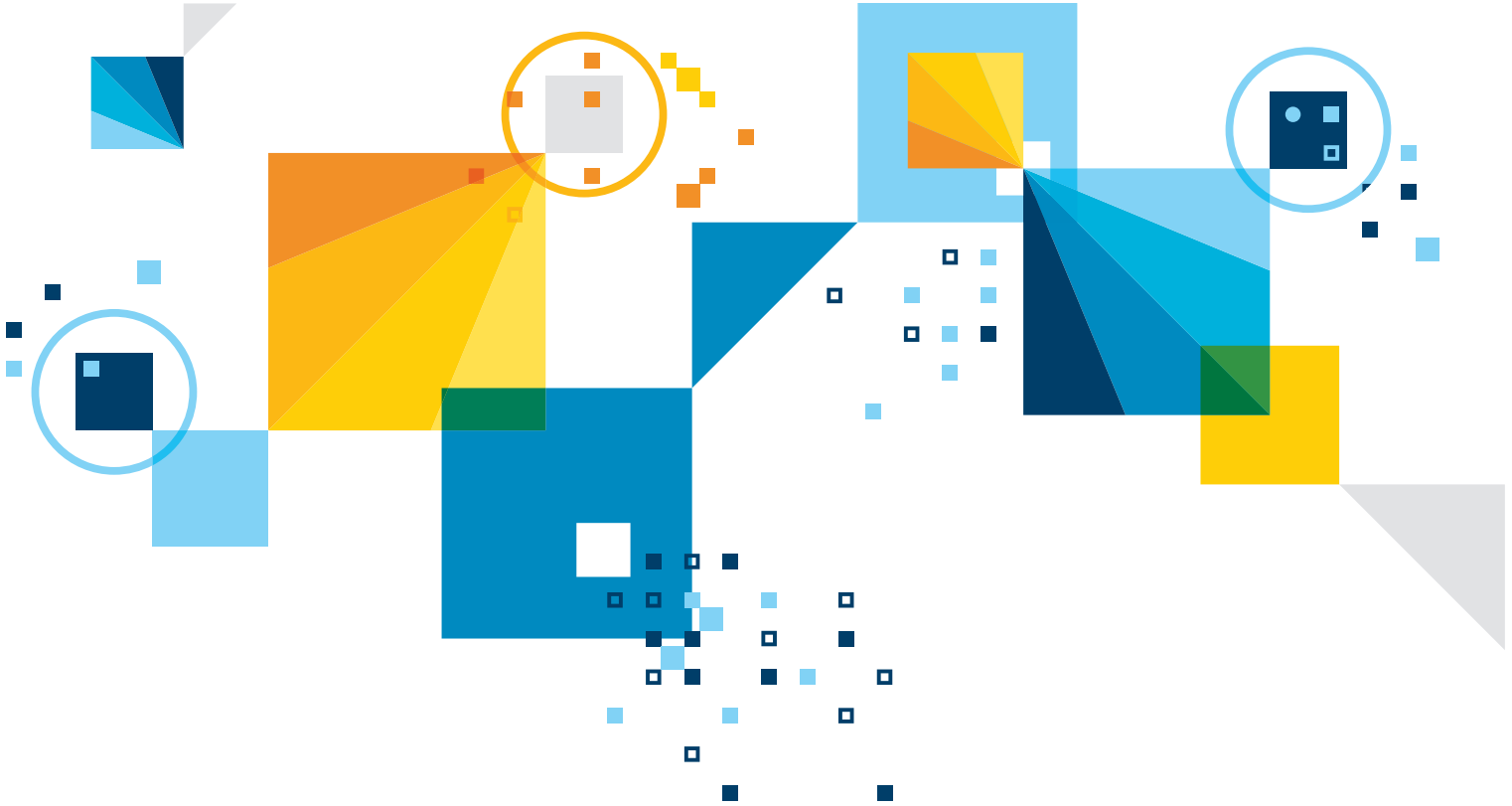
# Optimize operations

*Improving operational efficiency with big data and analytics*



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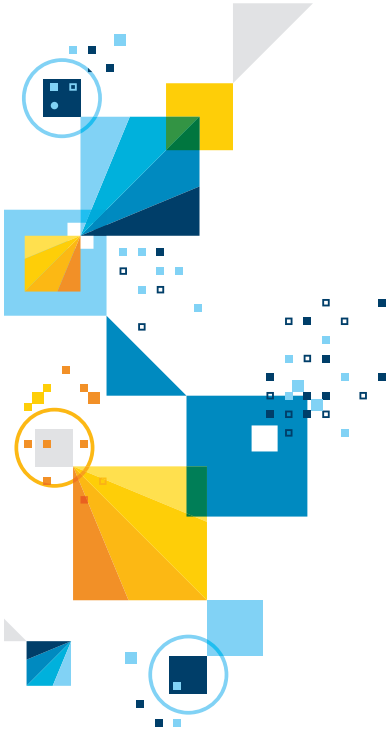

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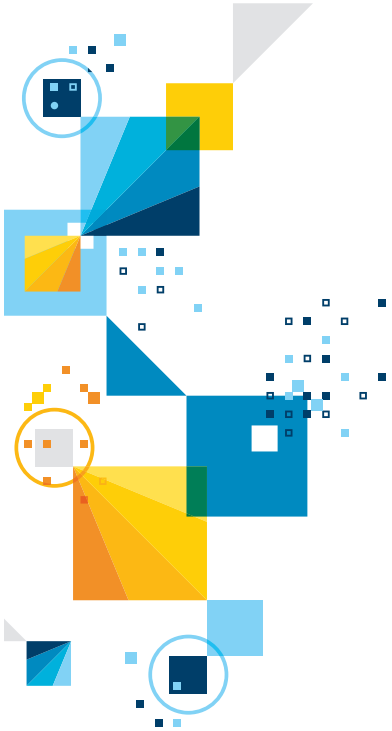
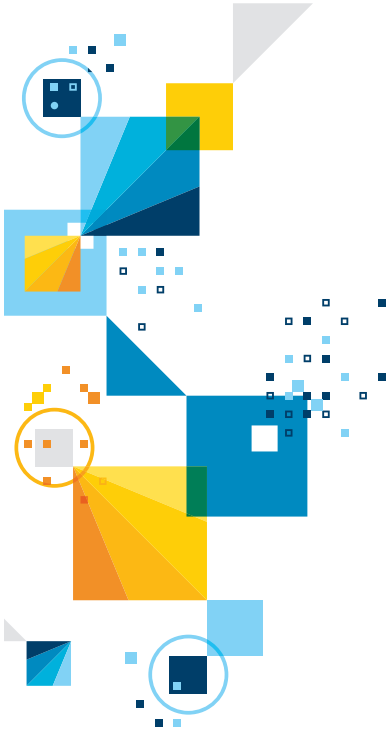


Consumers are demanding more from organizations, such as better products, personalized services and heightened quality of care. Workplace expectations are also changing. Many more people in an organization must make well-informed decisions so business can respond appropriately—often to events in real time.

A deluge of data has significantly added to the challenges of making decisions and achieving desired business outcomes. By 2020, the growth of all digital data is forecasted to reach 40,000 exabytes. In 2005, it was 130 exabytes, which means that in a 15-year period, the size of this data will have increased by a factor of 300.[1] Creating, duplicating and using this data can add to the complexity of organizations and can stress their assets and infrastructure. Companies must be prepared to handle the obstacles that accompany these complex assets and infrastructures. They must make sense of the distracting "noise" of unstructured data, overcome operational challenges and forestall asset failures.

Identifying signals in the noise requires complete visibility, which can help organizations understand what is happening inside and outside their business that can drive new demand. Yet, in an IBM survey of approximately 400 supply chain executives in more than 25 countries and 29 industries, 70 percent stated that their biggest challenge was visibility.[2] They do not have the appropriate level of insight into what is happening with their assets in the field, let alone their operations on the ground-level or on the production floor in real time. This lack of insight hampers their ability to make the right decisions at the right time.

The rising cost of maintaining operational infrastructure is also burdening businesses worldwide. As companies collect more varied and voluminous data, they are incrementally increasing the scale of their current infrastructure to handle their problems, as opposed to investing in their future needs. With the forecasted growth of data, companies cannot afford to continue these reactive infrastructure and asset strategies. For a sustainable solution, organizations must take a fundamentally different approach to their infrastructure and assets.



# Optimizing operations with big data and analytics solutions

To optimize operations, you should create streamlined production and distribution channels. More efficient critical infrastructure is paramount, as are efficient business processes that can meet ever-changing customer demands. These channels, infrastructure and processes should be supported by a nimble, information-enabled big data and analytics strategy.

A big data and analytics implementation can help companies uncover ways to make operations more efficient and effective by improving asset efficiency and streamlining global operations. In fact, a recent study found that 63 percent of respondents believe that big data and analytics solutions are creating a competitive advantage for their organizations.[3] As indicated by this study, the overabundance of information that is being generated today can be an important asset to those companies that choose to capitalize on it.

Because businesses are no longer limited to small sample sizes and narrow data sets, they can analyze all relevant data—often in real-time—to discover previously hidden and unknown correlations. These discoveries can help companies reduce the latency in their current decision-making and business processes. Big data and analytics can even enable them to automate decisions where it makes sense.

Above all else, organizations with big data and analytics initiatives are continually generating a wealth of insight. With that insight, companies can build the confidence to act with speed and conviction and make the best decisions more often. By implementing a big data and analytics solution for optimized operations, organizations can be better prepared to take advantage of and respond to unforeseen changes in the marketplace.

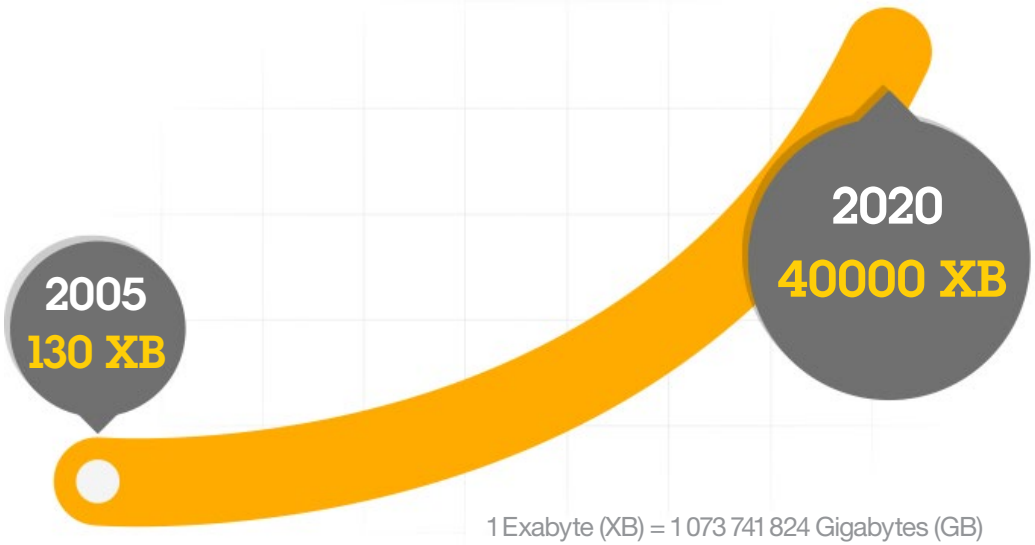
## What is big data and analytics?

Without analytics, big data can be just noise. Running analytics on a wide range of existing data combined with new data sources creates a more vivid picture of your business and the forces that affect it. Big data and analytics solutions enable companies to use large volumes of operational data to gain a more complete view of business and act quickly on insights. It is an evolution of the core functional capabilities of business intelligence, information management and predictive analytics with the emergence of big data as a new data source.

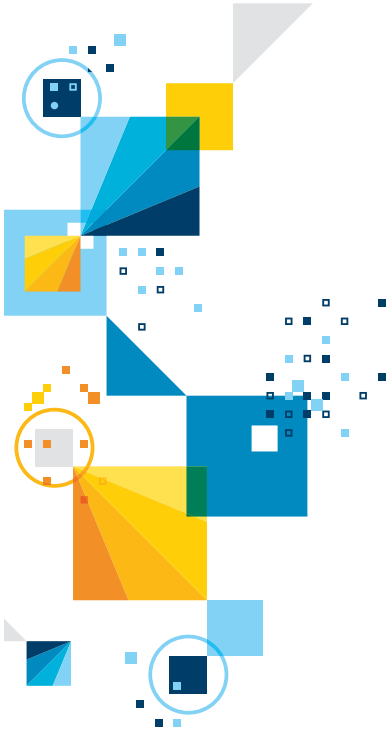
Big data and analytics from IBM can help your organization:

- Acquire, grow and retain customers.
- Optimize operations.
- Transform management performance.
- Manage risk.
- Create new business models.
- Maximize insight, ensure trust and improve IT economics.

**By 2020, the growth of all digital data is forecasted to reach 40,000 exabytes. In 2005, it was 130 exabytes, which means that in a 15-year period, the size of this data will have increased by a factor of 300.**




1 Exabyte (XB) = 1 073 741 824 Gigabytes (GB)



# Infrastructure and asset efficiency with big data and analytics solutions

Big data and analytics solutions can improve the efficiency of assets and critical infrastructure and help organizations take a proactive approach to preventing or minimizing costly outages. When assets are not functioning correctly, costs go up. Downtime and failures of manufacturing equipment, production-line assets and field-level assets must be kept to a minimum. Machine-generated data is projected to increase to 42 percent of all data by 2020.[4] By analyzing this machine-generated data to the ensure efficiency of their infrastructure and assets, companies can:

- Reduce costs.
- Improve service levels.
- Reduce scrape rates.
- Prevent failures.

Ultimately, this streaming operational data can help critical decision-makers improve their processes and enact time-sensitive repairs.

Maintenance is a necessary function and directly affects profitability. For a physical asset to be productive, it must be functioning properly. If an essential asset is in need of maintenance, whole processes can be stalled until the problem is solved. First, the production asset fails. The machine operator then observes the breakdown and reacts to the failure. When the failure is reported, an engineer and supervisor deliberate and decide upon a course of action. With a course of action, asset maintenance workers are notified and begin working to resolve the issue. The solutions that are implemented are often based exclusively on the professional experience of the maintenance staff. These solutions might solve the problem, but they can also result in further issues at a later time. Predictive maintenance and predictive asset optimization solutions, both part of a big data and analytics solution, can help.

## Predictive maintenance and asset optimization

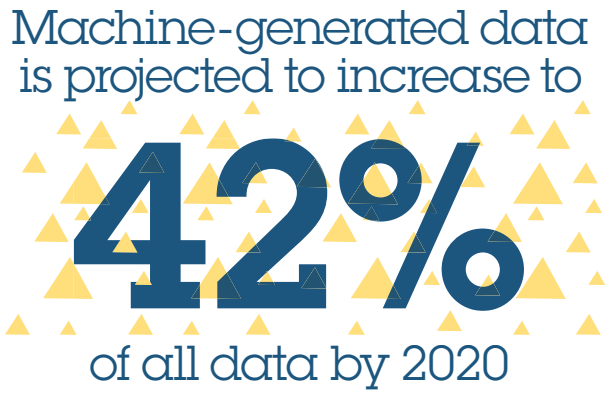
Some companies are preventing the major production gaps that are caused by maintenance downtime with predictive maintenance solutions. Predictive maintenance offers the opportunity to resolve operational issues before they ever occur. Companies can make the most of maintenance intervals, analyze failures, enhance process diagnostics and minimize unplanned downtime. Predictive maintenance also can solve many critical problems with:

- Instrumented, connected assets
- Collection of operational data
- Integrated technological, business and operational processes

The benefits include:

- Better asset productivity
- Greater lifetime value for each operational asset
- Extended asset lifespan with minimized asset downtime
- Increased ease of data collection and analysis
- Reduced cost of computing, network and storage technology

For a predictive maintenance solution to deliver the best results, it must be able to capture and analyze structured data, unstructured data, resting data, and—most importantly—streaming data. Streaming data includes information from sources such as sensors, satellites and programmable logic controllers—digital computers that are used for the automation of electromechanical processes. Therefore, predictive maintenance must include big data and analytics solutions so that no data is missed or omitted because of size, speed, or data type.



Predictive maintenance is not the whole story. Infrastructure and asset efficiency requires predictive asset optimization, which monitors, maintains and improves assets for better availability, utilization and performance. Just as importantly, it predicts asset failure so your organization can take action before the failing asset adversely affects quality and supply chain processes. With a big data and analytics solution, you can use input from other domains. These domains include environmental, facilities monitoring systems and text information such as maintenance logs.

Predictive maintenance and predictive asset optimization offer a number of benefits to business operations. Your assets remain available, safe and reliable. They can also help you maximize your return on your facility assets.

## Optimized assets and infrastructure: A success story

Faced with an aging infrastructure and numerous customer complaints, the District of Columbia Water and Sewer Authority (DC Water) needed to improve the reliability and lifespan of their existing assets. The median age of their 1300 miles of water distribution pipes was 76 years old, and much of the 1800 miles of their sewer collection pipes were installed in the mid-1800s and early 1900s. These aging systems were responsible for the water and wastewater services of 2.2 million customers. The estimated cost to replace these pipes was in the billions of dollars and the estimated time for completion was well over a century.

With strategic maintenance, automation and asset management, DC Water is modernizing their assets and critical infrastructure. With the help of IBM, DC Water implemented a big data and analytics solution that does more than simply automate processes. This solution enables DC Water to better serve the community by intelligently repairing and replacing water distribution pipes, valves, public fire hydrants, collection pipes, manholes and water meters.

With the integration of spatial and asset data, DC Water can view the location and condition of each asset on a detailed map and quickly access information about history, cost, problems and water quality. This information is crucial to staff who must decide when and where to make repairs and replacements. When customers call to report an issue, customer service staff can now record the information and automatically initiate a work order. As a result, a process that used to take days can now be completed in minutes.

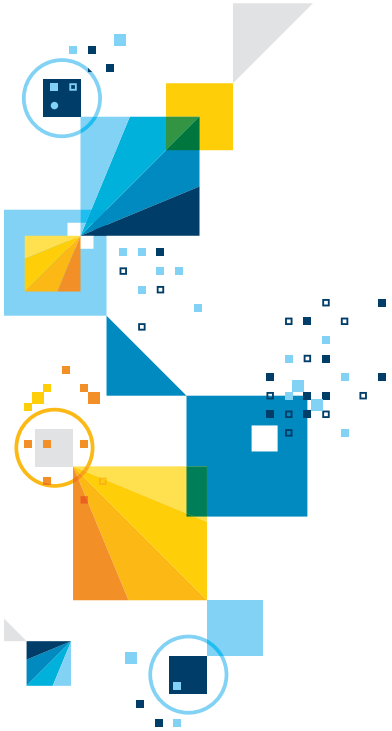
> “With preventive maintenance and automated meter readings, DC water was able to reduce customer complaints by 36 percent and improve emergency response dramatically.”

This new system also records useful data such as the time it takes to complete repairs. This data can then be compared with typical resolution times. As a result, supervisors can identify jobs that exceed acceptable parameters and research the causes of these anomalies. When a cause is discovered, process improvements can be implemented to alleviate reoccurrence.

Another part of this initiative was the development of a new hydrant inspection program. Previously, firefighters had to complete paper forms while they inspected the district’s 9000 fire hydrants, then mail their reports to DC Water headquarters. When this information was received, DC Water then assigned work orders as needed. This process was time-consuming and prone to errors. Now, digital handheld devices are used for inspections. Within 10 feet of a hydrant, the device automatically identifies the hydrant and its location, and then prompts the inspector for the required information. If a problem is noted in the inspection, the system automatically generates a work order.

With preventive maintenance and automated meter readings, DC water was able to reduce customer complaints by 36 percent and improve emergency response dramatically. The percentage of emergencies responded to within 10 minutes increased from 49 percent to 93 percent. In addition to these improvements, DC Water realized the following valuable operational improvements:

- Reduced asset downtime
- Generation of regulatory compliance reports in seconds instead of days
- Performance of meter readings at a fraction of the previous cost



# Global business operations with big data and analytics solutions

Achieving a high level of operational excellence can be an overwhelming challenge. Big data and analytics solutions can enable companies to make significant improvements by helping them address their operations as an interconnected ecosystem, as opposed to a collection of isolated departments.

At the foundation of any company's ecosystem is their customer base. Customers are very aware of the value of their patronage. This awareness has created greater expectations from consumers and clients. Although customer demands are expanding, not every company's revenue is growing with them. Big data and analytics solutions can help companies streamline their existing operational processes to meet ever-changing customer demands. They can automate and simplify customer interactions, personalize services based on individual needs and integrate organizational systems. How? With an optimized blend of predictive models, business rules and process analysis.

## Predictive models, business rules and process analysis

For an ecosystem to thrive, it must be able to guarantee some level of regularity. Business rules provide this regularity and the resulting structures that govern operational processes. The problem with business rules is that they are structured and rigid and cannot account for unexpected changes in something such as consumer behavior. For this reason, organizations commonly managed unexpected events by reserving funds or just reacting to the situation at hand. Now, however, predictive models, which can be built from all kinds of data, including big data, can continually monitor and adjust to changing circumstances.

With these models and real-time analysis of events, your organization can overcome short-term stresses and unexpected marketplace changes. Because you can predict what is likely to happen, you can redistribute reserved funds to departments capable of driving revenue. You can uncover patterns and trends in big data that enable you to better invest in progress and implement more agile strategies to accommodate market fluctuations. And you can begin to automate high volumes of operational and tactical decisions that previously were manual. This automation can help you save money and help you make consistent, flexible decisions that are infused with intelligence.

The optimized blending of enterprise business rules and predictive models creates the most balance for organizations. Most companies have certain risk thresholds that they just do not want to exceed. Business rules can help govern that, while predictive models can account for the unexpected scenarios that are bound to occur.

No ecosystem is free from change. Ecosystems survive only through the efficient exchange of resources. In addition to meeting customer expectations and increasing operational agility, big data and analytics solutions enable companies to optimize their production and distribution channels.

Process analysis based on all kinds of data enables you to understand the “big picture” view of what’s going on throughout all operations. As a result, you can react quickly to changes in demand, supply, capacity and product while balancing critical resources to meet performance goals.

With a greater understanding of customer behavior, location-specific demand and employee workloads, businesses can develop a holistic view of their operations. Companies can then better allocate resources and distribute goods based on a genuine understanding of customer needs. By optimizing their production and distribution channels, organizations can reduce waste, increase customer satisfaction and improve employee morale.

## Global operations: A success story

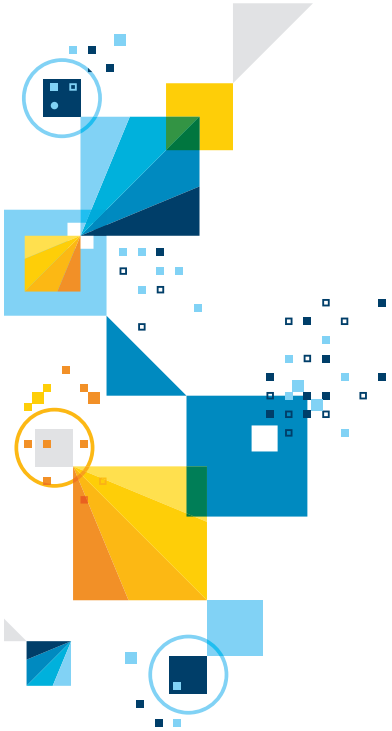
As the leading bookseller in the United States, Barnes and Noble often faces unusual challenges. Chief among these issues is that a single store can carry up to 200,000 titles, which includes single copies that sit on a shelf for a year or longer. Unlike apparel retailers, who might have to deal with 10,000 SKUs, Barnes and Noble needed a system capable of handling at least 20 million. Additionally, the stationary nature of Barnes and Noble's inventory makes it difficult to accurately track results and deliver precise information to publishers. Because the leading industry solution produced weekly status reports at best, publishers were left without any valuable insight into their sales and supplies. To resolve this issue, Barnes and Noble decided to create an online reporting tool that informed publishers of sales data in real time.

Barnes and Noble aimed to provide a solution capable of integrating supply chains and helping publishers reduce costs, but it had to be easily understood by all 10,000 independent publishers. The result was a web-based sales and inventory portal on a platform that enabled Barnes and Noble and publishers to conduct previously impossible analytics and improve communications with suppliers. The solution transformed their existing environment into a dynamic, agile platform that provides real-time insight into product sales and stock ratios. Publishers can now access:

- A comprehensive view of supply chains
- Data points organized by geographic location
- Stock charts
- Heat maps that indicate the progress of titles and subjects over time

By feeding metrics directly to publishers and suppliers, Barnes and Noble could provide new insights into sales, supply ratios, strengths and weaknesses.

When this system was deployed, it helped Barnes and Noble drastically reduce unnecessary inventory levels and the carrying costs of inventory. With real-time feedback and historical perspectives, small publishers finally had the necessary tools to improve their business results. The company could charge publishers to use this new service, but instead they offer it for free as an incentive to promote business relationships with publishers. In the future, publishers plan to use this system for advanced forecasting, predicting stock shortages and clustering stores.



# How to implement big data and analytics successfully

When organizations optimize their operations with big data and analytics, they can do more with less. The insights that are provided by big data and analytics solutions can help companies run their operations efficiently and effectively. When you integrate techniques such as descriptive, predictive, prescriptive and cognitive analytics into your existing systems, decision-makers can better access critical information when they need it most.

How can your organization reap these benefits? The answer to that question is to implement big data and analytics thoughtfully and carefully. The goal is for big data and analytics to become almost second nature for your organization with the right mix of strategy, technology and adoption.

## Big data and analytics strategy

For a successful big data and analytics implementation, your company should identify your business problems and what they are costing your company, along with the value of resolving them. Then, your company should work together to develop a business-driven agenda for the implementation that aligns to enterprise strategy and business goals.

This agenda should also define any new business capabilities needed to deliver new sources of revenue and efficiency.

To help maximize the impact of big data and analytics, this strategy should include ways to help everyone in your organization:

- **Trust the facts.** A big data and analytics initiative is about creating a shared set of knowledge. A shared set of facts, insights and correlations can help employees and departments develop a singular view of your operations. With a common foundation of trusted information, you can spend less time debating numbers and more time making decisions.
- **Emphasize privacy and security.** The use of data must be protected with privacy and security policies. Only with these practices can your company be sure that the data and insights you rely on are protected.
- **Empower decision makers with governance.** Companies must embed governance into all processes. These governance practices help companies proactively identify, understand and manage events in real time.

## Big data and analytics technology

Big data and analytics technology should help your company capitalize on existing investments. It should enable you to identify all types of data and where it is stored, along with enabling effective data analytics. Investing in big data and analytics technology often requires a transformational approach to many critical IT processes:

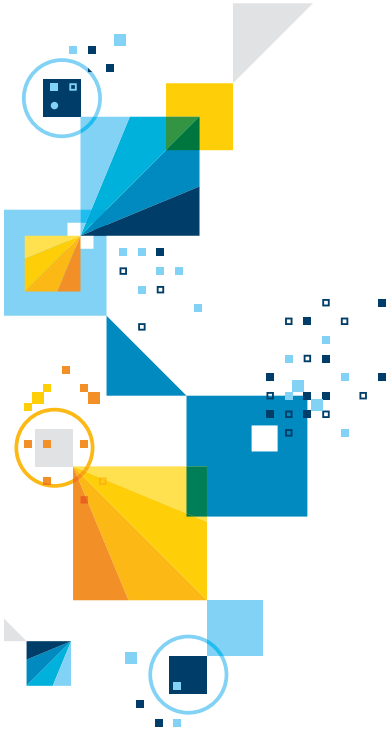
- **Establish fluency in all forms of data and analytics.** All forms of data can create value. New statistical relationships are being found between transactional data, sensor data, social data, images and machine-to machine information.
- **Analyze data in motion.** Capitalizing on real-time information that is flowing through your organization is paramount. Your technology should be designed to record, analyze, and correlate information as it arrives from thousands of sources. As a result, you can assess events as they are happening and respond with automated business processes, better agility and improved economics.
- **Cultivate new partnerships and roles.** A transformational big data and analytics implementation requires business and IT leaders to work together. Many progressive firms are creating new roles—Chief Data Officer, Chief Analytics Officer and Chief Data Scientist—that better address business and technology needs.

## Infuse analytics everywhere

By infusing analytics into business processes and employee interactions, you can enable company-wide innovation. Developing a curiosity-driven and experience-inspired workforce requires a methodical approach:

- **Start with the people.** An analytics-driven organization consists of employees who are passionate and skilled in exploring data and content. They understand the implications of critical data points and apply insight to every task. Companies that encourage this kind of behavior can liberate teams that previously had to make crucial decisions based on instinct and past experiences alone.
- **Engineer analytics into key business processes.** Maximum value can be derived by engineering analytics-driven business processes and practices. Operations leaders can determine when a critical asset is likely to fail and take preventive action before it happens. Sales and operational plans can be optimized to balance capacity, cost and opportunity to maximize profits.
- **Deploy a full range of analytics.** Descriptive analytics can help employees better understand what happened in past events and why an event happened. Predictive analytics can find patterns and see what is likely to happen. Prescriptive analytics can help users decide upon a course of action. Employees can apply each of these analytical models to derive insight from human decisions, management systems and machine-to-machine processes.

# Find your path to operational efficiency



Today's market seems to change almost every minute. A big data and analytics implementation can help you make the decisions that enable your organization to take advantage of the changing marketplace. It can also improve asset and infrastructure productivity, enable business process optimization, maximize efficiency and help reduce costs throughout your entire enterprise.

Companies who infuse big data and analytics into their operations can secure their position in today's market. With big data and analytics solutions from IBM, such as IBM® Watson™ Foundation, you can optimize operations and create the visibility and efficiency that supports changing business processes. To be competitive in the marketplace, companies are looking to IBM and IBM Watson Foundation to enable corporate viability and profitability not only for today but for the long-term future.

You can follow their lead. IBM can help you get started on the path to transforming your business with efficient assets and infrastructure and a global approach to operations.

## For more information

If you would like to learn more about big data and analytics solutions from IBM, visit: **ibm.com**/big-data/us/en/big-data-and-analytics/

IBM Corporation
Software Group
Route 100
Somers, NY 10589

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