Point of View

Surfing the Data Deluge

How Retailers Can Turn Big Data into Big Profits

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From medieval shops to modern megastores, retail has always been a dynamic, high-pressure environment. But regardless of the century, one simple maxim has always held true: *know thy customer.* Retailers who best anticipate their customers' wants and needs—offering the right product, in the right place, at the right time, and for the right price—will prevail.

Today, however, there is a vast and challenging new dimension to understanding the consumer: data. And not just traditional data: *Big Data.* Never before have customers generated such a deluge of information about their habits, behaviors, and desires. With every click, tap, or touch; every swipe, search, or share, consumer information is created. If ignored, Big Data will leave retailers in the dark.

All of this promises a revolution in the retail industry, with exciting possibilities and unprecedented opportunities. But challenges abound. For starters, that tsunami of data threatens to swamp a retailer's capacity for understanding. It is one challenge to compile and store terabytes of information on consumers, much of it unstructured data from sources like social media and video feeds. It is quite another to extract those crucial nuggets of golden insight that will enable retailers to understand—indeed, *predict* beforehand—the behavior of consumers *in real time.*

Yet for retailers competing in a digital, connected world, meeting this challenge is essential. Companies that master the ability to *rapidly* sort through massive amounts of data, identify the differentiating bits of insight, and take quick action will be the winners.

To accomplish this, they will need to understand every step of the shopping journey, from that initial, furtive web search or social-network share (as a potential customer first *thinks* about a need or desire), all the way through the moment of transaction and beyond. New data streams and data points will need to be established, identified, and combined with more traditional sources of data. And once those information streams meet, the resulting, seemingly overwhelming data deluge will have to be corralled, managed, and refined through Big Data analytics.

As daunting as the challenges may seem, there are exciting opportunities for retailers to begin reaping the benefits of Big Data. The good news for retailers is that while the sheer volume of the data deluge may be intimidating, the actual insights, once isolated, are not. The key is speed and efficiency in finding them. Once captured, those insights will intersect with the same four R's (right place, right time, right product, right price) that have always defined retailing.

The opportunities that come with Big Data are impossible to ignore: the Cisco® Internet Business Solutions Group (IBSG) predicts a 54 percent improvement in margins once Big Data analytics are adopted. Moreover, retailers that lag in stepping up to the Big Data challenge run the risk that competitors will begin to know their customers better than they

do. "It's a race to see who can use all this data the best," Anand Rajaraman of @WalmartLabs told Reuters. "This will change the retail industry, as well as most other industries."

But Big Data is not just a technology; it is a transformational strategic capability that will drive sustainable competitive advantages. So, instead of being overwhelmed and inundated by the torrent of data, retailers must learn to, in effect, *surf* the deluge rather than drown in it. In particular, mobile, video, and social networking data promise enormous insight for retailers. They are the key levers in retail to drive value from Big Data.

And while those emerging data streams may be enormous, *once the differentiating nuggets of insight are isolated, Big Data won't seem that big.*

In addition to identifying the financial benefits for retailers, Cisco IBSG has developed a pragmatic approach for retailers to begin the process of stepping up to Big Data, right away. This paper will examine the challenges facing retailers in the coming era of Big Data; some case studies of retailers already adopting Big Data analytics; and the first steps to developing Big Data capabilities.

It will also offer a vision of a fully empowered Big Data retailer surfing the deluge and reaping the benefits of a greatly enhanced relationship with consumers. In effect, retailers will know their customers' wants and desires at the earliest possible moment and position themselves to meet those demands like never before.

What Is Big Data?

Big Data is a term used to define the new and exponentially increasing amount of structured—and especially, unstructured—data flooding today´s world. In this paper, we will focus on how "Big Data" is changing the relationship between the retailer and the customer, impacting virtually every major area of retail operations.

As we have seen, Big Data brings big challenges for retailers. Coping with the coming zettaflood of data calls for a new and faster approach to innovation, and an overall shift in thinking. It may require new levels of expertise, from people who can combine data streams and determine where value and insights lie. And it will require technical capabilities beyond the classic forms of data mining that many retailers are already employing (often with varying degrees of success).

Those challenges are inherent in four characteristics—the four V's—that differentiate Big Data from "traditional" data: volume, velocity, variety, and value:

- The sheer **volume** of Big Data overwhelms the normal data warehouse. It is difficult to keep up with it, much less to sort it, analyze it, and extract value from it. The amount of data flooding retailers is expected to grow 800 percent in the next five years; 70 to 80 percent of that will be unstructured data.[1]
- The **velocity** of that data is far outpacing processing capacity. Social media data streams, for example, produce a massive and rapid influx of opinions and relationships that are potentially valuable to retailers. Each day, for example, there are 55 million Tweets and 60 million status updates on Facebook.[2] For Big Data to be a retail game changer, such feeds will need to be analyzed as quickly as they arrive.
- The **variety** of data can be broken down into two main categories: structured and unstructured. *Structured* data is more traditional; it comes into a data warehouse

already tagged and is easily sorted. But the vast majority of data today is *unstructured:* massive, rapidly changing feeds from sources like social media, video, and more. It's random, difficult to analyze, and *enormous*. In 2010 alone, the top social networking sites generated 14,436 terabytes of unstructured data.[3]

- The economic **value** of nontraditional data varies greatly. Typically there is crucial information hidden within the larger body of nontraditional data. The key for retailers is to gain the capabilities necessary to extract those truly valuable nuggets of insight from the tsunami of data, as rapidly as possible. Once Big Data is filtered and refined, it is not nearly as intimidating.

When Traditional Retailing Meets Big Data

The coming world of Big Data may seem exotic and futuristic in some ways. But it can fit seamlessly into the traditional rules of retail. Even with high-powered computers and sophisticated data analysis, the 4 R's of retail—right product, right place, right time, and right price—still apply.

Figure 1. Where Traditional Retailing Merges with Big Data, Opportunities Abound.

4RV	Volume "Increased granularity"	Velocity "Increased timeliness"	Variety "Increased relevance"	Value "Success"
Right Product "What should I sell?"	▪ Accurate individual recommendations ▪ Less / no supply of input on preferences ▪ No out of stock ▪ Richer innovation	▪ Contextual awareness of consumer likes ▪ Suggestions based on community groups, related to customer ▪ Better cross-sell and up-sell	▪ Individual product innovation/ creation ▪ 3D (food) printing ▪ Unique products—e.g., smart, sensing, self-healing, products ▪ Full insight in "Installed base"	▪ Improved product experience ▪ Product loyalty ▪ Drive new experiences
Right Place "Where should I deploy inventory?"	▪ Location aware, personalized service and promotions ▪ Improved supply chain operations	▪ Shopping habits drive location-based suggestions ▪ Awareness of activities related to promotions ▪ Invites to new communities	▪ Awareness of vehicle, mood, health situation ▪ Advertising pinpointed to optimal locations based on multiple factors	▪ Improved customer experiences, loyalty ▪ Time savings ▪ New friends and communities
Right Time "When should I deploy inventory?"	▪ Promotions and service based on past behavior ▪ No out of stock ▪ Enhanced offer timing ▪ Improved demand forecasting	▪ Awareness of activities related to promotions, suggestions ▪ Invites to new communities, friends ▪ Ability to take "high-touch" customer service to new levels	▪ Automated ordering based on stock situations at home ▪ Automated ordering based on wear and tear ▪ Awareness of health ▪ Resource allocation	▪ Improved customer experiences, service ▪ Increased retailer loyalty ▪ Time savings ▪ New friends, communities
Right Price "How much should I charge?"	▪ Insight into "point of conversion" ▪ Price comparison history ▪ Optimized pricing strategy ▪ Customer value proposition	▪ Contextual awareness based on location / peer groups ▪ Awareness of community of influencers ▪ Personalized pricing based on multiple factors	▪ Fully differentiated individual pricing, based on individual requirements & relevant environmental factors ▪ Better understanding of product value proposition	▪ Financial benefits, planning ▪ Customer experience ▪ Customer service ▪ Loyalty

Source: Cisco IBSG, 2012

The four V's of Big Data—volume, velocity, variety, and value—may seem challenging at first, but with the right capabilities, they will intersect with the four R's of Retail. The result is a new wave of unprecedented opportunities for retailers. These may be driven by new technology, but retailers' traditional areas of expertise remain highly relevant (see Figure 1).

Video, Social, and Mobile: The Key Big Data Drivers in Retail

After analyzing these opportunities, Cisco IBSG believes that three major trends—video, social, and mobile data—drive the Big Data thrust in retail—not just the explosion in the ways they are used, but the rapid advances in how they are analyzed. Each of these emerging data streams promises unprecedented insights into what consumers want or need, at the earliest stages of interest.

- Many retailers already deploy **video** cameras in their stores for security and to deter shrink. But high-definition cameras combined with Big Data analysis promise a wealth of new insight. This will include everything from facial recognition and information on shopping partners to age, gender, ethnicity, and socioeconomic indicators. Looking further, the growing sophistication of video analysis could determine the health, mood, and buying habits of a consumer by feeding information on body temperature, gait, and posture.
- **Social** media is another wellspring of insight. Once these torrents of unstructured data are tamed, they will offer retailers relevant, subjective information in all major consumer demographics by tracking consumers' real-time interactions and behaviors. A consumer's age, gender, employment and relationship status, social and family influences, interests, buying history, likes, dislikes, technical sophistication—all will combine to form a highly detailed picture of that individual.
- **Mobile** devices also offer a new horizon in consumer knowledge, especially considering that they are becoming the predominant standard for digital interaction. By tracking a consumer's location, retailers can glean crucial contextual insight, while enabling store touchpoints with mobile access for an omnichannel experience. Mobile devices can offer a wealth of insight through chats, Tweets, blogs, browsing and search histories, and purchase records. In turn, retailers can send targeted alerts and promotions in real time.

All of this information will influence a wide variety of factors for the retailer, especially sales and marketing, supply chain, merchandising, and operations. More specifically, it will impact store layout, product assortment, store merchandising, and pricing/distribution strategies. There will also be leaps in in-store service, marketing and promotions, social media strategies, and understanding of wallet share and overall profitability.

By carefully breaking down these projected impacts from social, mobile, and video data, Cisco IBSG estimates impressive after-tax operating profits of 6 percent, 17 percent, and 17 percent, respectively, for an illustrative retailer. Combined with 14 percent profit from additional sources, that adds up to an impressive 54 percent after-tax gain (see Figure 2).

Figure 2. Cisco IBSG Estimates a 54 Percent After-Tax Profit Gain for an Illustrative Retailer.

		Social	Video	Mobile	Other	Total (avg)
Revenue	Customer traffic	Location-, sentiment-based engagement; event- and trend-sensing 2-4%	Context-aware signage 0-2%	Location-based promotions; event- and trend-sensing 3-5%		8%
	Average basket size	Assortment optimization 0-2%	Placement optimization, context-aware, semi-individual promotions 0-2%	Behavior analysis; individually targeted promos 3-5%	Assortment optimization 0-2%	6%
	Out-of-stock	Event- and trend-sensing	Inventory management 0-2%		Inventory management; distribution & logistics 0-2%	2%
Gross Margin	Product mix effect	Pricing optimization 1-3%	Placement optimization 5-7%	Pricing optimization 5-7%	Sourcing optimization 5-7%	21%
	Supply-chain effect		Replenishment strategy 2-4%		Distribution & logistics opt.; informed supplier negotiations 5-7%	9%
	Avoided discounting	Event- and trend-sensing; promotion optimization	Inventory management	Promotion optimization 2-4%		3%
SG&A	Productivity		Labor inputs optimization 4-6%			5%
Total (avg)		6%	17%	17%	14%	**54%**

Source: Cisco IBSG, 2012

In short, Big Data will transform retailing:

- Today, retailers may know what customers want; with Big Data, they will *predict* what customers want.
- Today, retailers provide customers with the ability to research, decide, and buy; with Big Data, customers will be able to do this when and where they experience the need.
- Today, retailers provide products; with Big Data, retailers will offer an experience that is unique to the individual customer over time.
- Today, retailers strive to create a pre- and post-purchase relationship with the customer; Big Data will enhance and solidify this relationship immeasurably.

Feeding the Deluge (Identifying New Data Tributaries)

Big Data is all about information. But from a retailer's perspective, where exactly will it come from? And how will it converge and be integrated into one stream that can be correlated in a meaningful way?

Most retailers already track a certain amount of information about their customers—for example, basic item-level purchase histories. But there are almost limitless opportunities to go much deeper into every aspect of consumer behavior and the operational performance of the company. Where, when, and how did a transaction take place? Was it in-store or online? Which type of device was involved, either for shopping or during the actual

purchase? How long did the transaction take? What was the share of wallet? Was the shopper alone, or with a friend or family member?

Further insight can be gained by combining outside data streams via the wisdom of the cloud. For example, which social media activities were associated with the sale? And what are the shopper's gender, age, income, marital status, educational level, and community memberships?

Through all of this, a detailed picture of the consumer emerges. Patterns can be charted, and future trends—individually and collectively—can be predicted.

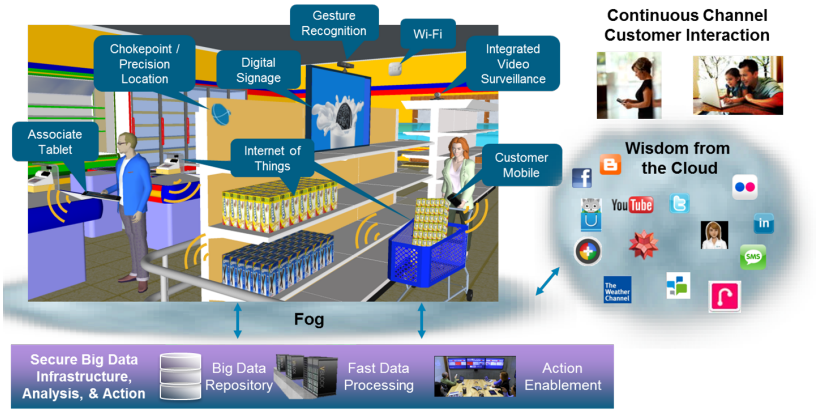
Big Data will further impact store operations in terms of layout, inventory, staffing, and customer interactions. Merchandising will gain from leaps in the efficiency and accuracy of marketing, branding, and promotions, while sourcing of products will benefit from a supply chain vastly improved in quality and logistics.

Shopping Scenarios of the Near Future

- As Jan browses near the toy section, location-based services track her mobile device. Big Data correlates her location with a calendar event for her niece's birthday, as well as her niece's social-media activity, to offer a toy promotion. Jan browses to that particular toy, but video analytics detect uncertainty in her body language. Big Data sends an associate to help alleviate her concerns and confusion. Jan buys the toy, and the entire episode is recorded and analyzed. Merchandisers review and update their data so that future promotions will preempt concerns.
- Elsewhere, a supermarket parking lot is filling up quickly, and the number of available hand baskets is low. Milk begins leaving the refrigerator section faster than usual. The count of items in pushcarts is trending above average. Big Data senses all of these events in real time, and sends two additional associates to the front, just in time to avert the buildup of lines and frustrated shoppers.

The in-store experience will evolve into something similar to the online shopping experience. Integrated video surveillance able to recognize gestures; the Internet of Things embedded into shelves, products, parking lots, and shopping carts; the customer's own Wi-Fi-enabled device—all will combine into new and complex data streams. Digital signage in the store will offer promotions and product information, while touch-screen interactivity will generate still more data about shoppers' wants and needs (see Figure 3).

Figure 3. Big Data in the Retail Store.



Source: Cisco IBSG, 2012

Going further, biometric sensors can potentially gauge a shopper's mood through gait, posture, gaze, and even body temperature. Real-time, in-store basket analysis can be compared with historic transaction analysis (just as online retailers do) to generate on-the-spot, highly personalized promotions and suggestions.

Today's consumers are so connected and device savvy that *they* will drive some of this innovation, not the retailers. Indeed, some of the interactive services will be *demanded,* not just appreciated. So retailers will have to be sure that they are opening their doors to the digital consumer by providing the right services.

Data that can't be captured by the retailer itself could be purchased through third-party intermediaries, what Cisco IBSG calls Data Infomediaries. Some companies, such as Pachube.com, are already brokering data streams. Moving forward, the Data Infomediary role promises to be an essential and expanding element in smoothing the path to Big Data success. These entities will have an opportunity to tie data originators (consumers) to data beneficiaries (including retailers) in lucrative and productive new ways. For retailers, a higher level of collaboration with these outside players will be essential.

Bundling all these streams together will result in a huge amount of information. But if processed properly, it promises a transformation in vital insights, impacting virtually every major area of retail operations. Merchandising will become customized and personalized. Sourcing and supply chain operations will gain much greater efficiency through speed, transparency, and enhanced collaboration. Marketing would benefit from the richness of customer profiles, and distribution and logistics would attain a leap in precision.

Retailers Already Stepping Up to Big Data

- **Walmart's** Social Genome project captures insight from unstructured data. It offers deep analysis of Tweets, Facebook messages, blog postings, and YouTube videos, and its customer database includes hundreds of millions of entities and relationships. Shopycat, the company's social-gifting platform, analyzes the social media activity of Walmart customers to recommend products. So far, 11 million Facebook users have "liked" Shopycat.[4]
- **Macy's** is using unstructured data to determine customer lifetime value. It uses SaaS technology to measure online marketing methods, including its marketing emails on store sales. Analysis of these emails helps measure a customer's life period with the company, while gauging the effectiveness of e-mail promotions. The company estimates that this analysis saves $500,000 per year.[5]
- London-based **Debenhams** implemented survey data aimed at collecting quality customer feedback to be used as a store audit program. In an online survey, the retailer collected 380,000 feedback responses, amounting to 25 million data points. In response, the company improved point-of-service and merchandise availability, as well as fitting-room conditions. Customer satisfaction improved by 9 percent (from 47 percent to 56 percent) in one year.[6]
- **Williams-Sonoma** has a database of 60 million households tracking variables such as income, number of children, and housing values. Offers embedded in email are tailored to consumers the moment they are opened, as analytics software calls on real-time data on location, age, gender, online activity, and inventory data. The retailer has lifted conversion rates by as much as 30 percent.[7]

Overall, mastering the new data streams represents an opportunity for retailers to be closer to the market, closer to the customer location, closer to the point of need, and closer to the customer value triggers—essentially knowing the customer in ways never before possible.

Architecting for Big Data Success (Concrete Steps to Big Data Bliss)

Retailers will need to gain the capability to acquire and store data, analyze and interpret it, decide what's important, implement on the basis of the insights gained, and measure and refine the actions taken from the new insights.

Here is a breakdown of what each of these capabilities entails:

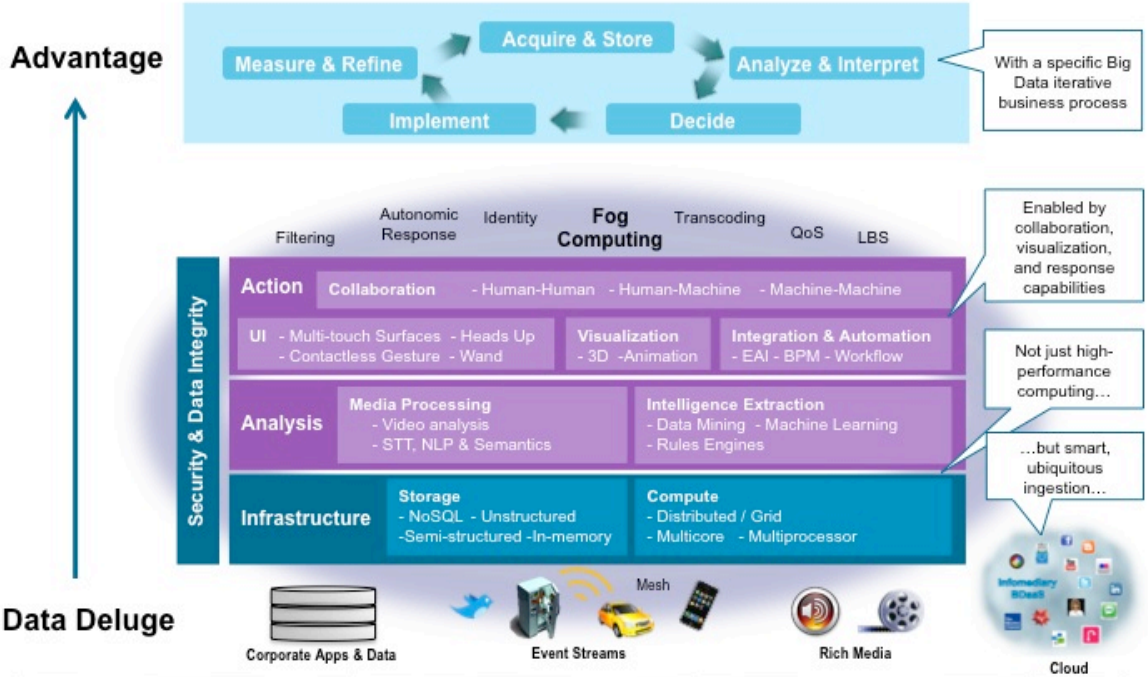
- To **acquire and store** data, retailers will infuse a data ecosystem mentality into their overall, companywide culture. Cross-functional approaches to data management will become part of their processes, and their assets will require the availability of new data sets and IT resources.
- To **analyze and interpret** data, retailers seek a culture rife with analytics teams, cross-functional collaboration, and openness to new types of talent (data scientists, IT specialists, data analysts, etc.). Company processes must reflect a cross-functional approach to data management. Company assets will need to acquire cloud readiness and analytics architectures.
- **To decide** on how best to use data insights requires a company culture centered on data-driven decision making. Its processes will demand a new data-driven intensity and use of collaboration tools. Once integrated throughout an organization, a collaboration architecture will link expertise from all levels into the decision-making process while supporting a fast final decision (and prior to that, alternative courses of action) with hard data.
- To **implement** on a Big Data level, the organization will develop a culture of innovation. Its processes will reflect speed of execution and process flexibility, along with an ability to customize its sales offerings to individual customers. At this stage, retailers will acquire reconfigurable digital assets such as data-memory systems, smartphone apps, and an interactive, data-driven website. All of these will enhance the ability to implement recommendations and actions based on Big Data insights.
- To **measure and refine,** the retail culture will take on an awareness of privacy issues and overall industry growth and pace of change. The value of accelerating or mass-customizing and automating processes will be fully understood. And assets will include unique capabilities for data acquisition and analytics, implementation, and advanced metrics.

To accomplish all of this, retailers need to consider adopting a holistic architecture for Big Data. This requires not only high-performance computing, but also the abilities to ingest large volumes of high-velocity information from myriad sources; to analyze new data streams from video and rich media; and to take action once that intelligence is filtered. This action will be greatly facilitated by new visualization and collaboration capabilities, and via integration with workflow and business-process management (see Figure 4).

To gain the core capabilities of storing and processing high-volume and high-velocity data, retailers can adopt an in-house platform. But they can also simplify the process by employing a cloud service, such as one of the growing list of Big Data-as-a-service providers. Others may opt for a hybrid approach.

Again, third-party infomediaries could play an important role in helping retailers build Big Data competency, increase data quality, and engage in beneficial "co-opetition" with other retailers, partners, or even players in other industries.

Figure 4. A Pragmatic Execution-Focused Mind-set, Enabled by the Right Architecture.



Source: Cisco IBSG, 2012

Building new Big Data business and technology architectures, however, is not enough. A key factor for success in driving real value and competitive advantage through Big Data lies in the ability to seamlessly and productively *collaborate.* This includes developing and executing Big Data opportunities at high speed, both inside—and outside—the walls of the enterprise.

Data will not answer questions just by itself. People will need to communicate quickly and effectively about the insights and, thereby, realistically link analytics to strategic decisions affecting the bottom line. A strategically architected, agile collaboration infrastructure is an absolute requirement.

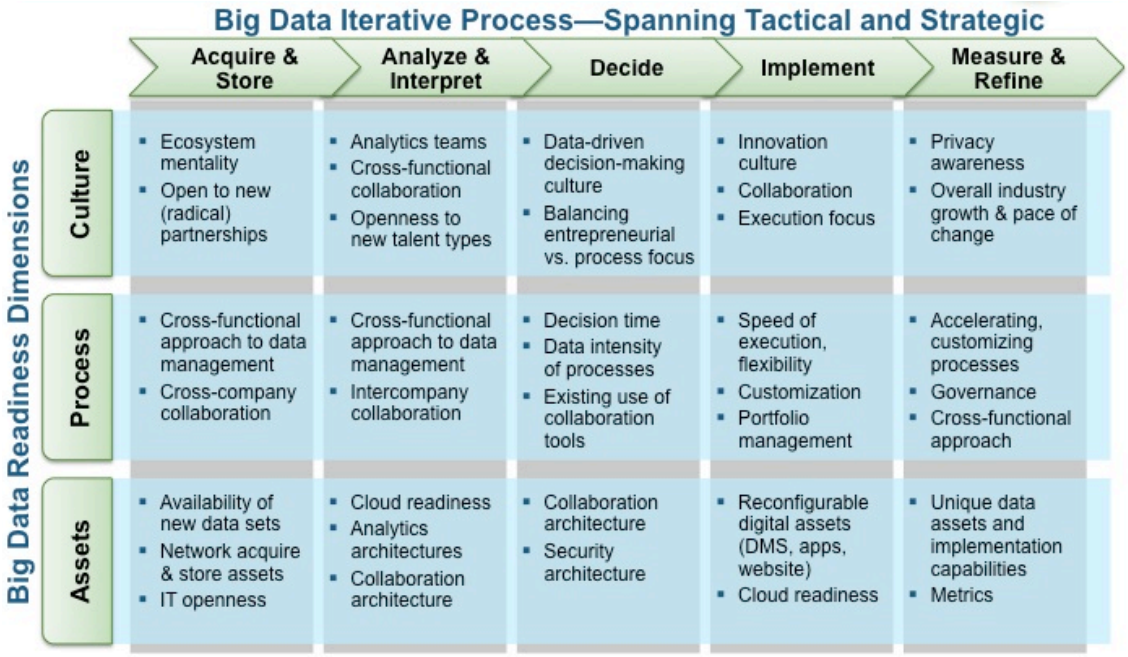
The Way Forward: A Pragmatic Plan for Getting Started with Big Data

Cisco IBSG has identified three key steps for retailers looking to reap the advantages of Big Data. It is important to note that these steps should not be seen as a "once only" activity. Rather, they will be part of a continuous process toward achieving a new mind-set within a company's culture, with the ultimate goal of building, expanding, and enhancing Big Data capabilities:

1. **Identify your big questions.** Business leaders will need to confront the crucial strategic decisions required for their organizations to grow (even if they are particularly difficult questions concerning shrink, new business models, and so forth). In short, what do you need to know that Big Data can answer? The organization will

need to identify specific metrics and data points that most closely align to its strategic goals. Some of those data points will already exist; some will need to be created anew. To accomplish this, decision makers will need to assemble a business-focused, cross-functional team incorporating business leaders, new analytic skills from data scientists, IT specialists, and so on; work through a fast, iterative proof-of-concept approach; and differentiate between what the team knows and what it can actually do about it. Alignment with overall strategic business goals is crucial—the organization must seek clarity around the value that Big Data analytics can bring.

Figure 5. Assess Your Big Data Readiness.



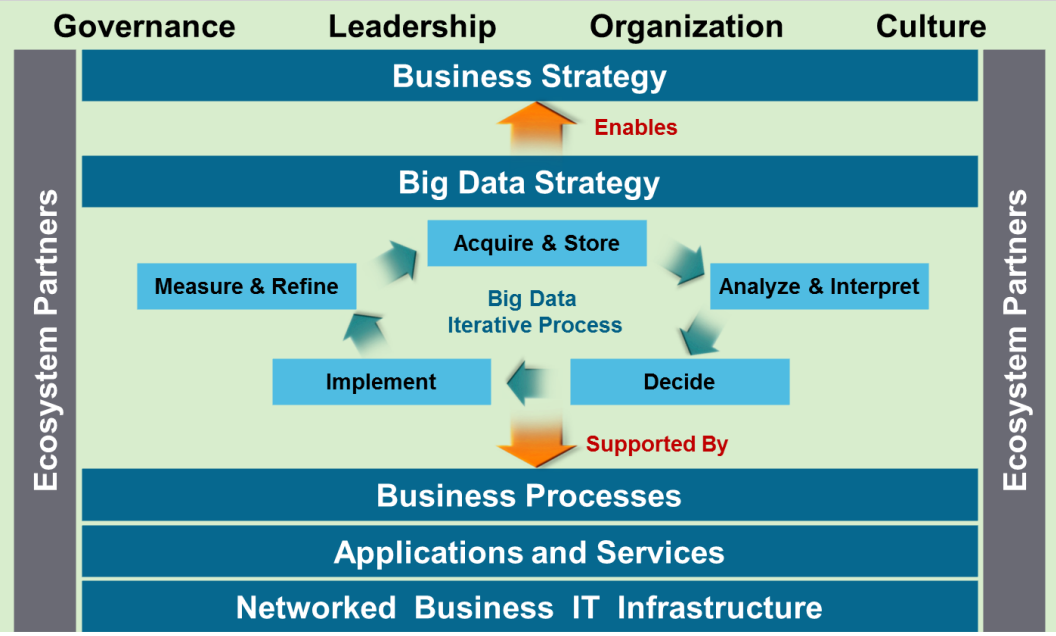
Source: Cisco IBSG, 2012

2. **Assess your organization's Big Data readiness and organize for success.** Once the organization reaches clarity and consensus on its big questions, it is time to assess where it stands in building Big Data capabilities. Figure 5 intersects the aforementioned Big Data process steps (acquire and store; analyze and interpret; decide; implement; measure and refine) with three organizational readiness dimensions: culture, process, and assets. Assessing the organization's strengths and weaknesses will help decision makers map their gaps and build a specific roadmap to full Big Data capability.

   Once that is accomplished, Organizing for Success (see Figure 6) becomes one of the most important steps in the Big Data journey. It involves anchoring Big Data capabilities throughout the organization to ensure that they will continue to grow and drive future success. Leadership is crucial; an executive should assume overall responsibility for Big Data strategy and operations. He or she can drive strategies and processes designed to cover all aspects of data management—ensuring accurate, complete, and integrated data—and then isolate the most essential

nuggets of data insight for decision making. Overall, the organization should seek to create an ongoing innovation mechanism to explore emerging data sets and connect with new partners for future collaboration. The goal must be to drive a truly collaborative business environment, thereby increasing the speed of innovation, and the accuracy, efficiency, and impact of Big Data.

Figure 6. Organize for Success.



Source: Cisco IBSG, 2012

3. **Develop business technology architectures** that enable Big Data capabilities. Beyond simply adopting specific technologies, such as cloud or analytics, the goal is to create a solid, agile, and scalable Big Data architecture capable of meeting current and future demands. Collaboration, visualization, and response capabilities are crucial. Over time, this will require a significant new IT domain with new design systems, administrative skill sets, and data management, access, and use policies.

Surfing the Data Deluge

These days, beleaguered retailers may feel that they are fighting to stay relevant in a world of Amazons, Googles, and Facebooks. The shifting paradigms and changing business models may seem overwhelming. And while they may have a good sense that business analytics is the way forward, they may also struggle with where to start. A retail organization might employ hundreds of thousands of people, and altering its overall culture and direction can seem a daunting challenge.

The good news for retailers is that their expertise is more relevant than ever. The four R's of traditional retailing that they know so well dovetail seamlessly into the realm of Big Data analytics. In short, Big Data offers a fundamentally more advanced and highly effective way to do what retailers have always done: *know the customer,* then supply the right product, at the right time, at the right location, at the right price.

Furthermore, that journey into the seemingly uncharted waters of Big Data is not as daunting as it may first seem. No matter how large the organization and no matter how entrenched its traditions, the approach outlined in this paper can help retailers identify first steps that will show concrete results rapidly. Those results will then drive further evolution in stages, eventually transforming the store setting, the organizational culture, and the customer relationship in vastly positive ways—at a pace that is manageable, without disrupting operations.

Again, once those essential insights are extracted, *Big Data isn't all that big.* The payoff for retailers that learn how to surf the data waves, however, will be.

For further advice on surfing the data deluge in retail, please contact:

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Endnotes

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