

Beyond Big Data: How Next-Generation Shopper Analytics and the Internet of Everything Transform the Retail Business

By Kathryn Howe
Senior Advisor - Retail Industry



Executive Summary

Few industries are changing more rapidly than today's retail sector. A still-turbulent economy, new selling channels, advanced digital technologies, and increasingly demanding consumers all challenge retailers to find new ways of remaining relevant and competitive. The purchasing decision journey for consumers involves multiple steps, many of which are now being captured, digitized, and transformed into metrics and data. As this data becomes an implied derivative of essential retail and consumer technologies, the focus is shifting from

how to acquire the data to how to extract insights from it—insights that can be turned into differentiation and competitive advantage for the retailer and a better shopper experience for the consumer.

But the main challenge of big data is just that—it's big. Massive amounts of structured and unstructured information are piling up in retailer and supplier data warehouses. Customer metrics derived from video and other sensors, social media, call centers, and mobile devices have the power to provide unprecedented insight into the purchase decision process.

Yet the rate of data flowing into the enterprise and the vast array of sources available can paralyze retailers as they try to decipher which data types to use, in which combinations, for which insights and decisions. Selecting the metrics to operationalize into dashboards and KPIs versus those which should be tapped only occasionally for directional insight is an ongoing exercise in data value assessment.

Still more data can be derived as businesses and consumers move into the realm of pervasive connectivity that defines the Internet of Everything (IoE) world. IoE combines people, processes, data, and things to enable the transfer of information and create new potential for business innovation. Sensors and devices offer up data from previously unconnected processes and their components, expanding the role of data in decision making across the entire retail enterprise.

This paper introduces some general concepts of shopper behavior analytics and explores why getting started using analytics is an imperative for today's retail operators. We will also outline a number of use cases where inserting the right data and analysis can deliver value to the decisions retailers are making today. This helps them to optimize every part of the customer decision journey to improve conversion, margins, and brand experience.

The Role of Analytics in the Retail Sector

Analytics are driving the move from merchant-driven business models—where the product is the differentiator—to digital models, where every decision is informed by data. Brand engagements are becoming more closely aligned with individual shopper preferences, creating a brand relationship that is shifting from a “nice to have,” time-sensitive offer-based relationship to a “must have” digital companionship based on deep insights and understanding of the consumer. To achieve this critical differentiation, retailers are depending less on

increasingly shorter product cycles and more on the enduring differentiators of relationship and customer experience created through strategic use of data and analytics.

Companies increasingly understand that their ability to compete is tied to their ability to create and harness value from data, and are seeking new ways to look at big data and beyond. Nearly half of retailers worldwide have big data initiatives, and across all industries companies will spend an average of \$8 million on big data initiatives in 2014 alone.¹

Yet so far, while retailers regularly utilize web analytics for site maintenance, management, and marketing, relatively few utilize advanced analytics in the physical store. Shopper insights in the physical store have historically been gained through highly manual processes lacking objectivity and scale. According to Tony Costa in the *Harvard Business Review*,⁶ “most companies are flying blind when it comes to understanding their customers in the analog world.”

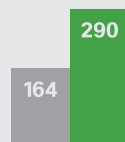
In fact, Cisco® research shows that retail has a significantly high potential value to be gained by using IoE to gather store metrics—up to 11 percent, or up to \$1.584 trillion in additional net profits.⁷ This value is driven by specific use cases: For example, it might encompass guiding and influencing the customer journey, improving workforce productivity, creating connected inventory views, or reinventing investment models for marketing, promotion management, and advertising.

Retailers need good data; but more importantly, they need the *right* data to gain the insights that can transform their businesses. Value comes from analyzing new data types in the context of specific business knowledge, such as transaction log (T-log) and loyalty information, campaign results, and pricing actions. Every shopper engagement, inventory movement, and promotion leaves a data trail providing opportunities for new capabilities, both from historical data and real-time information, to support decisions across the business.

Big Data Explosion

164TB

Manages an average of 164TB data²



Will manage 290TB in the next 12-18 months (76% growth)³



The amount of managed data will grow 800% over the next five years⁴



Nearly 1/3 of the largest enterprises will manage 1PB datasets by 2015⁵

Operationalizing New Metrics

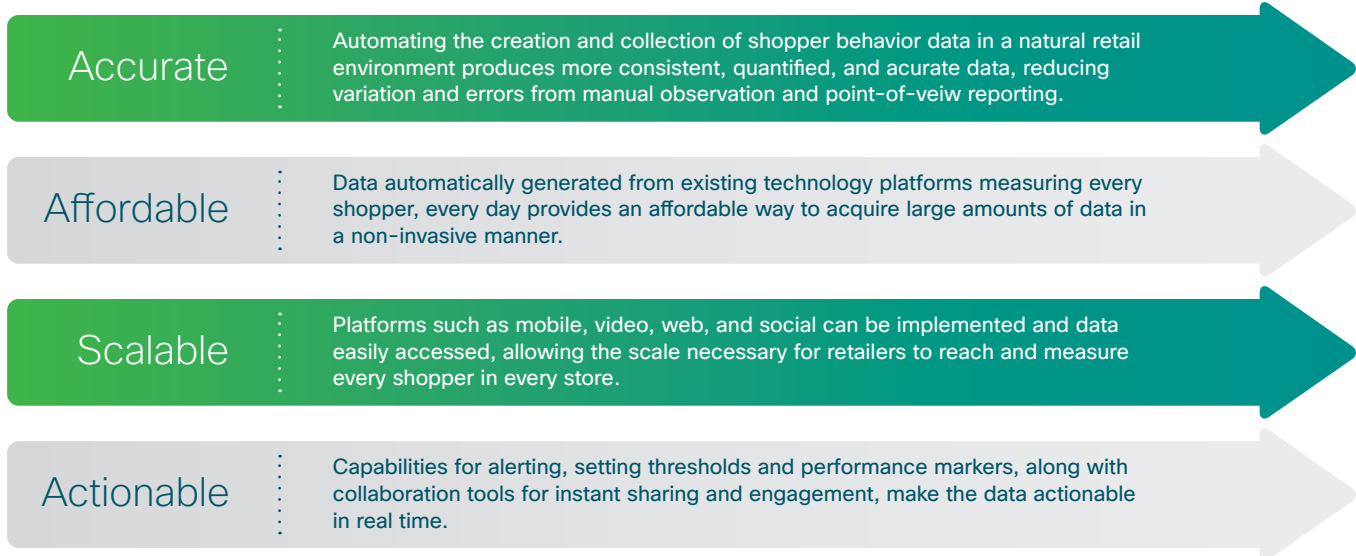


Figure 1

Data science and analysis allows retailers to collect and fuse data from multiple customer touch points such as web, store, social media, and call centers. IoT technologies combine these with metrics from previously analog components such as carts, doors, machines, and merchandise. Operationalizing the use of this data across business processes now becomes a more practical proposition, with reliable, automated methods of producing and collecting data across large populations of people and devices.

Trusting the Data

The use of data to inform decision-making is of course not a new concept. What is new is that through IoT technologies, retail data can finally be extracted in ways that make it reliable for use in managing large-scale retail businesses. For such data to be useful it must meet four key criteria: It must be accurate, affordable, and scalable (all afforded by the evolution of key technologies), and finally it must be actionable (Figure 1). Retailers in turn must commit to using the data to make business decisions—a pivotal cultural change that sounds easier than it sometimes is to accomplish!

As an example, a retailer has a seasoned and accomplished shoe designer who insists that a new five-color palette of neons for teen athletic shoes is spot-on for back to school. At the same time, social media data is showing positive sentiment around three core colors, and minimal or negative interest around the

retailer's campaign focused on neons. As well, last year's T-log data shows a trending up for black and white in the last two weeks of the back-to-school program.

Convincing this seasoned designer to create or assort a product based on data evidence for shopper preference can be challenging and even risky. Inserting insights into the creative process at the *right time* can give it direction and inspiration. Inserting the facts at the wrong time can stifle the process and put product innovation at risk. Based on trustworthy analytics, the retailer can preserve the value of the "art" and still balance it with real data-driven decision making using a combination of social sentiment, T-log data, and their own brand value position. This is how true business value can be derived; from mapping the right data to the right process at the right time.

Defining the Metrics

Understandably, retailers are so far focusing on metrics that reflect and impact the customer journey. Such analytics are essential for creating differentiation, as they provide insights into how and why shoppers make the decisions they make along their path to purchase. Metrics generated from mobile, video, web, and social media help to improve shopper marketing as well as operations (Table 1 shown on page 4). Many of these metrics and insights are used by retailers across their entire store population to measure a key performance element

Shopper Behavior Metrics / Insights	Operational Metrics / Insights
<ul style="list-style-type: none"> • Traffic (entrance, aisle, endcaps, departments) • Unique visits, repeat visits • Associated/unassociated devices • Path metrics • Photo pins/repin activity metrics • Dwell times and events • Queue metrics (number in queue, wait times, abandonment, behaviors in queue) • Gender metrics • Kinetic heat maps • Behavioral data visualization • Facial detection/recognition • Basket metrics (IPT, ATV) • Conversion analysis for promotions/tactics • Social sentiment/influence • Conversion (store, aisle, category, SKU) • Check-in/opt-in rates 	<ul style="list-style-type: none"> Point-of-sale analysis and transaction attributes • Staff productivity metrics • Engagement rates • On-shelf availability – out of stocks/replenishment • Shelf activity/item movement • Sweeps and risk management • Asset tracking (carts, fixtures) • Energy use analytics (lighting, HVAC) • Space analysis metrics (hot spots/cold spots) • Wi-Fi service utilization/ interference • Repair, replacement warnings • Queue metrics • Conversion analysis for operational variables

Table 1: Examples of Metrics

that, either on its own or in combination with other metrics, quantifiably improves their ability to manage the business.

For example, measuring traffic into each store provides interesting information on store activity trends, peak periods, and some top-level impact assessment of variables such as weather, holidays, and promotional events. The real value, however, is in combining operational data such as workforce management information with these insights in order to lower the cost of labor or improve return on labor investments. Doing this in every store, every day can contribute to significant bottom line savings and top line revenue growth. Ultimately, these insights help leaders make large-scale decisions across the company that can add up to millions of dollars.

Other metrics can be used for informing specific decisions that may impact all store locations, but don't necessarily need to be measured all the time. One example of this would be using traffic and dwell time metrics to measure the ability of a digital sign to engage shoppers. A retailer may wish to test

which message content on which screen size stops more shoppers before making a major investment. This data can be extremely valuable as part of an IT investment decision process, but it doesn't need to be collected in every store, every day.

Data-Gathering Sensors and Tools

Metrics can be gathered using a wide variety of sensors and devices, including smartphones, Bluetooth® beacons, weight and motion sensors, counting systems, active RFID tags, and even ambient condition sensors for moisture, weather, and temperature. The most advanced analytics systems can integrate data streams from these types of sources with business information systems, merging workforce information, POS transactions, loyalty, and subscription data. Ultimately, seamless sharing and access to all these different types of information is the key to creating adoption and delivering business value. Strategies that consider real-time collaboration tools as part of the data value equation, deliver complete systems to their users; facilitating the insights-to-action value proposition.

Because consumer preferences are often expressed through their movements and activities around the store, retailers are increasingly using video as a sensing device. Today's HD cameras provide highly sophisticated analytics capabilities that convert movement into data right at the camera. With analytics at the device, or "edge," of the network, stores can respond to customer needs and inventory demands in real time, making the operation more flexible and efficient. Since achieving scale and accuracy are two of the pillars that lead to improved operational use of data, note that video-generated data achieves this by converting the process of gathering manual observations into a set of automated metrics. Video footage does not necessarily need to be stored once the metrics have been generated.

This results both in reduced storage costs and more accurate metrics, scaling to apply to every shopper in the camera view while providing privacy and data anonymity. (However, when cameras are also used for loss prevention or physical security, video may be retained according to normal retailer governance around privacy.) While many retailers are concerned about crossing the privacy line with such programs, Cisco's most recent shopper preference research in fact indicates that especially younger customers are willing to give up a certain amount of privacy if they can get something in return for it.⁸

Information gathered from in-store and online activity can also be augmented by opt-in social media monitoring and location-aware mobile analytics. Participating customers using mobile networks and social media from the store, or showrooming, at the same time identify their influencers, relevant demographics, likes, dislikes, and preferences, allowing stores to capitalize on this often-dreaded practice. Based on the fusion of this data, a map can be automatically created to help location-aware systems deliver contextual content. Such messages may promote products, offer timely price matches, or drive related product awareness to encourage upsell as the customer moves throughout the store.



By combining these data streams and many others, retailers can now have visibility into all customer/brand touchpoints, creating a truly better omnichannel experience from leveraging a more complete picture of the shopping journey.

The Power of Understanding Conversion

In specialty retail, it is generally accepted that conversion is the standard for comparative performance measurement. Conversion is a foundational metric—the first of the predictive analytics building blocks and a requirement for creating high-performance retailing in the IoE era. It normalizes sales performance against the variable opportunity associated with each store, aisle, and category.

There are different definitions of conversion, but the true basic calculation is quite simple: Conversion is the measure of transactions generated by a population of shoppers. For example, if 1,000 shoppers generate 800 transactions, the result is an 80% conversion rate.

Key Metric for Creating Actionable Insights

$$\text{Conversion Rate} = \frac{\text{Number of Transactions} \text{ (document icon)}}{\text{Number of Shoppers} \text{ (people icon)}}$$

Some retailers, particularly in fast-moving consumer products segments, use the number of transactions as a proxy for conversion, assuming that all shoppers generate at least one transaction. This is fundamentally incorrect and can cause businesses to overlook key problem areas. Of course, in grocery and other areas where conversion is usually very high, some of the most valuable conversion comparisons actually come from aisle-, category- and display-level analysis. Here the same calculation applies, only the traffic count, or opportunity, is the number of shoppers reaching the aisle, category, or display.

In the past, T-log data has been used to measure store performance, with comparisons being made between stores, prior years, and seasons based on sales revenues. The issue is that store managers and financial officers often assess such numbers and then offer anecdotal insights to caveat the numbers, such as "Traffic was down that week," or "The weather was especially bad this week and fewer people were shopping." These insights can in fact contribute to performance variations. But because they are collected subjectively and not

consistently reported, their important contributions to learnings are often discounted or even disqualified from the analysis.

Let's examine a typical store-to-store comparison using sales revenue and transaction count. If Store A reports POS revenue of \$10,000 and 60 transactions, and Store B reports \$20,000 and 100 transactions, the conclusion might be that Store B is the better performer. However, once shopper traffic is taken into consideration, we may find that Store A had 100 shoppers that week and Store B had 200. We now must consider the performance results in the context of one very important variable: *opportunity*. What opportunity did each store have that week to generate sales? Let's look at the population of shoppers. Using this definition of the opportunity variable, we see that Store A actually converted 60% of its opportunity, while Store B only converted 50%. The sales numbers and ATV are of course better in Store B, but over time they can create a false sense that the business is healthy, when in fact more shoppers may be leaving without purchasing. If Store B could actually convert at the rate of Store A (60%) and keep its average transaction value (\$200/transaction) the same, it would contribute \$4,000 more each week, even without any improvement in traffic. That would be an additional \$208,000 per year from a single store!

Such an example illustrates how lack of visibility into store metrics can unintentionally place the business at risk. In such a case, retailers who don't measure traffic to get a true conversion calculation may find themselves confronting the "silent killer": symptomless factors that are silently eroding their business and causing shoppers *not* to purchase.

The good news is that today's automated analytics provide powerful ways to detect, track, and measure these critical factors and bring symptoms to the surface early, before they do too much damage. With these capabilities, not only can retailers accurately measure store-level traffic, scaling up to the largest of retail enterprises, but they can also measure traffic at more granular levels down to departments, aisles, fixtures, and individual products.

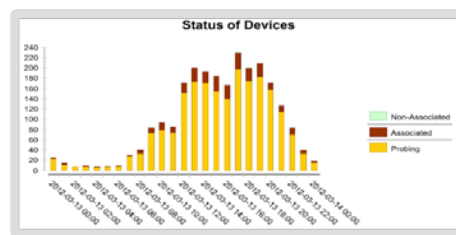
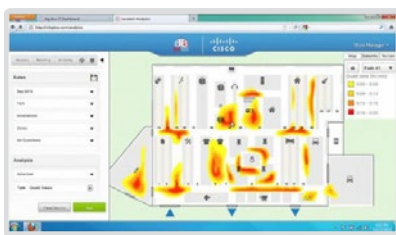


How Can Retailers Get Started with Analytics?

Defining a far-reaching analytics strategy starts with the basics: having a good vision of the endgame. Each retailer needs to answer the question, "What does it take to win?" in the context of their specific company, market, promotion, category, department, or process. It sounds easy, but it often is not: Part of designing a data strategy is defining the decisions that need to be made and mapping the right data to inform them. Once the data requirements are defined, the analytics sources can be selected. Let's look at some simple examples to highlight the process.

Imagine that *what it takes to win* for a mall retail store is the basic need to get the shopper to enter the store. Perhaps the conversion rate is actually quite high once they enter, with an average ticket that is up year over year, but the greatest hindrance to "winning" is the low volume of traffic entering the store.

The focus for this retailer is to acquire and analyze data on traffic passing by versus actual shoppers entering their store. Managers



Today's automated analytics offer powerful ways to detect, track, and measure, providing retailers with enhanced visibility into the shopping journey.

would want to examine their “mall traffic conversion” (the percent of shoppers passing by who also enter the store) over time as they change window displays, execute incentives, and leverage promotions to shoppers who are nearby, on mobile, using social media, or visiting the store website. They should also be interested in mobile metrics such as unique and repeat visits and associated and unassociated devices, as the store will benefit from monitoring Twitter and photo postings to ensure the right products are being featured. Knowing what works best for getting shoppers to enter the store, measuring it, and achieving it allows this retailer to use the right data to win in their business.

In another example, suppose that what it may take to win for a multi-department retailer with a new back-to-school product line is raising customer awareness with a seasonal display featured at the front of the store. If getting shoppers to stop and notice this display increases the probability they will continue to the aisle and be exposed to the entire back-to-school product line, then the effectiveness of this display becomes critical to achieving the endgame.

For this program, the retailer is best served by measuring the percentage of store traffic reaching the fixture, those stopping there, and those who reach the full (seasonal) aisle location. The metrics needed here are dwell times and traffic counts,



with analysis that correlates them. These can be derived from a combination of mobile- and video-based analytics. Measuring conversion in the aisle and at the fixture helps to further pinpoint where shoppers are most likely to purchase, which products, and from which location. Dwell metrics help to understand whether shoppers need to actually spend time at the fixture to convert or just enough to become aware and continue to the home aisle location.

If dwell times are shorter (indicating less engagement) but associated with higher conversion, then the assortment on the fixture may not need to be so broad, leaving room to provide visibility to additional or related products in this high-priority location. However, if dwell times are high (showing interest and engagement) but conversion is low, the display may not be aligned with the needs of the shopper and the assortment may need to be reconfigured to be more effective at driving shoppers to the aisle. For this operator, optimizing the front-end fixture to stop more shoppers and engage them longer is what they need to win.

The same consistent, data-driven approach can be used to help perform A:B market tests of products across multiple sites. Through video and mobile analytics, pilots can be run more accurately and with better scalability than ever before, often requiring fewer stores and less investment to attain large sample sizes than through traditional methods. Through analysis, retailers compare and evaluate the effectiveness of variables such as display features, location, assortments, and adjacencies.

An interesting aspect of this approach is that the resulting data is generally far more accurate than information obtained from shopper interviews. In the study of physics, the presence of the observer can change the nature of the observed—and this is just as true for consumers, although for different reasons! Even when asked, shoppers frequently do not provide the same data they send out over social media or share with their friends. Aggregating social media information with in-store observations builds a connection to what customers truly think and feel, providing a strong differentiator for competitive advantage.

With this valuable data in hand, aimed at the right decisions, retailers can know sooner, act faster, and decide smarter about the data they need. This leads to better decisions that can save the retailer up to millions of dollars in costs while driving sales across the enterprise. The key is knowing what it takes to win and lining up the decisions, data, and analytics to support and execute for success. This process can be facilitated with experienced retail analytics experts who can help with defining data requirements for projects and mapping data sources to the project.

Use Cases: Retail Analytics in the Real World

The applied uses of analytics to real-world decision making are numerous, and many retail industry leaders are achieving value with innovative new approaches. A few recent examples include:

- Specialty retailers using video analytics to study customer paths and behavior, helping them to design more effective store layouts
- Big Box retailers investing in Wi-Fi networking and new mobile way-finding apps to help customers navigate through large stores or malls, getting them to desired products faster
- Resorts and hotels investing in mobile analytics to gather shopper information from their retail spaces
- Mall operators using the network to track social media and shopping patterns, and delivering this value-add information to tenants
- Grocery and fast-moving goods retailers utilizing video analytics for traffic and conversion analysis, and then using the same information to integrate workforce management and re-align staffing based on traffic trends
- Specialty retailers using social sentiment analytics to improve “voice of the customer” feedback to assess overall brand status and the launch of new products, services, or offers

Shopper Marketing Use Cases

Use Case #1: Predicting resource requirements

Retailers can use analytics tools to measure traffic, wait times, and queue lengths, proactively anticipating resource demands across the store. For example, front-end staffing demand in grocery can be anticipated using a combination of real-time traffic counting, trip time data, and data on staff on hand. Resources are thus dynamically allocated based on real-time information, improving productivity of labor hours and improving customer satisfaction.

Use Case #2: Drive traffic to the store

Through presence and location-based mobility analytics, retailers pinpoint the location of opt-in shoppers when they are close to a store location. With personalized reminders or discount offers sent directly to their smartphones, consumers are more motivated to visit the store if they are nearby.

Use Case #3: Personalized digital engagement

Combining social and mobile analytics with loyalty information, retailers can create personalized, more relevant engagements with shoppers. For example, say that a customer enters the



shoe department. Their store history shows that 60% of past purchases included a coupon. The retailer can improve the chance of another sale by sending, in real time, a special offer or communicating through Twitter about a current promotion. Such communications change the customer/store relationship from transaction-based to more value-based, creating more sustainable brand loyalty.

Use Case #4: Counteract showrooming

Retailers can leverage customer showrooming activities by providing real-time discounts and price matching on the shopper's mobile device based on their location in the store. For example, analytics from mobile or video may detect high wait times in a department or category. In response, the store can alert staff to offer immediate assistance, or send a personalized offer to the shopper's mobile device. This capability turns showrooming from a threat into a promotional opportunity, improves the shopper's opinion of the store (which they are also more likely to share online), and builds a strong long-term relationship.

Use Case #5: Improving return on marketing campaigns

Based on gathered path-to-purchase (P2P) data, Marketing can use analytics capabilities to assess campaign effectiveness and make dynamic adjustments to optimize results. The data answers questions such as: Did the campaign drive traffic to the store? Did consumers get to the store but not to the aisle or category promoted? Did they visit the aisle but not stop at the promoted display area? Did they stop but not purchase? Was the item being promoted in stock? Did the shopper still not buy? Was there an issue with the price, the assortment, or other factors? Each answer drives a different action for improving the campaign.

Use Case #6: Remote management of merchandising compliance in-store

Use of video and analytics (mobile or video) can help ensure consistent deployment of shopper marketing tactics. For example, if a campaign calls for a set of SKUs to be prominently displayed at the front of the store, video can detect variances in a designated planogram as well as offer remote observation of the displays across many stores. Analytics such as dwell times are used to detect variations that flag stores that are out of compliance. This reduces or eliminates the cost and time normally required for store visits and phone calls confirming set-ups.

Use Case #7: Optimize use of “expert” resources

Presence-based analytics can be used to detect when a shopper is in a particular department and may be in need of assistance. For example, grocery store staff is alerted to a customer who has been in the premium red wines section for an above-average amount of time. In response, a wine specialist who has been busy in other sections is immediately deployed to offer help. This optimizes an expert sales resource at the right time, while also providing better service across the entire store.

Retail Operations Use Cases

Use Case #1: Managing on-shelf availability

With shelf sensors and integrated video analytics, stores can have unusually high visibility into out-of-stocks, even those not always indicated through the POS system. For example, if items have been displaced by shoppers, they may still appear in the inventory report as “in stock,” causing customer dissatisfaction that can go undetected for long periods of time. If items are missing from the shelf due to theft, they too will show up as “in stock” but actually not be on the shelf. Such lengthy out-of-stock situations can cause customers to lose confidence in the retailer. If these are key items (usually the case with high-theft items), this scenario could actually cause shoppers to change loyalties as they begin to expect out-of-stocks on favorite items.

Use Case #2: Labor efficiency and performance management

Analytics such as traffic counting and conversion can be used to inform staff scheduling and improve performance metrics such as sales and conversion per labor hour. For example, if labor is currently allocated by transaction volume or straight line allocation using a coverage-per-square-foot model, simply using traffic and conversion patterns to inform scheduling, a

retailer can reallocate labor to map to traffic (opportunity) and achieve performance improvements. Measuring the results on conversion, average transaction values, and average items per transaction will help quantify the effects of reallocating labor.

Use Case #3: Staff optimization on shift

Traffic and dwell analysis throughout the store informs resource planning, both in real time and through trend analysis. For example, a normally unattended counter in a department store can be staffed for a 20-minute peak period as identified by trend analysis. Alternatively, a customer who has been waiting for too long, or a sudden surge in traffic, may be detected in real time and an alert sent to a staff mobile device to provide prompt service where needed.

Use Case #4: Test and learn program management

Metrics generated from video, mobile, and social analytics can be used in retailer or consumer packaged goods (CPG) manufacturer testing programs, measuring shopper reaction to changes in the store. Whether the retailer uses pre- or post-testing methodologies or A:B store testing, analytics create the control or benchmark for analysis and measure against it to provide quantifiable results. Based on this data, decisions can be made that improve ROI and enable better supplier management and space allocation.

Use Case #5: Queue management for improved service levels

Queue metrics such as wait times, queue length, and behavior patterns can be generated from video analytics. Service or wait times may also be measured to determine when shoppers are present and their dwell times through zone-based analysis. For example, a grocery store can determine whether deli customers are waiting longer at certain times of day to pick up or to place their order, helping to pinpoint problems and improve service.

Use Case #6: Risk management

Stores may improve security by monitoring real-time metrics from shelf sensors, counting the number of items in a location and sensing when one is removed or added. Such devices help to determine when a theft is occurring and alert personnel to potentially high-risk activity. For example, if an alert is sent when three copies of the same video game are removed from the shelf, a service agent is alerted and engages at the shelf by offering to assist through voice or video. This simple, courteous action can be a deterrent to theft as well as a value-added service for a shopper who is genuinely looking for multiple copies of the game.

Conclusion

In this paper, we have introduced a vision of analytics as a new guiding principle for operating in today's tumultuous retail environment. We've discussed the power of becoming a data-driven decision-making culture, and shown how access to accurate, scalable, and actionable data can help retailers set a roadmap to success through a better understanding of their customers and of their store operations. We've also covered how data can reveal exposures as well as opportunities for the retailer. Knowing who is not purchasing and why can be as important as understanding those who do purchase. The right insights enable a closer, stronger relationship with consumers.

We have also examined a number of use cases that show how analytics can be implemented for operational and shopper marketing benefits. Of course, the possibilities are almost endless when it comes to analytics projects—retailers may choose to begin in any number of business areas, pivoting to the data-driven decision culture required as the Internet of Everything evolves. The key is to launch and define a winning data strategy for key business areas, mapping the right metrics to decision processes. Such programs help retailers achieve differentiation of products, drive conversion, personalize the



customer journey, and manage the business more efficiently. Based on a more accurate and comprehensive body of data, you will lay the groundwork for business success both now and into the future.

For More Information

Retail analytics experts from Cisco's retail IoE practice are available to help assess current investments, choose the most effective solutions, and determine a roadmap to meet your business needs. For more information, please contact your Cisco representative, email nextgenretail@cisco.com, or visit our Cisco Analytics for Retail webpage at <http://www.cisco.com/web/strategy/retail/casr.html>.

1 *Big Data Report for 2014*, IDG Enterprise (Jan. 16, 2014)

2 Ibid.

3 Ibid.

4 QuBit Products, quoted in "Making Sense of Unstructured Data," *RetailWeek* (Oct. 21, 2011)

5 IDG Big Data Report, 2014

6 "How Location Analytics will Transform Retail," by Tony Costa, *Harvard Business Review* (March 12, 2014)

7 Cisco Consulting Services, 2013

8 *Digital Shopping Behavior in an 'Internet of Everything' World*, by Jon Stine and Hiten Sethi (Jan. 2014), <http://www.cisco.com/web/about/ac79/docs/loE/loE-Retail-Key-Findings.pdf>



Americas Headquarters
Cisco Systems, Inc.
San Jose, CA

Asia Pacific Headquarters
Cisco Systems (USA) Pte. Ltd.
Singapore

Europe Headquarters
Cisco Systems International BV Amsterdam,
The Netherlands

Cisco has more than 200 offices worldwide. Addresses, phone numbers, and fax numbers are listed on the Cisco Website at www.cisco.com/go/offices.