

Big data and advanced analytics in the commercial insurance industry



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Key insights gained from analyzing previously untapped sources of data enable commercial insurers to optimize business practices along the value chain. However, most insurers are still at the beginning of the big data journey, currently searching for appropriate business cases, putting their operational model in place and building up required capabilities. Defining and implementing a strategy to leverage big data requires a clear vision, detailed planning and senior-level commitment. Successfully addressing the challenges and opportunities big data offers can open up new sources of competitive advantage. Hence, big data and advanced analytics will remain high on the agenda of top management in the coming years as they are expected to have a dramatic impact on the way insurers do business.

Terms like «big data» and «advanced analytics» have been creating quite a buzz lately in the insurance industry. However, the underlying technology that powers most advanced analytical techniques in fact dates back to the year 2000. With the decrease in cost of technology and the growing access to massive amounts of data since then, the potential power of advanced analytics has significantly increased making it attractive to companies of all sizes. Across different industry sectors, companies are recognizing the tremendous potential of unlocking insights embedded in their internal and external data sources. Supporting this, Gartner¹ has concluded that the topic of predictive analytics has reached the «plateau of productivity» in its recent Hype Cycle.

The ongoing use of advanced analytics during the financial crisis and in fluctuating market conditions remains an important topic, especially for the insurance industry. The huge volume of data being

amassed provides the opportunity for insurers to uncover valuable insights. However, most are not equipped to make best use of big data and advanced analytics (BD&AA) as they struggle with the challenges of developing and implementing effective big data strategies. This article explores how BD&AA can be leveraged to better understand the needs of both commercial insurers and their clients in their quest to become more productive, boost profits, as well as offer new services and products. Furthermore, it describes a pragmatic approach to orchestrating a successful BD&AA implementation strategy.

Big data and advanced analytics

Traditional analytics on transactional or structured data have provided organizations with insights largely on their internal data. Today however, internal as well as external data from multiple sources in multiple formats (high variety) is growing at a rapid pace (high velocity) and is available in huge amounts (high volume).² The demand to analyze such big data is growing rapidly, as it enables enterprises to obtain both predictive and actionable insights. BearingPoint's analysis shows that ten percent of insurers' overall operational costs are related to information and data management.

According to Gartner³, big data demands cost-effective and innovative forms of information processing to enhance insights, decision-making, and process automation. This leads to the second important term related to big data: «advanced analytics». Advanced analytics is the process of applying sophisticated analytical techniques to big data in order to recognize patterns, correlations and other valuable information.

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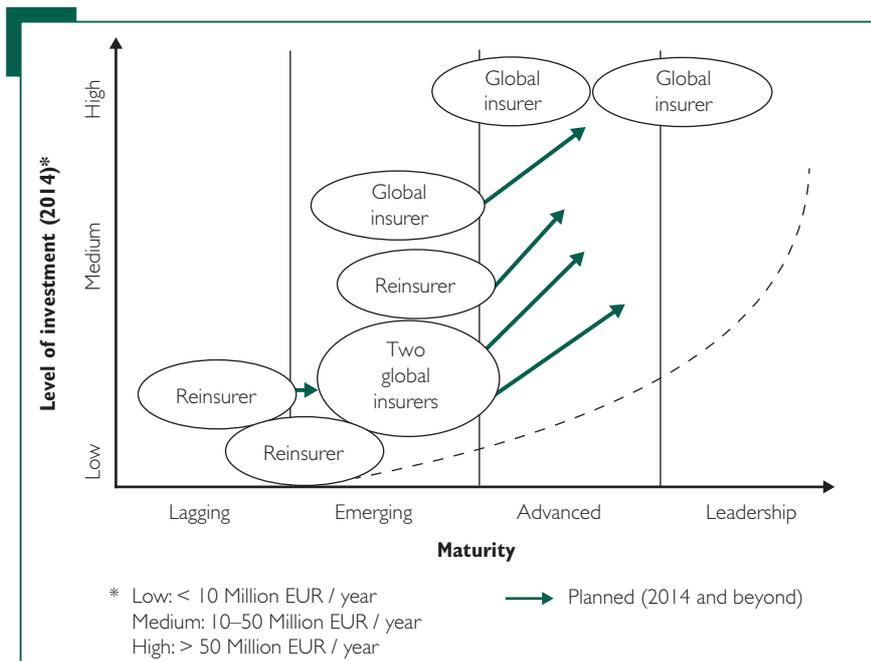


Fig. 1: BD&AA market assessment in the insurance industry (Source: BearingPoint)

BD&AA maturity of the insurance market

In 2013, BearingPoint conducted a market assessment covering insurance and reinsurance companies in Switzerland, Germany, France and the US. This market assessment showed that many insurance companies have started to invest in BD&AA activities. However, only a few companies to date have successfully implemented projects in this area. According to the BearingPoint BD&AA maturity model (Figure 1), most companies can therefore be classified as «emerging».

Insurers are increasingly realizing that BD&AA can provide a competitive advantage, by offering crucial insights that cannot be explained by standard analytical methods. In addition, insurance companies are facing competition from new market entrants like Google, the automotive industry, retailers and other market participants. BearingPoint found that the majority of companies assessed planned significant investments in BD&AA in 2014 and beyond. This is in line with Gartner's⁴ finding that BD&AA investments in the insurance market for the next two years are one of the highest across all sectors. The market assess-

ment also revealed that US insurers are at the forefront of BD&AA as most of those surveyed have established organizational functions to accelerate their BD&AA activities.

BD&AA application areas for commercial insurers

The insurance industry is in a unique position to leverage big data, as critical data are becoming readily accessible as are smart analytical methods which can offer valuable insights across an insurer's value chain. For instance, advanced analytical methods provide insurers opportunities to obtain client-specific insights, enabling them to create innovative, value-added services for their customers. Advanced analytics also enables them to speed up processes and to streamline business practices in areas such as portfolio management, underwriting, claims management and fraud detection. The three cases studies below are illustrative of these new opportunities.

Case 1: New service offering

Addressing the needs of commercial insurers and their clients is essential to de-

signing tailored products and services. BD&AA can support insurers to better understand and meet these needs. This case demonstrates the application of BD&AA to develop new services.

A global P&C broker recognized the potential value of delivering a full service analytics offering. BearingPoint designed and developed a portal solution that offered internal staff and external clients and brokers the possibility to manage their portfolio using advanced analytical techniques. The portal enabled clients and brokers to evaluate their portfolio from different vantage points – for example: own portfolio versus the market, opportunities based on the current portfolio, market share for carrier's position and customizable targets. Moreover, a dashboard was implemented to provide a comprehensive summary of claims, trends in claims (predictive capability) and to identify process impacts. The new service offering based on BD&AA was highly valued by the insurers' clients as it enabled them to optimize their own insurance portfolio mix, reduce risks and minimize claims.

Case 2: Portfolio optimization and underwriting

Traditionally, underwriting relies heavily on statistical methods to calculate accurate prices for individual policies. Nowadays, commercial insurers understand the need to improve and enhance underwriting and its underlying risk models. Leveraging information derived from big data supports insurers in creating models that enable better risk assessments and pricing of products. BearingPoint has performed several such portfolio optimization engagements, including a sizable project for a major marine insurer.

Marine insurance is one of the earliest forms of insurance, dating back to the Greeks and Romans who used statistical analysis over long periods to identify risky vessels. In today's context, increased competition, shrinking margins and a major increase in the number of vessels in service in recent years have placed significant pressure on the profits of marine

insurers. BearingPoint was asked to help optimize a client's portfolio and to improve the risk evaluation of each of its 10'000 vessels by identifying profiles of vessels and fleets with a higher risk of major losses (that is profiles that traditional analytical methods fail to identify). Data analyzed included the past history of a vessel, its age, country of registry and insurance registration, type of tonnage, its area of operation as well as fleet-specific information such as number of wet bulk vessels and overall fleet size. Using its HyperCube® methodology, BearingPoint succeeded in creating rules that clearly describe the attributes of risky and non-risky vessels and fleets, which could be adapted by underwriting, for example:

- «A ship registered under a Singaporean flag and belonging to a fleet with a high proportion of wet bulk cargo is 1.3 times safer than average.»
- «A ship belonging to a small fleet and that has had three minor incidents in the last five years is 7.6 times more likely to suffer a severe loss compared to average.»

In all, 13 rules were identified which accounted for 90 percent of all major losses (over 100 Million Euro over five years). Based on a better understanding of the insured vessels, the procedures for pricing, targeting vessels and recruiting new customers could be optimized which led to a significantly improved loss ratio.

Case 3: Claims management and fraud detection

Another important area for the application of BD&AA is in the detection of fraud which is often part of the claims management process. The use of advanced analytical methods has a high potential to increase productivity by reducing time spent on fraud investigation and by lowering the amount of losses, as demonstrated in the following case.

A leading provider of outsourced insurance subrogation, claims recovery and cost containment solutions for the healthcare payer and property and casualty industries manages the auditing of

millions of claims per year. Using expert rules, neural networks and statistical approaches, the company had achieved some productivity improvements. For example, the investigation rate of claims was reduced from 68 percent to 50 percent to discover the five to ten percent claims containing fraud cases. However, the company was looking for a novel technological approach to reach a new level of productivity. BearingPoint conducted a pilot in which it demonstrated that its analytical approach could deliver an additional 1.7 Million USD margin per year – by increasing the productivity in subrogation by 31 percent, bill auditing by 50 percent and overpayment by 40 percent. As a result, the client has decided to proceed with a five year contract incorporating BearingPoint's recommended approach into its continuous improvement process.

Strategic areas to address

As shown in these case studies, BD&AA offers a high potential return for commercial insurers. In BearingPoint's experience, to successfully implement a BD&AA strategy, the following five areas need to be systematically addressed.

Organizational set-up

To fully leverage big data, a data-driven culture is necessary. A leading practice is to establish a dedicated center of excellence that is embedded within business functions. Typically, such a center has the following responsibilities:

- Operate a portfolio management process (priorities, transparency, synergies)
- Identify new innovations
- Support pilots and projects
- Share best practices across the organization
- Ensure data governance and compliance
- Develop capabilities and leverage existing skills, methods and technologies to ensure economies of scale
- Keep up with BD&AA market trends and developments

Change management and communication

Similar to other strategic projects, change management and communication is critical to the success of BD&AA projects. Involvement of key stakeholders and clear communication of the goals of BD&AA initiatives is essential. Additionally, an organization should clarify how it wishes to position itself in the market with regard to BD&AA. This positioning also affects an insurer's ability to attract the talent needed to carry out its agreed strategy.

Data capabilities

Organizations need to have a clear picture on available internal and external data. Creating a big data landscape overview may also help to identify new business opportunities. What's important here is also to consider how access to critical data can be managed and safeguarded.

People, methodologies and other capabilities

A strategic dimension that needs to be kept in mind from early on is the necessity to build up BD&AA capabilities in terms of skills, methods, and tools & technology. Options to be considered range from setting up alliances with universities and BD&AA providers, educating internal staff, engaging consultants, hiring BD&AA specialists directly, or even acquiring companies with strong BD&AA capabilities.

Tools and technologies are widely available on the market and are often cloud-based, in order to ensure scalability. Moreover, big data technologies need to be regarded as complementary and not as a substitute for traditional information management and analytics.

When it comes to skills, the term «data scientist» is omnipresent. According to Gartner⁵, the emerging discipline of data science encompasses hard skills like process knowledge, statistics, data visualization, data mining, machine learning and database and computer program-

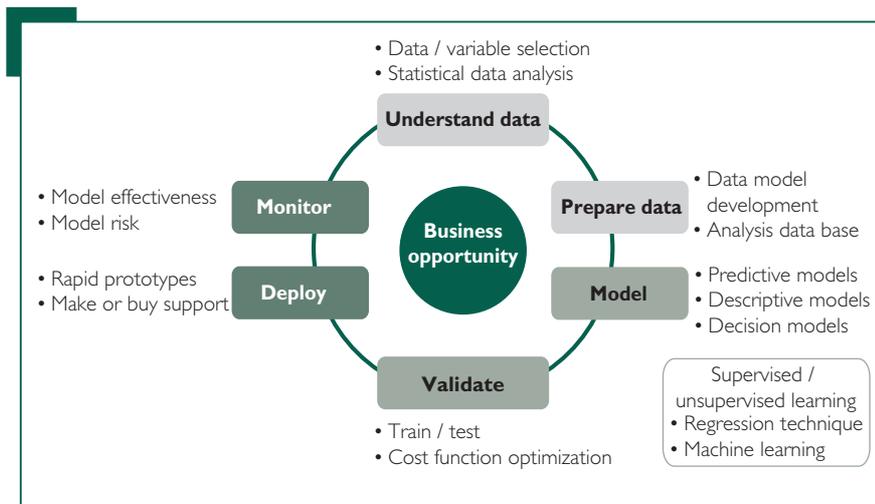


Fig. 2: BD&AA approach (Source: BearingPoint)

models by analyzing (big) data sources to improve business performance or mitigate risk.»⁶

Most commercial insurers already have in place the mathematical and statistical know-how to perform advanced analytics, but many struggle with the operational and technical transformation towards a data-driven environment. BearingPoint has developed a standard approach – building on the original CRISP-DM model of the cross industry standard process for data mining⁷ – to help companies address BD&AA-related business opportunities (Figure 2).

ming. However, soft skills such as communication, collaboration, leadership, and a passion for data are also necessary.

Some capabilities, such as social media analytics, can be partly sourced from external providers. For more specific cases, methods and techniques need to be developed by an insurer’s own data scientists. In future, such methods are expected to become a source for competitive advantage. One emerging issue here is that data scientists are in high demand, and are thus relatively difficult for smaller insurance companies to attract.

Business cases

BearingPoint recommends that insurers set up an innovation and portfolio management process to facilitate the management and further development of business opportunities. This process needs to define how new ideas are identified and evaluated, what the criteria for evaluation are and who carries the responsibility. Developing a pilot for each business opportunity can offer an early indication of the feasibility and potential of a business opportunity.

Overall, the long term success of BD&AA in a company requires a clear vision, solid planning and long-term alignment with the company culture and structure.

Operational model to address a business opportunity

Having identified five strategic areas for BD&AA, we present in this section an approach to operationalize a business opportunity. In a recent publication, Forrester Research made the following statement about predictive / advanced analytics: «Software and / or hardware solutions allow firms to discover, evaluate, optimize, and deploy predictive

Business opportunity

In recent years, decision-making has moved from a «sense and respond» towards a «predict and act» mode which also involves the shift from IT to business-driven analytics. The new model clearly places business at the core of performing advanced analytics and establishing related goals. However, developing analytics that create true business value is only possible if the business articulates clear goals for BD&AA. Quite

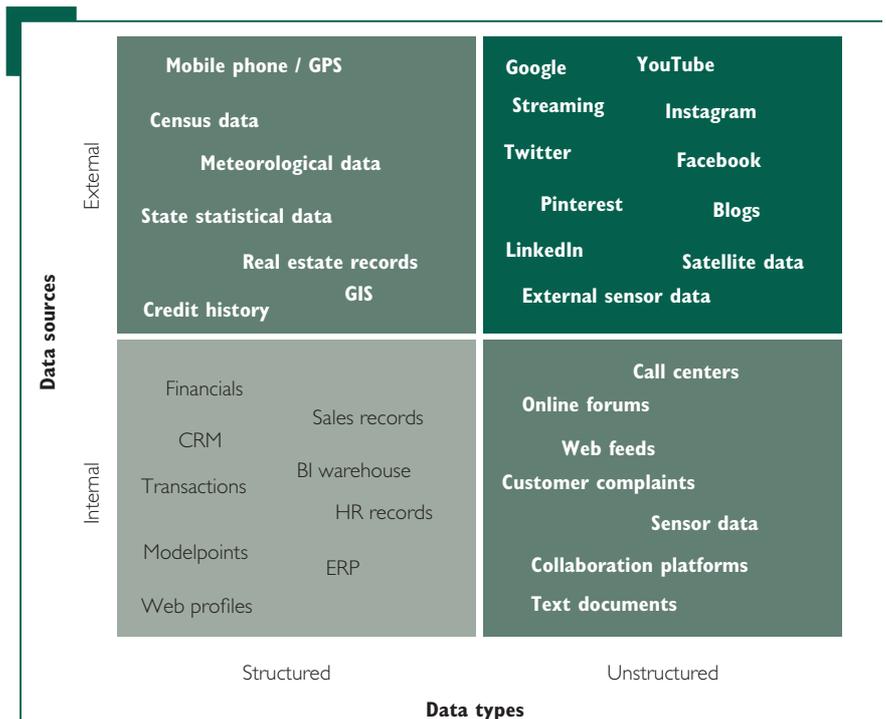


Fig. 3: Types and sources of data (Source: BearingPoint)

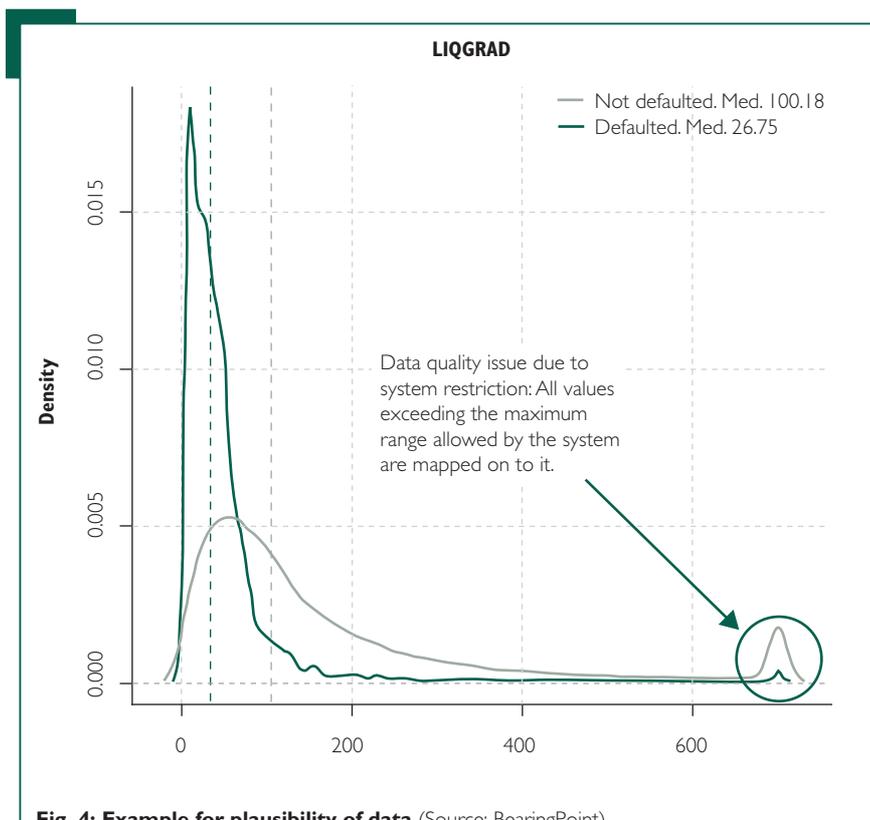


Fig. 4: Example for plausibility of data (Source: BearingPoint)

often, there is no lack of ideas or pain points to be addressed, but difficulties arise due to poorly formulated goals and / or a poor collaboration between lines of business.

Understand data

Data is the basis for sound analytics and business decisions. For maximum value, it is important to understand two different contexts for data which must both be considered:

- Business context: Which data are required to answer business questions?
- Technical context: Where is data stored and how can it be accessed?

The variety of data has dramatically increased over the past few years. Reinsurers rely heavily on both internal and external data, whereas direct insurers primarily use structured internal data for analysis. In a BD&AA environment, it is necessary for insurers to expand their view to consider all types and sources of data (Figure 3) in order to gain the full benefits of advanced analytics.

To encompass all available data, BearingPoint recommends insurers draw on structured and unstructured «internal» data before exploring the «external» data market. Following this approach, an insurer can first build know-how and experience using readily-accessible data, and subsequently enhance its capabilities step by step.

Prepare data

Data preparation is an absolute must to obtain reasonable results from advanced analytics tools. Tasks include – but are not restricted to – transformation and cleaning of data to be processed by an analytical tool. Data preparation tasks are likely to be performed multiple times.

Typically, initial insights are already gained while performing a plausibility check, as data quality is often affected due to sub-optimal user practices or specific system restrictions. Such checks provide an early indication about potential data quality challenges – for example due to ill-trained users, poorly-designed user

interfaces and / or data governance issues (Figure 4).

Modeling

In this phase, suitable modeling techniques based on business requirements are selected and applied. There are often several techniques for the same analytical problem type. Some techniques have specific requirements related to the form of data. Therefore, stepping back to the data preparation phase is often needed.

Development of mathematical models is usually not the main problem as insurers usually have such skills already in place. Nevertheless, insurers can face challenges in the modeling phase, due to their limited technological knowledge on how to implement and apply newly-developed techniques to handle big data. Technologies such as Hadoop / MapReduce, HBase, Cloud Computing, and so on are often missing from insurers' IT architectures. To harness the full power of advanced analytics, it is crucial that insurers take full advantage of such technologies.

Validation

Validation is the first step to ensuring rigorous analysis. The validation process can be split along qualitative and quantitative lines (Figure 5). Qualitative validation involves a review of the model design, the underlying data and its quality, as well as the usage of internal tests. Quantitative validation is used for «back-testing» and benchmarking. Backtesting is a critical step, as it validates the discriminatory power of the model(s), checks their stability and reviews the calibration of the parameters used.

Deployment

Once an approach has demonstrated its applicability and value for advanced analytics, it can be deployed within an insurer's operation. How it gets deployed depends highly on the definition of the overall operational setup strategy. In relation to the technical system, questions such as «who will run the analytics», «which tools and infrastructure are need-

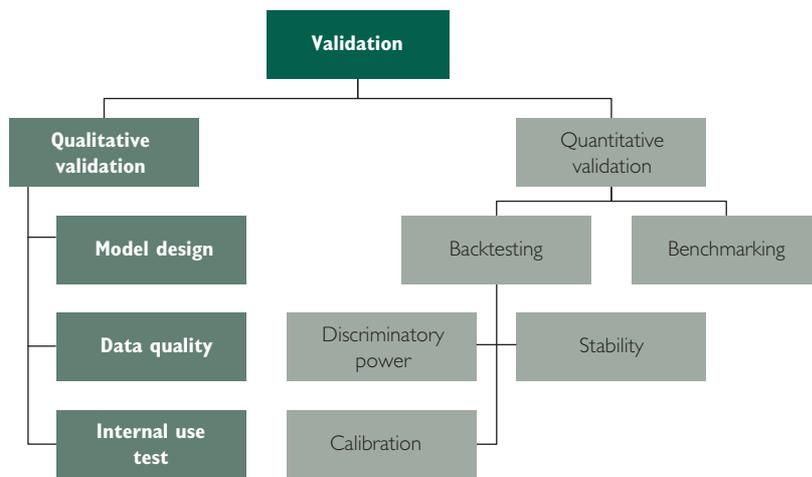


Fig. 5: Validation framework for banking institutions using IRB (internal rating base, Source: OENB⁹)

ed» and «how to integrate it in the operational system» must be addressed.

Monitoring

Past results do not guarantee future performance. It is crucial for an insurer to continuously monitor the performance of deployed analytic models and to adapt them if needed. In particular, models covering a long time horizon should be reviewed on a regular basis to ensure their validity. Insurers need to be aware that «model risk» is of particular importance for insurance companies and that it may also soon be audited by local regulators (for example OCC, BaFin or Finma).⁹

BearingPoint recommends that insurers monitor analytic models company-wide to enable the control of processes and ongoing initiatives in each line of busi-

ness. For insurers employing a wide variety of models, BD&AA initiatives can be initiated by undertaking a comprehensive inventory of all available models. The key objective of this screening is to identify cases of critical models (that is having a high impact on the company's operation), for which an investment in improvement is warranted.

Conclusion

The opportunities to gain competitive advantage make BD&AA a topic of utmost importance for all commercial insurers. Even though the maturity of most insurers in this subject is only emerging, initiatives and projects are in the pipeline to successfully define and implement BD&AA strategies. Innovative advanced analytical methods such as HyperCube®, BearingPoint's unique and award-win-

ning technology that has a proven track record in several BD&AA implementation projects, offer a way to uncover the hidden drivers underlying complex business issues.

In future, applying BD&AA across an insurer's value chain is expected to dramatically change the way insurers do business. New insights will continue to transform the business models of commercial insurers by enabling the development of new products and services as well as the optimization and automation of business processes.

BearingPoint recommends that insurers reflect on their strategic positioning in regard to BD&AA without delay. We believe that early pilot projects are vital for insurers to gain critical experience and build up core skills needed to successfully implement BD&AA projects that create business value.

Notes

- 1 Gartner (2013): Hype Cycle for Analytic Applications, July 2013.
- 2 Celent (2013): Perceptions and Misconceptions of Big Data in Insurance, April 2013.
- 3 Gartner (2012): Best Practices for Big Data Maturity in Financial Services, August 2012.
- 4 Gartner (2013): Survey Analysis: Big Data Adoption in 2013 Shows Substance Behind the Hype, September 2013.
- 5 Gartner (2012): Emerging Role of Data Scientist and the Art of Data Science, March 2012.
- 6 Forrester (2013): The Forrester Wave™: Big Data Predictive Analytics Solutions, February 2013.
- 7 Shearer C. (2000): The CRISP-DM model: The New Blueprint for Data Mining, Journal of Data Warehousing, 5(4): 13-22, Fall 2000.
- 8 OENB (2004): Ratingmodelle und -validierung, Leitfadenreihe zum Kreditrisiko, April 2004.
- 9 Keywords from «OCC – Sound Practices for Model Risk Management», April 2011.