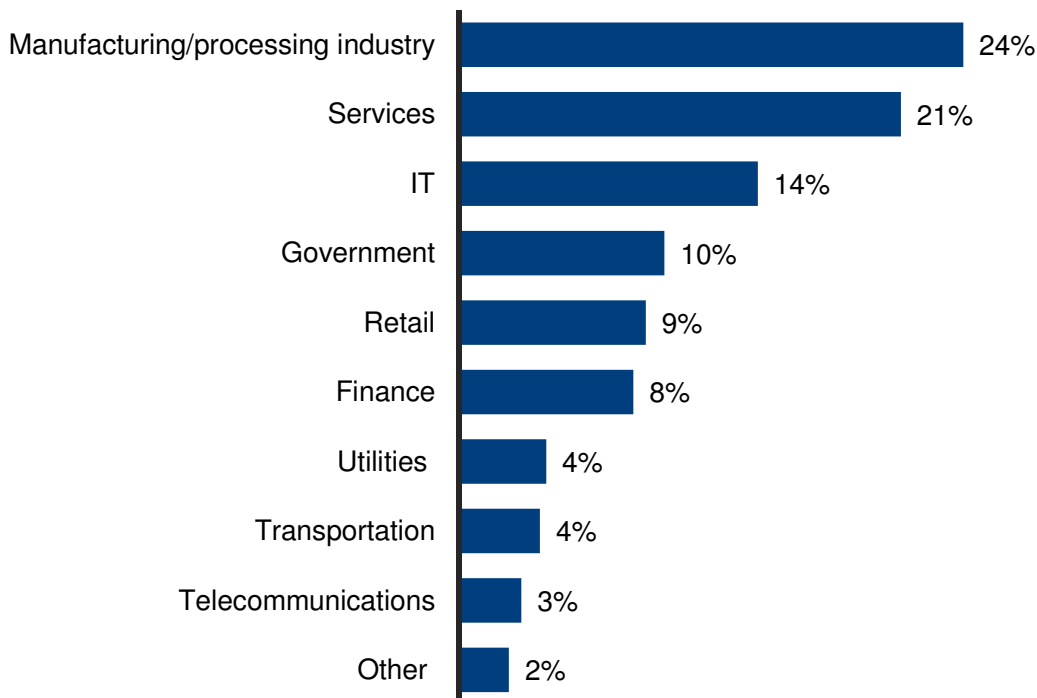


Figure 1: Industry distribution (n=366)

Figure 2 shows business size by number of employees. Large organizations with 250 to 5,000 employees make up 43 percent of the sample. 28 percent of respondents came from smaller companies (with less than 250 employees), and the remaining 29 percent represent enterprises with over 5,000 employees.



Figure 2: Business size, by number of employees (n=334)

Respondents work predominantly in the IT (33 percent) and finance & controlling (29 percent) departments, with a further 14 percent in management. Other departments account for 24 percent. In comparison with the previous 2013 study, which was more focused on data management, the 2014 study has more participants from line departments (67 percent in 2014 vs. 44 percent in 2013) and fewer from IT (33 percent vs. 56 percent).

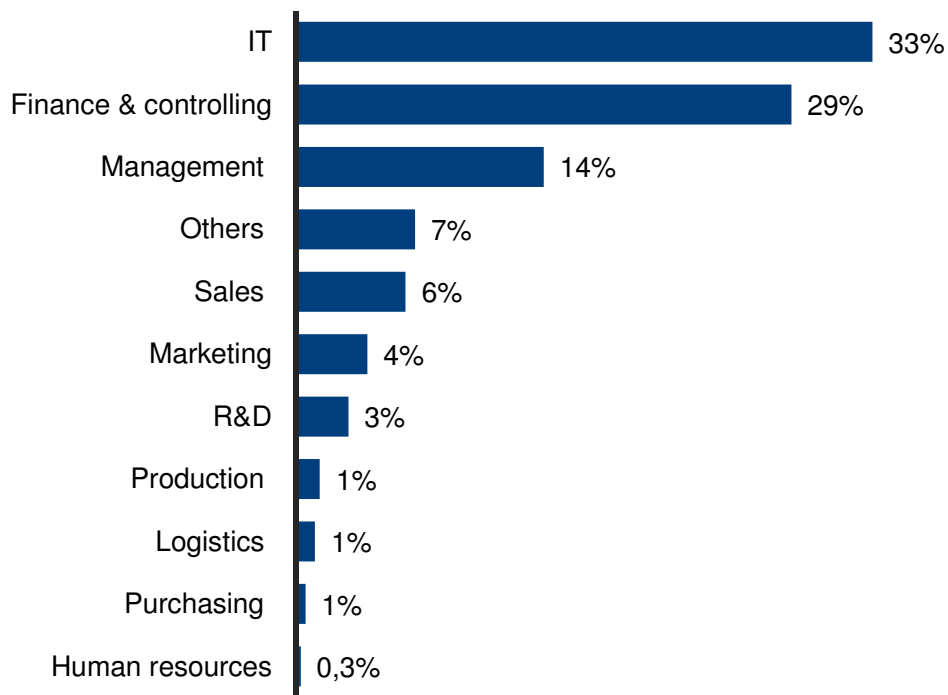


Figure 3: Survey participants, by corporate department (n=363)

Learning from the best

Reliable and consistent information about big data's exact challenges and practical application scenarios is hard-to-come-by due to the absence - and infancy - of big data projects. Consequently, this study focuses on enterprises that distinguish themselves by handling data in an above-average way and by using competitive big data analytics. The study takes time to consider the question of what differentiates these enterprises from their competitors and what we can learn from them.

This survey uses the classifications of "best-in-class" and "intensely data-driven" based on how participants gauge their enterprise's capabilities and competencies against their main competitors and what role data plays in their enterprise.

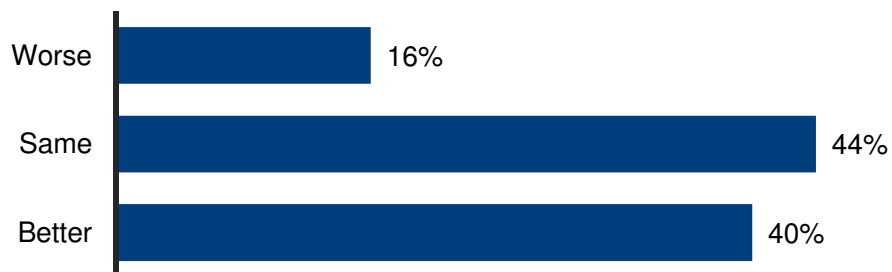


Figure 4: How do you gauge the capabilities and competencies of your enterprise in the area of data analysis compared with your main competitors? (n=325)

Approximately half of those surveyed (44 percent) view data usage in their enterprise to be as good as their competitors (Figure 4). For the purposes of this study this group has been designated as "**average**". 16 percent of respondents considered their handling of data to be poorer than their competitors. This group has been designated as "**laggards**". Finally, the group termed "**best-in-class**" (40 percent) report their enterprise uses data better than the competition, an assertion this report investigates to discover what makes this particular group different.

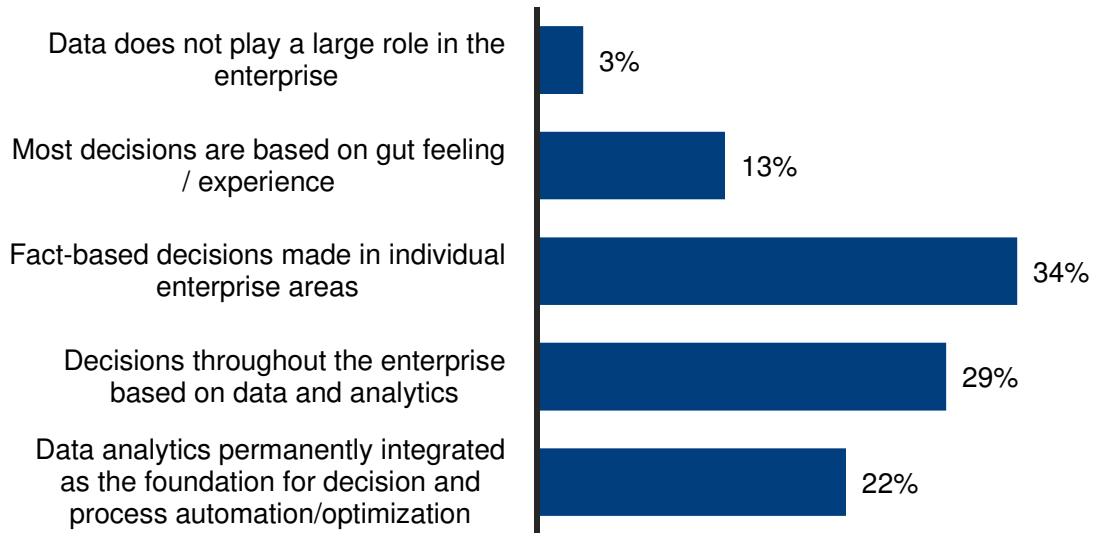


Figure 5: What role does data play in your enterprise? (n=343)

Nearly two-thirds of respondents indicated that business decisions in individual departments, or across their organizations, are based on data (Figure 5). Approximately a quarter of participants stated that permanent data analysis provides the basis for both decision and process automation as well as optimization. For the purposes of this study, we have designated this latter group as “intensely data-driven”, differentiating them from other companies in this study, who are classed as “not/partially data-driven”.

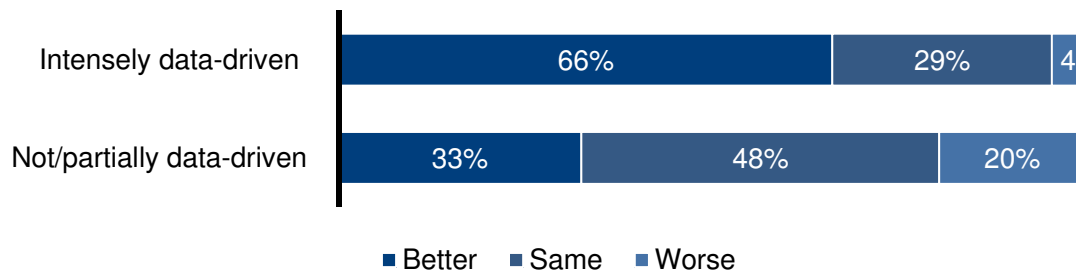


Figure 6: Capabilities in the area of data analysis by data-drivenness (n=343)

Figure 6 shows a correlation between survey participants’ self-evaluation in respect of their capabilities and competencies in data analysis and the more objective criterion of the role played by data in the enterprise. 66 percent of “intensely data-driven” enterprises state they do better than their competition in terms of data analysis, with just 4 percent judging their capabilities as worse.

Survey results

The survey focused on the application scenarios and challenges that big data analytics presents. Participants were given a specific definition of big data (Figure 7) in order to ensure a mutual understanding for the purposes of this survey.

Big data

describes methods and technologies for the highly scalable loading, storage and analysis of unstructured data. Big data technology can help companies to manage large data volumes, complex analysis and real-time integration of data from a variety of data structures and sources.

Figure 7: The BARC big data definition

Big data: Driven by the need of decision makers to get better information faster

Big data has received a high level of exposure in both the media and vendor marketing material in the past 12 to 18 months. Indeed, the subject may be ‘wearing thin’ with some. However, the potential of untapped big data markets is evident from the survey data.

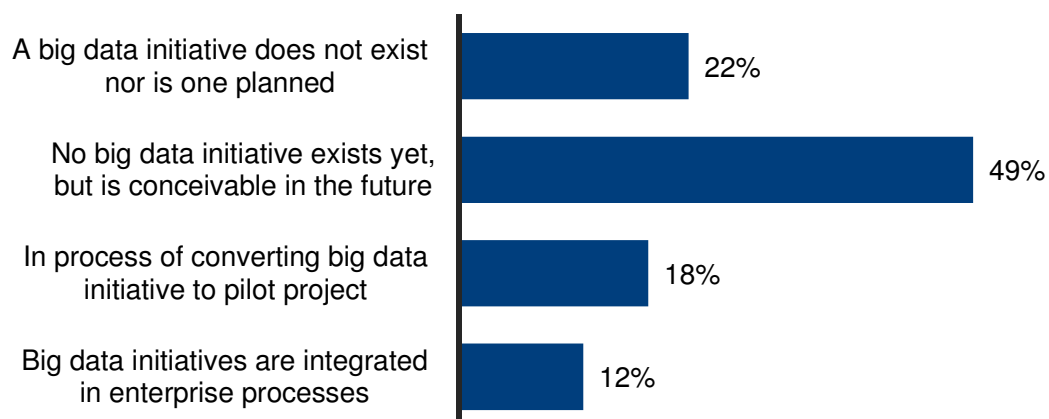


Figure 8: Does a big data initiative exist in your enterprise? (n=341)

With 12 percent of respondents claiming big data initiatives are already present in their processes and another 18 percent reporting pilot projects currently underway,

big data will soon be part of the day-to-day operations of nearly one-third of companies. The fact that a further 50 percent see big data initiatives as at least feasible in their organizations reveals the enormous potential lying dormant.

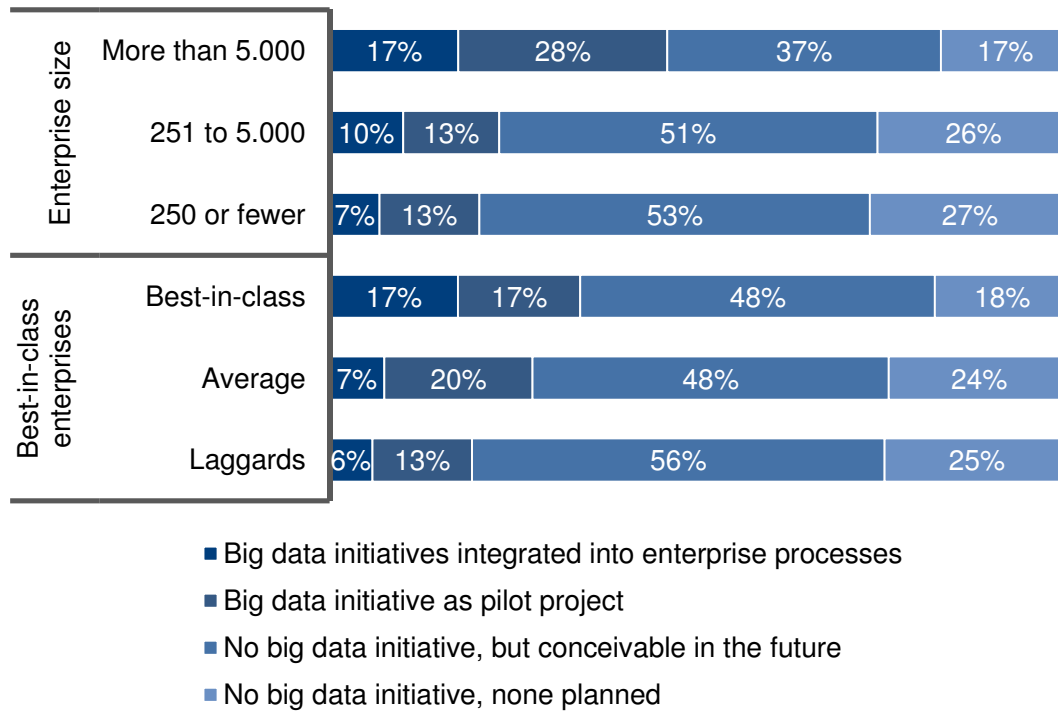


Figure 9: Status of big data initiative, by enterprise size and best-in-class (n=312/308)

Detailed analysis of big data initiatives show it as a priority among large and best-in-class enterprises (Figure 9) where 17 percent have already integrated it into business processes – nearly double the rate of their competitors. Focusing on enterprises with more than 5,000 employees, our analysis found that nearly half are already implementing big data (including organizations with pilot projects). However, big data also resonates with mid-sized and smaller organizations, with just a quarter of these reporting no planned initiatives.

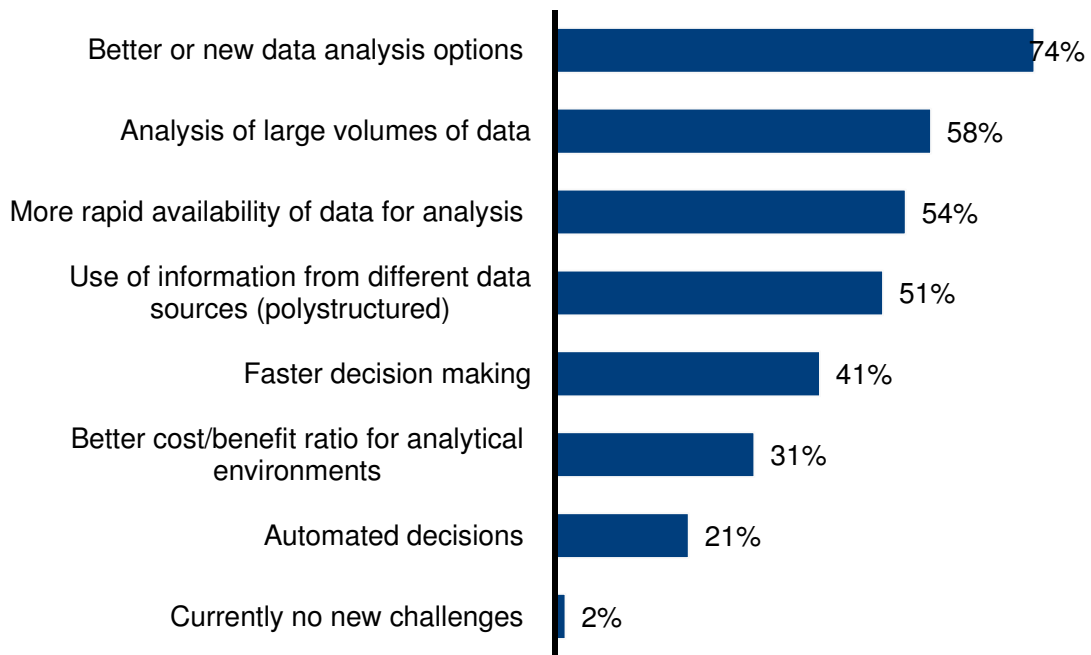


Figure 10: Which challenges do you want to address with your big data initiative(s)? (n=257)

Figure 10 highlights the objectives behind the current wave of big data initiatives. Our results show that companies are not simply seeking to handle large volumes or poly-structured masses of data, although over 50 percent of respondents cite these as important challenges. The need for new and more powerful analytics (the top ranked challenge cited by 74 percent) and timely availability of data (54 percent) are also key drivers, indicating that the challenges to big data are not solely driven by external forces but are equally driven by the need for decision makers to be more rapidly - and better informed.

Just 2 percent of survey participants see no new challenges stemming from big data, underlining the importance of big data and putting paid to suggestions that it is simply media hype.

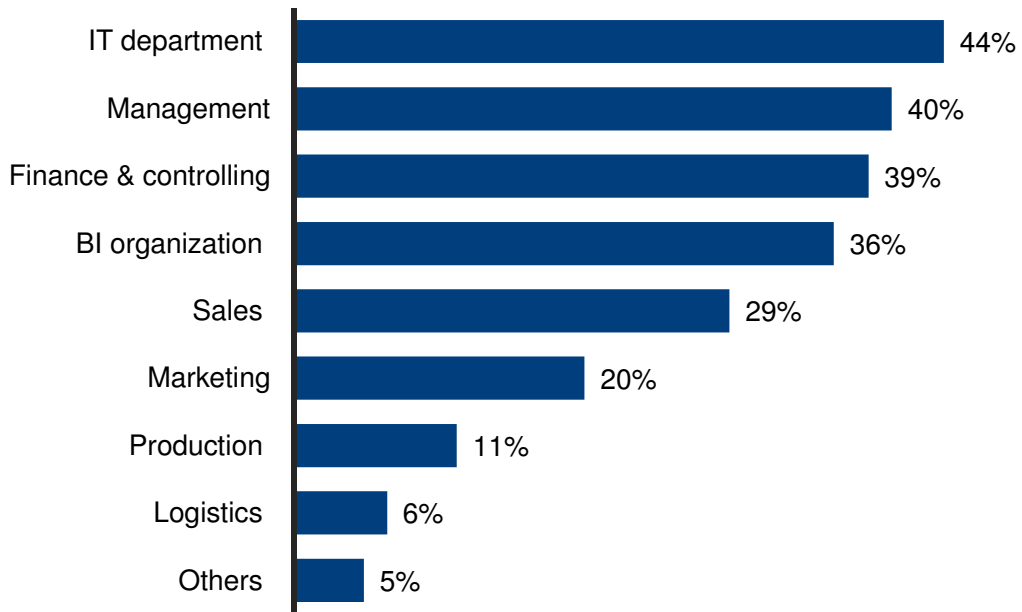


Figure 11: Who are the key thought leaders/drivers of the big data subject in your enterprise? (n=255)

Big data projects are primarily driven by an alliance of IT, management, finance and BI organizations, with an average of 2.3 entities taking responsibility for projects across the organization. Surprisingly, line-of-business departments, where applications are ultimately deployed and used, tend not to be those driving implementation.

In large enterprises, which form the vanguard of big data initiatives, the IT department (57 percent), BI organizations (50 percent) and sales (36 percent) stand out as leaders. Since there is generally a wider spectrum of departments driving the subject of big data (2.8 on average), it is not surprising that large organizations are more likely to have already launched an initiative. By contrast, in businesses with fewer than 250 employees it is often left to management to drive big data initiatives (59 percent).

Big data analytics exceeds its expected benefits, but building the knowledge base falls short

Real-world data on the benefits reaped and problems faced by organizations implementing big data is still in relatively short supply due to the newness of the area. This study offers a rare opportunity to peer over the shoulders of those enterprises already putting big data analytics to use.

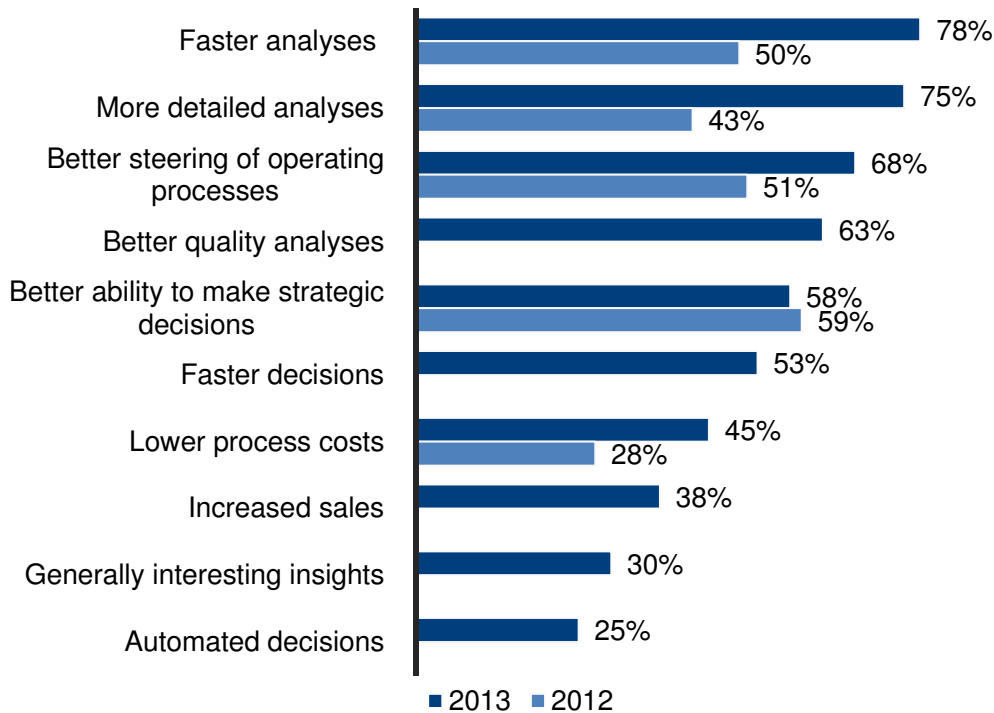


Figure 12: Expected benefits 2012 and realized analytics benefits 2013 (2012 n=167, 2013 n=40)

Our previous survey asked participants about expected benefits but this year's survey focused more specifically on those organizations with an initiative in place allowing a comparison to be drawn between expected benefits the year before and actual realized benefits this year (Figure 12).

A number of interesting findings came to light:

- Big data analytics has yielded benefits to an impressive percentage of respondents in a range of key areas:
 - Analytical aspects (more detailed, faster, better)
 - More informed strategic decision making
 - Better control of operating processes
 - Monetary (cost reduction, sales increases)
- Expected benefits have been exceeded in practically all areas. 'Better strategic decisions' is the only benefit for which expectations in the year before were not quite met a year later.
- Faster and more detailed data analyses are currently perceived as the most important value-add benefits ahead of cost reduction, sales increases and process automation. This may be a question of market maturity: enterprises must first learn to draw the right conclusions from their data (something that,

to date, does not seem to be happening on a large scale) before achieving further benefits.

- Year after year, BARC’s annual “BI Survey” shows that users find it difficult to put numbers to the financial effects of their BI deployments. It is therefore impressive that 45 percent of businesses surveyed in this study reported a direct decrease in process costs while 38 percent reported increased sales.
- Although it is the least recognized benefit, an impressive 25 percent of respondents with a big data implementation report that they now use some degree of automated decision making. Business intelligence and data analysis typically deliver transparency, new information and sometimes actionable recommendations. When big data is introduced into the equation, the sheer volume of data and decisions to be made, combined with the need for rapid decision making, are usually too much for a human to translate into meaningful action. These factors have brought about a demand for automated decision making whereby analytic models and algorithms extract conclusions and initiate appropriate follow-up processes. Automated decision making is already deployed in areas such as online retail, supply chain management and analysis of - and reaction to - data produced by social media analytics.

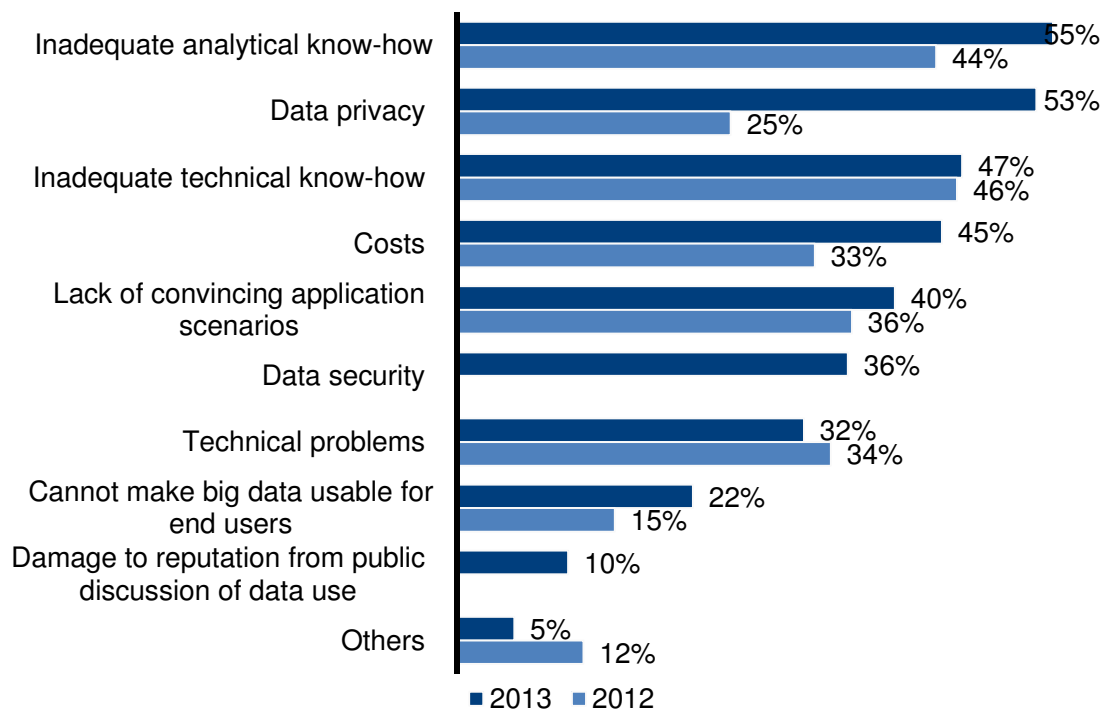


Figure 13: What problems do you see when deploying big data technologies/analytics? (2012 n=206, 2013 n=322)

The challenges in implementing a big data project are shown in Figure 13. Experience and analysis of potential issues are valuable aids in ensuring the smooth implementation of projects.

It might be assumed that widespread reporting, discussion and activity surrounding big data during the past year would have led to a downward trend in problems as knowledge of the topic increased. However, compared with the previous year's data, this year shows a clear rise in perceived issues related to deployment.

Key findings:

- The greatest concern in big data deployments is the lack of analytical and technical know-how. “Data scientists” are still a rare species and the issue of training and recruiting them is critical to the smooth running of big data projects. However, we are seeing progress in this area. For example, the first professorship for big data in Germany was endowed in early 2014 at the Bauhaus University in Weimar.
- Data privacy has once again become a sensitive subject in the wake of revelations about NSA practices. While this year's survey has seen a 100 percent increase in participants reporting privacy of personal data as one of their most urgent problems, only 10 percent foresee a threat to their reputations if the public learned about their data handling processes.
- The number of respondents that view the lack of convincing application scenarios as a problem remains high at 40 percent, even climbing slightly since last year's study. As more organizations grapple with the problem, we would expect to see more beneficial application scenarios coming to light and for this problem to diminish. At present it is premature to conclude that there are no convincing application scenarios for many organizations, especially while they are still in the early phases of identifying them. This is an area which requires continued attention.
- The decrease of technological problems may be linked to knowledge gains stemming from higher involvement with big data technology. We are seeing organizations realize how existing technologies can, in part, contribute to solving big data issues, e.g. through the use of BI front-ends.
- Cost is another issue that has seen a significant rise this year from 33 percent to 45 percent, although it could be countered that initial expenditure would be offset by the cost advantages that big data potentially brings.

Further insights gleaned from analysis of the challenges related to big data highlight which issues are underestimated and which are overestimated by organizations at various stages of implementation (Figure 14):

- The survey found data security issues are underestimated in projects until they go live. Data security is reported as a problem by 58 percent of businesses with a live big data initiative while only about a third of respondents in the early phases of implementation view it as an issue.
- Data privacy is considered much less of a problem by organizations for whom big data is irrelevant.
- Enterprises with big data initiatives report fewer technical problems than those in the prototype phase. It appears that organizations eventually learn to manage many of the technical problems that emerge in the early stages of implementation.
- Worryingly, even enterprises with big data initiatives in place still complain about a lack of expertise in both analytical (48 percent) and technical know-how (42 percent).

Another interesting phenomenon emerges from observing differences between IT and line of business departments. In very general terms, IT is much more inclined to be skeptical and judges practically all aspects somewhat more critically – except for data privacy. A significant difference can be detected above all when it comes to cost (with 40 percent of business users vs. 50 percent of respondents from the IT department regarding this as a problem).

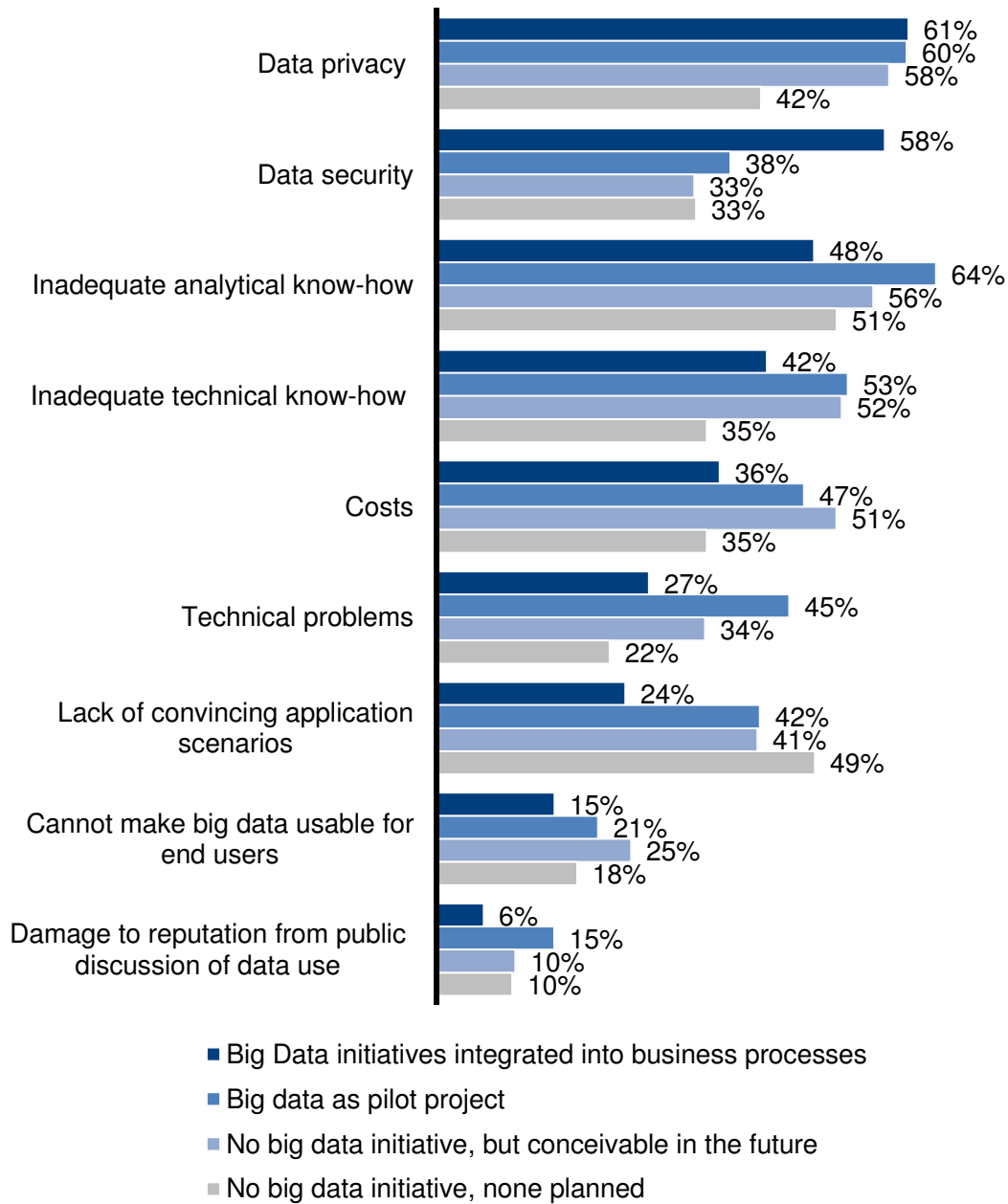


Figure 14: Problems, by status of big data initiatives (n=306)

Big data use cases: Focus on the customer and more transparency

Many real-world examples of successful big data analytics deployments now exist, however a lack of big data application scenarios (Figure 14) continues to be a challenge for enterprises looking to deploy new big data technologies and software solutions in the most practical and beneficial way. This chapter investigates the dispersion and planning of specific application scenarios for big data analytics.

The following charts are based on data drawn from a sub-sample of approximately 80 percent of survey participants for whom a big data initiative was at least feasible. Only those participants with relevant initiatives or project plans in the appropriate departments were included in our analysis.

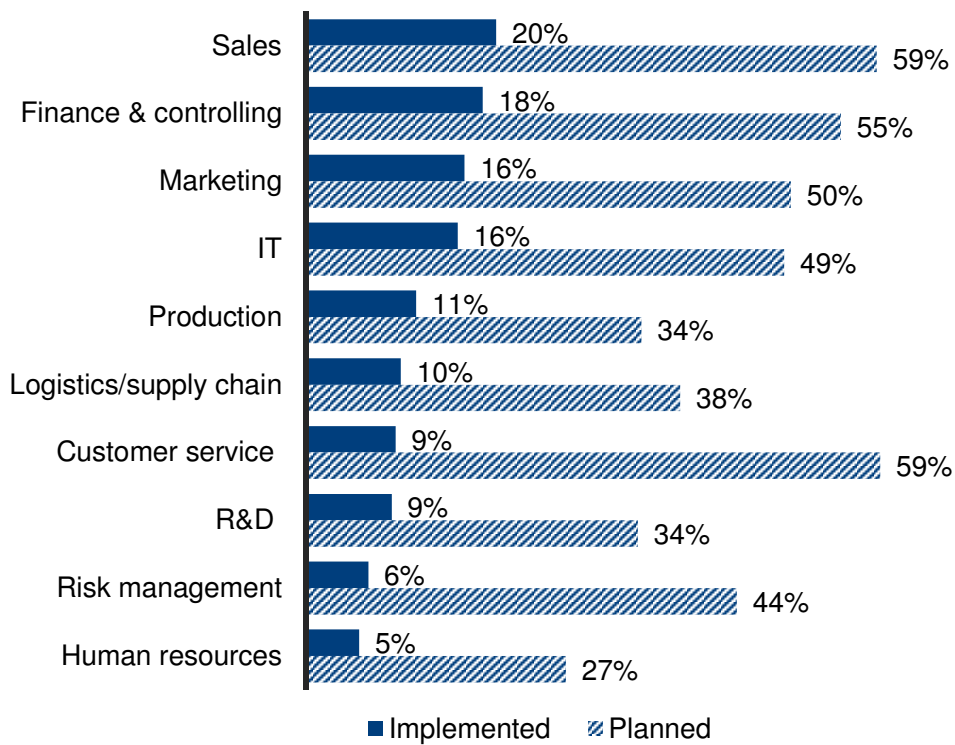


Figure 15: In which areas of your business do you perform or plan to perform big data analytics? (n=253)

Figure 15 only includes data from organizations using – or planning to use - big data analytics. It is clear that big data is used to varying degrees across almost all areas of business, with planned initiatives in these areas also at a healthy level. In our experience, survey participants regularly overestimate their planned projects, usually realizing only about a quarter of them in the projected timeframe. However, these

results – especially those over 50 percent - provide a strong indication of future engagement.

Big data is a pervasive technology found in all areas of business. Leading the way in implementation are the customer-facing processes of sales (20 percent) and marketing (16 percent) where a high volume of customer data across varying channels and structures, as well as the integration of social media data, provides fertile ground for initiatives.

Interestingly, 18 percent of surveyed businesses are currently carrying out big data projects within the sphere of finance and controlling, with a further 55 percent having future plans in these areas. In contrast to the widely-publicized application examples cited in the media and vendor marketing which focus heavily on the use of unstructured data in operational areas (such as sales and marketing), these departments typically deal with “classic” structured data. Controlling tasks are in demand across departments with financial data being a significant element of big data analytics. The data analysis skills and experience in the controlling and finance department can be useful in other business areas. In risk management, timely analysis of large masses of data from different sources is paramount.

Best-in-class and large enterprises (Figure 16) make up the vanguard of big data analytics in many areas, especially operational. In particular, marketing and logistics departments in best-in-class companies use big data analytics substantially more than in other businesses.

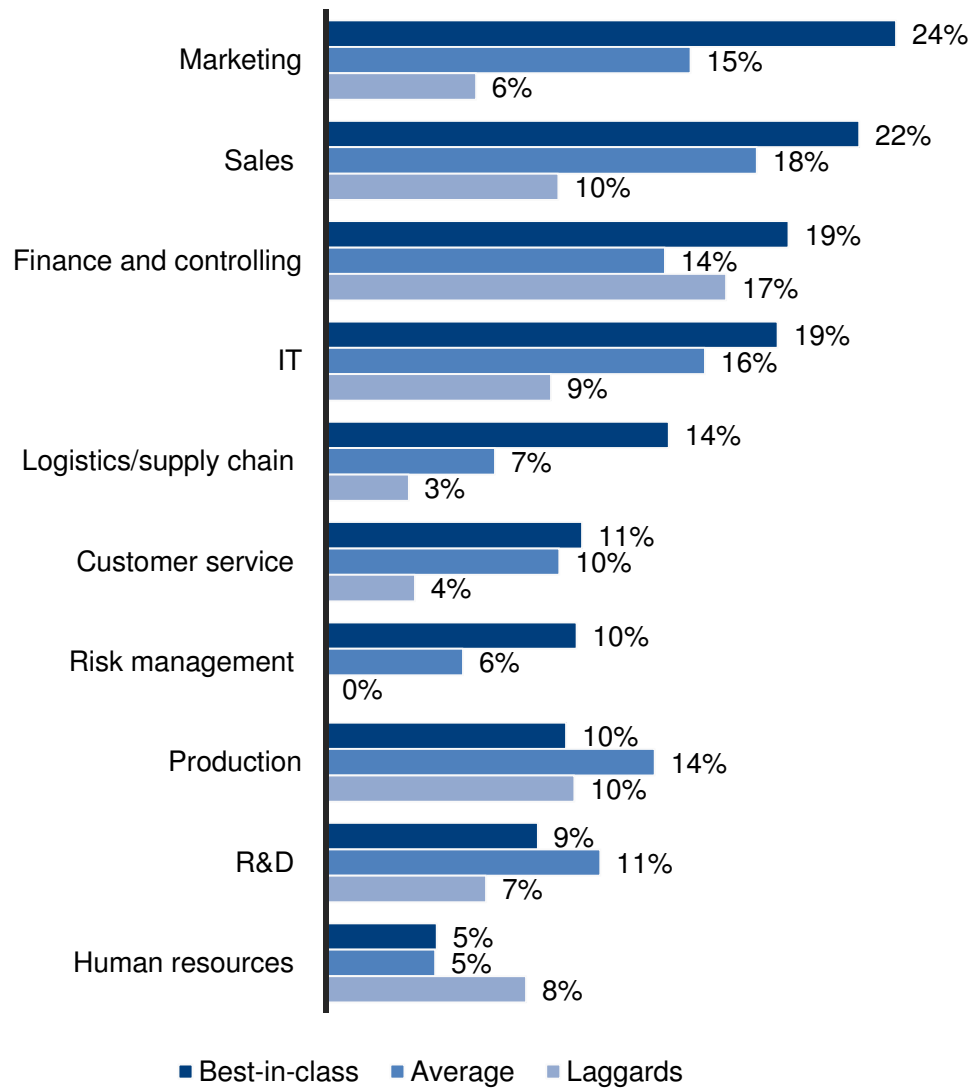


Figure 16: Corporate departments in which big data analytics are performed, by best-in-class enterprises (n=231)

Big data use cases can be divided into two distinct categories: Those that focus on the present - such as increasing the transparency of decision making and improving efficiency - and those geared to the future, which include improved forecasting and planning, as well as helping to identify and accelerate worthwhile innovations.

Marketing and sales

The most frequent application scenarios in marketing and sales show organizations value the increased transparency (identifying high value and potential customers, more granular customer segmentation, identifying anomalies in customer data) and efficiency (creating more finely tuned sales plans and predicting customer behavior) that big data delivers. However, forecasting and planning applications (creating more

finely-tuned sales plans and predicting customer behavior) remain less common (Figure 17). There is a high level of planned projects for almost all application areas with “predicting customer behavior” especially high at 65 percent. Two-thirds of participants are planning big data applications for market and competitive intelligence, where analysis of a multitude of variously-structured external data sources can yield interesting insights and help to generate – for example - rapid, automated price adjustments.

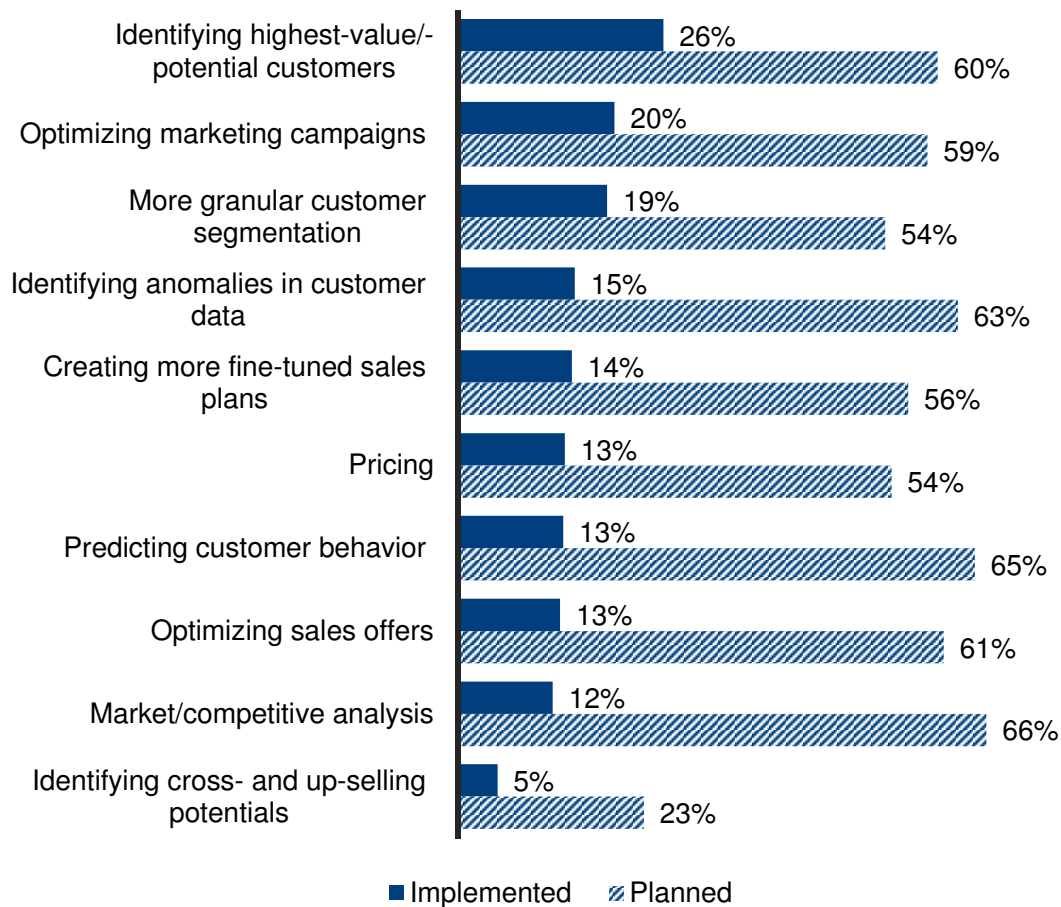


Figure 17: Application scenarios for big data analytics in marketing and sales (n=174)

The survey findings illustrate that marketing and sales departments value a personalized approach when it comes to customers (optimized marketing campaigns, more granular customer segmentation). The famous dictum by Henry Ford that 50 percent of marketing expenditure is money wasted - but we don't know which half - is no longer relevant in the era of big data where a greater understanding of individual customer requirements and behaviors facilitates more targeted marketing.

Obama's electoral campaign demonstrated how highly targeted marketing was accomplished with the help of big data: the need to reach millions of people in a personalized way reflected that of marketing managers in retail business. A team of statisticians provided Obama with a decisive competitive advantage despite early negative indicators. Big data made it possible to segment voters not only into wholesale categories based on socio-demographic variables but also to address their individuality - enabling the delivery of the right message at the right time to the right person. Such use of customer data must strike a balance between the best possible information gathering and data privacy - one of the greatest challenges to big data (see Figure 14).

Customer service

Boosting transparency and effectiveness are priorities for big data analytics in customer service (Figure 18) with organizations keen to find out more about their customers (analysis of customer behavior, 20 percent; customer value analysis, 17 percent), and improve on-site service personnel effectiveness (on-site data availability/analysis for outside employees, 18 percent). Currently, big data analytics in customer service seems to be geared towards providing employees with information about the individual customer with whom they are dealing at any given moment.

Predictive analytics provides trending information gleaned from customer inquiries as well as the identification of churn risk. 12 percent of respondents have already undertaken this and it exhibits the second-highest budgeted figure of 68 percent.

Application areas regarding product – or parts – related analytics often have a prognostic nature: predictive maintenance (41 percent), calculating availability of replacement parts (30 percent) and warranty analyses (39 percent) being the most frequently planned application scenarios in this area.

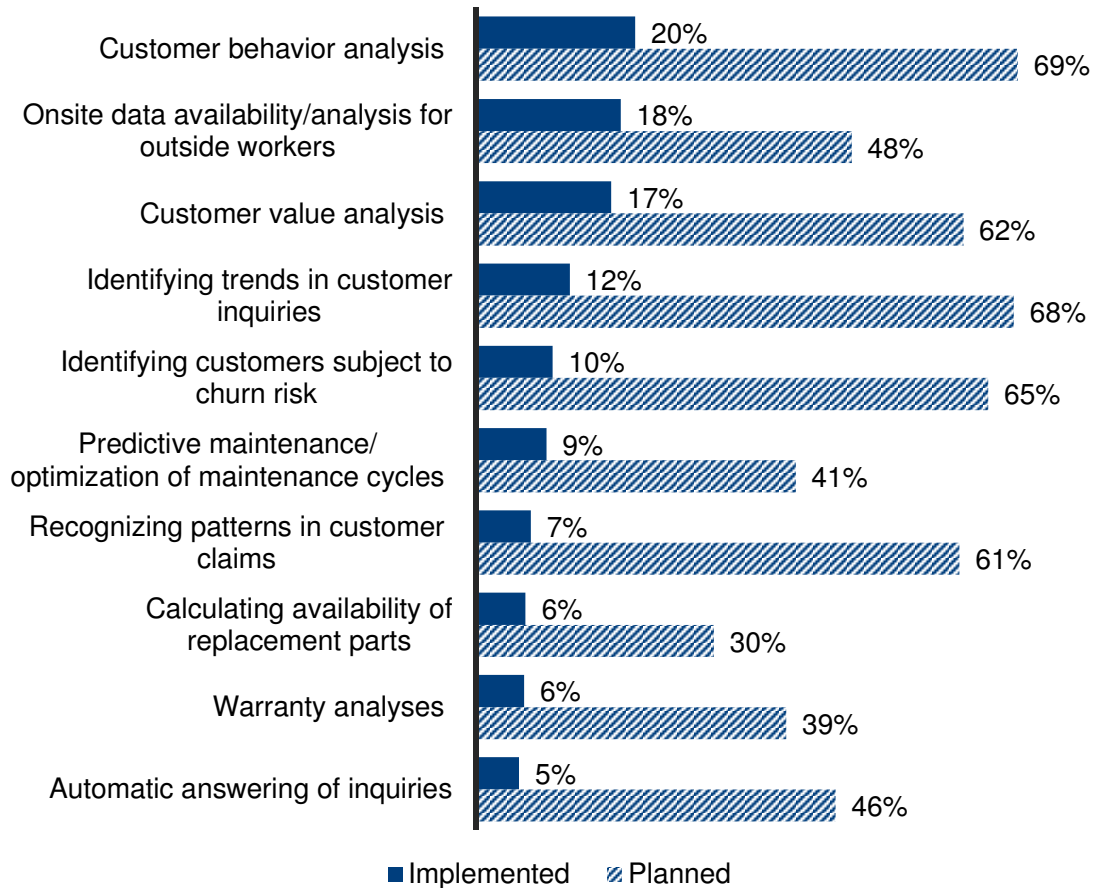


Figure 18: Application scenarios for big data analytics in customer service (n=116)

Production

The main application areas of big data analytics in production are quite varied (Figure 19) with quality control and quality improvement analytics ranking first. Large collections of poly-structured data are often found in this area - particularly measurement and sensor data. In our experience, big data analytics attempts to link this with other data in the process chain to provide a holistic view and, for example, to determine the cause and effect of quality defects.

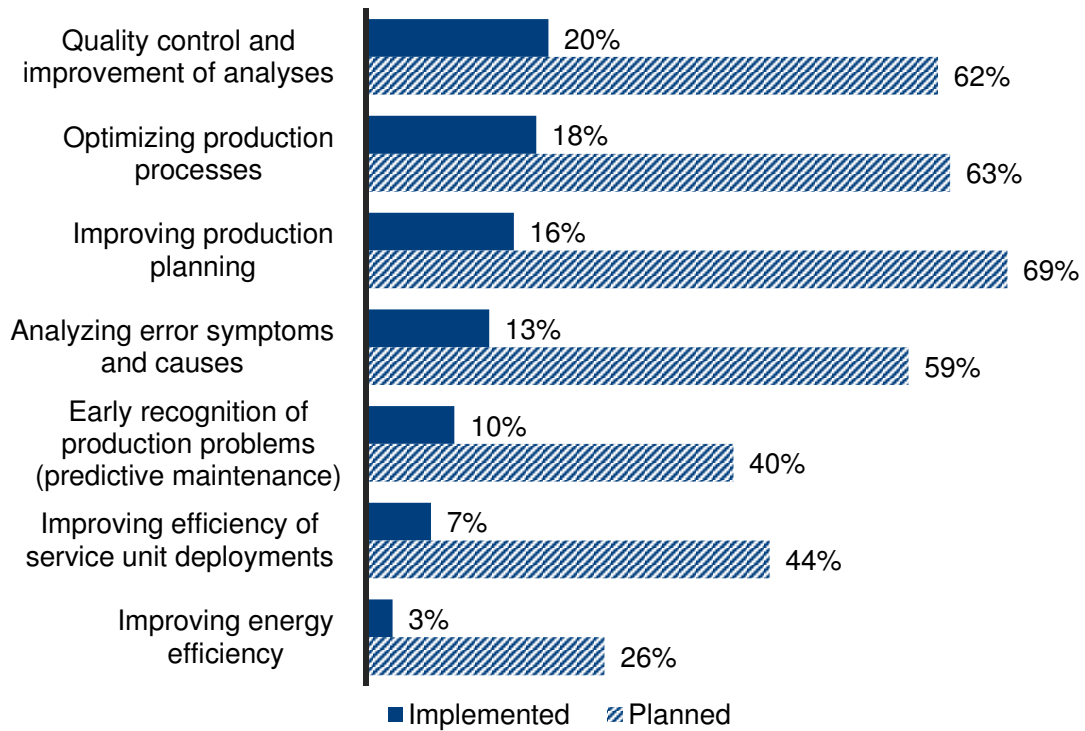


Figure 19: Application scenarios for big data analytics in production (n=80)

The linked issues of production process optimization (18 percent) and improvement in production planning (16 percent) are the next most frequent application areas for big data analytics. Priority here is given to the growing amount of data from means of production/machines, means of transport/carriers or from the products themselves and their use in descriptive and predictive analytical methods.

Research and development

While analyzing measurement data is the most common use case in R&D (20 percent), unsurprisingly big data methods devoted to the search for - and development of - innovations rank a close second (Figure 20). 19 percent of enterprises that use (or plan to use) big data analytics in research use it for testing new products and 17 percent for brainstorming new product ideas. The scope and robustness of big data is illustrated in early trend recognition where, for example, the systematic search of European patent databases, comprising some 80 million extant patents, would be inconceivable without big data analytical methods managing the huge volumes of data involved.

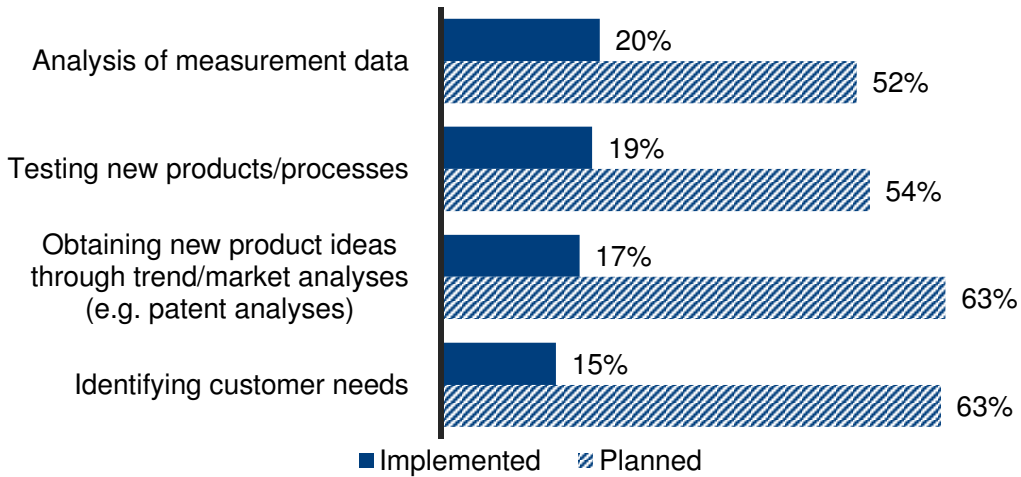


Figure 20: Application scenarios for big data analytics in R&D (n=67)

Logistics/Supply Chain

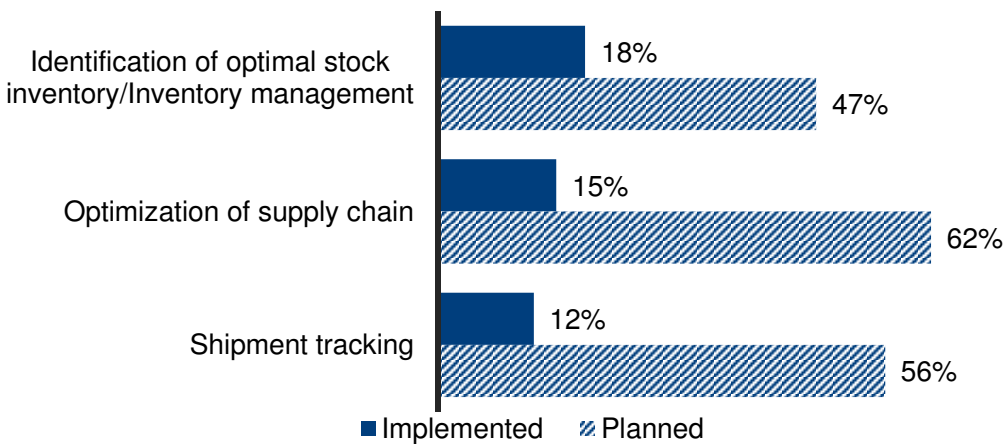


Figure 21: Application scenarios for big data analytics in logistics/supply chain (n=85)

Logistics applications that improve efficiency and transparency dominate in Figure 21 with organizations using big data analytics to optimize inventories (18 percent) and supply chains (15 percent). Amazon's recently patented "anticipatory shipping" system is an excellent example of how customer data can be used to optimize logistics. The system uses predictive analytics to identify geographical areas where Amazon expects to sell particular items. Orders are packed and shipped to these areas before they have even been placed, and can be routed for delivery to specific customer addresses while in transit. Budgeted numbers for logistics use cases, as with other application areas, are high.

Controlling/finance and risk management

The focus in controlling is on handling large amounts of structured data and increasing complexity through advanced analytics (Figure 22). Organizations rely on big data analytics principally to analyze finance data in ever more detail (29 percent) and to carry out complex simulations and scenario building for more precise forecasts (20 percent) with the aim of improving transparency and future-proofing to enable better informed decision making.

The calculation of credit default risk, which often surfaces in the media as an example of big data analytics, is actually in little demand (6 percent implemented, 16 percent planned). Accordingly, the budgeted amounts here, too, come in high, at up to 70 percent.

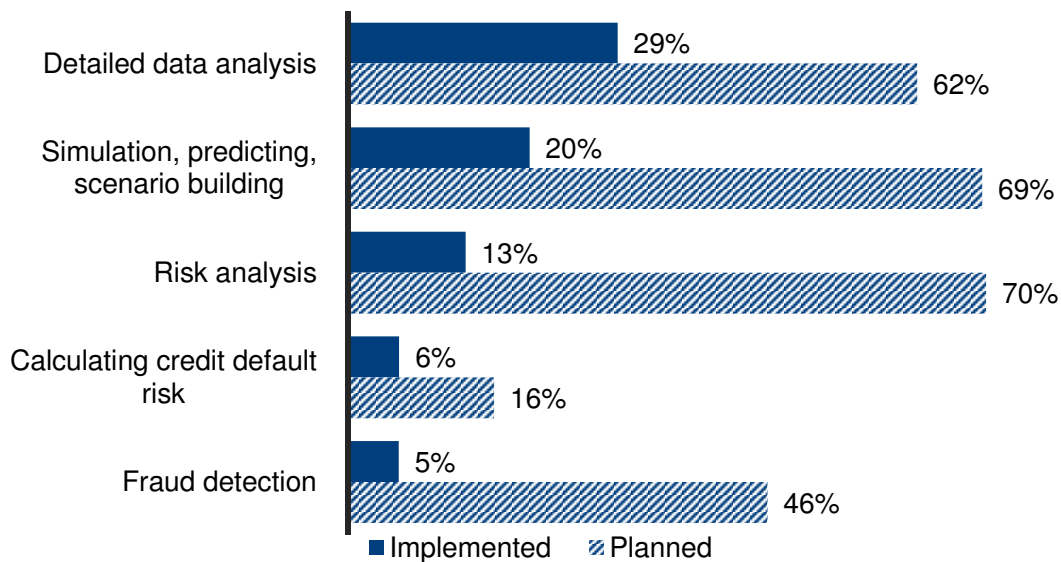


Figure 22: Application scenarios for big data analytics in controlling/finance and risk management (n=159)

IT

IT displays a healthy level of usage and planned implementation for the two applications that are in relative widespread use: The evaluation of log files for problem identification/performance optimization (27 percent implemented, 59 percent planned) and deployment for security purposes (22 percent implemented, 52 percent planned) (Figure 23).

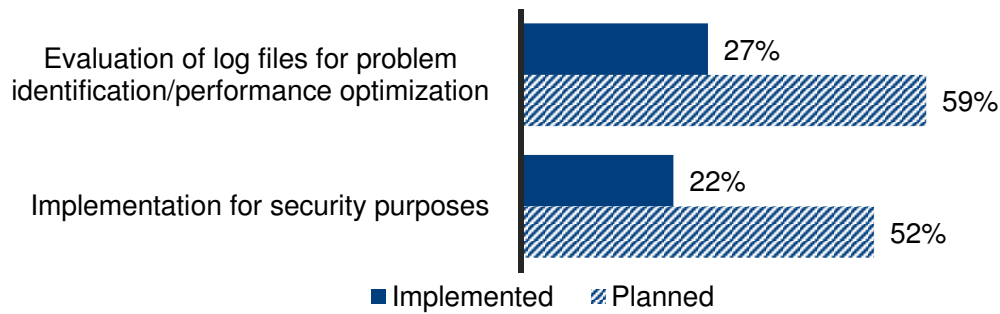


Figure 23: Application scenarios for big data analytics in IT (n=115)

Past methods of data handling saw unsystematic capturing of IT logs, which were stored for a limited time and reviewed selectively. The use of this data was limited and costly due to high data volumes overloading traditional data stores and the semi-structured nature of the data, which continually changed due to hardware and software updates. Cost reduction and service level improvement has been influenced by the detection of patterns, dependencies and trends, made possible by collation of data (typically by cross indexing) and comprehensive review options that permit performing analyses covering longer time frames and including all logged data.

A prime example of the value big data can add is in the area of IT security. 22 per cent of respondents use big data analytics for IT security, making it among the most frequently cited big data application scenarios across all enterprise areas, with data privacy being one of the most common problems (see Figure 14). Large amounts of security related data is generated on a daily basis by organizations and, where a threat level has increased, potential security gaps can be identified by analysis of user and system trends. In this capacity, big data's ability to detect attacks in real-time provides tangible cost benefits. Its technologies enable more data to be analyzed more quickly, and provide the capability to monitor all data traffic – even unstructured data. Time series analysis also delivers the benefit of accurate analysis as to when an attack began as well as the individual steps the attackers took. In addition, the system can monitor employee behaviors potentially impacting security.

The BI landscape is changing: New technologies, data, and analytics are challenging established structures

The study so far has presented a range of application options for big data analytics and analyzed the value-add these deliver. These applications, however, are dependent on the availability of special technologies, analysis functions and storage options for a wide variety of data types. This chapter concentrates on the technical side of big data.

The market for specialized big data technologies is starting to grow and its rapid development potentially makes it difficult for enterprises to keep different solution options in perspective. In light of this, survey participants were asked which technologies their organizations are using and which they plan to deploy in the future (Figure 24).

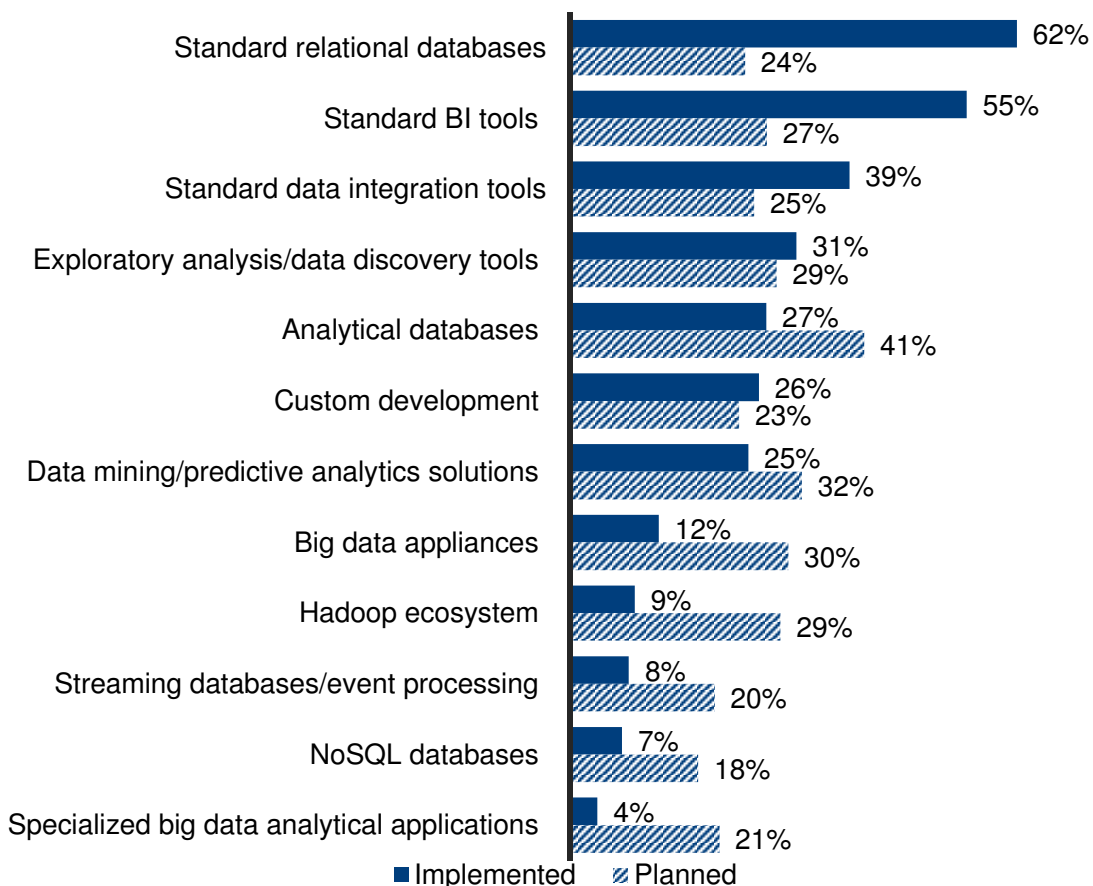


Figure 24: Technology types that are used/planned to be used for big data (n=229)

Standard tools occupy the top three positions in Figure 24. All architecture levels from BI tools through relational databases to data integration solutions are well

resented. With planned implementations of approximately 25 percent, these tools will continue to play a key role in the future. User plans reveal that specialized big data technology will supplement existing systems, but will not totally supplant them. Data integration solutions for connecting and governing big data technology are especially important in the context of big data landscapes and data streams in increasingly heterogeneous architectures. Such tools are particularly suited for use with big data analytics when data comes in a structured form – for example, from transaction systems (Figure 25) or when analytical options and scalability are adequate – which, it seems, is often the case.

This study has revealed a substantial rate of growth across a variety of application areas, which is likely to push standard tools to the limits of their performance resulting in increased demand for supplementary big data tools. While Figure 24 indicates that big data tools are not widely used at present, it also suggests there is considerable growth potential with the majority exhibiting budgeted amounts of 20 to 30 percent. Analytical databases are currently the most popular tools (used by 27 percent, planned by 41 percent). Best-in-class enterprises are already using explorative analytics applications more often than their rivals (41 percent best-in-class vs. 22 percent average and 26 percent laggards) as well as big data appliances (18 percent vs. 9 percent each).

The impressive budgets for specialized big data technologies in combination with the four different platforms used for big data applications on average indicate a slow but steady change in the current BI and data management landscape. As big data moves forward, the notion of the enterprise data warehouse (EDWH) that has long existed as a repository in which all data is secured and consolidated seems increasingly outdated as the ideal data foundation for any and all analytical needs. There is no doubt the data warehouse will continue to play a key role for now, but the high investment plans for additional analytical platforms will lead to heterogeneous architectures that will be difficult to reconcile with the EDWH ideal of complete data centralization. The future calls for a more sophisticated, flexible data management strategy that facilitates the effective interaction of a multitude of different analytical platforms with simultaneously high data quality, with concepts such as the “logical data warehouse” pointing the way forward.

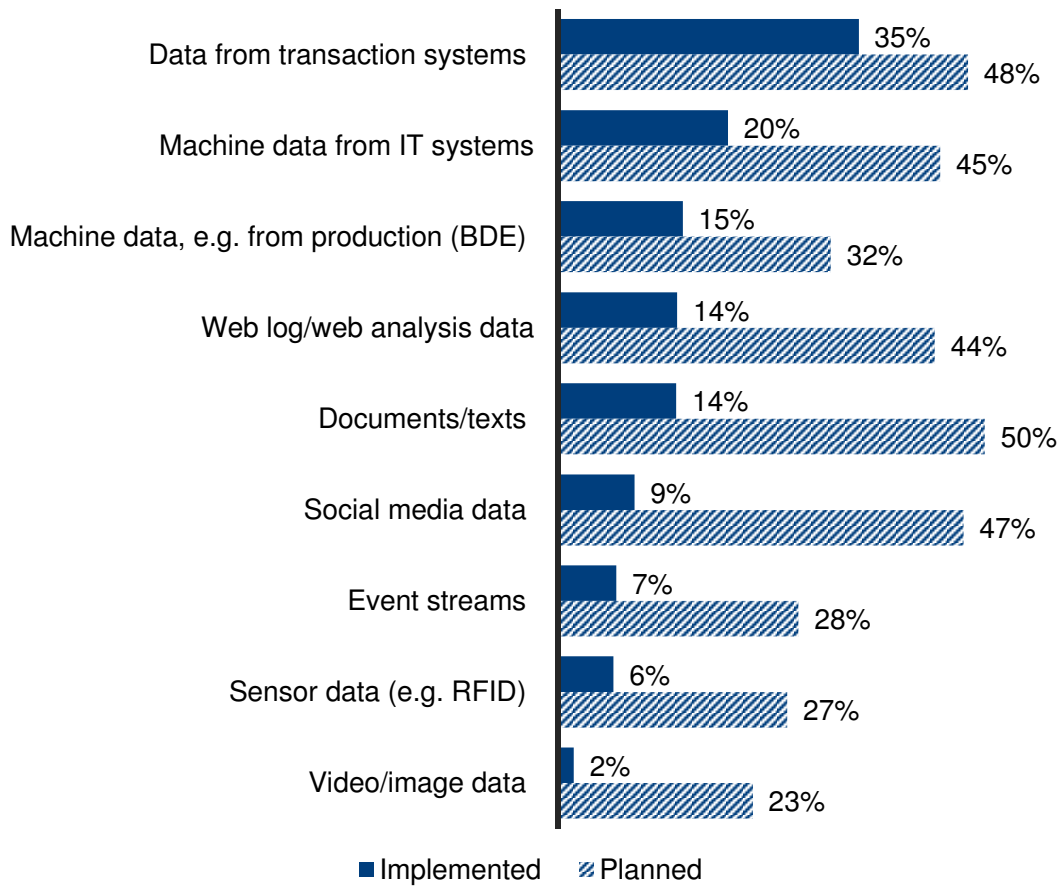


Figure 25: What data do you use – or plan to use - for big data analytics? (n=212)

The high level of investment plans for analytical platforms, in general, can be traced back to the variously structured data required for specific application purposes. Enterprises predominantly rely on data drawn from transaction systems (Figure 25), which usually come in a structured form and are therefore easy to process and analyze with standard tools.

Companies have hitherto been reluctant to use other types of data for analysis purposes, with machine data from IT (20 percent) and production data (15 percent) the most likely to be used. However, this is set to change with the spread of big data and the variety of data types that can now be analyzed. Increasingly organizations are realizing the potential value of data from other sources. This value is strongly reflected in the different data types that respondents are planning to analyze in the future, with particular focus being placed on transactions systems (48 percent), documents/text (50 percent), social media data (47 percent), log data both from IT (45 percent) and the web (44 percent) and the web (44 percent).

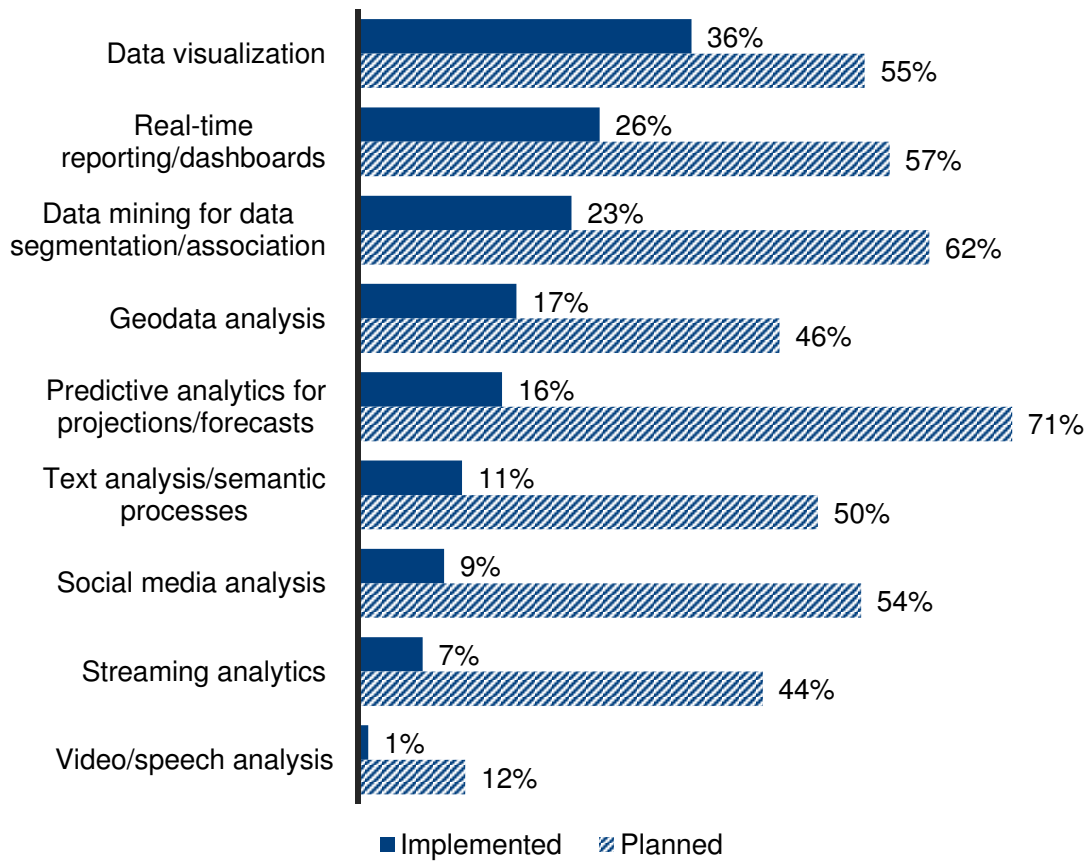


Figure 26: What analytical functionality do you use – or plan to use - in your business for big data analysis? (n=229)

Data visualization, pattern recognition and analytical modeling methods and tools have been in use for a long time so it is unsurprising that data visualization (36 per cent) and data mining (23 per cent) are not only the most widely used tools but also have among the highest levels of planned usage (55 and 62 per cent respectively) for big data analytics (Figure 26).

Other key findings include:

- The exceptionally high planned deployment of predictive analysis (71 per cent) in contrast to its relatively low usage rate (16 per cent). This tallies with previous findings showing that applications for forecasting purposes are not as prevalent as those focusing on the present, but often exhibit the highest budget figures. Nevertheless, we expect big data to make a significant value contribution to improved prognostication.
- Equally, the high rate of planned deployment in social media analysis (9 per cent implemented, 53 per cent planned), underlines the potential of data related to this area. If planned deployment rates are realized and sales and marketing departments – for which social media is now so important - imple-

ment big data to the degree to which they are currently planning (Figure 27), social media analysis will become much more widespread in the future.

- The real-time reporting/dashboard implementation figures (used by 26 percent and planned by 57 percent) are unexpected. Although almost everyone has a different understanding of what real-time reporting means, these values underline the relevance of timely channeling of information and direct data utilization.
- Best-in-class enterprises stand out from their rivals, especially in real-time reporting (32 percent implemented in best-in-class enterprises vs. 22 percent in average companies and 18 percent in stragglers) and geodata analysis (23 percent implemented vs. 16 percent and 7 percent respectively).

Data-driven enterprises are better at using big data

This study has highlighted the distinct qualities of best-in-class organizations, who claim they use data better than their competition. Next, we review what characterizes intensely data-driven businesses, a group that comprises 22 percent of our sample. Data analytics forms a permanent foundation for decision support and process automation/optimization for these organizations (see Figure 5). Given the high amount of investment currently planned in the big data analytics area, it is worth taking a separate look at these businesses so that we may learn from their experience. This part of the study focuses on benefits gained and how they are derived.



Figure 27: Business areas in which big data analytics are performed, by data-drivenness (n=243)

Unsurprisingly, big data initiatives have been implemented by intensely data-driven enterprises significantly more often than their peers (32 percent vs. 6 percent). This difference shows the interdependence of big data analytics and the automation and optimization of decisions and processes. At the present time it is almost exclusively data-driven enterprises that rely on big data analytics, although their peers are gradually catching up with 19 percent undertaking pilot projects, compared to 17 percent of intensely data-driven enterprises.

Figure 27 shows that intensely data-driven organizations have a much higher take up of big data applications across their businesses, especially in finance and controlling, sales, marketing and logistics.

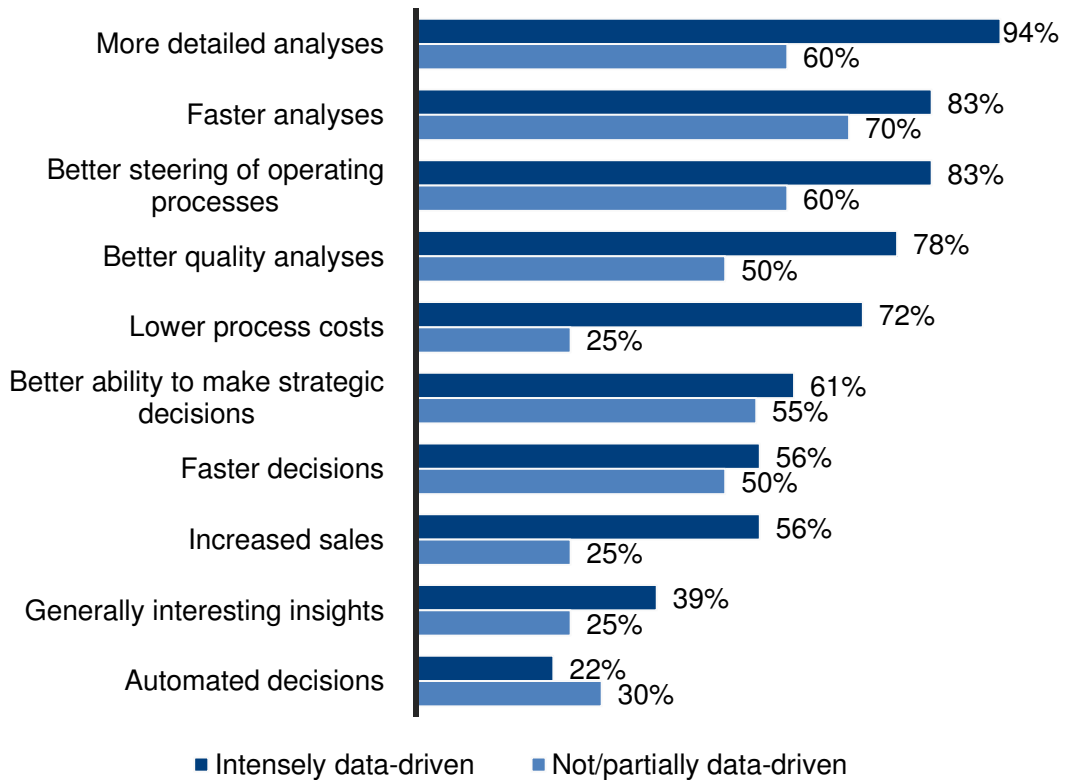


Figure 28: Realized analytical benefits, by data-drivenness (n=38)

Figure 28 is based on a sample of 38 respondents so has a relatively high statistical margin of error. However, the results are striking with intensely data-driven enterprises realizing a higher degree of benefits than their not/partly data-driven counterparts. The intensely data-driven group succeeds in deploying big data for more detailed, quicker and qualitatively better analyses as well as for operational purposes. Realization of cost savings derived from big data (higher revenues and lower process costs) reveals an exceptionally pronounced difference between the two groups.

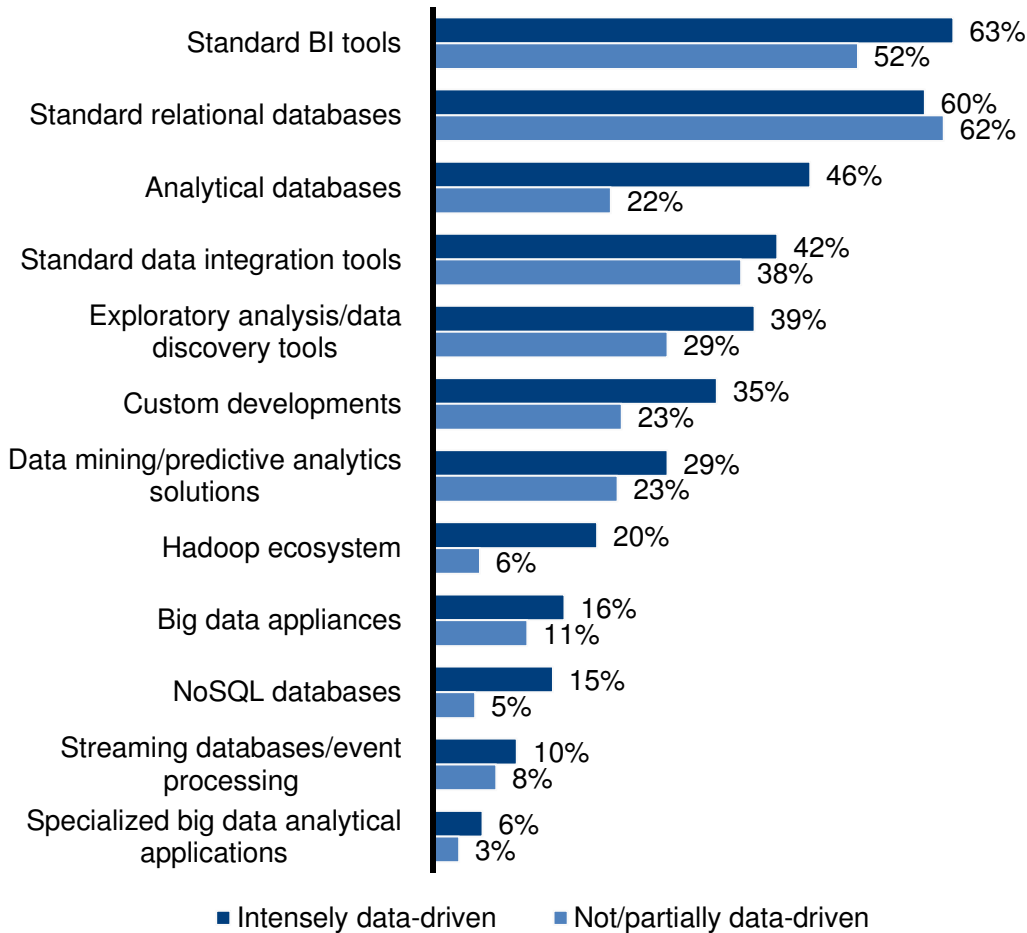


Figure 29: Deployed technology types, by data-drivenness (n=223)

How do intensely data-driven companies gain high added value from big data analysis? The fact that organizations achieve above average added value from big data analytics by increased use of specialized big data tools (Figure 29) is incontrovertible. While usage rates of standard tools are similar for intensely data-driven organizations and not/partly data-driven companies, analysis of certain specialized tools reveals distinct differences between the two groups. These are mainly evident in the areas of analytical databases (46 percent vs. 22 percent), the Hadoop ecosystem (20 percent vs. 6 percent) and NoSQL databases (15 percent vs. 5 percent). Furthermore, intensely data-driven enterprises deploy an average of 4.7 analytical platforms, while other organizations average just 3.7.

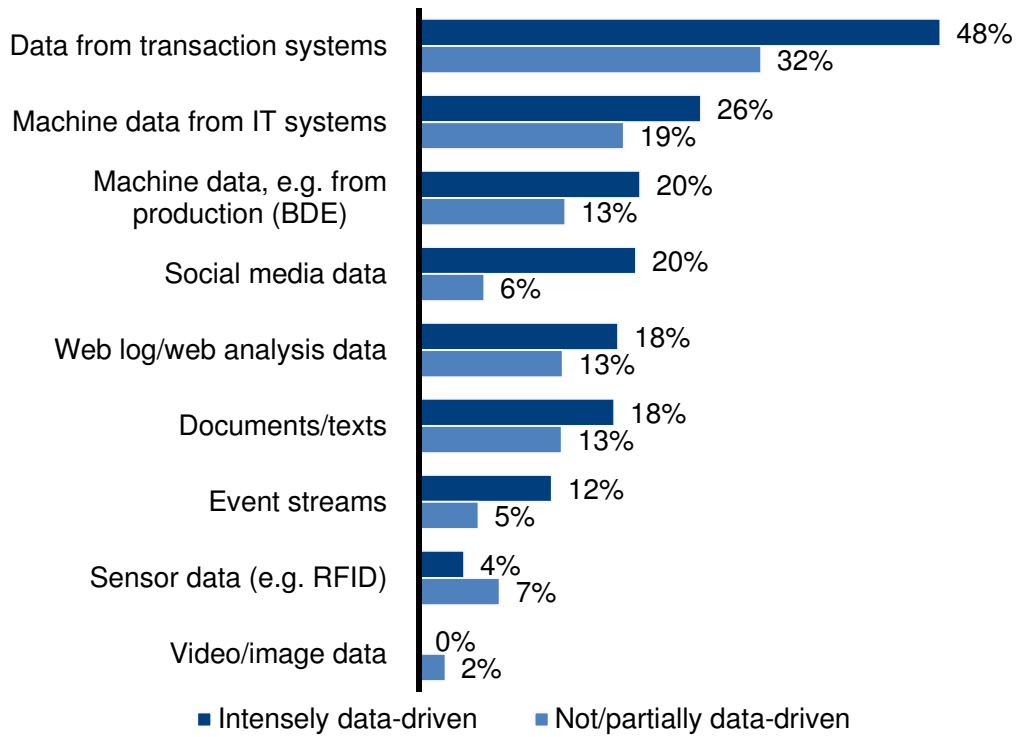


Figure 30: Data sources / types used, by data-drivenness (n=222)

Similar to Figure 29, Figure 30 reveals a broad variation in use between the groups, with the greatest differences seen in data drawn from transaction systems (48 per cent vs. 32 percent) and social media (20 percent vs. 6 percent).

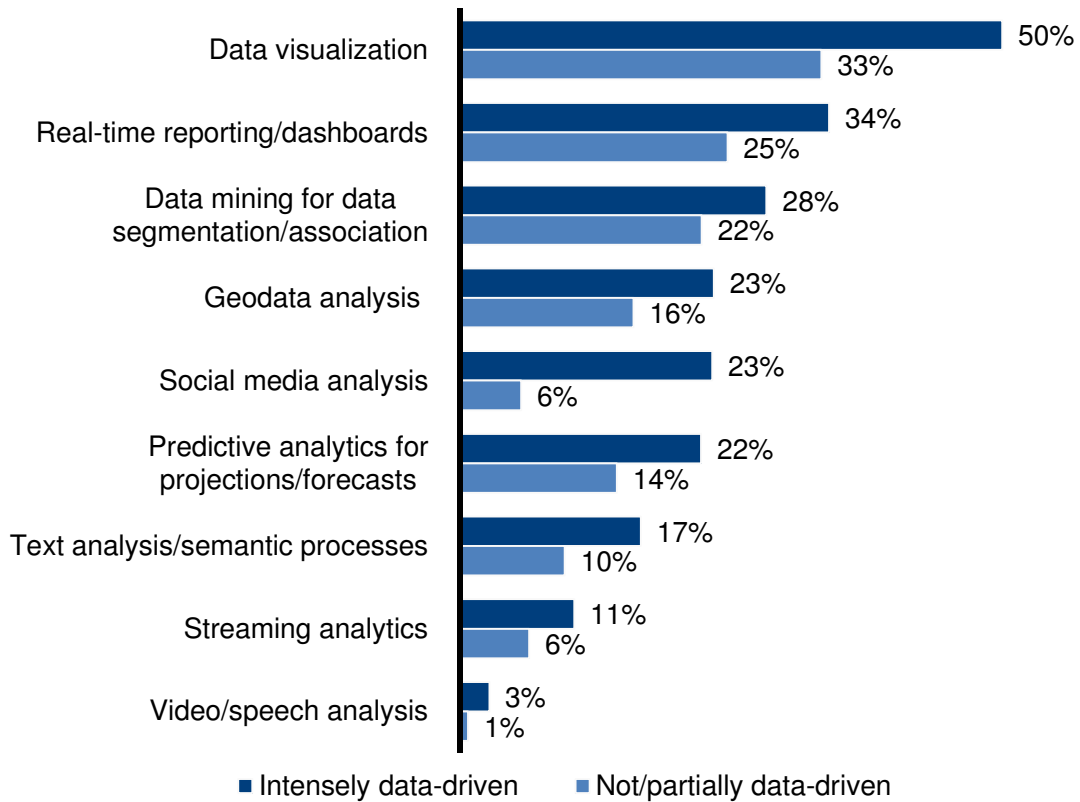


Figure 31: Deployed analytics functionalities, by data-drivenness (n=220)

The increased reliance on a variety of technologies and data sources is reflected in the various analytics functions deployed (Figure 31). This chart highlights how intensely data-driven organizations deploy all of the surveyed analytics functionalities at a higher rate than their less data-driven peers, with marked differences evident in data visualization (50 percent vs. 33 percent) and social media applications (23 percent vs. 6 percent).

Conclusion: Big data is revolutionizing business

This study has found that many enterprises have firmly integrated (or are in the process of integrating) big data analytics into their business processes. This drive for implementation is not based solely on external forces, such as the availability of newer technologies or increasing volumes of data, but also on the day-to-day challenges and requirements that businesses around the world face.

While big data analytics offers enormous opportunities and advantages, there is no doubt that its implementation poses formidable challenges, especially in terms of building analytical and technical knowledge, as well as effectively redesigning in-house IT landscapes.

Although the spectrum of application scenarios for big data is unlimited, organizations are particularly focused on improving their business through heightened transparency and efficiency. In this respect, impressive project plans exist for individual application scenarios with those concentrated on forecasting being most prominent.

We anticipate that big data analytics will increasingly, and in different ways, contribute to the success of businesses by the creation of a more transparent basis for decision making, configuration of processes leading to greater efficiencies, the raising of forecast reliability and the acceleration of promising innovations. Big data is no longer just a buzzword: behind it our study shows that a transformation has begun which will lead to a new era of business modeled on a data-driven economy.

Company profiles of the sponsors

Blue Yonder

www.blue-yonder.com



Company profile

Blue Yonder is the leading SaaS provider for Predictive Analytics in the European market. The company's technology automates mass decisions in real time, resulting in accurate and precise forecasts. Founded in 2008 and based in Karlsruhe, Germany, Blue Yonder provides industry-specific forecasting software that provides specialized business units within the enterprise with simple and quick access to big data, enabling organizations all over the world to become "predictive enterprises." Using scientifically-based and innovative technologies such as predictive modeling and machine-learning approaches, Blue Yonder can automate the decision-making processes and create accurate

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Comma Soft AG / INFONEA®www.comma-soft.com/infonea**Company profile**

Comma Soft AG has been founded in 1989 and composes of the separate business units IT-Consulting and INFONEA®. Since its beginning, Comma Soft belongs to the innovation leaders at the interface of IT and Business in Germany. With more than 110 employees, Comma Soft AG serves numerous companies with various DAX corporations amongst them. Pioneering In-Memory technology and current Big Data technologies designed to quickly process large data volumes, Comma Soft provides its customers with competitive advantages – with new approaches, innovative IT architecture and cutting-edge technologies such as the Business Intelligence software INFONEA.

Committed to the future-oriented concept of Self-Service BI, INFONEA enables every user to analyze

company data in detail – intuitively and independently – , to illustrate analyses in individual dashboards, and to share the results with others. Since 1996, INFONEA is continuously further developed based on methods and algorithms from particle physics and brain research by Comma Soft's own physicists, mathematicians, and computer scientists. Large and medium-sized companies benefit from INFONEA to draw very quickly and easily advantages from existing data within the companies and internet sources, and to ultimately decrease the cost per insight.

The business unit IT-Consulting by Comma Soft AG supports its customers in optimizing or newly designing their IT infrastructure and IT-based business processes.

Empolis Information Management GmbH

www.empolis.com

Company profile

Empolis Smart Information Management® Software allows for comprehensive creation, management, analysis, intelligent processing and provision of all information relevant to a company's business processes. Contents created and managed in a component content management system are uniquely combined with mined and generated knowledge about products, customers, their profiles, suppliers, and much, much more, in a knowledge management system to deliver intelligent, smart information and unparalleled added value. Decision makers, experts, employees and customers precisely receive required information according to their individual task and situation.

Empolis is the first German software company to be named on both prestigious lists, EContent's "100 Top Companies in the Digital Content Industry" and "KMWorld's 100 Companies That Matter in Knowledge Management," at the same time. This clearly reinforces Empolis' approach of uniquely combining knowledge and content management according to the

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Empolis motto "the right information, at the right time, to the right person, on the desired device." Empolis was also named "Big Data Leader 2013" by the Experton Group.

Many notable national and international companies and public sector institutions rely on Empolis solutions, based on more than 25 years of industry and process experience. Currently, around 500 Empolis installations exist around the world, and nearly 620,000 professional users rely on Empolis solutions on a daily basis to serve approximately 34 million end customers.

Empolis acts as a driving force in the development of innovative products and industry standards, participating in national and international research and development projects. Empolis is also an associate of the DFKI (German Research Center for Artificial Intelligence) and a member of the Fraunhofer IAIS (Institute for Intelligent Analysis and Information Systems) advisory board.

EXASOL AG

www.exasol.com

Company profile

EXASOL AG is one of the leading manufacturers of analytical database systems. Its scalable software “Made in Germany” can be found in the areas of data business, customer analytics, operational BI, advanced analytics and data warehousing. With their appliance and cloud solutions, EXASOL AG customers are able to make effective decisions and gain a significant competitive advantage. The



company was founded in Nuremberg in 2000 and has three subsidiaries in Brazil, the United States of America and the United Kingdom. Customers from around the world rely on the technologies from EXASOL AG. These include companies such as Cacau Show, King.com, XING, Sony Music, Olympus, media control, Zalando, IMS Health and Webtrekk.

Hewlett Packard Company, L.P.

www.hp.com/de



Company profile

HP creates new possibilities for technology to have a meaningful impact on people, businesses, governments and society. With the broadest technology portfolio spanning printing, personal systems, software, services and IT infrastructure, HP delivers solutions for customers' most complex challenges in every region of the world. More information about HP (NYSE: HPQ) is available at <http://www.hp.com>

Information Management including Big Data is one of the four strategic pillars of HP – besides Mobility, Cloud and Security.

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With the [Big Data Discovery Experience \(HP BDDE\)](#) service HP supports a low-risk, rapid path to leveraging Big Data technologies for innovation and better business outcomes. Offered as a service with Big Data consultants and data

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HP's Big Data solutions and services are based on HP [HAVEn](#), a platform, which leverages HP's analytics software, hardware and services to create the next generation of big data-ready analytics applications and solutions.

[HAVEn](#) combines proven technologies from [HP Autonomy](#), [HP Vertica](#), [HP ArcSight](#) and [HP Operations Management](#), as well as key industry initiatives such as Hadoop. It enables clients and partners to speed up time to value with highly optimized hardware solutions and gain value from 100 percent of information - including structured, semi structured and unstructured data.

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Pentaho

www.pentaho.de



Company profile

Pentaho is delivering the future of business analytics. Pentaho's open source heritage drives our continued innovation in a modern, integrated, embeddable platform built for the future of analytics, including diverse and big data requirements. Powerful business analytics are made easy with

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Platfora

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Company profile

Platfora is the #1 native Big Data Analytics platform for Hadoop. Platfora puts big data directly into the hands of line-of-business people through self-service analytics that help them uncover new opportunities that were once impossible or impractical across transaction, customer interaction and machine data. An interactive and visual full-stack platform delivered as sub-

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SAS Institute GmbH

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Company profile

SAS is one of the largest software vendors worldwide, and the leading independent supplier of business analytics software in the business intelligence market.

According to a recent study by the Lünendonk market research institute, SAS is also the clear leader in the German business intelligence market.

With annual revenue of US\$ 3.02 billion, SAS is the leader in business analytics software and services, and the largest independent vendor in the business intelligence market. Through innovative solutions delivered within an integrated framework, SAS helps customers to improve performance and deliver value by making better decisions faster.

SAS software solutions help organizations across all industries realize the full potential of their greatest asset: data. Simply put, SAS allows you to transform data about customers, per-

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The headquarters of the US parent company, founded in 1976, are located at Cary in North Carolina (USA). SAS Germany has its main office in Heidelberg, SAS Switzerland in Zurich.

In cooperation with its customers and based on many years of project experience, SAS has developed software solutions for integrated company management. These solutions can be used successfully in the area of customer relationship management, risk management, strategic personnel management, financial management and overall IT management.

Tableau Software

www.tableausoftware.com



Company profile

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Teradata

www.teradata.com



Company profile

Teradata (NYSE: TDC) is a global leader in analytic data platforms, marketing applications, and consulting services. Created by the merger of two traditional financial institutions, Bank für Arbeit and the postal savings bank, BAWAG P.S.K. is one of the largest Austrian banks today. Through the use of the innovative Teradata solutions, BAWAG P.S.K. could secure competitive advantages by increasing the value of their data and customer relationships.

Teradata analytic data platform:

Following a thorough market analysis and a successful pilot project with Teradata, BAWAG P.S.K. decided to implement a Teradata warehouse system which provides an analytical customer data repository and forms the heart of the bank's new CRM environment.

Result:

- Through better segmentation, analytics and modelling, the campaign success rates could be doubled, in some cases even tripled.

"We chose Teradata because they have great database performance, long-term experience and innovative concepts. The successful pilot project convinced us."

Christian Fribert, CRM Analyst

Multichannel campaign management application:

Convinced that these impressive results could be improved even further, BAWAG P.S.K. initiated an assessment study. As a result, "customer relevance" became a major priority.

With Teradata's multichannel campaign management solution, customer interactions were systematically made more meaningful to the customer and more profitable for the bank. The entire communication with the target audience was integrated, automated and optimized – across all products, departments and channels.

Results:

- CRM effectiveness rate increased by a factor of 10.
- At the same time, campaign costs were reduced by a factor of 3 to 5.

"We have a powerful open CRM architecture now on which we can build when we strive to reach new dimensions in integrating our traditional and digital customer communications."

Kaspar Trachsel, Manager CRM

For more information, please visit www.teradata.com

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