

Analytics: The real-world use of big data in retail

How innovative retailers extract value from uncertain data



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Saïd Business School at the University of Oxford

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By Keith Mercier, Bruce Richards and Rebecca Shockley

“Big data” – which admittedly means many things to many people – is no longer confined to the realm of technology. While big data is the convergence of more data from more sources than we have ever seen, it also represents a cultural shift in the way retailers connect with consumers in a meaningful way. This bottom-line impact of big data is what makes it a business imperative and why retailers around the world are leveraging it to transform their processes, their organizations and, soon, the entire industry.

Our newest global research study, “Analytics: The real-world use of big data,” finds that retail executives are recognizing the opportunities associated with big data.¹ But despite what seems like unrelenting media attention, it can be hard to find in-depth information on what retail organizations are really doing. In this industry-specific paper, we will examine how retail industry respondents view big data – and to what extent they are currently using it to benefit their businesses. The IBM Institute for Business Value partnered with the Saïd Business School at the University of Oxford to conduct the 2012 Big Data @ Work Study, surveying 1,144 business and IT professionals in 95 countries, including 50 respondents from the retail industry, or about 4 percent of the global respondent pool.

Big data is especially promising and differentiating for retailers. Today’s empowered consumers bring attitudes and expectations shaped by experiences across a diverse commercial world to every interaction with retailers. Now more than ever, consumers use data and technology to take control of their shopping experience. This trend is likely to continue; in fact, it is predicted that by 2020, there will be 80 million millennials, as shoppers under 30 years old are known, who have grown up using the Internet for everything.²

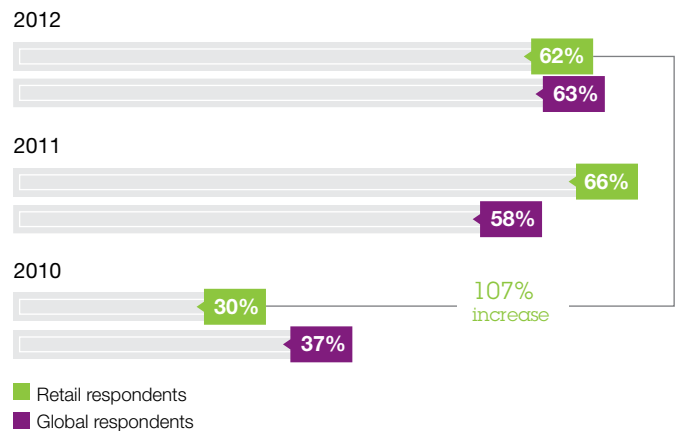
As consumer technology adoption and multi-channel shopping experiences become the norm, data becomes increasingly critical. For example, a consumer might begin researching a product on a mobile app, purchase it online and pick it up at a store. Coordinating this multi-channel shopping interaction requires entirely new data competencies for the retailer whose business now depends upon whether it can manage, integrate and understand this vast array of data coming at a non-stop pace.

The right information is important at every step, both to create a seamless interaction for the customer, and to coordinate complicated inventory and merchandise fulfillment operations. In today's globally integrated, time-sensitive retail environment, data is critical across the entire retailer value chain, including merchandising and assortment planning, inventory management, distribution, marketing, sales, service, returns, finance and more. All of this must be optimized under continual directives to become leaner, more cost effective and increasingly profitable. So the question for many retailers remains, "How do we harvest and leverage this information to gain a competitive advantage?"

We found that 62 percent of retailers report that the use of information (including big data) and analytics is creating a competitive advantage for their organizations, compared with 63 percent of cross-industry respondents. The percentage of retail respondents reporting a competitive advantage rose from 30 percent in 2010 to 62 percent in 2012, a 107 percent increase in two years after a peak in 2011 at 66 percent (see Figure 1).³

We also discovered that retailers are taking a business-driven and pragmatic approach to big data. The most effective big data strategies identify business requirements first, and then tailor the infrastructure, data sources and analytics to support the business opportunity. These organizations extract new insights from existing and newly available internal sources of information, define a big data technology strategy and then incrementally extend the sources of data and infrastructures over time.

Realizing a competitive advantage



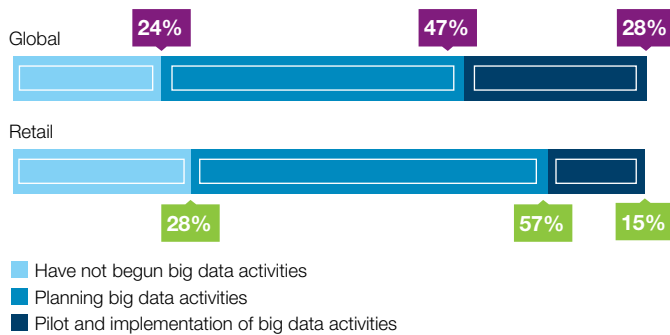
Source: "Analytics: The real-world use of big data," a collaborative research study by the IBM Institute for Business Value and the Saïd Business School at the University of Oxford. © IBM 2012

Figure 1: Well over half of retailers are creating competitive advantage from analytics and information.

Organizations are being practical about big data

Our Big Data @ Work survey confirms that most organizations are currently in the early stages of big data planning and development efforts with retailers slightly lagging the global pool of cross-industry counterparts (see Figure 2). While a greater percentage of retailers are focused on understanding the concepts than their peers in other industries (28 percent of retailers respondents compared with 24 percent of global organizations), the majority are either defining a roadmap related to big data (57 percent) or have big data pilots and implementations already underway (15 percent).

Big data activities



Source: "Analytics: The real-world use of big data," a collaborative research study by the IBM Institute for Business Value and the Saïd Business School at the University of Oxford. © IBM 2012

Figure 2: Almost three out of four retail companies have either started developing a big data strategy or piloting and implementing big data activities.

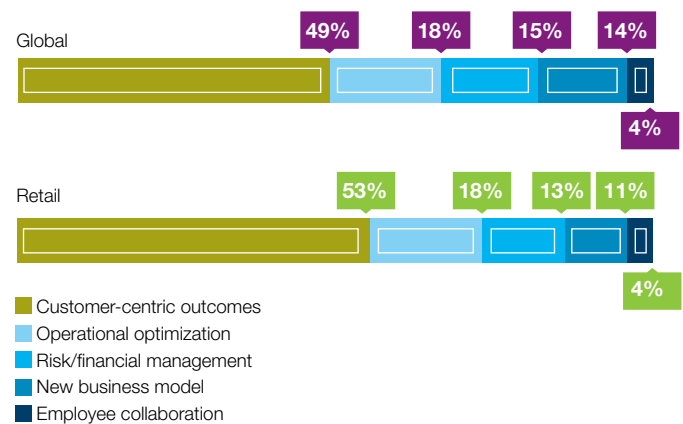
In our global study, we identified five key findings that reflect how organizations are approaching big data. In this industry deep dive, we will examine how retail-specific challenges impact these global findings, as well as provide our top-level recommendations for retail organizations. For a more in-depth discussion of each of these findings, please refer to the full study, "Analytics: The real-world use of big data."⁴

1. Customer analytics are driving big data initiatives

When asked to rank their top three objectives for big data, over half of the retail industry respondents with active big data efforts identified customer-centric objectives as their organization's top priority (see Figure 3). This is consistent with what we see in the marketplace, where retailers are

transforming from product-driven organizations to customer-centric organizations in which the customer is the central organizing principle around which data insights, operations, technology and systems revolve. By improving their ability to deliver the right merchandise assortments to the right outlets at the right price and manage their inventories to these data-driven consumer demand signals, retail organizations are better positioned to seize market opportunities by delivering new customer-centric products at more predictable costs.

Big data objectives



Source: "Analytics: The real-world use of big data," a collaborative research study by the IBM Institute for Business Value and the Saïd Business School at the University of Oxford. © IBM 2012

Figure 3: More than half of big data efforts underway by retail companies are focused on achieving customer-centric outcomes.

A major European online retailer uses analytics to make more effective use of its customer data and create more focused and successful marketing campaigns. This Internet-based photo service relies heavily on the use of electronic marketing campaigns, including e-mail and newsletters, for its sales efforts. To increase sales, build loyalty and reduce churn, the company needed to better segment its customer base to more accurately target promotions and meet customer needs.

The company now develops customer profiles to help predict what a customer will buy according to customer attributes, previous purchases and other factors. It then adjusts its marketing campaigns in terms of timing, frequency, offers and messaging to optimize sales, resulting for a 16 percent increase in the number of new prospects taking advantage of a “welcome” offer. Customers’ profiles can also be tapped to present the most relevant offers and a more dynamic, personalized experience for each type of customer. The company achieved a 94 percent “satisfied with purchase” rating from customers and substantially increased customer loyalty, with un-subscription rates falling to 0.6 percent. By tailoring customer interactions and using a more targeted marketing campaign, the company increased sales 30 percent in one year, compared to an increase of less than 10 percent for competitors in the same market.

2. Big data is dependent upon a scalable and extensible information foundation

The promise of achieving significant, measurable business value from big data can only be realized if organizations put into place an information foundation that supports the rapidly growing volume, velocity and variety of data. However, since infrastructure is not something most business executives know well, we asked only the IT executives and analysts to report on the state of big data infrastructure within their organizations.

Among the retail respondents, business-side respondents far outweighed the number of IT respondents; as such, there were too few to consider a statistically significant sample. Thus, our comments here reflect the responses from the cross-industry pool of respondents.

Among the global respondents, almost two-thirds report having started their big data journeys with an information foundation that is integrated, scalable, extensible and secure. Four information management components were cited most often as part of respondents’ big data initiatives.

Integrated information is a core component of any analytics effort, and it is even more important with big data. As noted in the 2011 IBM Institute for Business Value study on advanced analytics, an organization’s data has to be readily available and accessible to the people and systems that need it.⁵

Master data management and the integration of key data types – customer, product, vendor, employee and the like – require cross-enterprise data that is governed according to a single enterprise standard. The inability to connect data across organizational and department silos has been a business intelligence challenge for years. This integration is even more important, yet much more complex, with big data. Among cross-industry respondent organizations with active big data efforts, 65 percent consider their integrated information capability to be sufficient to support big data.

The next most prevalent information management foundation components in big data initiatives are a scalable storage infrastructure and high-capacity warehouse. Each supports the rapid growth of current and future data coming into the organization.

On the surface, a combination of adding storage and one or more larger servers can support the growth of an information management foundation. However, it is important to

understand that anticipating and architecting the infrastructure is key to delivering the business value of the intended business case. Organizations need to consider how best to support the ebb and flow of data to enable users to access data when needed, as well as how data can be analyzed within the business's time constraints (whether days, hours, seconds or milliseconds). This balanced configuration and deployment of servers and storage results in a more optimized infrastructure.

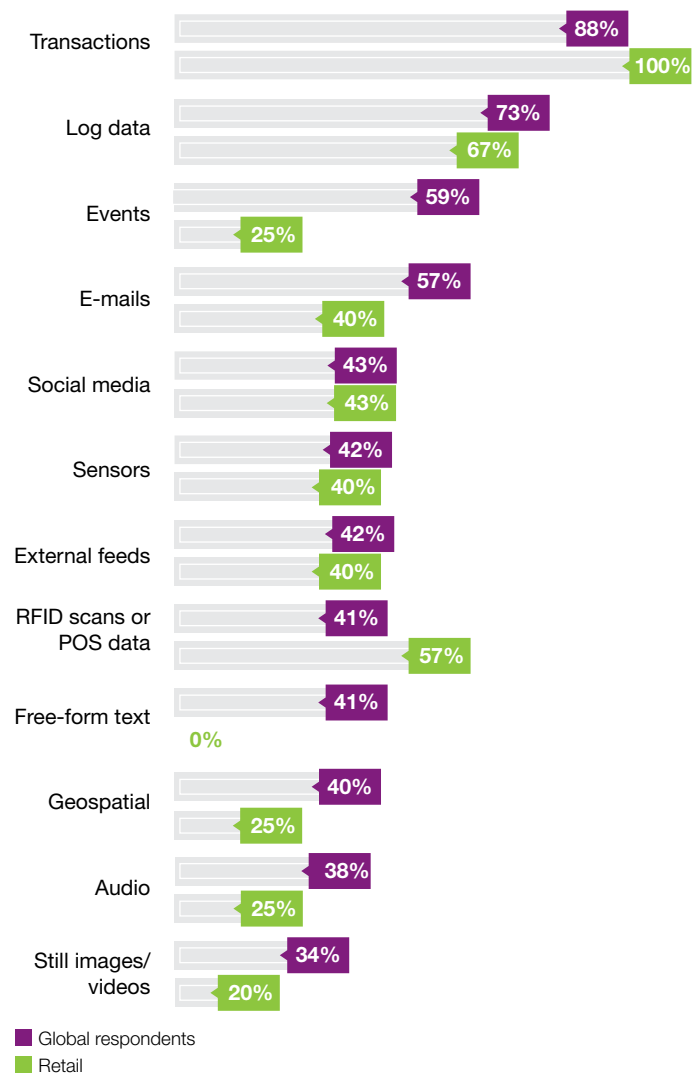
Strong security and governance processes are in place at 58 percent of the organizations that report having active big data efforts underway. While security and governance have long been an inherent part of business intelligence, the added legal, ethical and regulatory considerations of big data introduce new risks and expand the potential for very public missteps, such as a company losing control of data or using it in questionable ways.

As a result, data security and data privacy are critical elements of information management, according to several interviewed subject matter experts and business executives. Security and governance will become even more important and daunting as organizations embrace new sources of information, especially social media data. Compounding this challenge, privacy regulations are still evolving and can vary greatly by country.

3. Initial big data efforts are focused on gaining insights from existing sources of internal data

Most early big data efforts are targeted at sourcing and analyzing internal data, and we find this is also true for retailers. According to our survey, an overwhelming majority of retail respondents reported internal data as the primary source of big data within their organizations (see Figure 4). This suggests that retailers are taking a pragmatic approach to adopting big data and also that there is tremendous untapped value still locked away in these internal systems.

Big data sources



Source: "Analytics: The real-world use of big data," a collaborative research study by the IBM Institute for Business Value and the Saïd Business School at the University of Oxford. © IBM 2012

Figure 4: Retailers are focusing initial big data efforts on transactional and log data, both key internal sources, as well as data that comes from their point-of-sale systems and supply chains.

All retail respondents with active big data efforts are analyzing transactions (100 percent) and two out of three use log data (67 percent). This is machine-generated data produced to record the details of every operational transaction and automated function performed within the retailers' business or information systems – data that has outgrown the ability to be stored and analyzed by many traditional systems. As a result, in many cases this data has been collected for years, but not analyzed.

Retailers were more likely than global cross-industry respondents to use RFID scans and point of sale (POS) data (57 percent of retailers versus 41 percent of global respondents). This is a natural area for retailers to lead given their history and dependence on POS data for transactions.

Unlike other industries, retailers severely lagged in analyzing free-form text data, with no retailers reporting its use compared with 41 percent in other industries. This may represent an opportunity for some retailers to become early adopters of this area of analysis.

Early adopters of big data are turning information into insights that deliver value to their organizations. For example, a global clothing retailer leverages transactional insight to generate new opportunities and business growth. Previously, the company had its order, sales, inventory and financial data dispersed across the company, making it difficult for managers to quickly access data needed to make critical business decisions. Managers couldn't identify products in greatest demand, resulting in warehouses overstocked with less popular items and hot items on back order.

To enable more timely and effective operations decisions, the retailer created a seamless reporting framework that provides granular, real-time information from the sales floor to its suppliers' inventory and production schedules, which allows targeting of new customers and better inventory forecasting. In addition, transactional information from the company's five disparate core platforms was standardized and integrated into a single reporting framework to improve visibility into business activity, enabling deeper insight into customer needs.

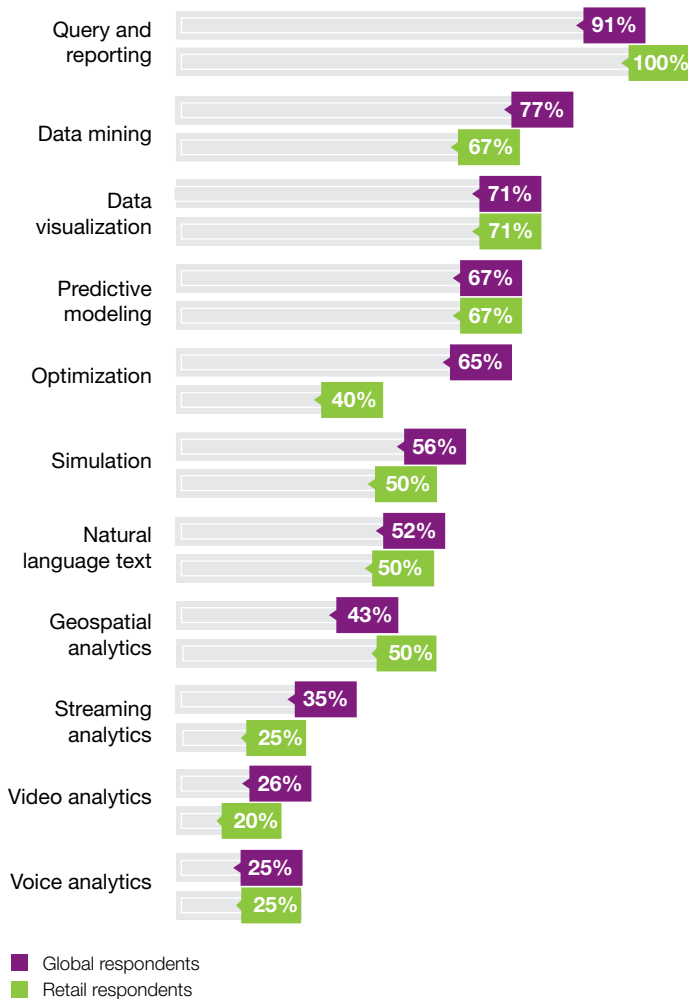
With these new capabilities, managers can quickly respond to marketplace demands and address business challenges. Having real-time and granular visibility into store-level sell-through and inventory data enables optimized replenishment and merchandising practices, while supply chain transparency promotes lower-cost logistics. The solution has positioned the company for competitive advantage by helping boost sales and lower operational costs.

4. Big data requires strong analytics capabilities

Big data itself does not create value until it is put to use to solve important business challenges. This requires access to more and different kinds of data, as well as strong analytics capabilities that include both software tools and the requisite skills to use them.

Examining those retailers engaged in big data activities reveals that they start with a strong core of analytics capabilities designed to address structured data, such as basic queries, data visualization, predictive modeling and data mining (see Figure 5). Retailers were on par with other industries in their use of simulation, natural language text analytics, geospatial analytics, streaming analytics, and video and voice analytics.

Analytics capabilities



Source: "Analytics: The real-world use of big data," a collaborative research study by the IBM Institute for Business Value and the Saïd Business School at the University of Oxford. © IBM 2012

A supermarket chain in Venezuela uses data analysis and optimization to gain deeper customer insights and generate sales. With US\$20 million in inventory and more than six terabytes of product and customer data spread across multiple systems and databases, the company was unable to easily assess operations at individual stores using manual processes. It needed a comprehensive and timely view of operations that would support and improve decisions about business operations. With a new solution, the company has seen dramatic improvements across its operations.

Managers now quickly review daily inventory levels, store sales and cost of goods to see which products are selling and most profitable and which promotions are most successful. The solution enables chain limit losses by scheduling price reductions to move perishable items prior to spoilage, effectively lowering losses on perishable goods, which are approximately 35 percent of the chain's products. Stores can adjust quickly as the government's price settings on staple foods fluctuate, and the company can compile sales tax data 98 percent faster than before. These improvements resulted in a 30 percent increase in revenue and a US\$7 million boost in profitability for the company. In fact, the newfound visibility into operations and consumer behavior provided the insight to choose optimal locations for four new stores.

Figure 5: Retail companies have a strong base of analytics capabilities, which were built to support robust business intelligence platforms.

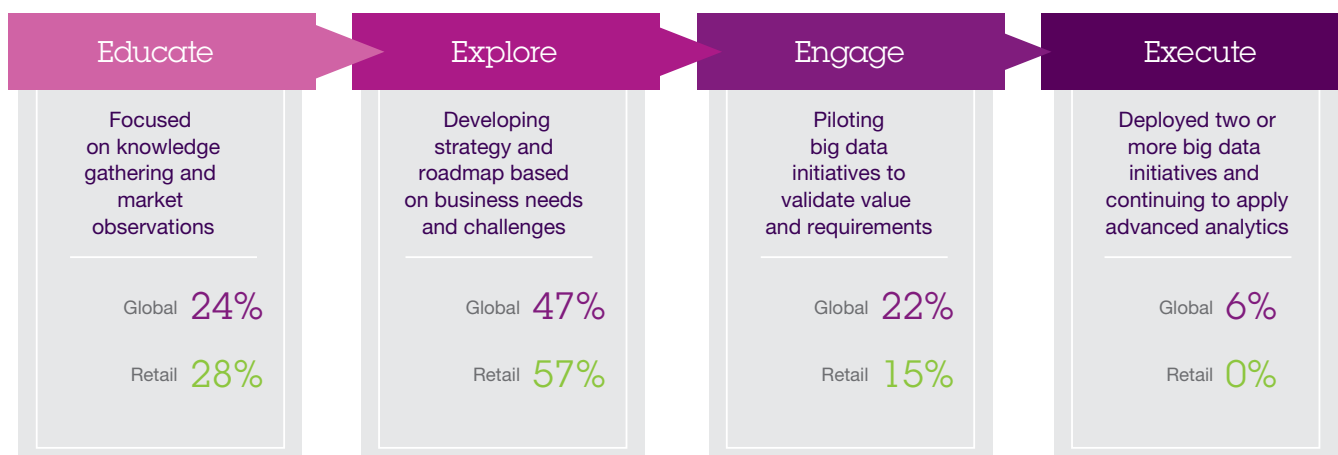
5. The current pattern of big data adoption highlights retailers' hesitation, but confirms interest too

To better understand the big data landscape, we asked respondents to describe the level of big data activities in their organizations today. The results suggest four main stages of big data adoption and progression along a continuum that we have identified as Educate, Explore, Engage and Execute. For a deeper understanding of each adoption stage, please refer to the global version of this study.⁶

- **Educate:** Building a base of knowledge (28 percent of retail respondents)
- **Explore:** Defining the business case and roadmap (57 percent of retail respondents)
- **Engage:** Embracing big data (15 percent of retail respondents)
- **Execute:** Implementing big data at scale (0 percent of retail respondents)

Retailers are lagging in big data execution, with none in the “Execute” stage compared with 6 percent in other industry groups (see Figure 6). While a 0 percent response may seem alarming, this gap is still relatively marginal in comparison.

Big data adoption



Source: “Analytics: The real-world use of big data,” a collaborative research study by the IBM Institute for Business Value and the Saïd Business School at the University of Oxford. © IBM 2012

Figure 6: Most retailers are either developing big data strategies or pilots, but none in our sample have moved to embedding those analytics into operational processes.

At each adoption stage, the most significant obstacle to big data efforts reported by retail firms is the need and ability to articulate measurable business value. For executives to embrace the investment in time, money and human resources necessary to create business value from big data, they must understand the potential or realized business value. Organizations must be vigilant in articulating this value, forecasted based on detailed analysis and tied to pilot results where possible.

Recommendations: Cultivating big data adoption

IBM analysis of our Big Data @ Work Study findings provided new insights into how retailers at each stage are advancing their big data efforts. Driven by the need to solve business challenges, in light of both advancing technologies and the changing nature of data, retailers are starting to look closer at big data's potential benefits. To extract more value from big data, we offer a broad set of recommendations tailored to retail organizations as they proceed down the path of big data.

Commit initial efforts to customer-centric outcomes

It is imperative that organizations focus big data initiatives on areas that can provide the most value to the business. For most retailers, this will mean beginning with customer analytics that enable them to offer better, more finely tailored products based on a better understanding of customer needs and predicted behavior patterns. Retail organizations can use customer insights to generate enhanced products, improve brand performance, drive customer loyalty, adjust pricing and improve customer satisfaction.

To effectively cultivate meaningful relationships with their customers across all retail channels (e.g., store, online, e-mail, mobile, etc.), retailers must connect with them in ways their customers perceive as valuable. The value may come through preferred features and pricing and more timely, informed or relevant interactions; it may also come as organizations improve their underlying operations in ways that enhance the overall consumer experience.

Retailers should identify the processes that most directly affect customers, pick one and start; even small improvements matter as they often provide the proof points that demonstrate the value of big data and the incentive to do more. Analytics solutions fuel the insights from big data that are becoming essential in creating the level of depth in relationships that customers expect.

Define big data strategy with a business-centric blueprint

A blueprint encompasses the vision, strategy and requirements for big data within an organization and is critical to establishing alignment between the needs of business users and the implementation roadmap of IT. A blueprint defines what organizations want to achieve with big data to ensure pragmatic acquisition and use of resources.

An effective blueprint defines the scope of big data within the organization by identifying the key business challenges involved, the sequence in which those challenges will be addressed, and the business process requirements that define how big data will be used. It serves as the basis for understanding the needed data, tools and hardware, as well as relevant dependencies. The blueprint will guide the organization to develop and implement its big data solutions in realistic ways that create sustainable business value.

For retailers, one key step in the development of the blueprint is to engage business executives early in the process, ideally while the company is still in the Explore stage. For many retailers, engagement by a single C-suite executive is sufficient. But a more diversified company may want to tap a small group of executives to cross organizational silos to develop a blueprint that reflects a holistic view of the company's challenges and synergies.

Start with existing data to achieve near-term results

To achieve near-term results while building the momentum and expertise to sustain a big data program, it is critical that retailers take a pragmatic approach. As our respondents confirmed, the most logical and cost-effective place to start looking for new insights is within the organization's existing data store, leveraging the skills and tools most often already available.

Looking internally first allows organizations to leverage their existing data, software and skills and to deliver near-term business value. In addition, companies gain important experience as they then consider extending existing capabilities to address more complex sources and types of data. While most organizations will need to make investments that allow them to handle larger volumes of data or a greater variety of sources, this approach can reduce investments and shorten the timeframes needed to extract the value trapped inside the untapped sources. It can accelerate the speed to value and help organizations take advantage of the information stored in existing repositories while infrastructure implementations are underway. Then, as new technologies become available, big data initiatives can be expanded to include greater volumes and variety of data.

Build analytics capabilities based on business priorities

The unique priorities of each company should drive the organization's development of big data capabilities, especially given the margins and specific production and distribution challenges that most retail firms face today. The upside is that many big data efforts can concurrently help reduce costs and increase revenues, a duality that can bolster the business case and offset necessary investments.

For example, many retailers strive for improved omni- or multi-channel models in which the customer experience leverages the strengths of different channels and enables alternate options such as buy online and then pick at store, all while promising and delivering the right inventory in the right place. From a planning perspective, merchandisers and inventory planners must be able to project how the right assortments and inventories must be planned and procured, often with months of lead time and a complex mix of vendors and suppliers. In operations, master data management and inventory visibility become crucial, as retailers must optimize inventory across stock,

Retailers should focus on acquiring the specific skills needed within their organization, especially those that will increase the organization's ability to analyze unstructured data and visualize its analysis to make it more consumable to business executives.

Create an investment case based on measurable outcomes

Developing a comprehensive and viable big data strategy and roadmap requires a solid, quantifiable business case. Therefore, it is important to have active involvement and sponsorship from one or more business executives throughout this process. Equally important to achieving long-term success is strong, ongoing business and IT collaboration.

Getting on track with the big data evolution

An important principle underlies each of these recommendations: business and IT professionals must work together throughout the big data journey. The most effective big data solutions identify the business requirements first, and then tailor the infrastructure, data sources, processes and skills to support that business opportunity.

To compete in a consumer-empowered economy, it is increasingly clear that retailers must leverage their information assets to gain a comprehensive understanding of markets, customers, products, distribution locations, competitors, employees and more. Retailers will realize value by effectively managing and analyzing the rapidly increasing volume, velocity and variety of new and existing data, and putting the right skills and tools in place to better understand their operations, customers, channels and the marketplace as a whole.

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