Order from chaos

Where big data and analytics are heading, and how life sciences can prepare for the transformational tidal wave

EY

Building a better working world

Patient-centricity powered by big data and advanced analytics is here.

Is your organization ready?

Disruptive consumer technology

It is 2015 and Julie's life may just have been saved by the power of big data-driven advanced analytics.

Julie wears a smart watch that connects to a cloud-based analytics platform. In real time it crunches through Julie's data, as well as the sensory data of millions of other people. As the smart watch wirelessly streams blood pressure, pulse and glucose levels, the analytics platform predicts that Julie has a high likelihood of experiencing cardiac arrest in the next 90 days without proper preventive attention.

The analytics platform alerts Julie's health care plan provider. The provider immediately notifies Julie of the findings and schedules an appointment with an in-plan cardio specialist. Following a series of tests, her specialist concludes that lifestyle and elevated blood pressure have caused a build-up of plaque in Julie's coronary arteries. The cardio specialist considers heart bypass or stent surgery. However, by using sophisticated analytic models of several million patients with similar diagnoses and genetics, as well as additional data sets and analytics such as electronic medical records, real world data and genomic markers, the cardio specialist determines that her condition can be best treated with a very specific and new genomic plaque cholesterol reducing medicine designed for Julie, a change in diet, exercise and weight loss.

Had Julie not been aware of her condition for 60 more days, she likely would have required stents or an invasive heart bypass. In 90 days, she could have suffered cardiac arrest and died.

So how did life sciences and health care get to a place where it could save Julie's life through a smart watch?

Converging megatrends

The journey to save Julie's life with big data-driven advanced analytics begins in 2014 as five industry megatrends converge to enable patient-centricity and outcome-based health care:

Disruptive consumer technology

New smart watch devices constantly and seamlessly stream in real time users' blood pressure, pulse rates and glucose levels. Right now in Europe, the first ear-clip-linked device monitors glucose levels. Another technology company is believed to have similar plans for a contact lens. Crucially, however, neither currently has the ability to wirelessly stream data (e.g., Julie's story).

Personalized medicine

Advances in genomic medicine have enabled medicines which target, more effectively, specific patient genomic segments that improve patient health outcomes.

Analytics everywhere

Until recently, most analytic tools were reserved for power users and only a select few who had mastered data manipulation and reporting. Building the necessary complex models was a major hurdle that most could not overcome. Today, advancements in technology and new tools have brought models and data sources into the hands of everyone from shop floor managers to C-level executives. The ability to integrate large volume sets of big data from a variety of sources in real time combined with advanced analytics provides insights and predictive models of patient health and outcomes.

Maturing capabilities of cloud computing

Cloud computing is enabling operational transformation through digital innovation. While life sciences organizations remain concerned about data security and privacy, the rate at which companies are adopting private, hybrid and public clouds that use open architecture is accelerating. A leading big data analytics provider helped the US Food and Drug Administration's Center for Drug Evaluation and Research improve safety signal detection when analyzing adverse drug events using a combination of Apache Hadoop, R and Gephi by allowing parallel processing of all the events in the data set at the same time.

Health care cost reductions

Health care costs continue to spiral out of proportion to patient health levels. To remedy this, institutional health care customers and the US federal government are focused on lowering costs through preventive medicine. In the UK and Europe, some regulators are paying only for specific drugs based upon pre-agreed levels of outcomes.

When combined, these five trends create an environment that gives life sciences and health care organizations the opportunity to provide true patient-centricity that delivers outcomes. They may enable organizations to develop models of preventive and outcome-based health care that aligns the goals of pharmaceutical companies; medical device companies; health care practitioners; providers; payers; and, most important, the patient.

Today's missing link is the ubiquitous, mobile, hyper-connected technology that seamlessly integrates the ability to beam personal vitals into the cloud, such as Julie's smart watch. Within two years (or sooner based on recent news reports), consumers will be universally adopting mobile devices with medical data capabilities. Soon thereafter, health care payers will be crafting plans and offering financial incentives to customers who agree to have their digital vitals beamed to the cloud — in much the same way automobile insurers provide discounts to drivers to agree to use a device that monitors driving habits.

Once technology, as well as the customers who use it, takes this giant leap, it is only a small step for health care providers to use the data in the cloud to predict wellness, anticipate preventive interventions and prescribe personalized medicine or devices that produce positive outcomes.

Julie's story may sound like the hyperbole that big data and analytics have generated the past few years. Yet, as history has shown time and again, although people tend to overestimate the impact in the short term, they often underestimate its impact in the long term. Patient-centricity and enterprise transformation powered by big data-driven advanced analytics is a reality. Is your organization ready?

Preparing for the transformational tidal wave

"Big data will deliver transformational benefits to enterprises within two to five years, and by 2015, will enable enterprises adopting this technology to outperform competitors by 20% in every available financial metric."

Gartner, 2012

EY continually researches analytics trends and patterns of use in the marketplace. The results of our research, combined with the lessons learned from our work with clients, enable us to provide insights into the impact of data and analytics on an industry's ecosystem as well as an organization's operational performance, today and in the future. In this report, we outline our insights and examine their impact across the life sciences ecosystem.

From the proliferation of digital data to the fragmented nature of most enterprise system implementations, large, complex organizations everywhere are suffering from data chaos. Organizations that consistently outperform their peers tend to share the trait of being "good" with data. In fact, research indicates that 77% of companies that are good with data are also ahead in financial performance.[1]

The good news is that increased access to powerful analytics, combined with the maturing capabilities of open architecture, cloud computing and predictive analytics, is helping more organizations become good with data. The bad news is that many organizations simply aren't moving fast enough to keep up.

[1] **Source:** Economic Intelligence Unit. Survey conducted with 530 senior executives across industries (Feb. 2013)

Managing data and analytics as a portfolio of assets

The first step in harnessing the power of big data and advanced analytics capabilities is to manage the data and analytics projects as a portfolio of assets. An agile analytics approach enables life sciences and health care organizations to balance realizing value quickly with the complexity of what it takes to get there. By managing analytics projects as a portfolio, much like individual investors manage their financial portfolios, life sciences and health care organizations can use an agile analytics approach to balance value (long term, moderate value, low risk), growth (medium term, higher value, medium risk) and aggressive growth (short term, high value, high risk) assets. A typical portfolio may include the following analytics:

Functional area	Analytics
Research and discovery	▸ Target/biomarker identification ▸ Portfolio optimization
Clinical development	▸ Trial planning and efficiency ▸ Clinical trial design ▸ Cohort identification and segmentation ▸ Safety monitoring ▸ Forecasting ▸ Resource allocation ▸ Scenario planning
Manufacturing and supply chain	▸ Supplier compliance ▸ Inventory management ▸ Demand planning and forecasting ▸ Manufacturing asset productivity and effectiveness
Sales and marketing	▸ Managed markets analytics ▸ Customer segmentation ▸ Sales force effectiveness ▸ Marketing channel analysis ▸ Pricing optimization ▸ Outcomes optimization

Creating an agile analytics framework

As data management and analytics technologies evolve, life sciences and health care organizations have new opportunities to turn data into innovative insights. However, typical software development life cycles require lengthy validations and quality control testing prior to deployment. An agile analytics framework allows organizations to rapidly capture the value identified through analytics implementation.

A typical analytics life cycle requires four initiatives:

1. **Innovation.** Identify key business problems and drive innovation to develop a solution that produces a proof of concept or prototype.
2. **Incubation.** Using the proof of concept, scale the analytics initiative to evaluate value across larger target beneficiaries and test the model across additional cycles. Determine whether there are enough benefits in the project to proceed to the next stage.
3. **Industrialization.** Move the solution from proof of concept to validation, deployment and monitoring. Provide a production scale solution that proves value and benefits.
4. **Sustainability.** Maintain the analytics solution. Provide support to solution consumers and enable continued value delivery.

Because the business environment is changing so rapidly, organizations seeking to develop agile analytics are demanding more creative problem-solving to accelerate the innovation and incubation periods. They can do this by:

- Improving competencies of available talent within the organization and positioning them to add value and be successful
- Implementing a lean governance model that supports the collection, sharing and reuse of analytics assets, where possible
- Defining processes to maintain data and enhance data quality
- Defining data technology capabilities and establishing adaptable procedures to access technology assets
- Developing and continuously maintaining a portfolio of analytics opportunities

The organization should also create a value realization framework by which to measure both qualitative and quantitative benefits to drive accountability and demonstrate value.

By using an agile analytics framework, organizations can significantly accelerate their analytics project delivery — for example, from three projects in 12 months to 12 projects in three months. Agile analytics increases the engagement from the business and the ability to deliver data-driven insights in all areas where the organization uses analytics.

Assessing strategic capabilities and resource requirements

Personalized medicine

Accelerating R&D using big data analytics

For life sciences organizations, clinical trials are often the largest source of any R&D budget. However, as regulatory requirements continue to tighten and research and development costs continue to rise, there is an ever-growing need to improve productivity. Historically, this has meant large trials and a focus on data gathering, collection and analysis. This approach increases costs but does not consistently improve outcomes.

As risk-based approaches focused on specific patient cohorts lead to a world where demonstrating actual outcomes is as important as initial, pre-market evidence, R&D organizations have an opportunity to improve productivity using big data analytical capabilities. By combining real-world outcomes data with clinical data, mining genetic data, and more broadly understanding regional and population data, analytics-savvy organizations can gain insights to recognize research failures faster, design more efficient streamlined clinical trials, and speed the discovery and approval of new medicines while reducing the cost burden.

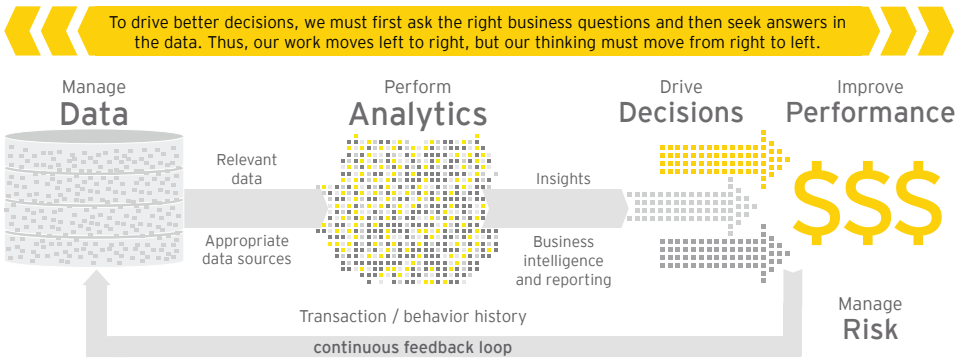
Strategic analytics capabilities address a diverse set of needs, but have a common foundation in an analytics value chain framework. The framework is simple in concept. Unfortunately, in many cases the framework is either only partially implemented or implemented in silos. As a result, even basic analytics capabilities, such as descriptive analytics, tend to fall short of what the organization envisions.

For descriptive analytics to assess past activities, the value chain needs to be able to consistently collect, blend, and distribute structured and unstructured data from both internal and external sources (manage big data). From there, analysis teams can perform pattern recognition analytics that business leaders can trust to drive decision-making.

As more organizations seek to improve descriptive analytics and establish new predictive analytics that enable them to see not only what has happened in the past, but determine what may happen in the future, they are employing visualization as a strategic capability. Long used in product development, organizations are applying visualization in operational functions as diverse as finance, supply chain and marketing.

Strategic visualization and predictive analytics capabilities often require organizations to improve the skills of existing resources or seek new talent. In some cases, organizations assimilate data scientists into operational planning and analysis. However, data science is a broad discipline and not all data scientists are created equal. Many are mathematicians well-versed in statistical programming. Others are analytical experts in a particular business domain. Some come from a database management and data warehousing background. The rarest — and most valuable — combine all of these traits.

Analytics value chain



Analytics everywhere

Using visualization to improve digital marketing

With the growth in digital channels, marketing in life sciences has become much more complex. Brand marketers invest in several different channels, but they don't always know which channels have the most impact. Often, it's because they can't see the whole picture.

Online systems aren't always standardized, and each brand can have different parameters for digital measurement. Further, if organizations use different agencies for different brands, the data they receive may not enable an "apples to apples" comparison among campaigns. These and other incompatibilities make it nearly impossible to assess the performance of individual channels in terms of their overall impact on the marketing system. This leads to ineffective decision-making around marketing allocation and an inability to use the data to actually improve marketing performance.

Organizations can resolve this challenge by using an integrated approach that creates standardized governance around key digital marketing sources and then combines all marketing sources into a single, visual reporting platform. Organizations can then standardize digital measurement systems and develop a model for capturing the data for all agencies to use.

By consolidating feeds from each marketing source, organizations can create visualizations that marketing professionals can use to examine the data at a detailed level across channels to track the total impact on sales. By using standard analytics across all brands, organizations can unify marketing reporting across all channels, making it possible for marketers to understand the impact each channel is having and make enhancements in campaign allocation to improve digital campaign performance.

To take advantage of value opportunities, such as accelerating R&D productivity, organizations assume the focus should be on effectively managing the data. Yet to truly capitalize, an effective organizational structure, governance processes and supporting enterprise architecture are also necessary. This would enable companies to mine their collective wisdom in historical trials rather than solely focusing on current studies.

Implementing advanced analytics for sustained success

Maturing capabilities of cloud computing

Improving compliance through data science

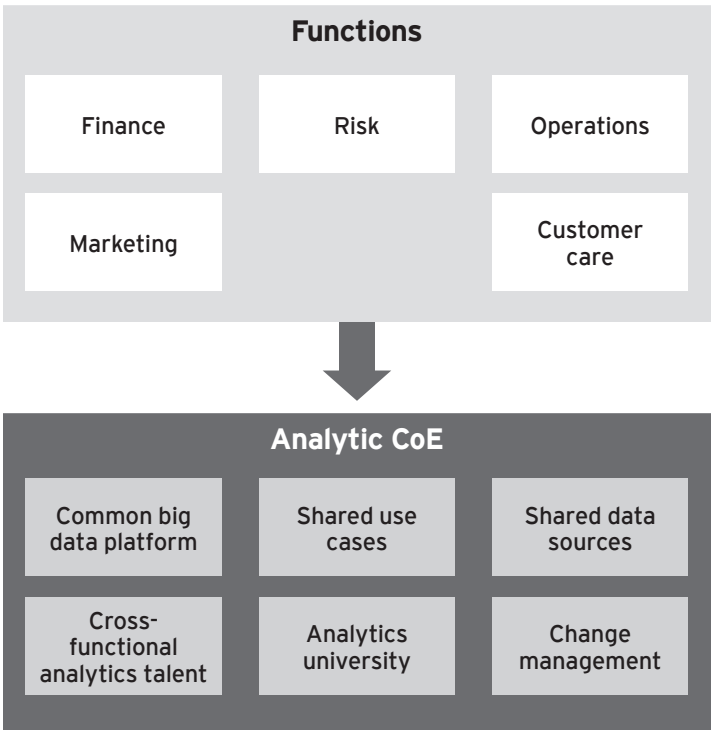
Health care reform, increases in regulatory requirements, competition and globalization, as well as changing demographics and population shifts are just some of the reasons that compliance and fraud risks are on the rise for life sciences organizations. Risks range from off-label marketing to speaker programs, grants, samples, research and third-party integrity.

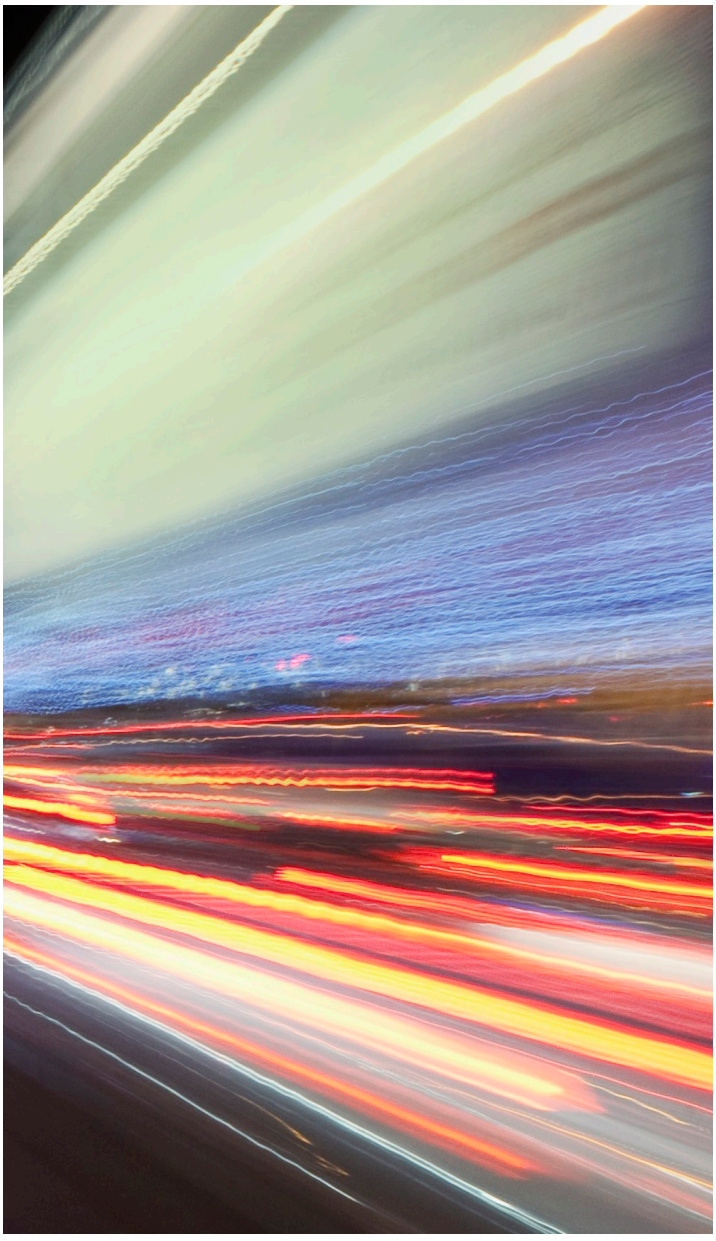
The ability to keep up with today's compliance demands requires both a proactive, integrated approach to analysis and the analytic tools to overcome the many obstacles to effective risk management.

That's why many compliance and legal functions within life sciences organizations are now teaming with internal audit to look beyond anti-corruption policies and training to include wide-scale testing of books and records. New forensic data analytics leveraging open architecture in the cloud specifically targeting corruption can help. With it, organizations are better able to mine unstructured data and conduct statistical analyses and anomaly detection, visual analytics and interactive dashboards, and specific data sampling. This then enables them to better assess high fraud or corruption risks and select suspect areas for further analysis and trending.

Once organizations have developed a business case that supports personalizing big data in terms of strategic analytics capabilities and outlines the value of advanced analytics, it's time to implement. There are six steps organizations can take to position their strategic analytics capabilities for success:

1. Adopt data science as a cross-functional discipline. Just as every function typically receives support from IT and Finance, organizations should offer data science or analytics support across the enterprise.
2. Manage analytics as a portfolio. Organizations that allow big data and analytics to remain siloed within separate business units rarely realize the value they seek. Analytics delivered as a shared service that is governed using portfolio management discipline is a common characteristic of high performing organizations that are good with data.
3. Implement an enterprise analytics Center of Excellence (CoE). An effective way to drive analytics portfolio management is by creating an analytics CoE. A CoE can increase analytics productivity; improve decision effectiveness; simplify data management, analytics performance and decision-making; and facilitate continuous analytics learning and innovation.
4. Implement a shared analytics network. A common analytics network managed by the CoE enables the organization to share methods, tools, data and models in an environment where results of prior analyses can be factored into new analytics projects. Organizations spend less time seeking the right data and the right tools and more time performing analyses and driving decisions.
5. Establish a structured change program. Transitioning an organization to a CoE-oriented operating model takes leadership, alignment, adoption and execution, from the boardroom to day-to-day operations managers. A formal change management process helps successfully manage the shift and offers an opportunity to identify analytics talent within the company and retrain them for specific roles in the CoE.
6. Partner for success. Whether determining an analytics strategy, implementing an analytics CoE or sourcing data scientists, few organizations are capable of going it alone. Partnering with a third party can drive new analytics innovation and add capacity for existing analytics capabilities.


Functions
Finance
Risk
Operations
Marketing
Customer care
Analytic CoE
Common big data platform
Shared use cases
Shared data sources
Cross-functional analytics talent
Analytics university
Change management



Conclusion

Health care cost reductions

The current operating model for the health care and life sciences sector is unsustainable. Better innovation with more predictable outcomes at a lower cost is the overarching imperative. The health care environment offers an abundance of new opportunities for improvement using big data and analytics — from patient-centricity delivered through smart watches and cloud computing to executing radically smaller, faster and cheaper clinical trials by combining genomic markers and real-world big data analytics.

Yet, these opportunities accompany some tough choices, calculated risks and significant challenges, including:

- Launching new business models based on data collaboration with payers and other organizations despite uncertain profitability outlooks and potential competitive exposure
- Embracing digital channel analytics to more fully understand perceptions about their products despite the increased adverse event reporting
- Managing and mitigating data privacy and security as more health care delivery capabilities move into the cloud

As life sciences organizations face these challenges being effective with data becomes essential for sustained success now and into the future. Those who understand how to manage both the internal and external data relevant to their products, markets and customers will create the opportunity for competitive advantage based on improved insight.

If life sciences organizations are able to apply their acumen with big data and analytics to drive decisions and engage in smart collaboration, they will find order and opportunity where others see chaos.

For more information, please contact:

Kim Ramko
Global/Americas Life Sciences Sector Leader
Advisory Services
Ernst & Young LLP
kim.ramko@ey.com
+1 615 252 8249

Todd Skrinar
Principal, Life Sciences Advisory Services
Ernst & Young LLP
todd.skrinar@ey.com
+1 415 894 4287

Ric Cavieres
Partner, Americas Life Sciences Analytics Leader
Ernst & Young LLP
ric.cavieres@ey.com
+1 305 415 1385

Ted Acosta
Partner, Fraud Investigations & Disputes Leader
Ernst & Young LLP
ted.acosta@ey.com
+1 212 773 3022

EY | Assurance | Tax | Transactions | Advisory

About EY
EY is a global leader in assurance, tax, transaction and advisory services. The insights and quality services we deliver help build trust and confidence in the capital markets and in economies the world over. We develop outstanding leaders who team to deliver on our promises to all of our stakeholders. In so doing, we play a critical role in building a better working world for our people, for our clients and for our communities.

EY refers to the global organization, and may refer to one or more, of the member firms of Ernst & Young Global Limited, each of which is a separate legal entity. Ernst & Young Global Limited, a UK company limited by guarantee, does not provide services to clients. For more information about our organization, please visit ey.com.

About EY's Advisory Services
Improving business performance while managing risk is an increasingly complex business challenge. Whether your focus is on broad business transformation or, more specifically, on achieving growth or optimizing or protecting your business, having the right advisors on your side can make all the difference. Our 30,000 advisory professionals form one of the broadest global advisory networks of any professional organization, delivering seasoned multidisciplinary teams that work with our clients to deliver a powerful and exceptional client service. We use proven, integrated methodologies to help you solve your most challenging business problems, deliver a strong performance in complex market conditions and build sustainable stakeholder confidence for the longer term. We understand that you need services that are adapted to your industry issues, so we bring our broad sector experience and deep subject matter knowledge to bear in a proactive and objective way. Above all, we are committed to measuring the gains and identifying where your strategy and change initiatives are delivering the value your business needs.

SCORE No. BT0417
CSG 1405-1250403 West
ED 0115

ey.com