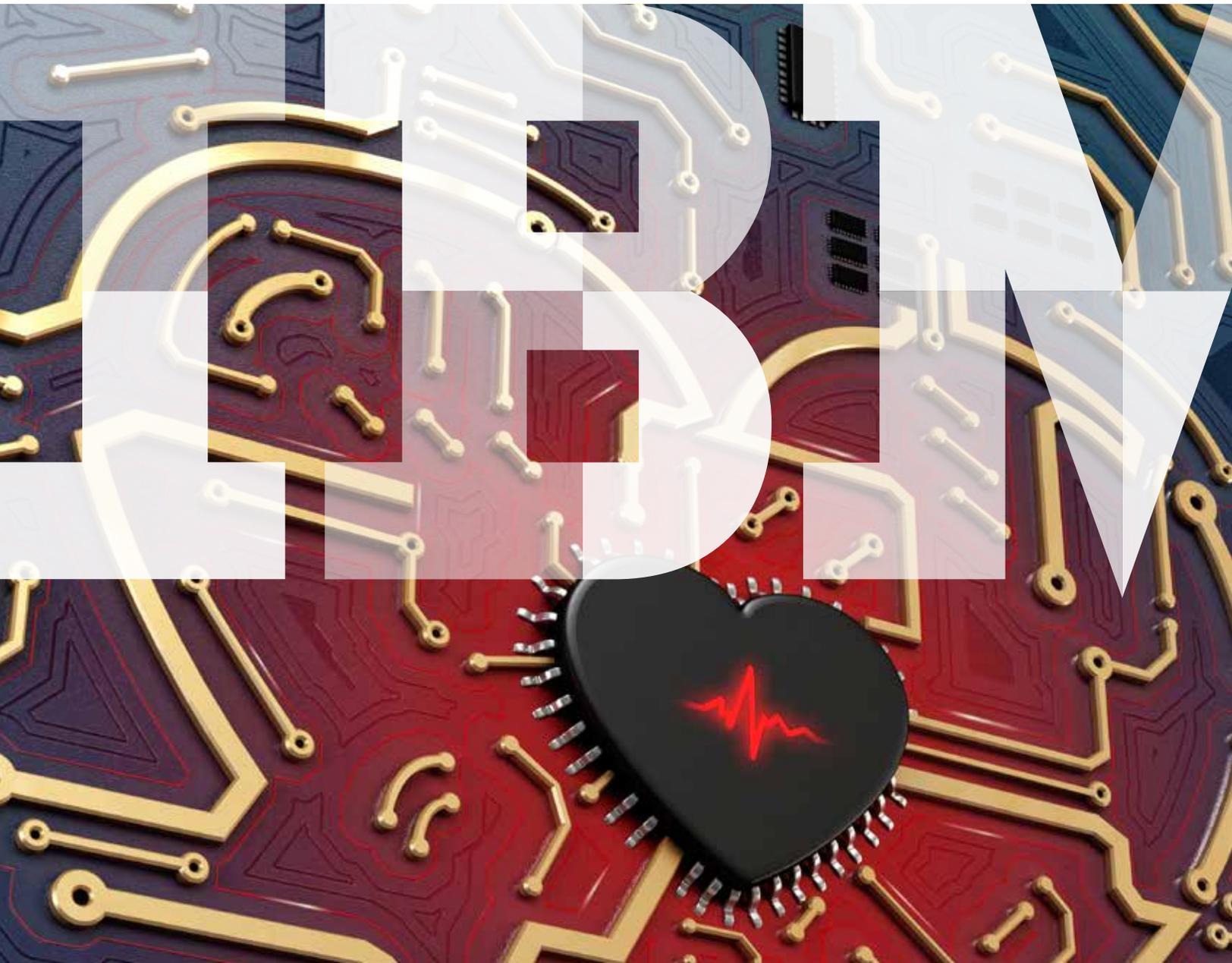


IBM Institute for Business Value

Analytics across the ecosystem

A prescription for optimizing healthcare outcomes



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IBM Global Business Services, through the IBM Institute for Business Value, develops fact-based strategic insights for senior executives around critical public and private sector issues. This executive report is based on an in-depth study by the Institute's research team. It is part of an ongoing commitment by IBM Global Business Services to provide analysis and viewpoints that help companies realize business value.

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By Heather Fraser, Chaturika Jayadewa, Jay Goodwyn, Peter Mooirweer, Dan Gordon and John Piccone

Analytics is a key enabler for life sciences and healthcare organizations to create better outcomes for patients, customers and other stakeholders across the entire healthcare ecosystem. While almost two-thirds of organizations across the healthcare ecosystem have analytics strategies in place, our research shows that only a fifth are driving analytics adoption across the enterprise. The key barriers are a lack of data management capabilities and skilled analysts, as well as poor organizational change management. To develop and translate insights into actions that enhance outcomes, organizations will need to collaborate across an expanding ecosystem.

The healthcare ecosystem is the convergence of otherwise separate entities, such as life sciences organizations, providers and payers, as well as social and government agencies. This convergence, along with enhanced connectivity and mobility, has resulted in a tremendous surge in healthcare-related data that can help create insights and inform actions to:

- Improve patient outcomes
- Reduce costs for chronic care
- Lower insurance premiums
- Quickly bring new and better drugs, diagnostics, devices and therapies to the market
- Enhance customer engagement
- Reduce fraud
- Improve return on investment.

But to optimize the impact these insights and actions can have, information must be shared across the entire ecosystem. Unfortunately, most organizations are not yet equipped to share information within their own walls, let alone across the entire ecosystem.

Consider, for example, that every day, people around the world die unnecessarily because of inefficiencies, uncoordinated care delivery and lack of integrated information across the global healthcare system. In the United States alone, 96 people per 100,000 die annually from conditions considered responsive to healthcare. U.S. hospitals, as well as those in Australia, Canada, Denmark, France, New Zealand, Spain and the United Kingdom, report high levels of preventable errors for hospitalized patients, as high as 45.8 percent in some cases. Of these errors, many – up to 51.2 percent in some countries – are considered preventable with the right information and resources in place.¹

Advanced analytics strategies can go a long way toward reducing errors that lead to these poor clinical outcomes (See Figure 1). Insights about the individual, developed through the analysis of data within a medical, wellness and social context, can help identify risk factors, promote health and drive more effective, early engagement from the entire community of care. From managing small details to large processes, analytics can aid exploration and discovery, help design and plan policy and

programs, improve service delivery and operations, enhance sustainability, mitigate risk and provide a means for measuring and evaluating critical organizational data. Perhaps most important, it can expand access to healthcare, promote personalized care, align pay with performance and help hold down growth in healthcare costs.

While analytics can potentially benefit individual organizations in any number of ways, this report focuses on those that are cross organizational. The realization of these benefits requires analytics to be applied across the entire healthcare ecosystem.

For life sciences organizations, for example, analytics can help identify better product candidates, facilitate faster, more cost-efficient development of new drugs and produce better scientific and clinical understanding of underlying disease processes. For healthcare providers, analytics technologies for medical homes, as well as traditional business intelligence reporting, can help reduce projected medical costs for both acute and chronic care. For healthcare payers, applying advanced analytic technologies can result in more efficient care and allow for more accurate prediction of disease onset, create early awareness of unusual utilization patterns and identify optimal clinical resource allocation.

In addition to improving outcomes, analytics can also help reduce the tremendous amount of resources wasted annually across the global healthcare ecosystem. Inefficiencies in the global healthcare system, including ineffective gathering, integration, sharing and use of information, total more than US \$2 trillion annually. Healthcare, in fact, is the largest contributor to inefficiency in the global economy.² Much of the waste can be avoided through more effective information sharing and collaboration.

So what does a vision for the future of the analytics-enabled healthcare ecosystem look like? Going forward, the ability to access and derive meaningful insights from the wealth of information available will become a necessity. Gaining and sharing insights from data across the entire healthcare

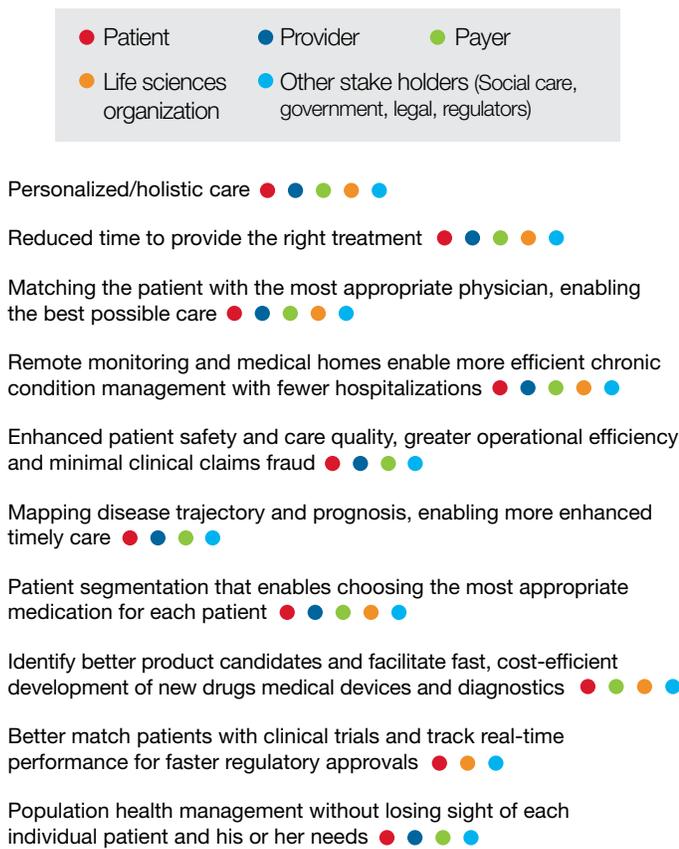


Figure 1: Some potential benefits from using analytics across the healthcare ecosystem.

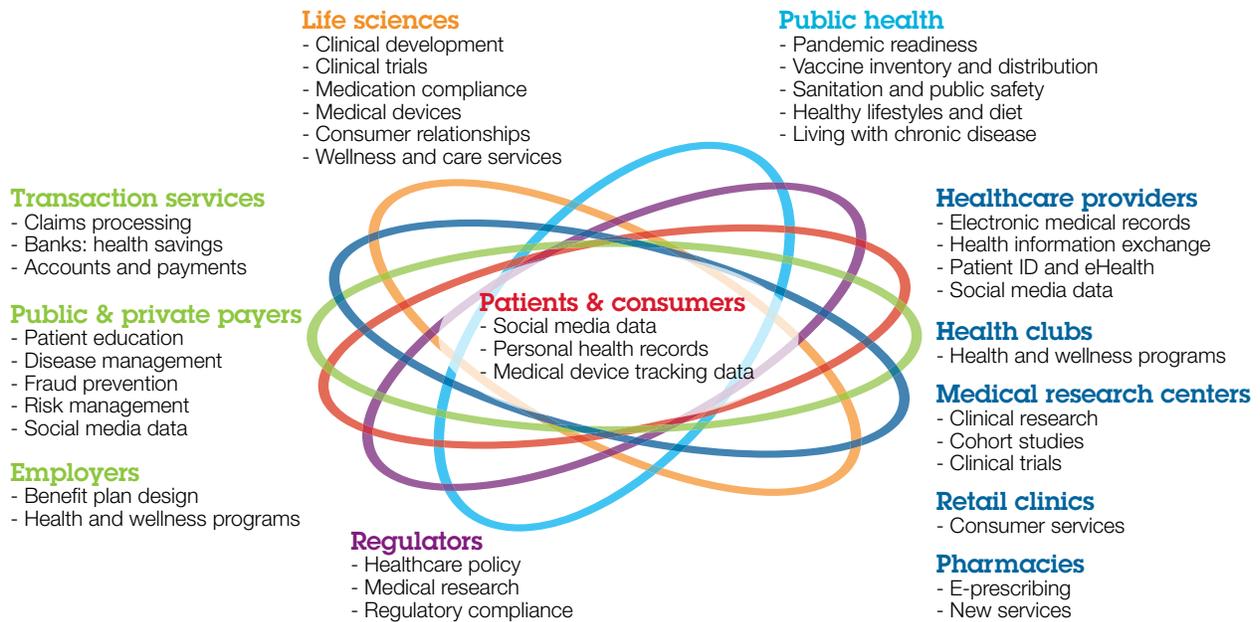


Figure 2: Healthcare organizations need to capture, share, integrate and analyze data across all the ecosystem stakeholders.

ecosystem will be required to correlate cost and quality of care, as well as apply findings back into business processes that can inform action and change behavior (see Figure 2). For example, increased interaction among providers, payers, life sciences organizations and patients can help prevent unplanned or crisis events. Patients can benefit from more individualized care. Insights from analytics can facilitate continuous learning and promote quality improvement.

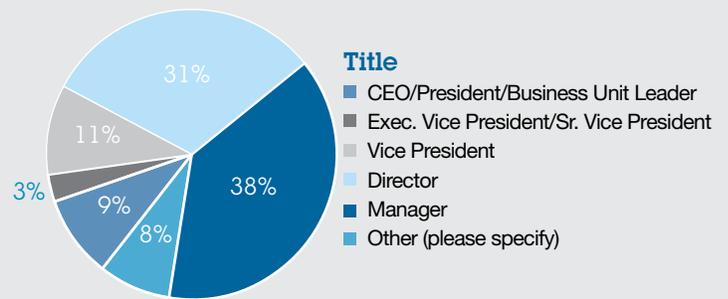
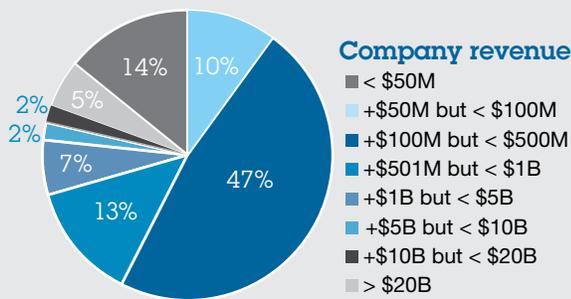
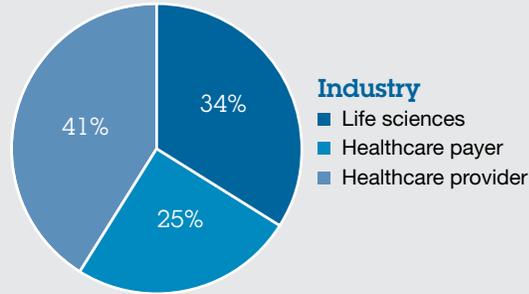
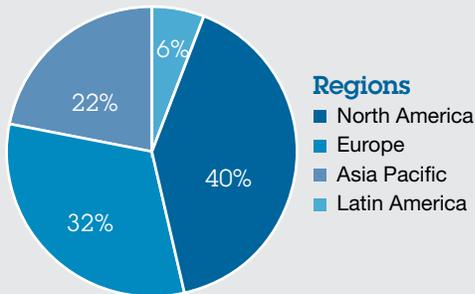
In this executive report, we will look at the current state of analytics across the healthcare ecosystem, including how organizations are implementing analytics strategies, coping with data management and business process integration, getting the right skills balance and enabling analytics across the enterprise and, eventually, the ecosystem. Finally, we provide a vision of how organizations and institutions can position themselves within the healthcare eco-system for competitive advantage through the use of analytics.

Study approach and methodology

To determine the state of analytics across the extended healthcare ecosystem, the IBM Institute for Business Value surveyed executives and qualified contacts within the healthcare industry. The survey generated 555 responses, of which 228 were from healthcare providers, 188 from life sciences companies and 139 from payers. The survey was conducted with healthcare companies in North America, Europe, India, Japan, China, Singapore and Mexico.

Additional field research was conducted, including:

- Interviews with representatives from the main healthcare models around the world
- Telephone interviews with client companies
- Discussions with analysts
- Interviews across IBM divisions, including IBM Research, Watson, Software Group, Global Business Consulting and Sales and Distribution
- Supplemental desk research.



The state of analytics in healthcare today

As previously stated, improving outcomes will require sharing information and insights through collaboration and partnerships – a daunting task, perhaps, for organizations that have not yet mastered sharing across the enterprise. To enable such collaboration, organizations will need to focus on three areas: strategy and governance, data and processes, and people and organization.

From descriptive to cognitive analytics: Progressing from monitoring, to predicting, to acting

Today, most healthcare organizations are extensive users of descriptive analytics, using reporting tools and applications descriptively to understand what has happened in the past and to classify and categorize historical, usually structured data. As analytics capabilities mature, healthcare organizations will trend toward predictive analytics techniques, which take an understanding of the past to predict future activities and model scenarios using predictive models, simulation and forecasting. Ideally, organizations will want to be able to take advantage of the full scope of capabilities of prescriptive analytics to provide decision makers with sophisticated alternatives (insights created with speed, scale, currency, breadth and depth) to be able to influence optimal future outcomes. These capabilities, for example, can facilitate personalized medicine, help in dynamic fraud detection and assist in behavior modification to improve healthier lifestyle choices.³ And, finally, there is cognitive analytics, which weights predictive analytics outcomes and provides the optimal course of action.

Strategy and governance

Our survey of 555 healthcare ecosystem professionals reveals that two-thirds of organizations in both developed and emerging markets consider analytics a priority and have an analytics strategy or roadmap (see *Study approach and methodology, page 4*). “Analytics is built in from the grass-roots at our company and evolves as an approach to inform our strategy,” said one U.S. executive.

Even so, organizations are struggling with understanding and using advanced analytics. Only 34 percent of our study’s respondents said they think in terms of analytics that can help gain actionable insight from data, use advanced mathematical methods for generating insights from large data sets and use the right information to make the best decision.

To derive the most value, analytics must become an increasingly important factor in corporate strategy decisions. To position analytics accordingly, organizations must define the enabling analytics strategy, prioritize their roadmaps to address internal requirements and create strategies for future collaborative partnerships across the healthcare ecosystem. “We need to ensure that the business case (for analytics projects) makes sense and that it’s understood by all parties, ensuring enterprise-wide acceptance,” said a healthcare organization director in Canada.

For the analytics roadmap of the future, organizations must define an enterprise-wide adoption plan that includes not only the implementation of routine reporting analytics, but also more advanced tactics, including predictive and cognitive analytics. This can facilitate such functions as managing compliance and regulatory requirements, creating a scalable infrastructure to deal with volume, and incorporating insights into routine business processes. Advanced analytics must be incorporated into the corporate culture.

Data and processes

Data management is still a major concern for organizations when implementing analytics, particularly because of the numerous data sources and formats (structured and unstructured) that must be addressed (see Figure 3). Issues such as data availability – the difficulty of locating relevant data needed in sufficient quality and volume for an analysis – create data management headaches. Even more troubling is the amount of unstructured data or data siloed in independent databases.

The highest impact on data management is caused by data unreliability, i.e., data from different sources that yields inconsistent results; data that is too incomplete to produce a reliable analysis; data and metrics with non-standard definitions; or data that is highly distributed and non-standardized. For many organizations, much of their analytics energy is spent collecting and arguing about the data, instead of debating and acting upon its findings. As one survey respondent noted, “We are looking to standardize data collection and interchange through transparency, data standards and access to get value from the information.”

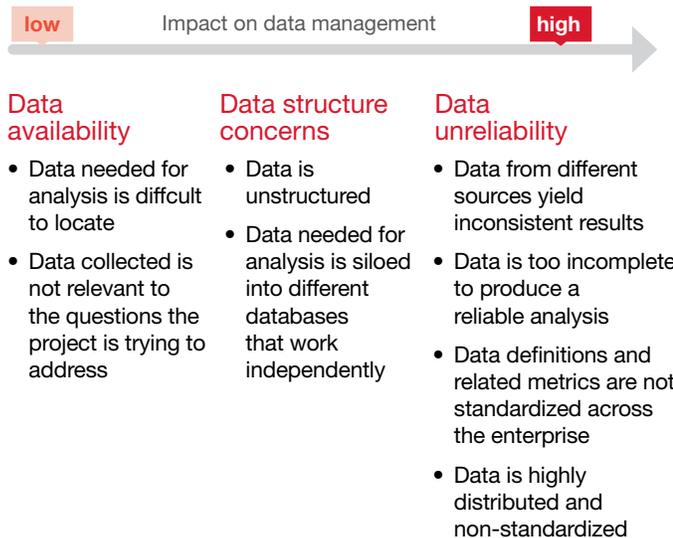


Figure 3: Data management is still a major concern for organizations when implementing analytics

Data mismatch exists across geographies due to differing healthcare models and regulatory requirements, as well as poor visibility of the impact of treatments (medication, care, payment) across the overall healthcare ecosystem. In addition, many organizations are challenged to translate analytical results into actionable insights that can be integrated into business processes.

Some of these issues are being addressed through the use of electronic methods to capture patient data (*see case study, Electronic health record adoption accelerating*).

Electronic health record (EHR) adoption accelerating

As part of our research, we conducted interviews to understand the changes in the availability of patient data vital for payer and provider analytics. What we learned is that many healthcare systems, driven by regulation or in response to particular circumstances, are making progress in capturing patient data using electronic methods, while others have a way to go:

- In Denmark, for example, EHR adoption was realized for the entire nation. Basic information is available dating back to 1977, and a detailed history is available from 2000 forward. Patients can interact with the system as well, accessing data via a national health portal online. Overall, the system has allowed physicians to see 10 percent more patients a day.⁴
- In Canada, a not-for-profit federal organization is used to accelerate the use of digital technologies for the assembly of electronic health records. In the United States, EHR adoption is expected to increase from 12 percent in 2009 to 90 percent by 2016. In the United Kingdom, The NHS Commissioning Board has plans for an integrated electronic record of patient care by 2015.⁵
- In New Zealand, a pilot project was rolled out within six months of the 2011 earthquakes in Christchurch. The program will introduce a cloud-based shared patient record system and demonstrates how EHR adoption can be accomplished quickly and efficiently.⁶
- In China, executives we interviewed expect the health system to be integrated within the next five years. Currently, only Shanghai has seen healthcare data integration, with 30 hospitals currently connected across six districts.⁷

A critical element of data management is the ability to track results from end-to-end – for example, tracking the clinical history of an individual or usage patterns of a plan member. Overall, only a third of the executives we surveyed said their organizations are able to use analytics to track a product or service end-to-end. In this instance, payers significantly outperform providers (see Figure 4). Payers were more adept at assessing usage patterns of a plan member than providers were of tracking an individual's clinical history. Life sciences companies were also poor at tracking data. Even when they did so, tracking was usually limited to one clinical trial, rather than across trials for similar compounds.

Healthcare payers

Track clinical history and utilization patterns of a single plan member



Healthcare providers

Track clinical history of a single patients



Life sciences

Track the successful delivery of a product or a service



Source: IBM Institute for Business Value, Analytics across the Ecosystem Life Sciences n = 190; Healthcare Provider n= 240; Healthcare Payer n= 136

Figure 4: Many organizations are unable to track end-to-end delivery of a product or service.

Enterprises will need to overcome data management challenges by enriching the data to meet the needs of the business and build relationships with data providers and other partners across the healthcare ecosystem. When sharing data outside the enterprise, transparency of data will be critical. To facilitate this, organizations should consider using a third party to host, anonymize and manage healthcare ecosystem data.

Additionally, organizations will need to provide end-to-end product and patient data tracking, from creation, to usage, to outcomes of treatments. This can be accomplished by setting up collaborations across interested parties, working to ensure a common return on investment and implementing global metrics to allow for translation of data and insights across geographies.

Finally, healthcare companies and institutions will need to enable the automatic integration of analytics results into managing business processes by mapping the processes at the start of analytics implementation and agreeing where insights can be incorporated into processes and automated. Continuous feedback on learnings will be required to make sure automation provides optimum processes.

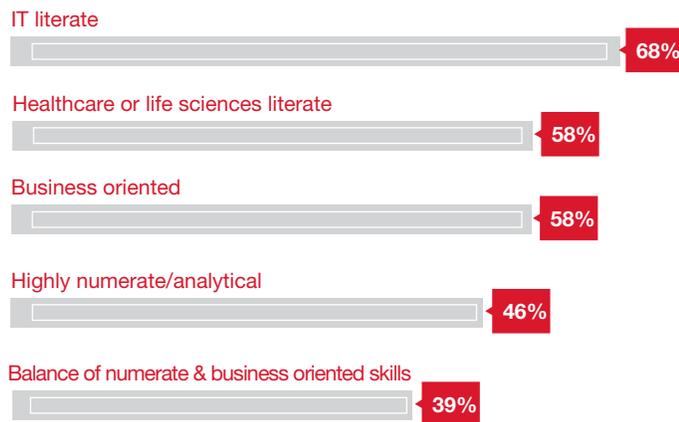
People and Organization

Currently, many analytics staffs lack a balance of analytics and business skills. Organizations are struggling to find the appropriate distribution of analytic resources, which leads to difficulties in adoption and translation to business processes. Two-thirds of study participants said their analytics departments were IT literate, which, on the surface, would appear to be a significant positive. At the same time, however, employees tended to lack a number of business-oriented skills. This leads to a gap in being able to translate data into actionable insights that can be incorporated back into the business.

Figure 5 shows the current skill profiles that organizations are seeking. Only 39 percent are currently recruiting professionals with the needed balance of skills. The good news is that, over the next three-to-five years, the number of companies looking for this mix is expected to increase by 25 percent.

Organizations are also asking existing employees to acquire the required balance of skills, with two-thirds of respondents planning to cultivate the required analytics skills through internal training.

Current skills profile that organizations recruit



Source: IBM Institute for Business Value, Analytics across the Ecosystem
n= 190; Healthcare Provider n= 240; Healthcare Payer n= 136.

Figure 5: Most organizations said they were lagging behind in recruiting staff who are equally proficient in numerate and business orientated skills.

So the challenge is not just about making data available, but also about building the capacity and the right people to extract valuable intelligence from it. This is a key point. As one North American respondent commented: “Data is not the problem. It’s the analysis of the data by smart people that is the problem today.” Added a U.S. industry executive, “The biggest barrier to adoption is human capital. One-hundred thousand data scientists are going to be hired in the next three years. We need the right kind of inquisitive, generically smart people who are [facile] with manipulating data and thinking outside the box.”

Enabling personalized care for epilepsy patients⁸

Epilepsy is a debilitating disease, the management of which is often guided by a combination of non-personalized clinical guidelines and the individual experience of the patient’s physician.

UCB Pharma is using supercomputers and intelligent analytics to examine anonymous data from more than 1.5 million U.S.-based epilepsy patients. The goal of the project will be to provide a decision support solution at the point of care that:

- Can inform and support physicians decisions
- Is seamlessly integrated into daily workflows
- Allows for patient input to identify personalized treatment options
- Allows data to be continuously updated.

The project is expected to provide innovative personalized treatment management for epileptic patients.

Organizations that successfully staff for analytics will cultivate this balance of skills and will define which capabilities are needed in house for meeting analytics requirements. They will collaborate with external education providers, advisors and other bodies to nurture and transfer necessary skills and provide ongoing in-house education to both business and analytic staff.

Additionally, successful enterprises will define the most appropriate resource distribution for ensuring success of their analytics projects, which may be a hybrid approach of a centralized function with some decentralized staff. They will make sure insights are shared across the enterprise and functions, as well as across analytics projects.

Gaining competitive advantage from analytics

In this final section, we will examine what needs to be in place to optimize analytics capabilities, both within the organization and across the boundaries of the entire ecosystem. Critical elements include access to data, availability of skilled resources, strategy and governance, information and metrics, supporting technology enablers and collaboration and partnerships. The impact on the organization can be considerable. For example, in a recent IBM Institute for Business Value study about big data, the percentage of respondents in the healthcare and life sciences industries reporting a competitive advantage from analytics rose from 35 percent in 2010 to 72 percent in 2012, a 106 percent increase in two years.⁹

A North American pharmaceutical company invests in the holistic care of chronically ill patients who use their medications – for better outcomes¹⁰

Pharmaceutical companies must demonstrate the efficacy of their medications to improve the well-being of end-consumers. This manufacturer recognizes that chronically ill patients need more support for productive lives. Proper medication management is critical, but for sustainable results, treatment may require broader support from physicians, educators, occupational therapists, home care agencies or other service providers.

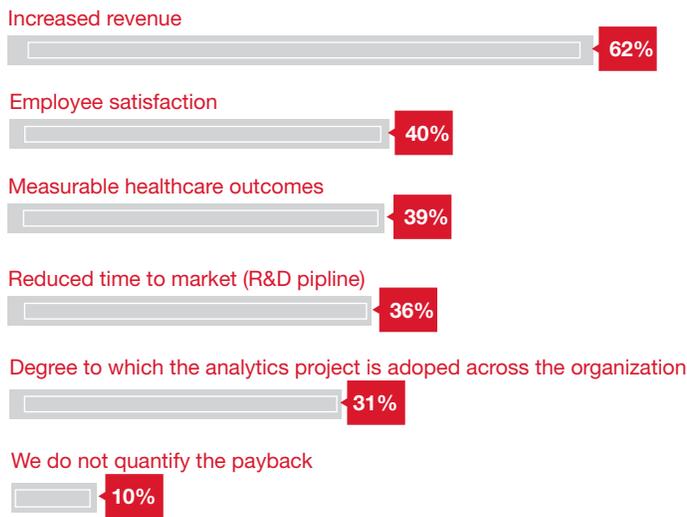
Solution: A care-management system was designed to embed industry-specific expertise for holistic assessment of patient needs and associated care activities. Personalized care plans are easy to design, manage and monitor: patients and providers manage medications better and collaborate more effectively on care activities to reach desired outcomes.

Strategy and governance: Focus on sponsorship and enterprise-wide adoption

A comprehensive plan for governance is foundational to any analytics strategy. High-level sponsorship of key analytics projects is an important success factor. A governance plan that addresses enterprise-wide adoption is essential at the start of a project. Focus should be placed on initiatives that can have the most impact on outcomes. The most effective analytics initiatives embed small, action-oriented analytics into key decision points of specific business processes that are used widely across the ecosystem. To get the most out of these projects, organizations should focus on early insights that enable refinement of processes over time.

In parallel, organizations should target effective, predictive analytics and simulations at senior executives who make complex strategic decisions across an organization's service lines, as well as key partners outside enterprise, to encourage continued sponsorship from key stakeholders.

Metrics to measure success should be in place from day one and be tracked via a balanced scorecard approach (see Figure 6). Organizations could start with the key metrics used to manage their business today. Enhancements to these original metrics should be aligned with the strategic direction of the organization. For example, metrics can be used for much more than just determining decreases in costs and increases in revenue. They can measure such key areas as successful adoption of analytics projects within the organization, employee satisfaction, quality of patient outcomes (reduction in hospitalizations, enhanced prognosis, reduced claims) and time to market for life sciences products and services.

 Metrics used for measuring analytic project success


Source: IBM Institute for Business Value, Analytics across the Healthcare Ecosystem n=555

Figure 6. While 62% of organizations use increased revenue as a measure for analytic project success, other equally vital metrics lag behind.

Data and processes: Manage and integrate data end-to-end

The ability to manage, understand and integrate data generated at all stages of the value chain and in all formats, both structured and unstructured – from discovery to real-world use – is a fundamental requirement for organizations to derive benefit from their analytics strategies. And this is one area in which organizations are struggling. Almost three-quarters of respondents said they have had limited success with integrating analytics capabilities and results. Further, a third of organizations do not consider incorporating insights into the business process on an ongoing basis as a driver for enterprise-wide adoption.

Implementing end-to-end data integration requires a number of capabilities, including trusted sources of data, the ability to establish cross linkages between legacy and current data elements, robust quality assurance and workflow management. The good news is that with new technologies integration does not require development of yet further data warehouses. Of particular importance, especially for health systems and providers, is the implementation of electronic health records (see case study, *Electronic health record adoption accelerating*, page 6).

As well, data needs to be enriched to meet the business needs of the organization. Partnerships are crucial in sharing data across both organizations and the entire ecosystem. Organizations should focus on building relationships with data providers and other partners that enable collaboration among interested parties.

Organizations must also evaluate regulatory restraints for data to make sure users from multiple facilities are authorized to view the information they need. Multi-tenant requirements must be built into such collaborative partnerships (see case study, *Enabling personalized care for epilepsy patient*, page 8).

Technology and cost proliferation need to be controlled through the overarching analytics strategy. Given the emerging nature of analytics, significant risk exists for the proliferation of data and software infrastructure. The focus should be on resolving the business problem, not on the supporting technology. Data collection should be centralized and standards enforced.

A common terminology is required to help business and technical teams understand each other's analytical needs. This standardized language will enable more rapid innovation and provided infrastructure and tools for effective data governance.

New analytic competencies are built on a foundation of existing technical data, operational and business capabilities. This requires that analytics initiatives be scalable, both in terms of technical architecture and in human resource requirements.

People and Organization: Enable adoption by building the right skills profile and partnering

Making sure that analytic resources have the appropriate skills profile will speed up adoption of processes across the enterprise. Organizations and institutions must use the right blend of both central and distributed control by maintaining a centralized core skill set. They must hire resources proficient in analytics and who also have relevant industry knowledge. To fill any other capability gaps, providers, payers and life sciences companies must look to resources outside their organizations, such as academia and consultants. Additionally they can consider using social business tools such as crowd sourcing to solve complex analytics challenges. Kaggle, for example, provides a consulting platform in which companies can connect with more than 100,000 data scientists to solve data science problems.¹¹

To make sure the optimum skill set is in place, a focus must be placed on training, including in-house training to bridge any gaps industry knowledge, partnerships with academic centers to deliver analytical modules aligned to specific industries, and internships that can cultivate and nurture future resources.

In addition to creating the right skills balance, developing trusted partnerships across the various stakeholders in the healthcare ecosystem can provide a competitive advantage. No single organization has all the data or all the capabilities to solve the healthcare ecosystem problems. Organizations need to work with data providers to evolve the necessary data sets and meet data strategy needs.

Integration can improve the linking of data elements. Collaboration will enhance linkages among all stakeholders in such areas as drug research, development, commercialization and delivery. Payers and providers will need to make the data available to life sciences companies in order to enable this. This will require the use of meta-data standards, as well as a trusted third party to manage patient anonymity. Ideally, data provided by patients on their vital signs can also be linked. This may come via sensors (e.g., heart-rate), devices (e.g., sensor enabled implants) or be self-reported (e.g., quality of life data).

Creating more patient-centric, coordinated and accountable care means all service providers will need to share risks and data, as well as conduct business with partners that cross traditional boundaries. For example, the University of Pittsburgh Medical Center (UPMC) has invested more than US\$1.6 billion in its IT infrastructure over the past five years to provide an integrated delivery system. Physicians, patients and payers exist in this system in what is, essentially, a “natural laboratory,” where different types of data can be mined about what works and what doesn’t. The first key step is getting data into a format that’s uniform and usable – fit for consumption. Then UPMC uses its highly skilled staff to organize and make sense of data and glean insights from it.¹²

Analytics-driven business transformation¹³

A leading pharma company wanted to move from a siloed analytics organization to a centralized organization, with standardized, cross-brand processes. This transformation included:

- Implementation of an offshore managed services organization for execution and maintenance of core analytics processes
- Creation of an analytics center of excellence to focus on high value business opportunities
- Application of best practices, standardizing core advanced analytics processes across the organization.

As a result, the overall cost of analytics process execution and maintenance have been reduced and there is consistent and transparent application of advanced analytics to sales and marketing processes across brands.

Conclusion

Organizations should have a bold vision – one not limited to traditional business models or regulatory constraints. For example, life sciences organizations should not just dispense drugs, they should also seek to know the patient outcome at the point of care and whether or not the patient was satisfied with the care provided.

How can companies within the healthcare ecosystem go about this? While the capabilities outlined in this report provide a roadmap to implementation, the overarching guidance is:

- *Optimize analytics within your own four walls* — As much as collaboration is necessary across the ecosystem to improve outcomes for all parties, the first step is to make sure the analytics strategy is applied across the entire enterprise.
- *Encourage disrupted collaboration* — This is collaboration that disrupts the status quo. Within the healthcare ecosystem the boundaries of organizations are evolving. So, too, should the roles of those organizations.
- *Accept no objections* — In this transitional stage there will be many objections and barriers. (e.g., regulatory constraints for a life sciences company when engaging at the patient level). Do not limit your vision in fear of these objections. They can be handled. Innovative market leaders across the healthcare ecosystem are proving it every day.

In today's information age, data rules. And the organizations that can harness and share that data to create insights, inform actions and drive better outcomes – across all the components of the healthcare ecosystem – will be those most likely positioned to become the outperformers of tomorrow.

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