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A sharper view:
Analytics in the global steel industry

By Nick Sowar and Kevin Gromley

A small-market major league baseball team, strained for revenue, looks for a new approach to help it keep pace with its larger, wealthier competitors. A proliferation of data on available players allows the team's management to use analytics to find the talent other teams overlook. While spending less, the team produces a winning record.

A retailer gathers information about customers to ensure that it spends its advertising dollars most effectively. A consumer goods manufacturer utilizes data from the internet to determine the impact of its latest marketing campaign on brand image. A political party studies voter behavior data to direct its campaign resources.

Increasingly, decision makers from organizations across a different sectors within the global economy have a wide range of data available to them. A deeper understanding of new and emerging sources of data and of the tools designed to analyze it are essential in today's business environment. Getting it right can make all the difference in a competitive landscape.

Pricing. Global supply chain management. Workforce trends. Health reform. Even security and terrorism threats. In each of these complex issues advanced signal detection[1] and predictive capabilities are critical. The new generation of analytics tools can bring these capabilities into reach for global steel companies. When businesses hardwire analytics technologies into their processes, the result can be a sharper view of the patterns and signals buried deep below the surface of the enterprise's data, which can ultimately lead to better decisions.

What is analytics?

Simply put, analytics is the practice of using data to drive business strategy and performance. Analytics includes a range of approaches and solutions, from looking backward to truly understand what happened in the past to forward-looking predictive modeling and scenario planning.

Analytics is a set of capabilities. These capabilities are the result of a process that identifies business issues, assembles facts, reports on and optimizes performance, and provides deep insight and answers. Figure 1 illustrates this process.

Figure 1: The analytics process
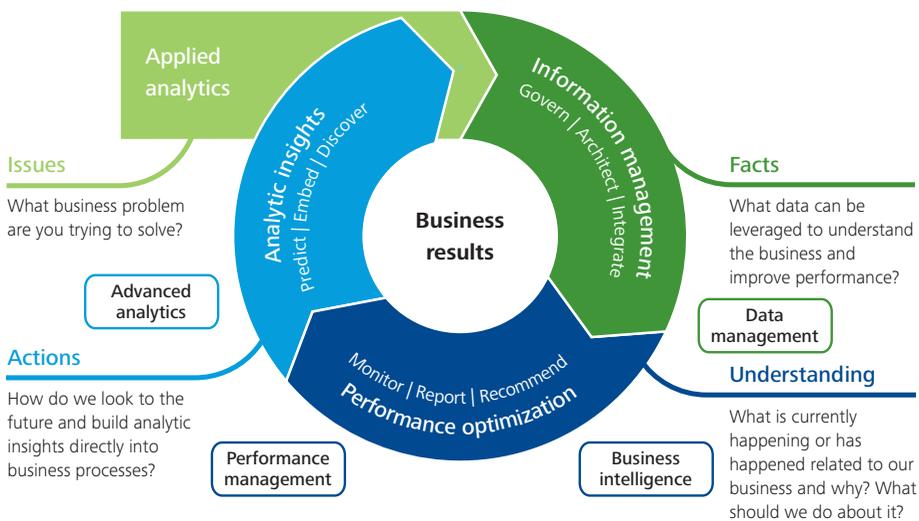
Source: "Business analytics: How trendy should your organization be?," Deloitte United States (Deloitte LLP) Dbriefs webcast, April 2011

Components of analytics

Four major components of analytics include:

- **Data management**. The development and execution of architectures, policies, practices, and procedures that manage the collection, quality, standardization, integration, and aggregation of data across the enterprise.

- **Business intelligence**. Querying, reporting, online analysis, and alerts that can answer the questions: What happened; how many: how often; where; what exactly is the problem; what actions are needed?

- **Performance management**. Advanced methodologies, comprehensive metrics, processes, and analytical applications used to monitor and manage the business performance of the enterprise.

- **Advanced analytics**. Use of modern data mining, pattern matching, data visualization, and predictive modeling to produce analyses and algorithms that help businesses make more meaningful, proactive decisions.

Trends in analytics

Interest in analytics is growing. Deloitte Touche Tohmatsu Limited (DTTL) Global Manufacturing Industry group works with leading companies that are investing in analytics to drive competitive advantage. This article includes some of the latest thinking in analytics and the implications to the global steel industry. Manufacturing executives in all sectors need to be aware of these changes and the advantages to their business.

Five important trends are driving this new interest in analytics:

- **Data volumes and technology capacity**. Global data volume continues to grow exponentially. Fortunately, so are analytical computing capacity and the corresponding tools.

- **Regulations**. From carbon emissions to compliance with the Foreign Corrupt Practices Act, regulators are demanding deeper insight into risk, exposure, and public responsiveness, requiring integrated data across the enterprise.

- **Profitable growth**. The competitive landscape compels investment in analytics infrastructure and tools that can improve financial, economic, environmental, and market information. Companies are using advanced analytics to help identify potential new customers and end-use niches. This functionality will help to determine where to focus new product development, identify challenges and improve customer retention, and provide the lowest cost to market.

- **New signals.** Holistic signal detection from traditional internal and external structured data, along with voice, email, social networking, and sensor-enabled products and assets, should be integrated and monitored for real-time operational insight and decision-making (see Figure 2).

Figure 2: Integrating and monitoring signal detection
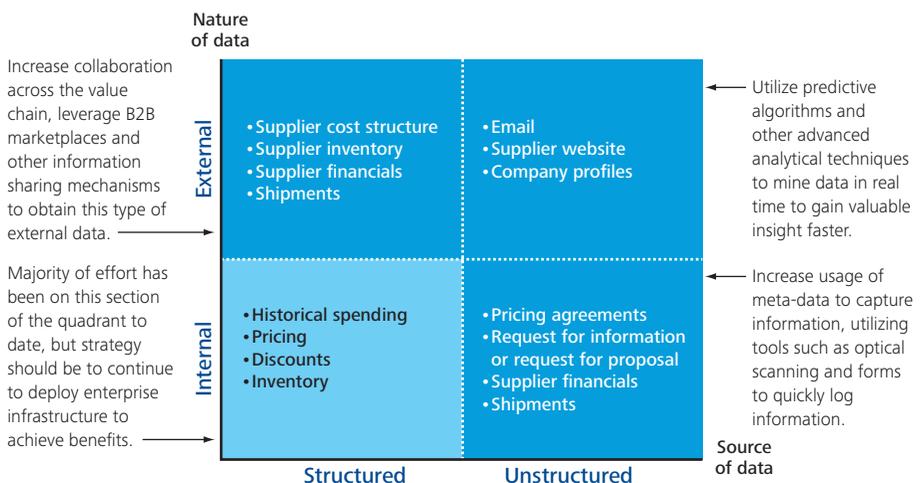
Source: Deloitte Touche Tohmatsu Limited (DTTL)

- **Hidden insight.** The growing complexity of global business has raised the stakes at all levels of decision making. Trying to process an exorbitant amount of information, decision-makers need more efficient tools to quickly uncover hidden patterns that may otherwise go undetected.

What is really new in analytics?

Global steel companies have employed advanced analyses for years, from process simulation to laboratory management systems to computerized maintenance management systems integrated with real-time production data. What is really new in analytics?

Firstly, the "new news" is the changing the nature of data along three dimensions:

- **Volume**. The volume of data is massive. Businesses face an unprecedented amount of it; the challenge is to separate the wheat from the chaff and produce actionable information. EBay, for example, processes petabytes of data, with hundreds of virtual data marts adding 50 new terabytes every day.[3] Analytics tools can decide which data is useful and output valuable information.

- **Sources**. The web, social media, blogs, smart assets, mobile devices — businesses have an ever-growing range of new sources for information on economic trends, consumer preference, competitor initiatives, supply chain disruptions, company brand and reputation, and much more.

- **Types**. New types of data emerge constantly. The rise of Web 2.0 and social media sites have created troves of unstructured text, voice, image, and video data, stored and accessible in electronic format.

The changing nature of data would be of limited interest to businesses without the second new development: tools that can effectively handle this data. New capabilities, such as data mining and pattern recognition, can reveal relationships and trends that yield business insights. Further, these tools, from personal computer based solutions to cloud-based open-source applications, are becoming more accessible and ubiquitous. Examples of new tools and techniques include:

- **Voice analytics** — e.g., For call center triage
- **Text analytics** — e.g., Voice of customer, warranty analysis
- **Video analytics** — e.g., Intelligence, warehouse, and operations applications

Figure 3: New data-handling tools

Modeling /analysis techniques	Tool functionality
• Bayesian estimation	• Data partitioning and transformations
• Decision trees	• Interactive variable binning
• Neural networks	• Data replacement
• Self organizing maps	• Descriptive statistics
• Psychometric analysis	• Graphs/visualization
• Cluster analysis (K-means)	• Clustering
• Non-parametric analysis	• Market basket analysis
• Genetic algorithms	• Dimension reduction
• Text and concept mining	• Rule induction

Source: Deloitte Touche Tohmatsu Limited (DTTL)

Figure 3 provides an overview of the new data-handling tools. These techniques and tools in turn give rise to new predictive powers for business decisions:

> "Predictive analytics is now coming into its own both because of the findings of cognitive science and behavioral economics and also because of a recent and rapid proliferation of huge databases, cheap computing power, advances in data visualization, applied statistics, and machine learning techniques. Any business process that calls on human decision-makers to repeatedly weigh multiple factors to arrive at decisions could more likely than not be improved through predictive analytics. Furthermore, if these decisions are central to a company's core strategy … much more is at stake than improvements in business process efficiencies. Analytics and predictive models can help companies succeed by identifying market inefficiencies."[4]
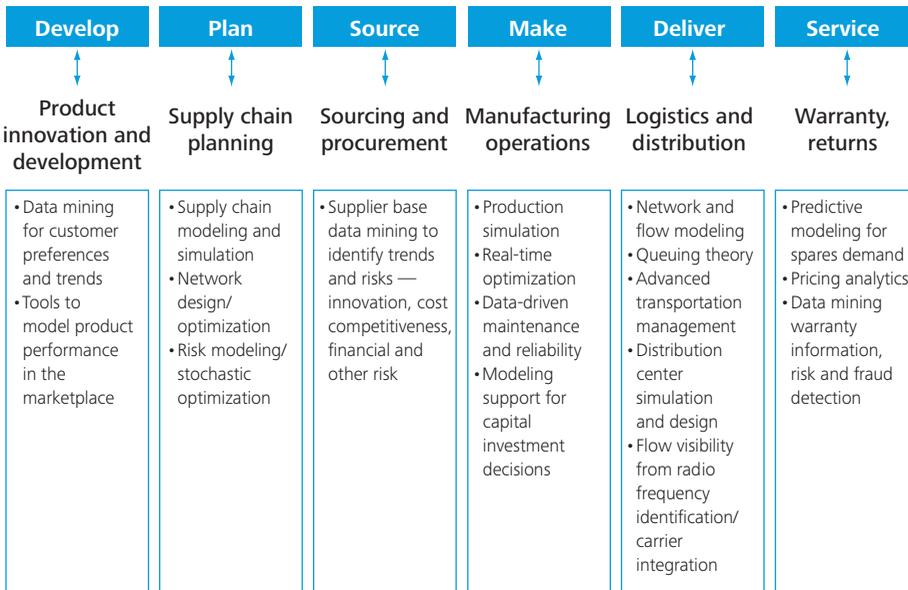
Implications for the global steel industry

"A gradual but pervasive evolution of analytics techniques in the global steel industry is expected over the next few years," says Kevin Gromley, Consulting leader for DTTL's Global Manufacturing Industry group. "Analytics has the potential to influence all major areas of the manufacturing value chain."

The manufacturing value chain (see Figure 4) is a significant place to look for initial analytic advantage. This is partly because of its complexity in the steel sector and of the central role the supply chain plays in a steel company's cost structure and, ultimately, its profits. Supply chains can appear deceptively simple compared with other parts of the business. A "done-it-this-way-for-years" attitude can mask opportunities and inhibit techniques to do better by digging deeper into the data and adopting a predictive (rather than retrospective) orientation to trends and operational changes.

"Manufacturing companies can gain a margin increase of up to 6 percent[5] by applying a more holistic approach to using analytics," adds Gromley. "Many of the first and most significant applications of advanced analytics in the steel industry will likely be in the supply chain operations."

Figure 4: Analytics for the entire value chain

Develop	Plan	Source	Make	Deliver	Service
Product innovation and development	Supply chain planning	Sourcing and procurement	Manufacturing operations	Logistics and distribution	Warranty, returns
• Data mining for customer preferences and trends • Tools to model product performance in the marketplace	• Supply chain modeling and simulation • Network design/ optimization • Risk modeling/ stochastic optimization	• Supplier base data mining to identify trends and risks — innovation, cost competitiveness, financial and other risk	• Production simulation • Real-time optimization • Data-driven maintenance and reliability • Modeling support for capital investment decisions	• Network and flow modeling • Queuing theory • Advanced transportation management • Distribution center simulation and design • Flow visibility from radio frequency identification/ carrier integration	• Predictive modeling for spares demand • Pricing analytics • Data mining warranty information, risk and fraud detection

Source: Deloitte Touche Tohmatsu Limited (DTTL)

Applications of advanced analytics for the steel sector

The following are early examples of applications of advanced supply chain analytics in the global steel sector:

- **Product costs and margins**. An established global steel producer found that its legacy systems were not providing sufficient granularity into cost and profitability by product, order, mill, or customer. In particular, the existing systems could neither respond quickly enough to the increased volatility of iron ore, scrap, and energy prices, nor adequately deal with increased pricing volatility on the demand side. This company is implementing advanced analytic capabilities on top of a contemporary enterprise resource planning backbone. The combination will give management faster and more accurate insights into costs and margins for each order and will help improve decision-making on pricing, demand management, production scheduling, and operational investments.

- **Customer insights and risk management**. The most recent financial crisis and recession hit the automotive sector especially hard. Most automakers and their large suppliers faced operating losses and cash constraints. The implications and risks for steel companies, themselves

facing plummeting market prices and stubbornly high raw material costs, were significant. Steel suppliers to the automotive sector had to make judgments on customer viability, terms, and exposure. Deloitte United States (Deloitte LLP) worked with leading companies to develop a risk scorecard for the U.S. automotive supplier industry. This scorecard combined traditional financial metrics with nontraditional indicators from many of the new sources of data noted above. The resulting dashboard (see Figure 5), updated as conditions changed, allowed automakers and suppliers to make informed decisions at both a tactical, daily order level and, for the longer term, looking at their mix of customers and product offerings.

Figure 5: Auto supplier "health" dashboard

Supplier	Financial rating	Strategic rating	North America exposure rating	Health rating
Supplier 1	Red	Green	Green	Yellow
Supplier 2	Red	Red	Red	Red
Supplier 3	Green	Yellow	Yellow	Yellow
Supplier 4	Red	Yellow	Yellow	Red
Supplier 5	Green	Green	Yellow	Yellow
Supplier 6	Red	Yellow	Green	Yellow
Supplier 7	Green	Yellow	Red	Red
Supplier 8	Green	Red	Red	Red
Supplier 9	Red	Red	Yellow	Red
Supplier 10	Red	Yellow	Red	Red
Supplier 11	Green	Green	Green	Green
Supplier 12	Red	Red	Yellow	Red
Supplier 13	Red	Yellow	Red	Red
Supplier 14	Red	Yellow	Red	Red
Supplier 15	Red	Red	Red	Red
Supplier 16	Red	Red	Red	Red
Supplier 17	Red	Yellow	Green	Yellow
Supplier 18	Yellow	Yellow	Yellow	Yellow
Supplier 19	Red	Red	Red	Red
Supplier 20	Red	Red	Red	Red
Supplier 21	Red	Yellow	Green	Yellow
Supplier 22	Red	Yellow	Yellow	Red
Supplier 23	Green	Red	Green	Green

Health rating	
Unhealthy	Red
At risk	Yellow
Healthy	Green

Source: Deloitte United States (Deloitte Consulting LLP)

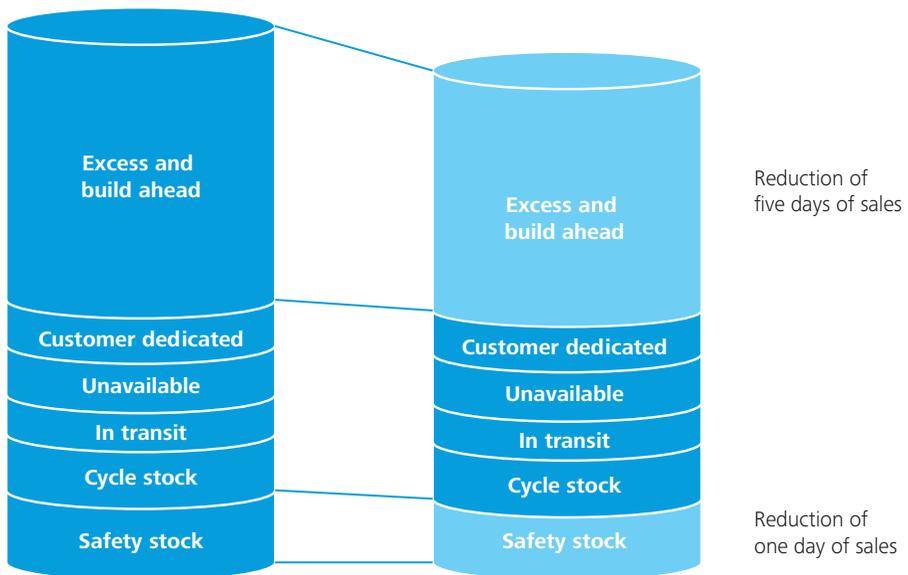**Figure 6: Basic oxygen steelmaking process simulation**
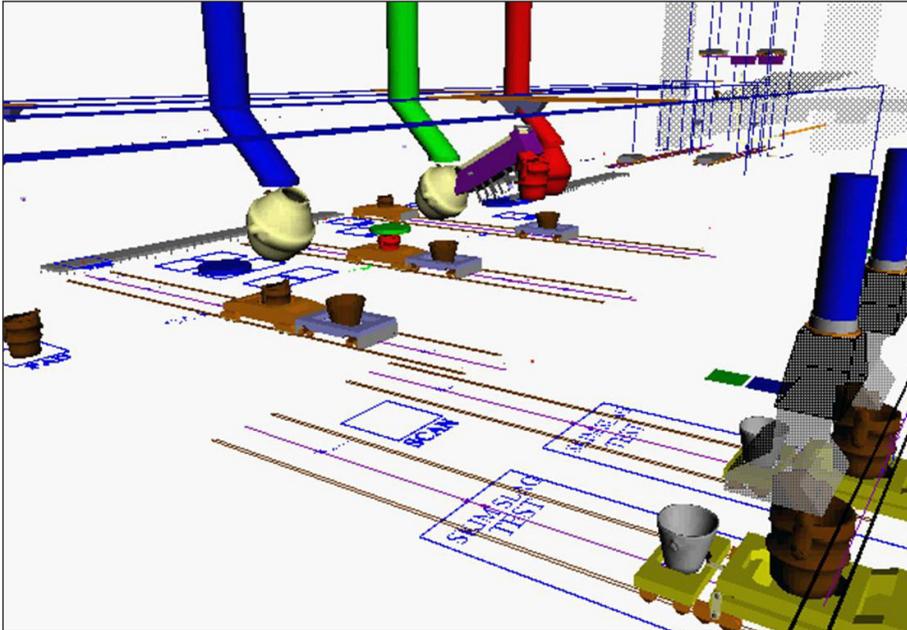
Source: Deloitte United States (Deloitte Consulting LLP)

- **Capital investment decisions**. The steel and process industries have long had tools available to simulate production processes. Companies have used these tools for years to assist with new plant designs and rebuilds. In the past, however, the tools were cumbersome, required highly trained experts to use them, and took weeks to provide answers. The new generation of tools combines visualization and dynamic simulation with traditional numerical results, and does so in a vastly more user-accessible fashion (see Figure 6, for example, of a basic oxygen steelmaking process simulation). Answers can be generated in days, not weeks. Consequently, several major steel companies are now using these more advanced tools to support a broader range of capital investment decisions, from removing bottlenecks from individual units to investments in fork trucks and coil handling.

- **Consumer product "demand sensing."** Downstream users of steel, such as manufacturers of white goods and consumer durables, are using analytics to better sense demand throughout the value chain. Steel users are collaborating with their trading partners (retailers) to generate improvements in customer service while at the same time lowering overall inventory levels and reducing scrap and obsolescence. Consumer product companies are collecting and sharing data with retailers — data such as point-of-sale information, product promotion calendars, and new-product launches — to jointly plan and predict consumer purchase activity. With this information, consumer product companies are

better able to predict demand and reduce uncertainty; Figure 7 shows an example of the results for a major consumer goods company. Using similar analytics tools and approaches, steel manufacturers can utilize this improved insight into end-of-the-value chain demand, enabling better production planning and demand matching, reduced inventory levels, and improved responsiveness.

Figure 7: Analytics at work

Consumer goods manufacturer applies analytics to achieve a $150 million inventory reduction

Excess and build ahead

Customer dedicated
Unavailable
In transit
Cycle stock
Safety stock

Excess and build ahead

Customer dedicated
Unavailable
In transit
Cycle stock
Safety stock

Reduction of five days of sales

Reduction of one day of sales

Source: Deloitte United States (Deloitte Consulting LLP)

Pricing, profitability, and safety

There are many other possible compelling applications of analytics for the steel sector, as these examples illustrate:

- **Pricing and profitability management.** A global diversified chemical company, facing increasing commoditization of its products, wanted to improve margins by pricing products based on customer-specific costs to serve. In addition, they wished to couple this with insights into customer value from alternative product and service mixes. To do this, the company had to better understand its customers' buying behaviors in the global market and to have a better understanding of how its own business units and various sales channels were actually pricing in the real world. The company employed advanced analytics tools to combine and analyze internal data on costs and "pocket" prices with external data on the market and individual customers. The result was a series of new pricing strategies that boosted margins by nearly three percent.

- **Safety management and accident avoidance.** A major employer in the service sector was facing the challenge of the rising costs of worker accidents, both in the form of time lost due to injury and direct costs for claims. This company employed advanced multivariate analysis of a variety of safety-related data, both traditional and nontraditional. The resulting model, which includes incident history, employee profiles, maintenance data, training records, and other factors, is a powerful predictor of safety issues. The work identified the top one percent of the employee base and working conditions that contributed to safety concerns. This group had a likelihood of accidents over seven times greater than the average. By addressing this focused set of employees and working conditions, the company achieved a significant reduction in safety incidents and related costs with relatively little effort.

What is next for analytics?

"Advanced analytics represents a step change in capabilities," says Nick Sowar, Global Metals sector leader for DTTL Global Manufacturing Industry group. "Steel companies have the opportunity to expand the use of analytics in managing their businesses and for strategic decision making."

For global steel companies, addressing supply chain challenges early through advanced analytics can create a positive impact on the overall business strategy. Advanced supply chain analytics represents an operational shift away from management models that were previously built on responding to issues and upsets, toward one that anticipates demand and events. This realignment will refocus the internal cross-functional sharing of data, to greater coordination and shared understanding of the data flows across value chain partners.

"Analytics can be applied to some of the more complicated issues that steelmakers face, including improving safety, meeting environmental requirements cost-effectively, and managing price volatility more effectively," comments Sowar. "Increasingly, new analytics tools are giving management new insights and levers to address these continuing challenges."

In conclusion, analytics is not a fad. It can have a profound impact on the global steel sector. Leaders should seek to understand the emerging capabilities and begin to include them in their strategic thinking and future business plans. These plans should be holistic and cross-functional in nature: enterprise, procurement, finance, sales, and information technology organizations can start working together to build capabilities related to advanced enterprise analytics. To learn more, please see the "Suggested reading" section on Page 12 offers a place to start for management to learn more.

The analytics journey in the steel industry has just begun.

Deloitte Analytics

Successful analytics requires three powerful engines: Deep industry knowledge, broad functional capabilities, and a high degree of technical sophistication. Deloitte Analytics is a service offering that addresses a continuum of opportunities for companies by understanding, defining, and operationalizing the value of analytics. A leader in the science of analytics, the Deloitte Analytics' team combines strategy-level insights with a deep understanding of ways to make it work on the front lines. Figure 8 shows the broad range of Deloitte Analytics services:

Figure 8: Deloitte Analytics services

Customer analytics	Workforce analytics
• Pricing and profitability analytics	• Workforce performance management
• Customer segmentation	• As One
• Brand/sentiment analysis	
Supply chain analytics	**Risk analytics**
• Supplier/procurement analytics	• Regulatory/compliance analytics
• Supply chain operations (logistics and distribution	• Fraud/forensic analytics
	• Cyber risk
Financial analytics	• Financial markets risk
• Financial performance management	• Governance, risk and compliance
• Advanced forecasting	

Quite simply, Deloitte Analytics helps companies turn data into information, and information into action and measurable results.
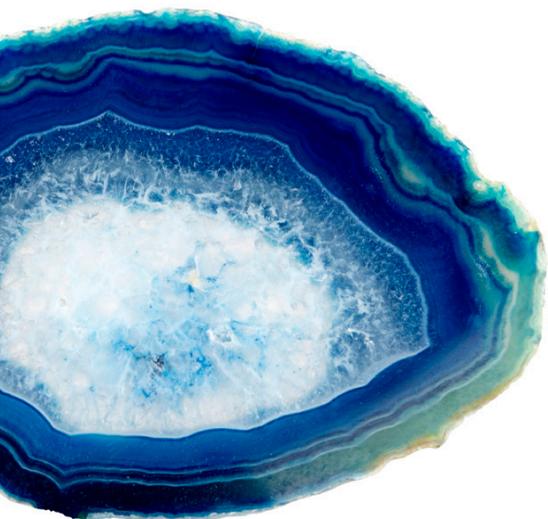
Suggested reading

Analytics at Work: Smarter Decisions, Better Results. Thomas H. Davenport, Jeanne G. Harris, and Robert Morison. "Harvard Business Press," 2010.

Beyond the Balanced Scorecard: Improving Business Intelligence with Analytics. Mark Graham, "Brown Productivity Press," 2007.

Business Intelligence and Analytics Fundamentals. Helena Schwenk, Ovum Summit, 2010.

Driving Better Business Intelligence Through Streamlined Analytics. Madan Sheina, Ovum Summit, 2009.

The New HR Analytics: Predicting the Economic Value of Your Company's Human Capital Investment. Jac Fitz-enz, AMACOM, 2010.

Text Analytics: The Road to Understanding Your Company's Unstructured Information. Fern Halper, Hurwitz & Associates, 2007.

Deloitte Analytics website - http://www.deloitte.com/view/en_US/us/Services/additional-services/deloitte-analytics-service/index.htm

Endnotes

1 The starting point for signal detection theory is that nearly all decision making takes place in the presence of some uncertainty. Signal detection theory provides a precise language and graphic notation for analyzing decision making in the presence of uncertainty. Source; Professor David Heeger. *Signal Detection Theory*. 12 December 1997.

2 Jane Griffin, Principal, Deloitte United States (Deloitte Consulting LLP), *Business Analytics: Just Another Passing Fad?* Deloitte Debates. 2010. www.deloitte.com/us/debates/ba.

3 *EBay looks to pioneer analytics as a service.* CIOZone.com http://www.ciozone.com/index.php/Business-Intelligence/EBay-Looks-To-Pioneer-Analytics-As-A-Service.html

4 James Guszcza and John Lucker, *Irrational expectations: How statistical thinking can lead us to better decisions.* Deloitte Review, July 2009.

5 Andrew McAffe and Erik Brynjolfsson, *What makes a company good at IT? The Wall Street Journal,* May 5, 2011.

For further information

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