How Advanced Analytics Will Inform and Transform U.S. Retail

Executive Summary
During the “Great Recession,” many retailers were forced to cut costs to stay afloat. This cost-cutting gave some retailers a head start toward profitability when the recovery began in 2009. Two years later, conditions are now ripe to embrace new technologies and processes to capitalize on building market momentum. One critical area for investment is advanced analytics.

Three forces are at work, reinforcing the need for retailers to more quickly transform the torrent of raw data generated from the Web (including social media) and their brick-and-mortar presence into bankable insights:

1. **Macroeconomic indicators:** Indicators such as personal disposable income, consumption expenditure and consumer confidence all point to a modest recovery for retailers (although the recent spike in oil prices could undermine these projections). Quicker conversion of raw data into foresight will provide a first-mover advantage that is critical to retailers seeking to establish or maintain segment leadership.

2. **“Spend shifters”:** The emerging class of “spend shifters” — or people who have downshifted their purchasing habits by buying less, choosing less expensive brands and saving more — has made it imperative for retailers to correctly target their customers.

3. **The ever-increasing volume of data accessible from multiple sources:** With offline retail sales increasing at an estimated 4.4% CAGR, and online retail sales expected to grow at an estimated 10% CAGR for the next five years, retailers will have a rich pool of available data from Web and store interactions to apply to more timely and precise decision-making.

The good news — in addition to the availability of more data — is the evolution of analytics, which has transitioned from standard reports to real-time data feeds that can optimize planning and fine-tune business strategies on the fly. Among the emerging approaches are operational analytics, text analytics, sentiment analysis and visual analytics. According to a study by Thomas Davenport, an analytics guru and distinguished professor of management and information technology at Babson College, retailers must look at applying analytics not only to maintain ruthless cost-cutting strategies but also to increase revenue across key geographies and market segments. The emergence of analytics services delivered via a cloud infrastructure can enable retailers to leverage lower-cost, pay-per-use models and skilled analytical resources, regardless of physical location.

**Macroeconomic Indicators**
The retail industry represents a key sector of the U.S. economy, with a total value of $4 trillion in 2010 and an estimated 27% of the U.S. Gross Domestic Product (GDP) emanating from retail consumption. The retail industry’s share of employment is roughly 12%. Between 2001 and

---

**EXECUTIVE SUMMARY**

During the “Great Recession,” many retailers were forced to cut costs to stay afloat. This cost-cutting gave some retailers a head start toward profitability when the recovery began in 2009. Two years later, conditions are now ripe to embrace new technologies and processes to capitalize on building market momentum. One critical area for investment is advanced analytics.

Three forces are at work, reinforcing the need for retailers to more quickly transform the torrent of raw data generated from the Web (including social media) and their brick-and-mortar presence into bankable insights:

1. **Macroeconomic indicators:** Indicators such as personal disposable income, consumption expenditure and consumer confidence all point to a modest recovery for retailers (although the recent spike in oil prices could undermine these projections). Quicker conversion of raw data into foresight will provide a first-mover advantage that is critical to retailers seeking to establish or maintain segment leadership.

2. **“Spend shifters”:** The emerging class of “spend shifters” — or people who have downshifted their purchasing habits by buying less, choosing less expensive brands and saving more — has made it imperative for retailers to correctly target their customers.

3. **The ever-increasing volume of data accessible from multiple sources:** With offline retail sales increasing at an estimated 4.4% CAGR, and online retail sales expected to grow at an estimated 10% CAGR for the next five years, retailers will have a rich pool of available data from Web and store interactions to apply to more timely and precise decision-making.

The good news — in addition to the availability of more data — is the evolution of analytics, which has transitioned from standard reports to real-time data feeds that can optimize planning and fine-tune business strategies on the fly. Among the emerging approaches are operational analytics, text analytics, sentiment analysis and visual analytics. According to a study by Thomas Davenport, an analytics guru and distinguished professor of management and information technology at Babson College, retailers must look at applying analytics not only to maintain ruthless cost-cutting strategies but also to increase revenue across key geographies and market segments. The emergence of analytics services delivered via a cloud infrastructure can enable retailers to leverage lower-cost, pay-per-use models and skilled analytical resources, regardless of physical location.

**Macroeconomic Indicators**
The retail industry represents a key sector of the U.S. economy, with a total value of $4 trillion in 2010 and an estimated 27% of the U.S. Gross Domestic Product (GDP) emanating from retail consumption. The retail industry’s share of employment is roughly 12%. Between 2001 and
Forces Driving Analytics

<table>
<thead>
<tr>
<th>Force</th>
<th>Implication</th>
<th>Impact</th>
<th>Application of Analytics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Macroeconomic</td>
<td>Disposable personal income and consumer spending are bouncing back; consumer confidence is growing.</td>
<td>The retail industry is set for better times, but consumers are more value-conscious.</td>
<td>Apply analytics to identify and serve the right consumer, profitably.</td>
</tr>
<tr>
<td>Spend Shifting</td>
<td>Consumers are becoming more tech-savvy and want transparency from retailers.</td>
<td>Retailers need to continuously listen, respond and innovate to cater to more knowledgeable consumers.</td>
<td>Apply analytics to bolster both the top and bottom lines.</td>
</tr>
<tr>
<td>Omnipresent Data</td>
<td>Data is available from multiple sources, including mobile and social media.</td>
<td>There are increased opportunities to analyze data.</td>
<td>Leverage analytics to make better decisions.</td>
</tr>
</tbody>
</table>

Source: Cognizant Research Center
Figure 1

2010, U.S. retail revenues grew at CAGR of 4.4% (see Figure 2). Disposable personal income and consumer spending are bouncing back after a dip in 2009, indicating a revival in consumer demand (see Figure 3). The long-awaited but still uncertain increase in employment and income, as well as improvement in consumer demand, could help further fuel the recovery of retail sales in 2011.

The consumer confidence index (see Figure 4) also shows an upward trend. However, research suggests that consumers are thriftier than ever before. As a result of limited consumer credit following the recession, consumers are increasingly opting for discounted products. This is further evidence that retailers need to understand shopper sentiments, product preferences and customer segments better than before.

Retailers face other macro-economic headwinds. The 34% spike in gasoline prices (from May 2010 to March 2011) is clearly a deterrent to retail performance. Sky-high gasoline prices are causing a ripple effect across global supply chains, driving up structural costs. As a result, retailers are passing on the extra cost to consumers.

The employment cost index is also far above its pre-recession levels (see Figure 5). This is adding further to retailers’ total overhead.

Overall, key macroeconomic indicators suggest that the U.S. retail industry is set for gradual improvement. The good news: The slow but steady upturn is likely to generate a treasure trove of data for retailers. The not-so-good news: Retailer capacity to effectively process, manage and apply analytics to fast-growing volumes of data will be tested. One key reason for this is that during the recession, many retailers cut costs to the bare minimum by reducing their workforce. Headcount reductions left many retailers suffering severe

Growth in Retail for Supermarkets, General Merchandise Stores

Source: U.S. Census Bureau
Figure 2
brain drain; in some cases, they eliminated specialty positions that were considered a luxury—business intelligence and analytics among them.

The projected uptick in business provides an opportunity to maximize value from available human resources, while extending capabilities with third-party experts. A trusted partner specializing in retail analytics can help rapidly transform data into actionable insights by tapping emerging techniques, such as operational, text, sentiment and visual analytics. If these analytics are delivered as a service, the retailer will then pay only for insights that are actually used, eliminating the need for additional capital expenditures, since no additional investment in hardware or software is required.

Spend Shifters

The Great Recession was preceded by a consumption binge. Consumers spent wildly on many luxury items. But today, post-recession consumers are radically reducing their rate of consumption and conspicuous display of wealth. Consumer spending is no longer outdistancing personal income. This is both a voluntary decision, as well as a result of increased consumer savings and reduced borrowing, due primarily to tighter credit policies.

Two attributes of spend shifters is that they are highly tech-savvy, and they want retailers to be as transparent as possible. They crave information about their retailers (product offerings, services, pricing, etc.), and they usually find it. Therefore, retailers that wish to serve this consumer
segment will have to continuously listen, respond and innovate. The growing use of social media gives retailers an additional stream of unstructured information on this segment’s beliefs and behaviors, presenting a great opportunity to convert raw data into bankable knowledge.

Omnipresent Data

Shopping is increasingly becoming multichannel, with customers completing transactions through smartphones, personal computers and physical stores, as well as researching products through social networks. All these devices generate growing volumes of consumer data, which retailers can utilize for more effective targeting. There were five billion mobile users globally in 2010, generating data about their location, the Web sites they visit and the products and services they buy through their mobile phones. Approximately 30 billion pieces of content are shared on Facebook every month. The projected growth in global data generated annually is expected to rise 40%, from 2011 to 2015.6

At a time when many retailers are offering an equivalent range of products, using similar promotional campaigns and suppliers and targeting the same customers, a key point of differentiation will be the quality of their decision-making. This makes it incumbent on retailers to not only integrate data from various sources, but to also use analytics to enhance business capability. This will help inform strategy and lead to long-term benefits (see Figure 6).

Benefits of Analytics

<table>
<thead>
<tr>
<th>Organization</th>
<th>Benefits Attributed to Analytics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cabela’s7</td>
<td>Improved direct mail performance by 60%.</td>
</tr>
<tr>
<td>Sam’s Club8</td>
<td>Increased response rate for coupons from 2% to 20%.</td>
</tr>
<tr>
<td>CVS</td>
<td>Analytics capability viewed as a nine-figure profit center.</td>
</tr>
<tr>
<td>Hudson’s Bay Corp</td>
<td>Achieved a 2.1 return on its database management and analytical efforts.</td>
</tr>
<tr>
<td>JCPenney</td>
<td>Increased inventory turns by 10%.</td>
</tr>
</tbody>
</table>


Employment Cost Index

Source: U.S. Bureau of Labor Statistics

Figure 5

Employment Cost Index

Source: U.S. Bureau of Labor Statistics

Figure 5

One of the most important activities for any business is optimizing business processes, and a very effective way to do this is to use analytics across various functions within the organization. Customer, employee and supplier data is plentiful and to some degree is the “oxygen” for analytics. Still, survey after survey reveals that organizations are not effectively using all the data they have. According to the study “CFO Insights: Delivering High Performance,” 60% of workers feel overwhelmed by the amount of information they receive, and 43% of managers believe that too much information is a hindrance to better decision-making.9 By using analytics to harness the plethora of information in organizations, management has the ability to drive better and more informed decision-making.
Application of Analytics
The practice of analytics has evolved from simple reporting to predictive modeling and optimization (see Figure 7).

Retailers’ use of analytics has gradually spread to several key areas of business:

- **Identifying the most profitable customers.** Correctly identifying the most profitable customers can maximize a retailer’s return on investment for various in-store activities. Retailer offerings should align with the behavior of the most profitable customer segments. For instance, the most profitable customers should be able to easily find desired products. If retailers ensure the availability of the right items at the right locations in the right quantities for the most profitable customers, margins will increase. For instance, when analytics helped Best Buy identify that 7% of its customers accounted for 43% of its sales, it reorganized its stores to address the needs of these high-value customers.10

- **Understanding customer behavior.** Though each customer is considered unique, it is still possible to classify groups of customers who exhibit similar behaviors. If retailers can understand this behavior, they can target specific customer types more effectively. This classification will also help them with cross-sell and up-sell opportunities, as well as targeted marketing. To accomplish the required customer classification and segmentation, a class of techniques called cluster analysis and decision trees can be used. Within cluster analysis, both hierarchical clustering and k-means clustering11 can be applied. In decision trees, CART (Classification and Regression Trees) and CHAID (Chi Square Automatic Interaction Detection) can be utilized. These classification techniques can profile consumers using demographic and behavioral predictors. Cross-shopping behavior can also be analyzed. Retailers can test hypotheses, such as whether they should differentiate their products if their strategic positioning is “low price.”

- **Assortment planning and optimization.** This helps retailers discover various style and color combinations, as well as the quantity they should buy. The retailer’s capacity requirements can then be defined and addressed. Consumer choice models can become the platform for assortment planning. These models have been further classified into utility-based choice models and exogenous demand models. In 2004, Walmart noticed a rush to purchase flashlights and batteries before a hurricane struck. The forecast of a hurricane also resulted in an increased sale of Pop-Tarts, a sugary breakfast food.12 This insight was obtained through exogenous demand models.

- **Accurate prediction of what products should be sold together.** Market basket analysis provides retailers with insights into the combination of products to be stacked together to increase individual transactions.

The Evolution of Analytics
• **Pricing optimization.** Pricing can be a game changer for any retailer. Macy’s was able to analyze pricing in 95% less time using price optimization. For pricing each item on a weekly basis, Macy’s examines the last three years’ worth of data and analyzes which of these items were sold in exceptional quantities, even at a higher price, and which items were not sold at a higher price. Based on this, merchandisers place an optimal price on each item. Pricing optimization is credited with saving Macy’s 70% in hardware costs, according to Brian Leinbach, Macy’s senior vice present, systems development applications.13

Staples is another retailer that puts pricing optimization to effective use. Staples runs approximately 1,500 multichannel campaigns and uses analytics to discover up-selling and cross-selling opportunities. In this context, Jim Foreman, the company’s director of circulation and analytics, recently told SASCOM Magazine: "We did a financial analysis of the implementation, and we found that we were getting a rate of return of 137%. That’s about as much of a slam dunk as you are going to see.”14

• **Procurement and spend analytics.** This optimizes the organization’s supply-side performance by integrating data emanating from the enterprise value chain. In this scenario, data from the supplier’s supplier is integrated all the way to the customer. The retailer, therefore, would know, with precision, total product costs. This helps in identifying cost savings across geographies, product categories, business units and procurement organizations. Suppliers that are inconsistent can also be identified. Data collection time can be reduced to allow managers to focus on decision making.

Walmart uses an inventory management system (called Retail Link) that enables its suppliers to see exactly how many of its products are on every shelf of every store at any given moment. This helps Walmart manage its stocks better. Published case studies reveal that the retailer’s sales increased by more than 40% per SKU as a result of using Retail Link.16

The Future of Retail Analytics

As increasing amounts of data become available and analytics grow more sophisticated, the following types of applications should be considered by retailers:

• **Operational analytics:** This is a method in which automated decisions are made almost immediately, as they are typically embedded within operational business processes. With better real-time availability of shopping cart information, as well as automated rule engines or rapid scoring of purchase behavior, it becomes possible to offer promotions and maintain stock in real time. This real-time information can be obtained by using RFID tags attached to each product. As soon as the item is put into a shopping cart, a message is dispatched to a supervisor to refill the shelf space. Analyzing this information over time will drive better inventory management.

• **Text analytics:** Loads of data are generated through social media. Retailers need to analyze this data to proactively see consumer trends and respond appropriately to discussions that can affect retailer performance and reputation. This technique can also be used to understand in totality what customers think about a particular product or service. Qualitative analysis of consumer behavior on Web pages, blogs, and social media can help determine more granular customer attitudes toward particular products. Text analysis of the information shared by customers on social networking sites and blogs is conducted to learn customer dispositions on a wide range of product and company attributes. This could be very helpful in getting the strategy of the retailer on the right track.

• **Visual analytics:** This is used to summarize patterns and activities in video images and to create alerts for particularly undesirable (or desirable) behavior in which human viewing would be required. This can be used in both in-store and online settings.

Harnessing New Opportunities: Analytics as a Service

While the aforementioned methods are moving into the mainstream, big retailers with multiple business units tend to have various databases supporting a wide range of market initiatives. Collating and analyzing all necessary data elements from disparate sources, however, can be a challenge without expert assistance. Working with a trusted third-party can bring sanity to an otherwise chaotic process beset by resource constraints.
While all these benefits can be obtained by crunching numbers internally, the complexity of individual tasks that lead to successful outcomes requires the deployment of specialty teams with interconnected and streamlined processes across functions. Traditionally, these teams are formed by removing employees from existing departments and creating new functions, thus reducing the productivity of those departments and, in some cases, adding overhead. On the other hand, if a specialist organization is given this responsibility, then operational efficiencies would be expected to increase, since existing headcount would remain flat and focused on core activities.

Analytics service providers typically possess demonstrated capability and the experience to streamline and jumpstart the process. With large pools of experts, analytics service providers often have an industry-wide view as a result of their work serving a wider audience. An outsider’s view of the data and analysis could also be a differentiator because in-house experts can be biased and challenged to see the bigger picture vs. business details.

This expertise can be provided through a model known as business process as a service (BPaaS), which is emerging as an alternative way of handling business activities that can be more easily standardized, virtualized and delivered via the cloud. While organizations obtain services in a lower cost, pay-per-use mode with BPaaS, they also take advantage of expert advice from their service providers.

According to a 2011 CIO survey by InformationWeek, 20% of companies won’t own their IT systems in five years. In fact, 43% of the respondents surveyed are either using or plan to use some type of cloud service in the next 12 months. If this survey is any indication, the future of retailing is upon us, a future where systems ownership is left to specialists responsible for hardware and software upkeep. With the right insights delivered as a service, no retailer should be left behind.

Footnotes
5. Employment Cost Index (ECI) measures the change in the cost of labor among occupations and industries.
K-means clustering is a segmentation technique where “n” observations are clustered in “k” clusters in which each observation belongs to the cluster with the nearest mean.


Resources


Author
Sanjay Fuloria, Ph.D. and Senior Research Analyst
Cognizant Research Center

Subject Matter Expert
James Pise, Senior Engagement Manager
Cognizant Enterprise Analytics Practice

About Cognizant
Cognizant (NASDAQ: CTSH) is a leading provider of information technology, consulting, and business process outsourcing services, dedicated to helping the world's leading companies build stronger businesses. Headquartered in Teaneck, New Jersey (U.S.), Cognizant combines a passion for client satisfaction, technology innovation, deep industry and business process expertise, and a global, collaborative workforce that embodies the future of work. With over 50 delivery centers worldwide and approximately 111,000 employees as of March 31, 2011, Cognizant is a member of the NASDAQ-100, the S&P 500, the Forbes Global 2000, and the Fortune 500 and is ranked among the top performing and fastest growing companies in the world. Visit us online at www.cognizant.com or follow us on Twitter: Cognizant.