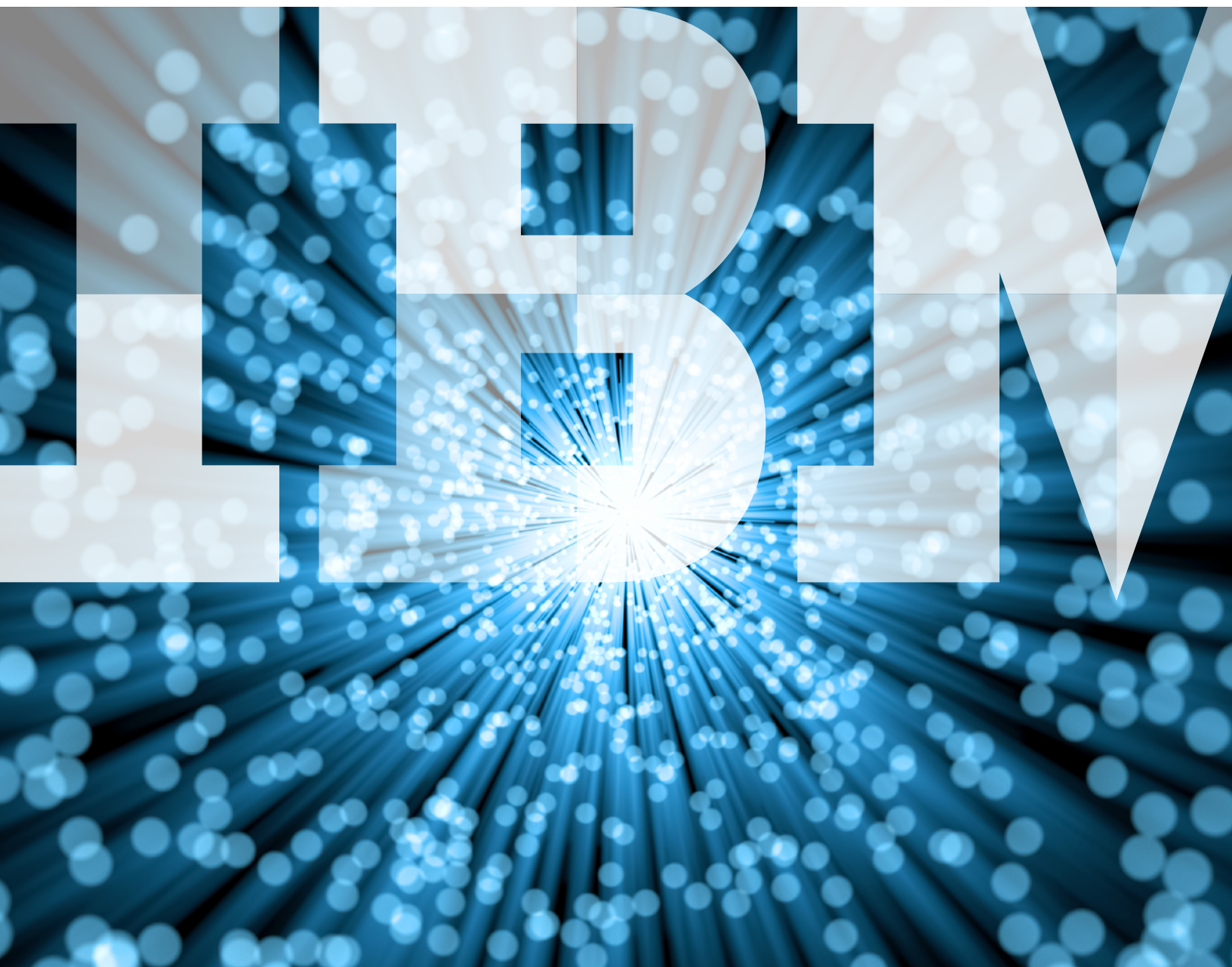


IBM Institute for Business Value

Driving innovation through data



Tapping data and analytics to innovate faster and at scale

To succeed in today's environment, businesses need to lead through increased complexity and volatility, drive operational excellence and enable collaboration across enterprise functions, develop higher quality leadership and talent, manage amidst constant change and unlock new possibilities grounded in data. The IBM Strategy and Analytics practice integrates management consulting expertise with the science of analytics to enable leading organizations to succeed.

By Rashik Parmar, David L. Cohn and Anthony Marshall

Innovation is happening everywhere.

It is transforming how and what people purchase, and how they communicate and collaborate. There are ever-greater demands on organizations to innovate faster and at scale. In response, data and analytics are being used to motivate radical new business models and disrupt traditional industry structures. How are data and analytics driving new ideas and new innovation, and what can executives do to incorporate data-driven innovation more directly into their strategies and initiatives?

Innovative

companies create substantially more business value than their less innovative peers

CEOs say

that new disruptive technologies are the most important force impacting their organizations

Outperforming

organizations are better at accessing useful data, applying analytics and translating new learning into action

In many ways, demand for innovation has become insatiable.

Chinese Smartphone manufacturer Xiaomi channels user feedback into design enhancements and operating system upgrades. Xiaomi includes feedback from users via Weibo (the Chinese equivalent of Twitter) into each weekly update of its smartphone operating system.¹ It uses analytics to determine which suggestions are most impactful and feeds them into development schedules in real time to underpin new operating system iterations.

Netflix, having already disrupted the home entertainment industry in the United States with its direct-to-customer DVD subscription model, is now re-revolutionizing home entertainment in its streaming content business.² Netflix is sourcing consumer data and applying analytics to predict how entertainment shows might perform based on elements such as director, actor or plot. Emmy award-winning drama “House of Cards” was motivated by data showing a viewership affinity for director David Fincher and actor Kevin Spacey.³

Progressive, a leading insurer in the United States introduced its auto insurance Snapshot program. Snapshot obtains data from a device located in vehicles, which record driving behaviors such as when people drive, how far they drive, and if they perform heavy braking. Analytics applied to the data inform premium pricing, which can then be based on driver safety and expected driving outcomes, rather than on blunt demographic proxies of predicted behavior.⁴

Innovation is becoming ever more disruptive, and big data and analytics has become intrinsic to the way innovation is happening. The recent IBM Institute for Business Value study, “Insatiable innovation,” concluded that while innovation of products, services and operations are becoming less sustainably differentiating, innovation of business models continues to be strongly correlated with outperformance: “It’s apparent that outperformers are not only engaging in more business model innovation, they are engaging in the more disruptive forms of business model innovation—moving into or creating entirely new industries”.⁵

Outperforming organizations will be those that make data and analytics central to their innovation processes, as well as to the innovation itself. Data promises to provide the input for creative endeavors and new ideas. But the importance of data and analytics will transcend ideation and inspiration. This powerful pairing will become a central part of innovation itself, including dynamic and potentially highly disruptive new business models.

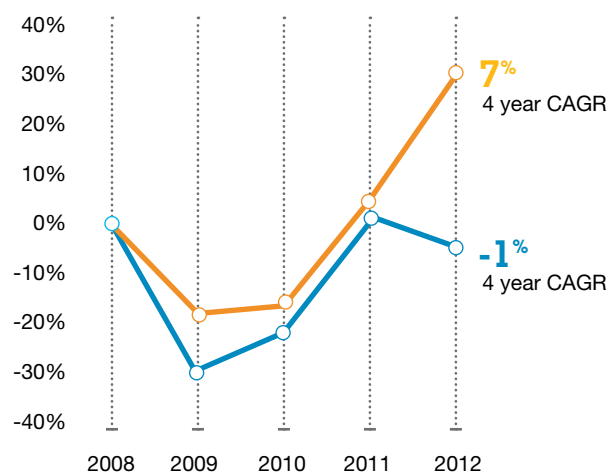
Innovation drives value, but technology is the key

Innovation is highly correlated with value creation. To demonstrate the point, our “Insatiable innovation” report analyzed market capitalization of companies recognized as among the top 50 most innovative companies by *BusinessWeek* magazine in 2010.⁶

Results showed that these top companies comprised approximately 20 percent of total market capitalization of Standard & Poor’s Global 1200. The ten most innovative companies realized 7 percent year-on-year market capitalization growth from 2008-2012, compared with -1 percent for the S&P Global 1200 as a whole (see Figure 1).⁷ “Insatiable innovation” concluded that, “Clearly, ‘innovative’ organizations are doing something different from others—something that is driving more growth and better financial results.”⁸

Market capitalization growth

Top 10 most innovative vs S&P Global 1200



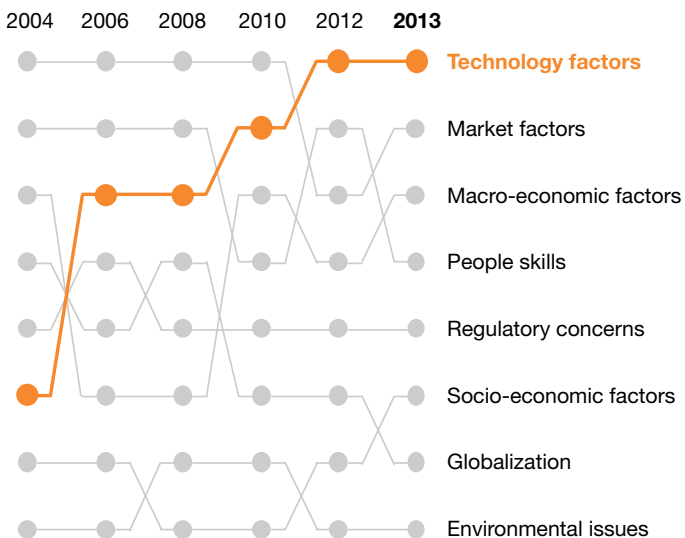
Source: IBM Institute for Business Value. “Insatiable innovation: From sporadic to systemic.” IBM Institute for Business Value.

Figure 1: Evidence that innovative companies outperform in market capitalization growth.

But innovation, and the value that it can bring, does not occur in a vacuum. Technology is key to motivating and driving innovation. Emerging technologies that both generate and use data—such as social, mobile, analytics, cloud, 3D printing, nanotechnology, sensors, wearable and biomedical devices, and 4G, among others—promise to have a massive impact on business economics, organizational structures and processes, as well as individual customer demands and expectations.

CEOs recognize the importance, and potentially disruptive influence of new technologies. For the second time in two years, CEOs identify technology as the most important force impacting their organizations, dramatically more so than in the past, even compared to the dot-com boom of the late nineties and early 2000s (see Figure 2).⁹

Most important external forces



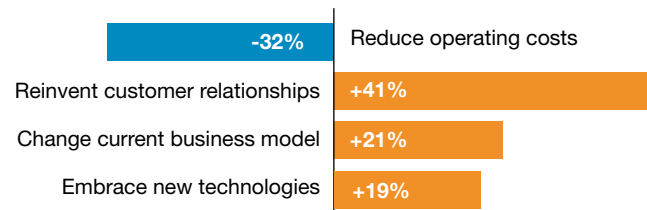
Source: IBM Institute for Business Value. "The Customer-activated Enterprise: Insights from the Global C-suite Study."

Figure 2: CEOs see technology as the most important force impacting their organizations, even more than markets and macro-economics.

Executives plan to use new and emerging technologies such as big data and analytics to reinvent customer relationships. They are recognizing that an overwhelming focus on cost control is inconsistent with value creation in the long term (see Figure 3). To grow, organizations need to invest and innovate, and recognize the intrinsic relationships among redefined customer relationships, new technologies and new business models.¹⁰

Technology-enabled innovation is becoming less about incremental improvement from the day-to-day "business-as-usual," but increasingly grounded in radical and unpredictable reinvention. Technological change and adoption are happening faster than ever before. But beyond that, emerging technologies such as cloud and analytics are providing the platform and the connectivity to combine and promote synergies across and between new technologies.^{11,12}

Anticipated change between previous 3 years and next 3 years



Source: IBM Institute for Business Value. "Digital reinvention: Preparing for a very different tomorrow."

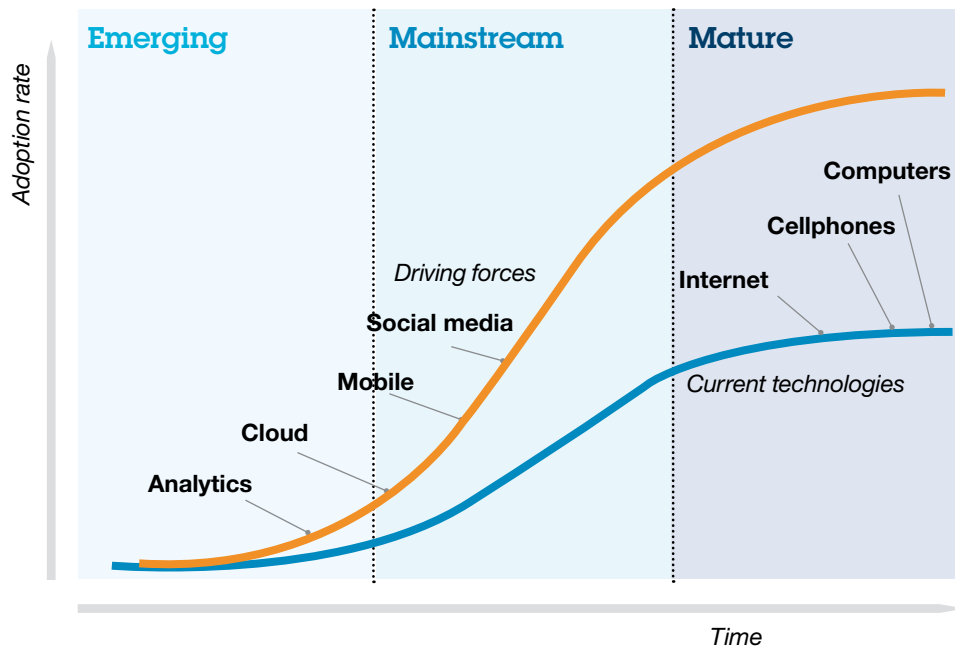
Figure 3: Organizations transition from intense focus on operating costs toward growth and transformation.

CEOs recognize the power and importance of these changes, at least at an instinctive level. The whole is become greater than the sum of the parts when it comes to the likely impact of new technologies (see Figure 4).¹³ As one prominent CEO said, “We’re innovating in collaboration with our clients—promoting more interaction between our R&D function and ‘factories of customers,’ and opening up our minds.”¹⁴

To summarize, there are three fundamental drivers powering a new wave of technology-enabled business innovation: a digital data explosion, better tools to derive insights and more business “in the cloud.”

1. An explosion in digital data:

- Massive data is becoming readily available and accessible
- Supplier and partner data is becoming near real-time
- Customers are sharing all kinds of information that was previously unattainable, or even unthinkable
- “Instrumented” objects are coming online in droves as the internet of things evolves and begins to mature
- Understanding the potential value and business model implications of these new resources is largely untapped and is currently its infancy.



Source: IBM Institute for Business Value. “Digital reinvention: Preparing for a very different tomorrow.”

Figure 4: When it comes to new and emerging technologies, impacts will be faster and the whole will be greater than the sum of the parts.

2. Better tools are becoming available to motivate information and insight:

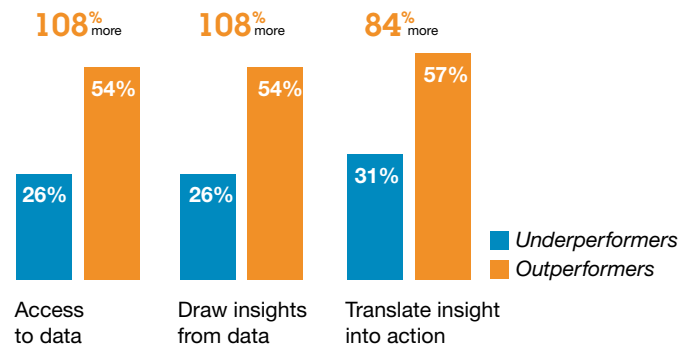
- New tools are improving the ability to integrate, analyze and exploit structured data
- The understanding of unstructured data has become more developed and refined
- Data is becoming available at scale, enabling a more comprehensive understanding of environmental context
- New probabilistic approaches to “answer generation” are freeing up attention to rethink how to ask the “right questions”
- Data management is transitioning from an era of information to an era of insight.

3. Ever more business is being done in the cloud:

- Business of all types is becoming increasingly virtual, or at least part virtual and part physical
- Processes are increasingly carried out with standard or interoperable software
- Functions and activities are becoming readily accessible as cloud-based services
- Digital technologies are reducing operating costs and enabling scalability
- New opportunities are emerging for new offerings and business models.

The centrality of data and analytics to business innovation and value creation is tangible. Data from our C-suite studies confirm clearly that not only are financially outperforming organizations more likely to combine business and technology to innovate, they are also leading adopters of data and analytics.¹⁵ Across the dimensions of data access, drawing meaningful insights from data and being able to translate insight into real actions, outperformers are clearly more capable than underperforming or peer-performing organizations (see Figure 5).¹⁶

Using data, outperformers differentiate their organizations in three key areas



Source: IBM Institute for Business Value. “Leading through connections: Insights from the Global CEO Study.”

Figure 5: Outperforming organizations are better at data access, data insight, and translating that insight into real, value-creating action.

Patterns of data-driven innovation

So how are data and analytics driving new ideas and new innovation? How can data and analytics be used to create radical new business models and disrupt traditional industry structures? What can executives do to incorporate data-driven innovation more directly into their strategies and initiatives?

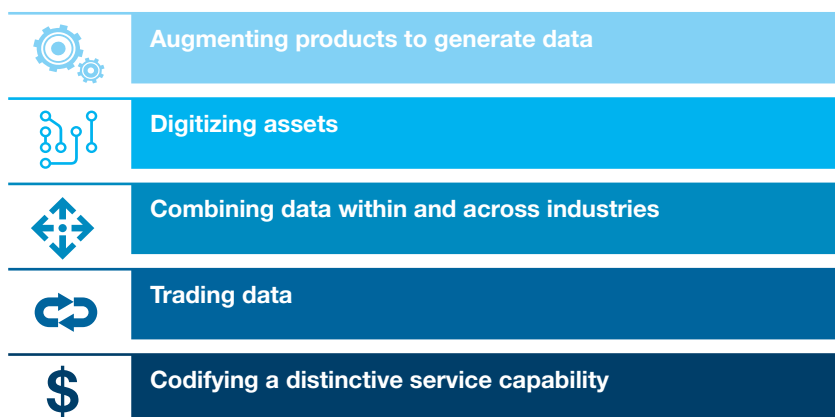
We have identified five distinct patterns of data-driven innovation (see Figure 6):¹⁷

- Augmenting products to generate data
- Digitizing assets
- Combining data within and across industries
- Trading data
- Codifying a distinctive service capability.

Innovation through data is characteristic of leading organizations

- #1** CEOs rank technology as the most important external force impacting their organizations
- 69%** of outperforming organizations combine technology with business to innovate
- 54%** of outperforming organizations as good at drawing insights from data
- 57%** of outperforming organizations are good at translating insight into action

Organizations can identify data innovation opportunities in five distinct ways



Sources: IBM Institute for Business Value. “The Customer-activated Enterprise: Insights from the Global C-suite Study”; IBM Institute for Business Value. “Leading through connections: Insights from the Global CEO Study”; IBM Research and IBM Institute for Business Value analysis.

Figure 6: There are five patterns of data-driven innovation.

Augmenting products to generate data

Data generated by products can promote product improvements, operational efficiency, and become the basis for new business models. Augmenting products to generate data can be especially powerful in circumstances where data can motivate improvement in product attributes, or where data has the capacity to motivate conception of new forms of business value. A secondary benefit is enabling manufacturers to stay in contact with the products after they leave the factory gates. Connectivity can provide the basis for deepening existing relationships or creating entirely new types of customer relationships.

For example, Rolls-Royce’s Engine Health Management (EHM) capability employs embedded sensors to monitor and record aircraft engine parameters such as pressure, temperature, altitude and vibration.¹⁸ Similarly, the Pacific

Northwest (USA) Smart Grid Demonstration Project has introduced smart meters into 60,000 homes across five states. These smart meters are empowering consumers to make educated choices on how and when they use electricity, while also enabling utility companies to better control electricity consumption during peak periods by directly shutting off home appliances.¹⁹

Digitizing assets

Transforming assets from analog to digital can open up new opportunities that were previously unthinkable. An ability to manufacture a physical representation of a digital design locally using a 3D printer—completely outside traditional supply chains—has the potential to be radically disruptive. And organizations are only beginning to contemplate the business potential of these types of technologies. Digitization of this kind will also enable an ability to expand measurement capabilities, further supporting a capacity for other forms of value improvement.

Peking University People's Hospital for example, is digitizing healthcare records and incorporating telemedicine that leverages mobile communications and real-time alerts. The ultimate objective is to monitor patient vital signs in real time, to support individualization and responsiveness.²⁰ Retail chain Homeplus in Korea has created virtual stores in physical environments such as subway stations.²¹ With their Smartphones, individuals can scan items on supermarket shelf-like billboards and have the real products delivered to their home within two hours.

Combining data within and across industries

Integrating information can unlock new insights by creating value chains that reduce waste and bridge gaps between organizations. Data can also be combined to create ecosystem connectivity and promote collaboration, each of which is essential for delivery of the sophisticated, compelling experiences that are increasingly demanded by customers.

The Cincinnati Zoo and Botanical Garden in the United States, for example, has integrated data, including location-specific point-of-sale data, customer data and even weather information, to understand buying behavior and preferences about zoo locations and installations.²² Uber is revolutionizing city taxi and limo services by providing a smart phone app and associated platform that better matches passengers with drivers, and calculates real-time dynamic pricing depending on customer demand and availability of vehicles.²³

Trading data

Translating existing data into information of value to other organizations in the same or adjacent industries can drive substantial value. Specifically, data can inform and motivate new business models across industries, spreading lessons learned, leading practices and generating inspiration. In so doing, trading data can promote increased convergence between industries.

For example, the Marine Institute of Ireland makes available data it collects on environmental conditions, pollution levels and marine life to outside parties through a customizable portal. Data is used to improve public safety and drive economic activity by improving flood prediction accuracy, and enabling more efficient and sustainable seafood and shipping operations.²⁴ Waze, a large, community-based traffic and navigation app, enables real-time traffic and map information to be exchanged among connected users to improve the daily commute. The amount of data increases as user participation increases via mobile connectivity, improving data quality and customer experience as users outsmart traffic and optimize routes.²⁵

Codifying a distinctive service capability

Internal data competencies and assets within organizations can be redirected and transformed into self-standing businesses themselves. Turning such capabilities into separate new businesses can be particularly successful when data capabilities can be exploited across industry or market contexts, particularly in circumstances where new economic ecosystems are emerging to capitalize on new opportunities.






IBM, for example, automated its internal travel booking and expense reporting processes, reducing administrative costs by up to 75 percent. Following its internal proof-of-concept, IBM developed the system into the Global Expense Reporting Solutions offering for IBM customers, sharing the benefits and driving economic value.²⁶ Similarly, Citigroup developed models to uncover market inefficiencies that hindered its clients' ability to make the most effective use of payment mechanisms. It refined and expanded its models into a set of specific client services under the banner of CitiDirect BE Mobile.²⁷

Organizations can start today

What can be done to innovate through data?

The starting point for organizations seeking to accelerate innovation is to make sure that they are asking the right questions (see Figure 7).²⁸

To fully capitalize on big data and analytics, organizations will need to transform, and then apply new capabilities to drive innovation (see Figure 8).²⁹ At its most fundamental level, data can drive innovation in two ways. Data can motivate ideation, development, execution and evaluation of new innovations. And it can underpin, or be a central component of new products, services, operations or business models.

| | | | | |
|--|---|--|---|--|
|  |  |  |  |  |
| Augmenting products to generate data | Digitizing assets | Combining data within and across industries | Trading data | Codifying a distinctive service capability |
| <ul style="list-style-type: none"> • Which of the data relate to our products and their use? • Which data do we now keep and which could we start keeping? • What insights could be developed from the data? • How could those insights provide new value to us, our customers, our suppliers, or our competitors? | <ul style="list-style-type: none"> • Which of our assets are either wholly or essentially digital? • How can we use the digital nature of assets to improve or augment their value? • Do we have physical assets that could be turned into digital assets? | <ul style="list-style-type: none"> • How might our data be combined with data held by others to create new value? • Could we act as the catalyst for value creation by integrating data held by other players? • Who might benefit from this integration and what business model might make it attractive to us or our collaborators? | <ul style="list-style-type: none"> • How could our data be structured and analyzed to yield higher-value information? • Is there value in the data to us internally, to current customers or to potential new customers? • Is there value in the data to other industries? | <ul style="list-style-type: none"> • Do we possess a distinctive capability that others would value? • Is there a way to standardize this capability so that it could be broadly useful? • Can we deliver this capability as a digital service? • Who in our industry or other industries would find this capability attractive? |

Source: IBM Research and IBM Institute for Business Value analysis.

Figure 7: Organizations begin by asking the right questions.

Build big data & analytics capabilities...

Enable

Basis for big data and analytics

Source of value

Measurement

Platform

Drive

Basis for big data and analytics

Culture

Governance

Trust

Amplify

Basis for big data and analytics

Sponsorship

Funding

Expertise

...and apply them to drive innovation

Data motivating innovation

1. Access a platform
2. Build connections
3. Initiate experimentation

Data underpinning innovations

1. Promote flexibility
2. Enable scalability
3. Disseminate across organization

Second, organizations can better measure impacts and model anticipated scenarios. In particular, they can define success metrics, predict future events and model outcomes more proactively and methodically, and focus more attention on measuring actual results.

Third, organizations can better integrate hardware and software to manage big data. They will need to embrace predictive analytics, introduce hardware capable of handling structured and unstructured data, and incorporate real-time, streaming data.

Build capabilities: Culture

Organizations can also build an organizational culture in which excellence in using data and analytics is seen as a high priority. They can promote more fact-based decisions through the increased availability of data and analytics. Organizations can take greater strides to distribute data and analytics to those who need it, and they can communicate clear expectations regarding the formation of fact-based decisions.

Second, organizations can build confidence in data and analytics with visible and strong governance and security. To build and perpetuate a strong governance culture, organizations should determine what is required to promote confidence, adopt robust privacy and security standards, and develop necessary infrastructure.

Third, organizations can promote the creation of strong, trust-based relationships. To build this type of environment, organizations must first create the parameters and conditions for confidence, establish mechanisms to build and maintain trust, and maintain clear behavioral norms and standards.

Source: IBM Institute for Business Value. "Analytics: A blueprint for value"; IBM Institute for Business Value analysis.

Figure 8: Organizations can build data and analytics capabilities, and then use them to drive innovation.

Build capabilities: Enablement

Organizations can advance three initiatives to promote capability enablement. First, they can aim to ensure alignment between what analytics need to deliver, and how they are created and developed. Specifically, organizations can align investments to the most valuable outcomes, explicitly focus on revenue opportunities and accelerate the speed of analytical development.

Build capabilities: Amplification

Organizations can promote a common vision for the organization, pool funding and expertise, and maintain clear expectations for a synthesis of data, analytics and innovation. First, organizations can actively work to establish a common vision to guide actions, deliver value and promote collaboration across the organization, as well as with external business partners.

Second, organizations can create a rigor or discipline to support their collaboration processes and activities by using business cases, and other objective targets and metrics. And third, organizations can expand knowledge-sharing opportunities by exchanging analytics subject matter experts both internally and externally, co-locating business analytics talent and formalizing analytics career paths.

The momentum of innovation through data

Once these analytical pre-conditions for innovation are in place, organizations can then channel insight and expertise toward the areas of highest likely return for data-driven innovation: using data to motivate new ideas, and using data as an intrinsic part of new products, services, processes or business models.

Data to promote innovation

These types of platforms can help connect insights to processes and individuals to parts of the organization tasked with generating new ideas. And data can enable the creation of physical or virtual environments that can support experimentation and testing of new ideas.

Data to underpin innovations

Organizations can use data to promote product, operational or business model flexibility by building a data environment in which insights and analytics can be channeled in multiple directions for multiple purposes. Data, analytics and other technologies such as cloud can enable scalability among new innovations. This can be done by using automation in data management and analytics to embed data and insight into new processes or offerings. More generally, organizations can raise awareness to help enable everyone across the organization to leverage and participate in innovation.

Claiming a stake in the data-driven future

New technologies related to data, analytics, cloud and other areas are motivating new and exciting possibilities for new products, new processes and new business models. We are only at the beginning of what promises to be a very different environment for both customers and organizations.

By tapping into the power of big data and analytics, organizations can position themselves closer to the center of the radical changes ahead. And through this ongoing commitment, business leaders and individuals can make both their organizations and themselves essential—rather than marginal—to what promises to be a dynamically orchestrated, symbiotic, contextual and cognitive omni-connected economy.

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