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## Highlights

- Gain greater insight and actionable intelligence by applying big data technology
  - Achieve measurable and improved outcomes with a progression of focused investments
  - Move beyond the constraints of one-off and EMR-only analytics solutions
  - Support evidence-based medicine by analyzing massive volumes of data
  - Recognize abnormalities quickly with real-time analysis of bedside monitors and devices
  - Enrich population health analytics by tapping into unstructured data
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# Harnessing big data for healthcare

*Build a strong foundation for breakaway analytics capabilities with IBM solutions*

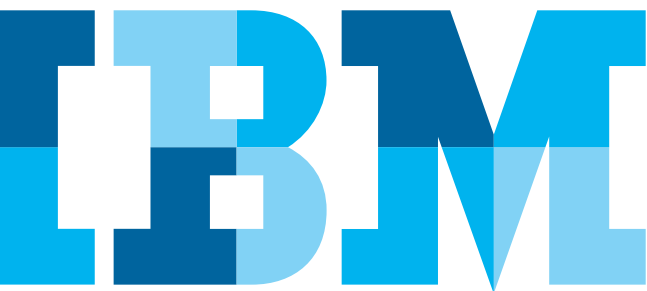
Imagine, as a healthcare provider, that you could analyze streaming data from bedside monitors in the ICU along with the patient's clinical information in their electronic medical record (EMR). Or, as a health plan, imagine you could tailor the conversation with your plan member and offer the most relevant programs by understanding clinical history and lifestyle behaviors relative to similar patients. Suppose you could anticipate and prevent fraud by analyzing patterns of behavior along with real-time claims or prescription activity.

Most organizations aren't there yet. In fact, every healthcare organization is at a different point in the journey toward turning their information into insight.

## Meeting new requirements and overcoming obstacles

Healthcare organizations need to gain greater insight from their data in order to meet federally mandated requirements for reporting and outcomes, support new insurance exchanges and adhere to mandated coverage requirements. Even aside from government requirements, data analysis is essential to remain sustainable and cost-efficient, support clinical collaboration tools and increase access to healthcare with improved consumer engagement. Additionally, the era of big data is here, requiring organizations to manage growing volumes of structured, unstructured and streaming content.

Many obstacles can get in the way of realizing these goals. Provider and health plan IT organizations must support the needs of multiple constituencies, including clinicians, finance, administration, operations, sales, marketing and many others. At the same time, capital and resources are often constrained. Other obstacles include data that is locked in older systems, is not standardized and may have questionable integrity. It's difficult to know where to start to make the most impact in a short period of time and deliver return on investment (ROI) quickly.



Many organizations are also hampered by manual processes. For example, EMR analytics solutions often don't contain key data such as claims and treatment history across providers, forcing organizations to manually pull data together. As a result, basic questions are often answered in hindsight, not in real time—and without timely and insightful information, opportunities are missed.

## Achieving change with analytics progression

An enterprise health analytics platform, coupled with an information strategy to scale and build along a continuum of capabilities, is essential for organizations to establish a foundation to achieve the change required for success in healthcare. Health analytics maturity levels fall on a business optimization continuum starting from an ad hoc approach and moving to foundational, competitive, differentiating and breakaway levels as capabilities increase (see Figure 1).

As health organizations advance along the analytics maturity scale, they acquire increasingly sophisticated methods

and technology to generate actionable insights. Most organizations initially find that they are positioned between the foundational and competitive levels on the continuum. Moving toward the breakaway level requires a comprehensive solution, one that can be implemented in steps with ROI at each level, rather than one-off systems that are not designed to contribute beyond the defined objective.

Forward-thinking organizations are focusing on data warehousing and the end-to-end information supply chain to create insights for clinicians, finance, operations, marketing and research. Many healthcare organizations start by moving from manual data management and reporting processes to expanding their perspective by analyzing data from an increasing number of sources. As their analytics capabilities mature, organizations begin to incorporate advanced and predictive analytics techniques. These techniques couple an understanding of the past with knowledge of the present to predict future activities and model scenarios using intelligence, simulation and forecasting.

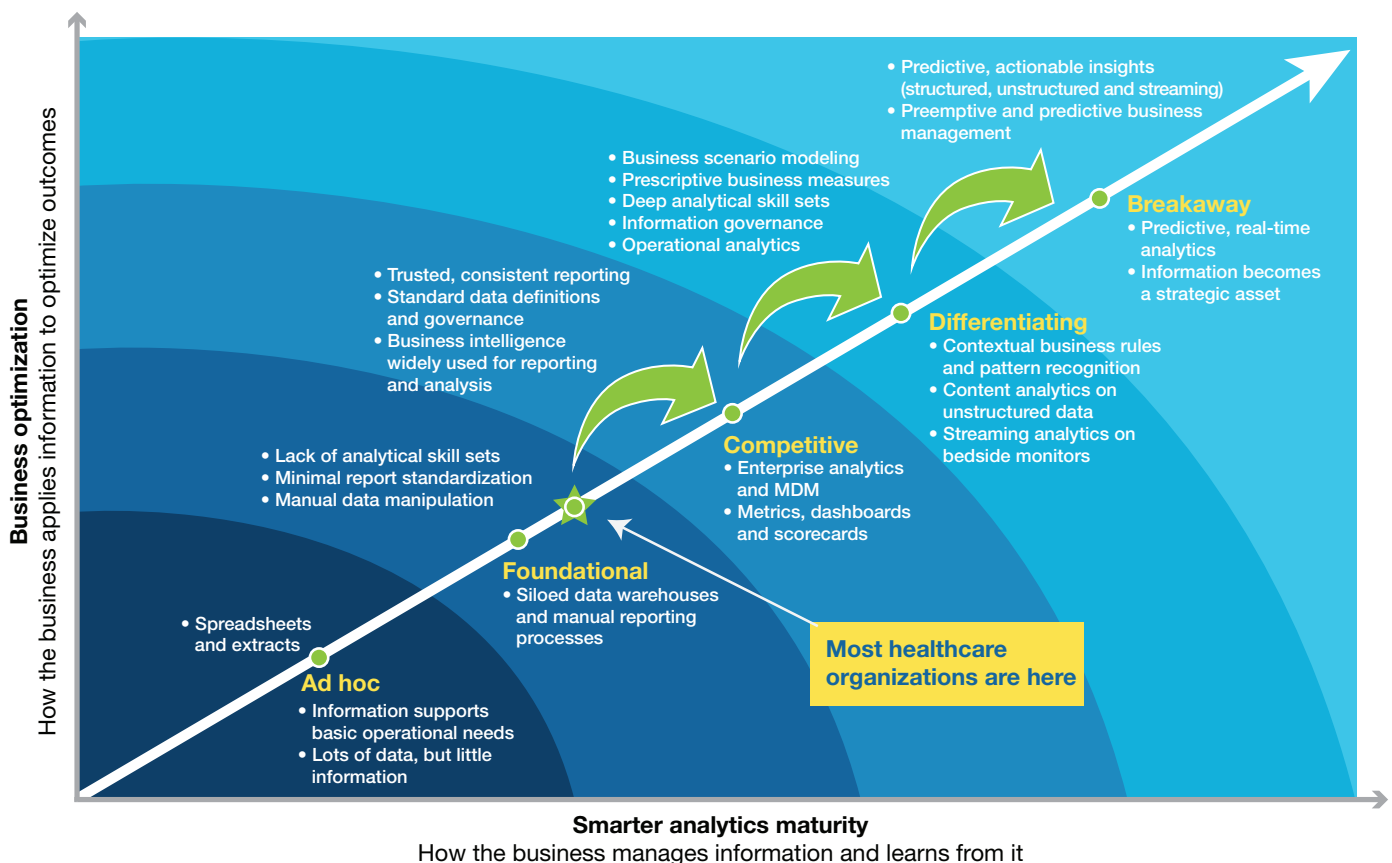


Figure 1. The health analytics maturity model defines progressively greater capabilities required to reach a state of predictive, actionable insights.

Key requirements for the analytics journey

To create insights that will transform the business, healthcare organizations need a platform that has proven information management and analytics capabilities, can easily integrate with the existing environment to add value, and scales to support new capabilities, new systems and new sources of data.

IBM helps organizations achieve these objectives with an integrated big data platform that leverages core information, integration and governance technologies required for managing the data, as well as innovative data warehouse, Apache Hadoop, content analytics and stream computing capabilities to support advanced and predictive analytics (see Figure 2).

Among the information integration and governance capabilities, the big data platform leverages a proven healthcare data model built on data warehousing technology to create a logical structure and support complex analytics at lightning speed. Master data management (MDM) capabilities help ensure accurate patient and provider identification to create a trusted data foundation and a single view for complex analytics and care coordination.

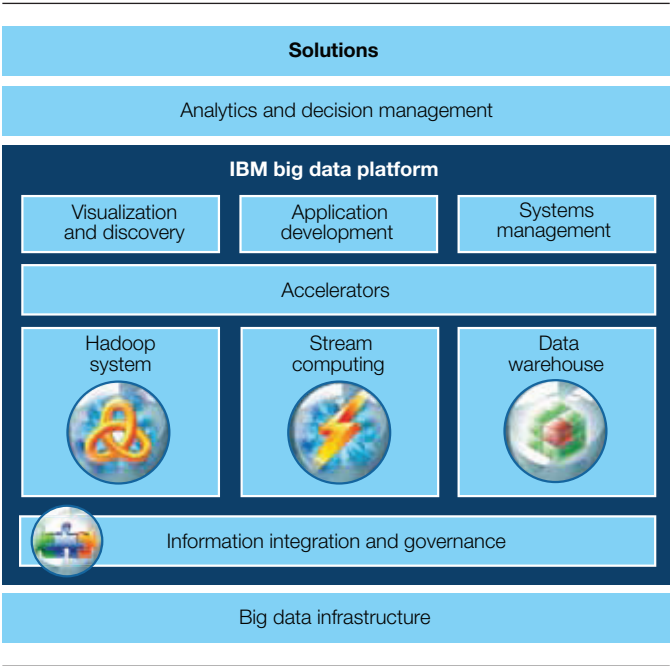


Figure 2. The integrated nature of the IBM big data platform helps organizations address a variety of data-driven processes, as well as improve efficiency and deliver deeper, timelier insights.

Enterprise Health Analytics

Some organizations find it difficult to identify a starting point for their analytics journey. Based on years of experience with healthcare organizations implementing health analytics, IBM has created a cost-effective, easy-to-deploy health analytics bundle that provides the technology foundation to enable multiple analytics applications that meet individual client needs. The integrated IBM Enterprise Health Analytics solution delivers immediate value for an organization’s specific business analytics use case such as measurements for ACO 33 or total cost of care, while laying the foundation for future analytics capabilities that may be added as needs evolve.

Enterprise Health Analytics is a powerful integrated solution that leverages core IBM information management, analytics and big data capabilities. Platform components include:

- **Dashboards:** A flexible analytics workspace with specific analytics and reporting, such as performance and quality management, as an option
- **IBM® Cognos® Analytics:** A proven solution providing business intelligence—report authoring and a browser-based report viewer
- **IBM PureData™ System for Analytics:** A comprehensive data warehouse platform powered by IBM Netezza® technology that is easy to deploy and requires no tuning and minimal ongoing maintenance
- **IBM Unified Data Model for Healthcare:** An integrated set of logical data models and business solution templates that help hospitals build and deploy a repository of reliable, accurate and up-to-date information for enterprise health analytics
- **IBM InfoSphere® DataStage®:** A powerful extract, transform, load (ETL) tool that supports the collection, integration and transformation of large volumes of data, with data structures ranging from simple to highly complex
- **IBM AIX® Solution Edition for IBM Cognos on Power:** An IBM Power® 740 system optimized for superior Cognos performance

With the Enterprise Health Analytics solution, organizations can establish a foundation for complex analytics capabilities that integrates with existing business intelligence applications and enables growth over time.

## Adding capabilities to increase analytics maturity

As a health organization moves up and to the right on the analytics continuum, additional capabilities increase value to the business.

### Establishing the veracity of the data

Big data enables health organizations to combine massive volumes of data from a variety of sources, some of which are trusted (such as EMR data from inside the health system) and some of which are not as trusted (such as data from social media or health information exchanges). However, users in health settings must be able to trust that all data used in analysis is high-quality. IBM MDM and Information Integration and Governance (IIG) solutions enable this level of trust by creating a data governance strategy and a unified view of data that supports clinical, administrative, business and analytics applications.

### Exploring and using unstructured content

IBM InfoSphere BigInsights™ brings the power of Hadoop big data management to the enterprise, with enterprise capabilities for complex, large-scale text analytics. For example, exploratory text analytics allow a health organization to explore unstructured content—such as the valuable, unstructured notes in free-form text that often go untapped—to uncover trends and patterns in certain disease states. Hadoop can be used for data warehouse augmentation, which enables the organization to cost-effectively manage large volumes of data, including images, data from bedside monitors and existing structured data.

Additional IBM technologies for content analytics, predictive modeling and enterprise content management integrate with the IBM big data platform to enable analysis of unstructured text. The solution can be tailored to the individual organization's environment and business objectives.

## Analyzing streaming data

Data is moving at extreme speeds and must be processed that way in order to capture events and alert caregivers in real time—for example, streaming analytics offers the opportunity to predict rising brain pressure in patients with traumatic head injuries or identify patients trending toward cardiac arrest. With IBM InfoSphere Streams, organizations can capture and analyze real-time streaming data from sources such as bedside monitors and sensors that output data points in different formats and high rates of speed.

With predictive analytics applied to this streaming data, practitioners can better identify abnormalities, trends and patterns in time to take preemptive action. This type of integration across innovative technologies is unmatched in the industry and critical for healthcare organizations that are seeking ways to improve care, outcomes and costs.

## Managing the organization's knowledge

IBM Data Explorer brings relevant data into a real-time environment with real-time search capabilities, helping organizations manage enterprise content to extract analytical insights that may assist in clinical research, patient care and customer service. Data Explorer breaks down silos without moving the data, enabling an organization to visualize and analyze unstructured content from sources such as medical journals, intellectual property and clinical research studies.

## Enabling key business processes

IBM Smarter Care solutions also leverage the capabilities and analytics generated from the big data platform. These technologies enable care coordination and case management for patients who may require additional support to manage the complexity of their illness.

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*“With IBM analytics, we expect to decrease preventable hospital-acquired conditions by 40 percent, reduce preventable complications during care transition and reduce 30-day readmissions by 20 percent.”*

— US healthcare provider

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## Combining capabilities for new levels of insight

By using two, three or more big data analytics capabilities together, healthcare organizations accelerate the value of analytics and become truly empowered. The ability to combine clinical and research data along with environmental factors or genomic data assists greatly in disease management, evidence-based medicine, and better prediction and analysis of patient care and outcomes.

For example, organizations can detect patients most at risk for rehospitalizations by analyzing clinical and claims data along with data locked in doctors' notes and patient feedback forms. Targeted action can be taken to proactively close the gap to increase the chances that patients will have a smooth transition once they leave the hospital.

Or, consider the following scenario for a disease intervention strategy currently in use at a national health plan. The information services organization within the health plan serves hundreds of thousands of medical groups. With big data analytics and predictive modeling, this organization can:

- Identify patients who have a chronic illness such as diabetes or asthma
- Analyze the history of disease progression and treatment paths among a cohort of patients with a specific diagnosis
- Align socioeconomic factors
- Identify the trends and patterns that lead to the illness
- Apply the model to the current patient population and identify patients at risk
- Work with wellness providers to proactively offer preventative programs or treatment paths for early intervention for these patients
- Track results and the effectiveness of programs through claims and patient activity to determine if they maintained their level of health, improved or contracted the disease

Another organization is performing this type of analytics while also identifying patients who have a propensity to enroll in wellness programs. Consider the impact of identifying patients at risk and also understanding their inclination to enroll in one program or another. The ability to focus resources and design outreach programs that suit the needs of various individuals really demonstrates the value of big data in healthcare analytics. IBM delivers a breadth of capabilities for big data and analytics that helps organizations realize exponential benefits from their investments.

## Insight for industry transformation

To be successful in today's industry transformation, healthcare line of business leaders must have access to actionable data. Healthcare IT departments must have a strategy to harness data and extract insights for various stakeholders, including clinicians, administrators, finance, quality assurance and others who are seeking better insights to drive the best health outcomes, demonstrate high-quality care to regulators and patients, and more efficiently allocate resources. But IT departments can't deliver these capabilities if they are focused on managing one-off solutions or cobbling data together from disparate systems.

The IBM big data platform meets this challenge with enterprise-class data management and analytics to help you securely manage, discover and analyze structured and unstructured data at rest and in motion. The platform enables your organization to start with an extensible set of analytics capabilities and then progress to a breakaway level of advanced and predictive analytics as you move up the continuum of business optimization. You can use the IBM platform to address your organization's key priorities, generating transformative insights at every stage to better identify, anticipate and shape the direction of your business.

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*"If we find that MRI usage patterns are similar across all 2.8 million members, the IBM application could mean multimillion-dollar savings for our group customers and improved healthcare for their members in the process."*

— Large US health plan

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## For more information

To learn more about IBM solutions for healthcare, please contact your IBM sales representative or IBM Business Partner, or visit: [ibm.com/big-data/healthcare](http://ibm.com/big-data/healthcare)



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