Operational risk management in the world of big data

Unlocking the value of loss event data and driving the risk-aware enterprise

IBM

Contents

Executive summary

Today, with operational risk emerging as a primary risk threat in all major economies, market players are looking to the potential of big data as a primary driver of next-generation operational risk management. Drawing on current IBM research in the field of big data, this paper shows how operational risk solutions can harness the potential of big data in its four dimensions—volume, velocity, variety and veracity—to inform risk management scenarios and analytics, fostering the development of the risk-aware enterprise to help control loss events, enhance profits and drive long-term growth.

The "high and increasing" threat of operational risk

2012 marked a seminal year in the history of operational risk management. While the 2007 financial crisis focused the attention of world markets and regulators on the interrelated challenges of market, credit and liquidity risk, in 2012 high-profile loss events impacting several major financial institutions has led to a renewed focus among regulators and industry leaders on the challenges of operational risk and corporate governance. For global markets, the significance of these loss events —measured, in some cases, in the billions of dollars—was that operational risk can impact even the strongest and best-run organizations.

"Some of our most seasoned supervisors, people with 30 or more years of experience in some cases, tell me that this is the first time they have seen operational risk eclipse credit risk as a safety and soundness challenge. Rising operational risk concerns them, it concerns me, and it should concern you."

— U.S. Comptroller of the Currency Thomas Curry[1]

This new significance of operational risk for global business was underlined by Thomas Curry—the U.S. Comptroller of the Currency and the primary regulator of U.S. banks—in a speech announcing what Curry termed the "extraordinary" fact that operational risk had supplanted credit risk at "the top of the list of safety and soundness issues for the institutions we supervise."[2] While operational risk has long been a primary focus of risk management, the growing frequency of loss events attributed to operational risk have led market participants and global regulators—including the U.S. Treasury—to focus renewed attention upon it. Chartis Research, in a 2014 report, notes how "operational risk has overtaken credit risk as the most important risk type," calling further attention to what the U.S. Treasury terms the "high and increasing threat of operational risk".[3]

A review of recent loss events linked to operational risk explains the reasons underlying the U.S. Treasury's growing concern regarding this threat (see Figure 1). In May 2012 the United Kingdom's Financial Services Authority (FSA) fined Mitsui Sumitomo Insurance Company (Europe) Ltd (MSIEu) £3,345,000 (USD $5,403,546) for "serious corporate governance failings" that left its board unable to properly assess risks. Meanwhile, in Spain the county's banking bailout program, the Fund for Orderly Banking Restructuring (FROB), agreed to inject a staggering $23.5 billion in fresh capital to shore up the liquidity of the country's fourth largest bank, Bankia, after losses and probes into its governance.[4]

Loss events linked to operational risk

Grupo Banco Financiero y de Ahorros/Bankia S.A.	Clients, Products and Business Practices	$29,550,413,100
Royal Bank of Scotland	Business Disruption and System Failures	$133,300,000
MS&AD Insurance Group Holdings, Inc	Execution, Delivery and Process Management	$543,403,500
Bank of America	Employment Practices and Workplace Safety	$10,150,000
AIJ Investment Advisors	Internal Fraud	$1,500,000,000
Wegelin S.A.	Internal Fraud	$16,000,000
Itau Unibanco Holding S.A	External Fraud	$62,217,687
SCOR Group	Damage to Physical Assets	$182,656,600
Grupo Santander	Clients, Products and Business Practices	$ 892,235,400
Barclays plc	Clients, Products and Business Practices	$ 452,841,420

Table 1: Loss events linked to operational risk chart

Source: IBM® Algo FIRST® for Web edition

The increasing frequency and scale of these loss events are attributed, in large measure, to the growing complexity of global markets and institutions and to the accelerating evolution of technologies and strategic processes that underpin them.[5] For example, one of the emerging areas of operational risk fostered by new technologies is that of social media. The increasing popularity of these dynamic, interactive online media systems — ranging from blogs and micro-sites to global platforms such as Facebook, Google+ and Twitter — has been identified as a growing and evolving challenge in operational risk today. In response, the Federal Financial Institutions Examination Council (FFIEC) — representing a range of regulatory bodies including the Federal Reserve, the Office of the Comptroller of the Currency, and the Federal Deposit Insurance Corporation (FDIC) — recently issued guidance highlighting the operational risk challenges of social media, and requiring that each institution implement a "risk management program that allows it to identify, measure, monitor, and control the risks related to social media." In recognition of the "constantly evolving technology" of social media — and, in particular, the large data sets created by social media users — FFIEC guidance requires that the "size and complexity of the risk management program should be commensurate" with the scale of engagement with social media.[6]

To successfully meet both existing and emerging operational risk challenges, it is becoming clear to leading market participants that we need to move beyond the often-siloed risk systems and piecemeal solutions of the past to integrated solutions that empower users across the enterprise — from management to the board level — to share accurate and actionable information that is both comprehensive in scope and granular in detail.[7] In this context, industry best practices to address operational risk challenges are increasingly taking the form of holistic enterprise solutions with the capability to manage the complex array of data challenges that derive from accelerating technological innovation. As innovation stimulates exponential increases in the volume, complexity and speed of data that global corporations must manage and control, successful operational risk management demands analytics with the power to address these data challenges across the enterprise and enable stronger and more effective data governance.

This new paradigm is gaining adherents among global regulators such as the U.S. Treasury, which has asserted that institutions today need to address operational risk challenges "in an integrated fashion across the entire enterprise."[8] Given that "no issues loom larger today than operational risk in all its dimensions," in the view of leading U.S. Treasury officials "[a]ll institutions, regardless of size, must resist the temptation to under-invest in the systems and controls they need to prevent greater risk and larger losses in the future."[9] Effective operational risk management in today's marketplace requires that solution providers not only have long-term experience in the field of operational risk management, but also the sophistication and capability to innovate and apply new technologies and strategies to dominate a risk landscape that is evolving at a rapidly-accelerating pace. In this analysis, one of the most fertile areas in current research towards development of best-of-breed operational risk systems lies in the field of big data.

Operational risk challenges and solutions

Big data is transforming our world at an unprecedented pace. In 2012 IBM surveyed 1144 business and IT professionals in 95 countries and found nearly two-thirds of respondents — 63 percent — reporting that big data and its associated analytics are creating competitive advantages for their organizations. This response marks a significant increase from the 37 percent response to the same question in 2010 in the IBM New Intelligent Enterprise Global Executive Study and Research collaboration — a remarkable increase in just two years, that is indicative of the current surge in global interest and investment in big data.[10] A particularly important finding from this study was that organizations that had implemented big data projects or deployments were 15 percent more likely to report significant advantage from the integration of big data and analytics compared to those relying on traditional analytics alone.[11] In other words, big data integrated with advanced analytics can yield significant business value.

What is "big data"? Given its widespread usage across mass media environments, it is not surprising that the precise meaning of the term is often elusive. In a major study, the IBM Institute for Business Value, in conjunction with the Said Business School at the University of Oxford, argues that "big data" may be best understood as the convergence of four dimensions, or four V's: volume, variety, velocity and veracity (see Figure 2).
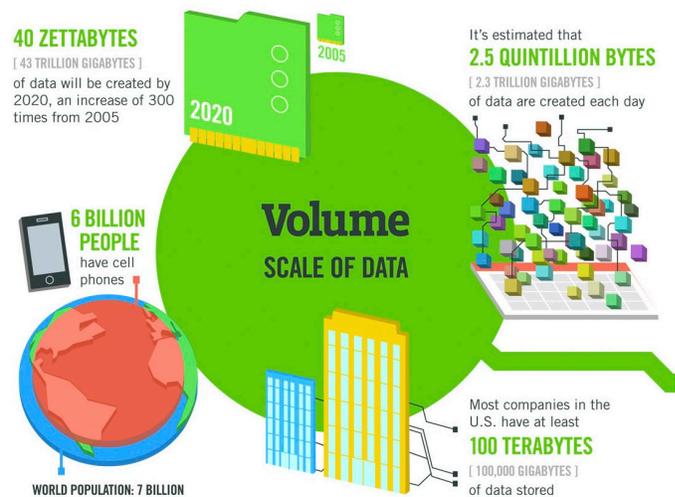

Figure 1: Big data — volume

The four V's of big data: Volume

This dimension refers to the quantity of data, as big data is frequently defined in terms of massive data sets with measures such as petabytes and zetabytes commonly referenced. The operational risk management challenge of this dimension of big data is that new technologies are increasing the size of these data sets at an exponential rate. This dimension stretches across industries — from utilities, to banking and financial services, to healthcare, telecommunications and retail — with organizations handling larger volumes than ever before with the only certainty

being that these volumes will increase over time. In particular, the volume dimension of big data represents a growing operational risk challenge given emerging regulatory requirements that institutions implement risk management systems with the depth and breadth of capability to meet the sheer scale of the data sets produced by social media.[12] As global business seeks to optimize the potential of social media to reach customers and clients around the world, regulators are increasingly demanding the risk and data governance systems with the capability to address the potential operational risk exposure presented by these new technologies.
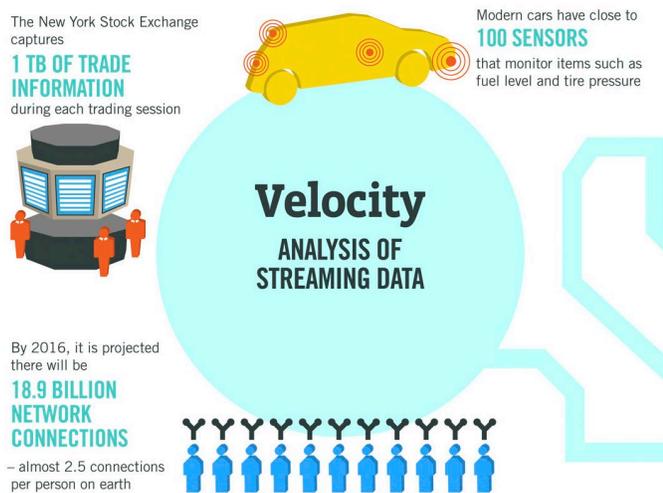
The four V's of big data: Velocity

This dimension refers to the accelerating speed at which data is being generated today. For organizations, this dimension is critical as velocity determines latency, or the lag time between when data is generated and when it is accessible and actionable for decision making. IBM research has found a high correlation between the revenue growth and efficiency of an organization and its capacity to derive actionable insights from data.[13] Essentially, big data has value only when it is accessible to yield insights, with action based on those insights.

The challenge for operational risk management in this dimension is that today data is created at such a rate as to exceed the capability of many existing systems to timely identify potential risk events for analysis and action. Meeting this challenge necessitates a technology provider with both data warehousing capabilities and a track record of success with IT and data governance to foster confidence among senior management and regulators that a firm's critical data is safe and secure. Moreover, risk analytics must be embedded within a larger, and clearly defined, risk and compliance framework to enable effective operational risk management for time-sensitive processes such as fraud detection.
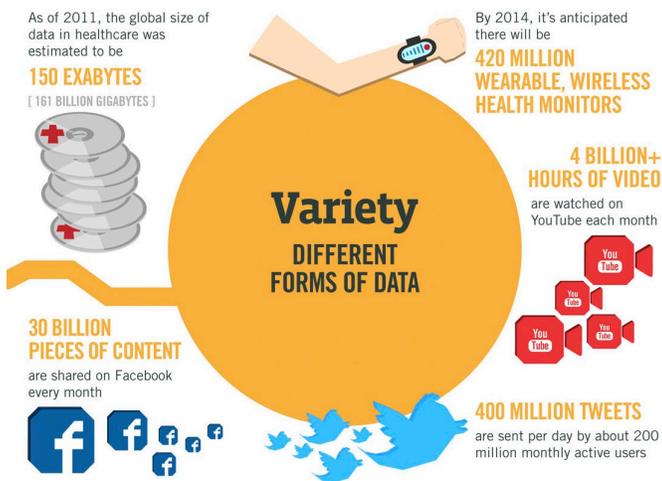

The New York Stock Exchange captures
1 TB OF TRADE INFORMATION
during each trading session

Modern cars have close to
100 SENSORS
that monitor items such as fuel level and tire pressure

Velocity
ANALYSIS OF STREAMING DATA

By 2016, it is projected there will be
18.9 BILLION NETWORK CONNECTIONS
– almost 2.5 connections per person on earth

Figure 2: Big data — velocity

As of 2011, the global size of data in healthcare was estimated to be

150 EXABYTES

[161 BILLION GIGABYTES]

By 2014, it's anticipated there will be

420 MILLION WEARABLE, WIRELESS HEALTH MONITORS

4 BILLION+ HOURS OF VIDEO

are watched on YouTube each month

Variety

DIFFERENT FORMS OF DATA

30 BILLION PIECES OF CONTENT

are shared on Facebook every month

400 MILLION TWEETS

are sent per day by about 200 million monthly active users

Figure 3: Big data — variety

The four V's of big data: Variety

This dimension refers to the increasing diversity in the types and sources of data requiring management and analysis. Organizations today find themselves needing to integrate increasingly complex, multiple data types — structured, semi-structured and unstructured — from an array of systems and sources both internal and external. In terms of operational risk, this dimension presents a challenge given research findings that organizations traditionally rely heavily on internal sources of data.[14]

The challenge for operational risk management in this dimension is that to proactively manage operational risk in a business environment characterized by sustained volatility, organizations need advanced risk analytics whose effectiveness can be enhanced when internal data is supplemented by external data. For example, organizations such as banks and insurance providers can acquire critical insights from self-assessment and scenario modeling informed by the combination of internal data together with external loss event data on control breakdowns and event triggers across industries. External loss event data with qualitative analysis provides not only competitive insights from the experiences of industry peers, but also enables more effective identification of potential risk exposures. For optimum effectiveness in analyzing potential risk exposures, predictive engines can be enhanced by disparate data types enabling the development of composite or index indicators. Such fully predictive analytics, that enable more accurate evaluation and prediction of future events as fuelled by comprehensive loss event data, will play a critical role in corporate governance in the world of big data.
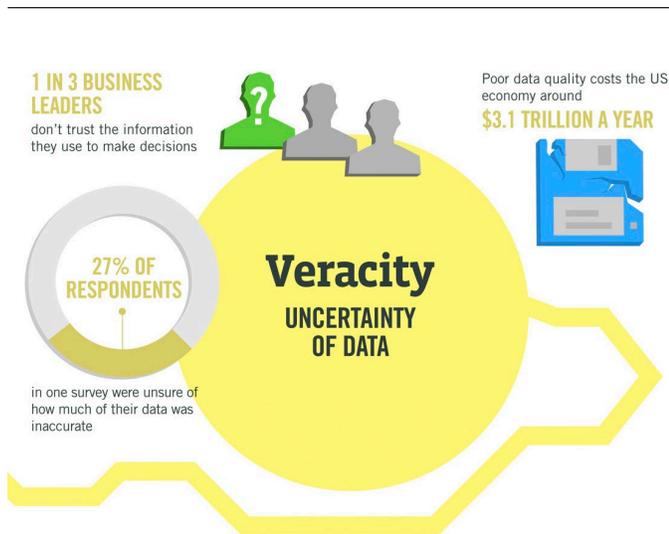
1 IN 3 BUSINESS LEADERS
don't trust the information they use to make decisions

27% OF RESPONDENTS
in one survey were unsure of how much of their data was inaccurate

Veracity
UNCERTAINTY OF DATA

Poor data quality costs the US economy around
$3.1 TRILLION A YEAR

Figure 4: Big data — veracity

The four V's of big data: Veracity

This dimension refers to the reliability associated with particular data. Given the increasing volume of data, being generated at an unprecedented rate and in ever more diverse forms, there is a clear business need for organizations to manage the uncertainty associated with particular types of data—such as physical security access data, social networking data, and sentiment analysis—that contain highly valuable information which can identify potential operational risk loss events. While in the wake of Edward Snowden's exposure of National Security Agency (NSA) data, global leaders in IT governance have focused on the challenge of "Insider Threat," more recent research has called attention to the potentially greater challenge of "Unintentional Insider Threat" (UIT) exposing organizations to loss of intellectual property or

data breach. The key issue here is that the other dimensions of big data—volume, velocity and variety—challenge the capacity of many existing systems to render these often disparate data sets into timely, actionable data to support effective day-to-day IT governance and longer term strategic planning.

In this dimension, the primary challenge is to better align broader Governance, Risk and Compliance (GRC) processes and capabilities. Organizations can find themselves overwhelmed by the need to control a vast array of sometimes similar or overlapping documentation in order to identify and manage corporate compliance risk. While operationalizing internal policy management is understandably difficult, boards of directors increasing recognize this as being critical for good governance and more effective corporate performance. For example, providing senior executives with capabilities for enhanced tracking and management—including conditional approvals—of any deviation from policy, along with an integrated reporting capacity to enable decision makers to visualize the impact of policy decisions upon business operations, would go a long way toward helping avoid the significant loss events we have seen in many industries.

To meet this challenge, organizations not only require integrated systems capable of yielding insights from large volumes of enterprise-wide compliance data, but they also need to be better able to manage uncertain data. IBM has found that one way analysts can do this is by creating context around big data. This can be achieved through data fusion, combining multiple sources of uncertain data and disparate data sets, together with robust optimization and predictive analytics employing advanced mathematics and modeling, for more accurate data points yielding actionable insights.

The business value of best-of-breed operational risk solutions

Big data presents clear and present operational risk challenges across the four dimensions of volume, velocity, variety and veracity. At the same time, for organizations that recognize the opportunities that are opened by an era of rapid change and technological innovation, big data also offers the potential for real business value. For example, IBM research has found a high correlation between the success of an organization — measured in terms of revenue growth and profitability — and its capacity to derive actionable insights from data (see Figure 5). In other words, to make the most of big data organizations need to invest not only in systems with the capability of making ever-increasing volumes of data accessible, but also in the advanced analytics to manage this data in order to glean insights that will be the basis of actions for growth and competitive advantage.
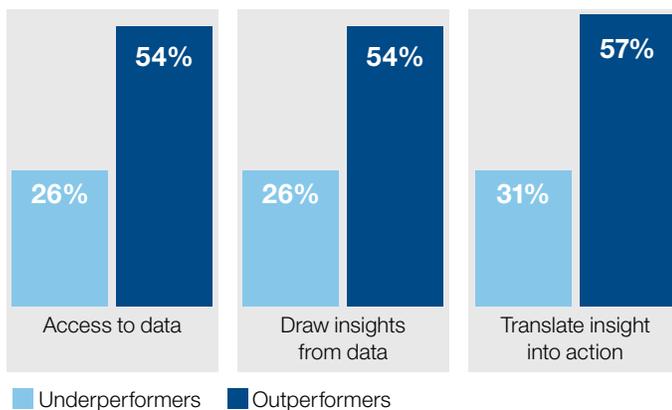
Governance, risk and compliance (GRC) systems can help organizations not only meet the operational risk challenges of big data, but also exploit the opportunities that it makes available. IBM research has found that to best address big data, operational risk management systems must be both scalable and extensible to give users the power and the flexibility to deal with the increasing diversity and complexity of operational risk challenges in today's business environment.[17] In particular, these advanced GRC systems require a business intelligence layer that enables analysis of a variety of data across risk categories, business lines, products, regions and legal entities.[18] This business intelligence layer must be:

1. *Flexible*, with the capability of generating reports to meet the needs of not only regulators and supervisors, but also a range of users across the organization.
2. *Powerful*, with analytics capable of evaluating the veracity of data in reports at a granular level of analysis.
3. *Accessible*, with the capability to deliver actionable data to different stakeholders through a diverse range of vectors, including: e-mail, mobile interfaces, intuitive ad hoc queries etc.

These capabilities, when integrated as part of a holistic operational risk management solution, render the solution greater than the sum of its parts as they foster the development of a "risk-aware" culture across the enterprise and support stakeholders in risk-enabled decision making.

In a global marketplace defined by sustained volatility, IBM research has found that veracity is a critical — if sometimes under-appreciated — dimension of big data: "The need to acknowledge and plan for uncertainty is a dimension of big data that has been introduced as executives seek to understand the uncertain world around them."[19] Creating context around data,

	Access to data	Draw insights from data	Translate insight into action
Underperformers	26%	26%	31%
Outperformers	54%	54%	57%

Figure 5: Outperforming organizations, defined as those with both high revenue growth and high profitability, surpass underperformers across three dimensions — data access, insight, and action — highlighting the correlation between success and the ability to derive value from data.

Source: IBM Global CEO Study 2012

with related data from multiple sources, can enable managers to better evaluate the veracity of data and create more accurate and useful data points. Operational risk management analytics with the capability of incorporating not only an organization's internal data but also external data—and, in particular, detailed external loss event data—can enable more holistic understanding of an organization's potential risk exposures and support more effective, risk-informed decision making.

IBM OpenPages Operational Risk Management

The promise of achieving significant, measurable business value from big data can only be realized if organizations put into place an information foundation that supports the rapidly growing volume, variety and velocity of data... Integrated information is a core element of any analytics effort, and it is even more important with big data.[20]

IBM is not only at the forefront of research into big data, but it is also driving the application of this research into new solution development. This can be seen in IBM deployment of best-of-breed operational risk management solutions for many of the world's most successful financial institutions, providing them with the foundation for an integrated operational risk program to better manage governance, risk and compliance. IBM OpenPages® Operational Risk Management (ORM)—as a part of the OpenPages GRC Platform—helps organizations to embed operational risk practices into their corporate culture and thereby create a more efficient and effective integrated risk management strategy.

In today's rapidly evolving regulatory compliance environment, business lines are being burdened by requests from various internal control and risk management groups, external ratings agencies, and regulators in different jurisdictions to provide the same or overlapping information, in different formats, with different schedules and with different degrees of granularity. Addressing these demands can result in a costly waste of resources, errors, omissions and duplication of work. In the world of big data, these challenges increase exponentially, with ever larger volumes of multi-structured data that may be stored in a diverse array of silos based on division, business line, regulatory jurisdiction or legal entity. As IBM research has noted: "The inability to connect data across organizational and department silos has been a business intelligence challenge for years. This integration is even more important, yet much more complex, with big data."[21]

The value of integrated solutions

IBM OpenPages helps organizations meet these challenges with an integrated operational risk management solution that draws upon the power of IBM Cognos solutions to provide embedded GRC business intelligence for risk analysis and reporting. This solution facilitates the collection of data in a standardized and cost effective process, providing management with reports and dashboards on the overall operational risk status of the organization. This helps establish accountability and ownership of risk processes, and supports the development of a culture of risk awareness across the organization. By deploying automated systems to reduce the dependence on human resources in performing data collection, validation, and dissemination these processes are made more efficient at a lower variable cost. With the integration of IBM Algo FIRST—a database of external risk case studies enabling financial institutions to proactively management operational and enterprise risk—OpenPages Operational Risk Management solution provides context to enhance the veracity of big data.

Currently, integrated solutions in market and credit risk management use historical data to assess risk exposure, using tools like portfolio back testing, scenario analysis, stress testing and the extrapolation of past market trending data to preventative purposes. Applied to the demands of operational risk management, these same tools and approaches can help stem or even avoid operational risk losses. For example, the collection of data on past loss events — as with IBM Algo FIRST — the tracking of key indicators which may presage a loss event, and the assessment of risk within the organization's business through both scenario analyses and self-assessment can help lead to strengthened processes and controls and, ultimately, to reduced loss exposures.

The value of computational and analytic power

IBM OpenPages Operational Risk Management also helps support adherence to evolving risk management regulatory requirements — such as Basel II, Solvency II or the FFIE Guidance on Social Media cited above — that demand improved risk measurement and management techniques for internal data, external data, scenarios, and business environment and internal control factors. As social media expands the data sets, and the potential operational risk and reputational risk exposures of institutions, the regulatory and business value of having tools capable of consistently identifying, managing and measuring operational risk in the world of big data is undeniable. By monitoring and evaluating its business practices and policies with this operational risk management solution, an institution can both increase shareholder confidence while helping reduce the likelihood of reputational and other risk impacts.

In particular, IBM OpenPages provides the necessary risk management tools around internal loss event data collection and analysis, including: external data, scenario assessment, risk and control assessment, and key indicator monitoring to conform to Basel and other regulatory mandates. In terms of more effective predictive analytics, this capability to incorporate disparate data sets into the development of a composite key risk indicator offers organizations the potential of using loss event data to more precisely assess potential risk exposures and realize significant business advantages through improved data governance and controls. OpenPages enterprise deployments foster the development of a risk-aware culture which has been linked to reduced losses through the timely identification and analysis of risk exposures before they metastasize into loss events. Operational risk management in this regard offers not only risk-enabled decision support for more effective strategic planning, but also potential for profitability and long-term growth.

About IBM Business Analytics

IBM Business Analytics software delivers data-driven insights that help organizations work smarter and outperform their peers. This comprehensive portfolio includes solutions for business intelligence, predictive analytics and decision management, performance management, and risk management.

Business Analytics solutions enable companies to identify and visualize trends and patterns in areas, such as customer analytics, that can have a profound effect on business performance. They can compare scenarios, anticipate potential threats and opportunities, better plan, budget and forecast resources, balance risks against expected returns and work to meet regulatory requirements. By making analytics widely available, organizations can align tactical and strategic decision-making to achieve business goals. For further information please visit **ibm.com**/business-analytics.

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