

# The Third Wave of Marketing Intelligence

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## Introduction

During the last 25 years, marketing research in retail settings has been transformed by technological change. The first wave of change occurred when retailers adopted point-of-sale (POS) systems with UPC barcode scanning. This provided companies with real-time data on purchase transactions and accurate estimates of product sales and market share. Retailers used this information in combination with shelf space allocation and product inventory information to measure the productivity of their stores. By modeling these data as a function of causal variables, such as product price, display activities, and feature advertising, marketers were able to assess the performance and profitability of their marketing investments (e.g., Blattberg and Neslin 1990). UPC scanning served as the foundation for syndicated research services such as A.C. Nielsen and Information Resources, and led to the development of brand and category management. Scanner data are in widespread use today and support many critical business decisions.

The second wave of change occurred when retailers started to track and analyze the purchases of individual shoppers. Some retailers, especially in the grocery industry, launched frequent shopper and customer loyalty programs to collect these data (see, e.g., chapter by Reinartz in this book). Shoppers who participate in such programs typically identify themselves with loyalty cards at the point of sale in exchange for price discounts or other incentives. Companies can also identify repeat customers by requesting their telephone numbers, capturing information from credit and debit cards, reading “cookies” stored on their computer disk drives, etc. This information is often combined with geodemographic and behavioral data from other public and private sources to create a profile and purchase history for each customer or household. These data can be used to estimate customer value and loyalty, measure individual-level response to direct mail and other targeted promotions, and conduct shopping basket analyses to identify product complementarities among other applications (Berson, Smith, Thearling 2000; Ravi, Raman, Mantrala this book). Once again, innovation led to the emergence of

new industries (data mining, data warehousing) and new practices (customer relationship management, or CRM).

Both types of data collection and analysis only became practical with the advent of the computer. With UPC scanning, the digital representation of aggregate consumer purchases, broken down by time and region, made it possible to measure the impact of temporal and geographic changes in marketing activities (e.g., product price, promotion, assortment, and advertising) on sales. With CRM, the digital representation of individual customer characteristics and purchase patterns allowed marketers to analyze shopper preferences and tailor marketing activities on a one-to-one basis. In both cases, the analyses that could be performed depended on the accuracy and detail of the representation of stimulus and response conditions.

The third wave of change is just beginning to take hold in retail stores. The technology drivers are the digital representation of the shopping environment and the real-time tracking of customers as they enter the store, walk through the aisles, and select and purchase products. Like the earlier innovations, it provides the capability to capture variations in consumer behavior over time and across people, but it adds to the mix the critical element of context. This new wave of marketing intelligence provides marketers with the tools to measure consumer response to the in-store environment and manage the shopping process. It is the foundation for *customer experience management*.

Each generation of marketing intelligence has enhanced our understanding of how marketing, customer, and environmental factors affect consumer behavior and store performance (see Table 1).

In the following sections, this chapter reviews the genesis of customer experience management, describes the tools available for tracking customer behavior and measuring store performance, and discusses two case studies conducted by the author. The paper concludes with a discussion of the challenges in conducting computer-based observational research and future directions.

## **The Advent of Customer Experience Management**

Marketers have discovered that the retail context has an impact on consumer behavior that goes beyond product assortment, pricing, and promotion issues. The shopping environment is the medium through which consumers connect with products. It affects the time consumers spend in the store, how they navigate through the aisles, and how they allocate their attention and money across departments and categories. It affects whether they notice a new product or promotion. It influences their framing of the purchase decision and their likelihood of buying complementary products. And it determines their shopping enjoyment and intention to return in the future. Manufacturers and retailers have found that it is to their mutual benefit to design shopping environments that effectively engage consumers and help to convert demand into purchase (see Burke 2005).

**Table 1.** The Evolution of Marketing Intelligence in Retail Settings

	<b>Wave I</b>	<b>Wave II</b>	<b>Wave III</b>
	<i>Brand and category management</i>	<i>Customer relationship management</i>	<i>Customer experience management</i>
<b>Enabling technologies</b>	UPC barcode scanning	Customer loyalty cards, credit/debit cards	Real-time customer tracking (RFID, GPS, video, clickstream, portable shopping devices)
<b>Causal variables</b>	Product assortment Shelf space Price Promotions Displays Feature advertising	<i>Wave I, plus:</i> Customer attributes (geodemographics) Purchase history Targeted promotion	<i>Wave II, plus:</i> Store layout Store atmosphere Navigational aids Product adjacencies Service levels Queues/crowding In-store events
<b>Performance measures</b>	Sales Market share Gross margin Sales/square foot Turn rate GMROI	Customer retention Customer loyalty Share of customer Lifetime value OC curves	Store traffic Shopping path Aisle penetration Dwell time Product interaction Conversion rate

This new focus on the shopping process has fueled two recent trends in retailing research. The first is the increased use of observational and ethnographic research (see, e.g., Underhill 1999). Merchants have found that, by watching how customers shop in their stores, they can isolate points of friction in the shopping process and identify opportunities to improve the convenience and enjoyment of the experience. This research is usually executed by setting up one or more video cameras within the store, recording consumer shopping activity for several hours a day, and then manually coding shopper behavior at a later time. Video observation is often combined with intercept interviews to identify both how and why consumers buy.

This research provides a number of important insights. By noting the dominant pathways and directions that shoppers take through the store, retailers can position signs and displays to catch the customer’s attention. By recording how long consumers spend at various locations (“dwell time”), they can identify points where shoppers will be most receptive to communication. By tracking the shopper’s path through the store and monitoring which areas are shopped together, merchants can identify cross-sell opportunities. Video observation can pinpoint crowding conditions and bottlenecks in traffic flow that suggest the

need to widen aisles or reposition product displays. It can be used to measure queue lengths and waiting times to flag problems with customer service. Observational research can also capture customer characteristics (age, gender, ethnicity, group composition) and shopping habits: use of shopping aids (carts, baskets, circulars, shopping lists), reading signs and packaging, taking product literature, and interacting with salespeople.

The second trend in retailing research is the increased use of computer hardware and software tools to track customer behavior in both online and conventional retail shopping environments. Unlike traditional ethnographic research, which can be very time consuming and subjective, computer tracking provides an efficient and reliable means of collecting and analyzing data on the consumer shopping process.

The first attempts at computer-based tracking used simple counters at the entrances of stores to measure incoming and outgoing traffic (Robins 1994). Various technologies have been employed for this application, including pressure-sensitive mats, infrared light beams, door-closure switches, and ceiling-mounted video cameras. These devices provide hourly traffic counts that can serve as a rudimentary measure of consumer demand or sales potential. When these counts are combined with transaction data from POS systems, retailers can calculate purchase conversion rates, a key indicator of store productivity. Store traffic and conversion information has been used for a variety of applications, including the evaluation of store promotions and sales force scheduling (Lam, Vandenbosch, Hulland, and Pearce 2001).

Over time, these counting methods have evolved into sophisticated customer tracking solutions. In online environments, detailed records of website usage behavior ("clickstreams") allow retailers to analyze the path that shoppers take through a site and assess how consumer and marketing variables affect click-through rates and purchase likelihood (see, e.g., Montgomery, Li, Srinivasan, Liechty 2004). In conventional retail stores, sophisticated RFID, GPS, and video-based customer tracking solutions have recently been developed that permit retailers to track how shoppers navigate through stores and respond to changes in the store environment (Gogoi 2005; Pereira 2005). Other methods of customer sensing, including the use of kiosks and the provision of personal shopping assistants, provide additional information on in-store customer behavior and consumer response.

Customer tracking is now in widespread use in online environments, but it has been somewhat slower to gain acceptance in conventional retail stores. This is largely due to the significant capital investment and technical complexity of installing a whole-store tracking solution. RFID, infrared, and GPS tracking systems require an infrastructure of sensors and tags to locate shoppers, carts, and hand baskets. Machine-vision-based tracking solutions require that a set of cameras be installed throughout the store. While existing security cameras may be used to collect these data, most surveillance systems do not provide adequate coverage or video fidelity. Fortunately, once a system is installed, the incremental costs for

collecting and analyzing the computer tracking data are much lower than for human observation. Customers can be tracked through the entire store, 24 hours a day, 7 days a week.

Computerized tracking provides retailers with the information necessary to measure and manage the shopping process. By counting the number of customers who enter the store and walk through each aisle, department, and product category, retailers can create thermal maps showing the percentage of customers who penetrate each section of the store. If some sections are visited infrequently, this may suggest the need to provide navigational aids, reposition product displays and merchandising, run traffic-building promotions, and/or revise the store layout to improve traffic flow.

When traffic data are combined with transaction log data, retailers can calculate overall and category-specific purchase conversion rates, reflecting the store's ability to turn consumer demand into purchase. These conversion rates can be compared across product categories, time periods, and geographic regions to evaluate the store's performance and identify opportunities for improvement. If, for example, many shoppers are observed to enter a category and examine merchandise but then leave without buying, this may indicate a need to adjust the product assortment, pricing, or presentation. Because the tracking data are collected and analyzed in real time, this information can be used to dynamically adjust staffing levels, the content of digital signs, and other aspects of the shopping environment in response to momentary changes in store conditions.

Other research tools may be used in conjunction with electronic tracking to provide a more complete understanding of the shopping experience and consumer response. Customers are often interviewed after the shopping trip to gain insight into their attitudinal and emotional reactions (Donovan et al. 1994). Shoppers may also be contacted at home and asked to remember the last time they went shopping for a particular product (e.g., Kerin, Jain, Howard 1992). Consumers recall the positive and negative aspects of the shopping experience and offer suggestions for improvement.

Once the retailer has identified opportunities for improving the shopping experience using customer interviews and observational research, the next step is to make changes to the store environment and measure how shoppers respond. While it is possible to jump directly to implementation, a better approach is often to test several different concepts in the laboratory and choose the alternative that performs best. Recent innovations in computer graphics permit researchers to create highly realistic simulations of the retail shopping environment (Burke et al. 1992; Burke 1996). These simulations provide tremendous flexibility, allowing retailers to go beyond existing conventions and explore new approaches for improving the shopping experience. Like in-store tracking solutions, computer simulations can record detailed information about consumers' shopping patterns and purchasing behavior, and the results can be used to forecast future sales and profitability.

## Research Applications

Two case studies are now presented to illustrate the power of customer tracking research for measuring and managing the customer shopping experience.

### Measuring Retail Productivity During the Holiday Shopping Season

Retailers slash prices on popular products and spend heavily on advertising to draw consumers into their stores during the holiday season. But how do shoppers behave once inside the store? Are the legends about the customer stampedes for one-of-a-kind bargains and the last-minute shoppers on Christmas Eve really true? And how effective are stores at transforming high levels of consumer demand into purchase? For many retailers, sales during this period drive profits for the entire year.

To address these issues, Indiana University's Kelley School of Business partnered with a major consumer electronics retailer to study shopper behavior during the 2003 holiday shopping season. The research team selected two stores in the Midwest U.S. that reflected the demographics of the national population, and installed digital video recorders to capture images from four surveillance cameras positioned throughout each of the two stores.

The study observed how customers shopped during the entire holiday season—from before Thanksgiving through Christmas. The video images were analyzed using a combination of computer vision software (to count the numbers of shoppers and track their path through the store), supplemented by human judgment (to classify shoppers into demographic groups and record their use of shopping aids). The findings confirmed many of the stereotypes about holiday shoppers, but also suggested several opportunities for retailers to improve the customer experience and retail performance during the holiday season. For simplicity, the following discussion will focus on just one store, but shopping patterns were similar across both stores.

The season kicked off with "Black Friday," the day after Thanksgiving and one of the busiest shopping days of the year. Consumer shopping patterns on that day were unlike any other during the holiday season. Despite the cold, rainy weather, shoppers arrived at the store before dawn and lined up around the building waiting to buy \$20 DVD players, \$130 video cameras, and \$200 computers. *When the doors opened at 6:00 a.m., 650 people poured into the store in the first 10 minutes. In the first hour, over 1,400 shoppers entered the store.* To put this in perspective, traffic on a typical Saturday afternoon might be in the range of 200 to 300 shoppers per hour, and numbers typically approach 600 shoppers per hour on the weekend before Christmas and on Christmas Eve.

The people entering the store during those early hours were clearly destination shoppers who were anxious to buy. They traveled light, leaving kids, heavy coats, and handbags behind. Most were familiar with the store layout and walked quickly to the desired products. In some cases, they used team shopping techniques, one

partner holding a place in the checkout line while the other rushed from aisle to aisle looking for hot specials. The level of activity was especially frantic during the morning, as people hurried to complete their purchases before the noon deadline on early-bird specials. Despite the commotion, people were generally polite and even tempered.

Given the huge numbers of customers, it is not surprising that the transaction volume during Black Friday was the highest for the holiday season, with hourly sales rates that were two to three times those on other shopping days. The number of products purchased per buyer was also significantly higher on Black Friday. People appeared to be stocking up on hot promotional items and gifts for the holidays: the average basket size peaked at 5 items for those early risers who completed their purchases before 8:00 a.m. Most buyers during the day purchased two or three items.

One would expect that any shopper who made the effort to visit a store on Black Friday would buy something. Surprisingly, *many people left the store empty handed*. The average purchase conversion rate (the percentage of adult shoppers who bought) on Black Friday did not exceed 44% in the first few hours, and averaged only 31% for the entire day. A lower percentage of shoppers bought on Black Friday than on the Saturday before Christmas (44%) or Christmas Eve (48%). In fact, the percentage of buyers was even lower than on a pre-holiday weekend, when an average of 33% of adult shoppers made purchases. From customer observation and personal interviews, it appears that the low purchase conversion rates on Black Friday were due to several factors, including long checkout lines, an overwhelmed sales staff, crowding, and out-of-stock conditions. In some cases, shoppers with only one or two items gave up and left rather than waiting in line. These issues were typical of many other retail chains during the holiday weekend.

The volume of shopping activity subsided somewhat after the Thanksgiving weekend, but picked up again as the number of shopping days counted down to Christmas, with a steady increase in customer traffic and sales. Purchase conversion rates peaked on 23 and 24 December as people rushed to complete their shopping. While the total number of people buying products was quite high, many of these were “fill-in” purchases of just one or two last-minute items. Not surprisingly, most people waited until after Christmas to make returns.

Creating a great customer experience is of critical importance throughout the year, but is a special challenge during holiday periods when the stores are crowded and shoppers are rushed. The findings suggest several ways in which retailers could provide a more pleasant and productive shopping environment:

- *Make the Experience Enjoyable*. Shoppers who arrived early on Black Friday were forced to wait in a cold, dark parking lot during a rain shower for the store to open. Customer interviews suggested that this had a negative impact on their perceptions. Retailers could keep shoppers in a positive mood by providing hot coffee, umbrellas, and entertainment. As Walt Disney once said, “People spend money when and where they feel good.”

- *Streamline the Shopping Process.* When consumers entered the store, they rushed to specific departments and categories to find the desired items, but were often blocked by large aisle displays and frustrated by out-of-stock conditions. Retailers should streamline the process by keeping aisles free of obstacles, positioning “hot” items in convenient and well-marked locations, and using demand forecasting systems to insure sufficient inventory.
- *Manage Human Resources.* A few puzzled customers would sometimes tie up all of the available salespeople in a department, leaving other shoppers stranded. To address this issue, retailers could provide preprinted materials and automated resources to answer frequently asked questions, and allow salespeople to deal with unique customer concerns.
- *Provide Sufficient Time and Space to Buy.* When customers shopped for complex products (such as laptop computers) during busy periods, crowding conditions caused people to shop quickly and leave without buying accessories (e.g., cases, batteries, extended warranties). Retailers should consider expanding the promotional period for these items to balance the volume of traffic in corresponding sections of the store and encourage browsing and impulse purchases.
- *Tailor Product Assortments by Time Period.* Surprisingly, purchase conversion rates declined during the day on Christmas Eve, dipping below 50 percent in the afternoon. Clearly, these last-minute shoppers were looking to buy, but there were no products available to meet their needs. Retailers could do a better job of understanding their requirements and providing an attractive assortment of products at reasonable prices for these time-pressed shoppers.
- *Accelerate the Checkout Process.* Long checkout lines were an obstacle for customers navigating through the store and an inconvenience for shoppers attempting to pay for their purchases. Retailers could speed up the checkout process by simplifying complex transactions (e.g., scheduling home deliveries and buying service agreements), opening more registers, and using remote checkout stations and handheld “line-buster” devices (see, e.g., Litfin and Wolfram in this book).

And what about that old saying that men wait until Christmas Eve to shop? All true! *Over 70 percent of the lone shoppers on Christmas Eve were men.*

### Measuring the Effectiveness of Digital Signage

In the Fall of 2000, Indiana University and a major specialty apparel retailer conducted one of the first controlled tests of the impact of electronic signage on consumer behavior and store performance (see Coleman 2000). Four retail stores participated in the study: one test store and three demographically-matched control

stores. The research team installed four 50-inch plasma display screens in the front windows of the test store. The screens were mounted in vertical pairs, and displayed four channels of high-definition video and still images. The control stores used conventional 6×8 foot paper signs with similar (static) content. Tracking devices were installed to count the number of shoppers who walked past and into each store. These data, along with the transaction log data from the POS system, allowed the researchers to calculate the volumes of mall and store traffic, the average purchase conversion rates, as well as sales per customer.

The results of the test were encouraging. When the digital displays were installed, customer traffic in the test store jumped 30 percent above the level observed during the previous seven-week period. Part of this increase was due to seasonal fluctuations in mall and store traffic, and the three control stores were therefore used as a baseline for comparison. The actual increase in traffic attributable to the electronic signs was estimated to be about 23 percent. The displays attracted a somewhat greater proportion of browsers, as evidenced by a 10 percent drop in the purchase conversion rate. However, the digital signs still produced a significant net gain of over 10 percent in store sales.

To evaluate the impact of the displays on consumer perceptions, attitudes, and purchase intentions, the research team also conducted short interviews of 356 mall shoppers. Of the 70 percent of mall shoppers who reported walking past the retailer's store, 23 percent recalled seeing the plasma display screens in the store windows and 9.6 percent correctly recalled the specific product being advertised. These percentages were even higher (30 and 12 percent, respectively) for people who had shopped at the retailer's store during the last year. Of those people who correctly recalled the message, an impressive 46 percent said they would consider buying the product.

While the test results indicated that the digital displays were generally effective in increasing store traffic and sales, several additional insights emerged from the research.

- *Message content is critical.* The digital displays produced the greatest gains over conventional signage when the advertising featured innovative products that were unique to the retailer, appealing to the target audience, and consistent with the retailer's brand image. The research also revealed that the content had a diminishing impact on store traffic and sales over time and must be regularly refreshed to maintain shopper interest.
- *Visibility and aesthetics are also important.* The performance of digital displays depends on the retail context. For example, a pilot test in one store was unsuccessful because sunlight from windows facing onto the street washed out the digital displays. The technology must have sufficient brightness, resolution, and color fidelity for ambient lighting and viewing conditions. Aesthetics and customer traffic patterns are also important considerations in selection of the size, position, and viewing angle of the displays.

- *Communication should be adaptive.* Observational research and customer interviews revealed that people shop differently at different times of the day. Shoppers who visited stores early in the day were older and tended to be more mission focused, more price sensitive, and less brand conscious. In the evenings, shoppers were younger and enjoyed browsing through the latest fashions with their friends. When the electronic messages were tailored to the unique interests of these groups there was a consequent lift in store traffic.
- *Reliability and security must be high.* When digital signage is prominently featured in the store it becomes a key point of contact with the customer. When the technology fails, there is a significant negative impact on customer traffic and sales. It is critical that the digital signs are reliable, network connections are secure, and backup systems are available in case of a problem.
- *Measure and manage costs.* The total cost of digital signage includes the hardware and software costs, installation and maintenance, and employee training, as well as the costs of creating and managing the digital content. An important part of the testing process is value engineering; measuring whether the same communication benefits can be delivered with less expensive hardware and message content. Customer tracking technology allows retailers to assess the relative performance of these alternatives.

When these issues are borne in mind, retailers and manufacturers are more likely to achieve success in their applications of digital signage.

## Challenges and Opportunities

For computer-based observational research to be widely adopted in retailing, several technical and behavioral challenges must be addressed. The first and most critical issue concerns the accurate collection of tracking data. Each of the available technologies has certain advantages and limitations that affect its suitability for different retail channels. For example, several companies have developed tracking systems that use RFID, GPS, or infrared sensors attached to shopping carts, hand baskets, or hand-held shopping devices to track the customer's path through the store. These systems can provide reliable information on the shopping process, and the data are easily linked to individual-level customer transaction and loyalty information. However, they are not effective in environments where customers do not use shopping carts, leave their carts to shop in the store aisles, or otherwise choose not to use the tracked devices. Also, the cart-based technologies provide no information on the size or composition of the shopping party.

One way to address this problem is to set up a panel of consumers who agree to carry an RFID tag or other tracking device in exchange for compensation. This

allows the researcher to collect information from a representative sample of consumers, but at the expense of sample size.

An alternative approach is to use video cameras and machine-vision tools to track customer behavior. With this method, it is possible to track the path of every shopper who enters a store, and not just those who use a shopping cart or carry a special card. In practice, this requires a large number of cameras, with each camera positioned directly overhead to limit occlusions. Consequently, video tracking solutions tend to work best in smaller stores.

Another benefit of video tracking is that—with a suitable camera view—the technology can classify shoppers electronically into demographic groups (gender, age, ethnicity) based on visual appearance (Pereira 2005). If certain demographic groups have different average transaction sizes, then the retailer can weight the demographically classified traffic by these purchase rates to produce a more accurate estimate of sales potential. This technology can also be used to code the facial expressions of shoppers, capturing their emotional reactions to the in-store environment.

A second challenge in computer-based tracking concerns the digitization of the store environment. The spatial tracking information collected by video cameras or other location-sensing devices must be mapped onto the physical locations of product departments and categories, and then linked with the associated transaction data to calculate department- and category-specific penetration and purchase conversion rates. Existing store floor plans and planogram files can be used to facilitate this mapping process, but retailers must confirm that these electronic representations accurately reflect the actual store layouts. An additional level of complexity is introduced when the same products are merchandised in several locations throughout the store.

A third major issue is consumer privacy. Shoppers have expressed concern that retailers may violate their right to privacy by linking their shopping patterns to their personal identities. For example, the MIT/Cambridge Auto-ID Center conducted a series of international focus groups and one-on-one interviews which revealed that people have consistent, negative opinions about the use of RFID tags on consumer products, especially when these tags are not disabled or removed at the time of purchase (Duce 2003). To address this issue, most customer tracking studies do not attempt to identify individual shoppers, but rather focus on aggregate shopping patterns. In addition, these projects limit tracking to the in-store environment.

## **Conclusion**

The third wave of marketing intelligence will significantly enhance the practice of retailing, allowing manufacturers and retailers to manage the shopping experience in response to the unique needs of customers and the characteristics of the shopping environment. In the future, the focus will be on measuring unfulfilled con-

sumer demand, tracking the shopping process, measuring consumer response to changes in marketing activities, and analyzing returns and customer feedback. This information will be used to spot trends in consumer tastes, identify and address points of friction in the shopping process, and create product assortments, prices, and promotions that will attract consumer attention and stimulate purchase. Exceptional retailers have always paid close attention to customers' needs. Modern technology allows this to be done on a much larger scale and at a lower cost.

How is retailing likely to evolve in response to these innovations? From the customer's perspective, the biggest change will be the increased transparency and convenience of the retail shopping experience. Store layout, signage, and product organization will improve. Product selections will provide greater real assortment with lower levels of duplication. Consumers will be more likely to find the products they seek. The items will be in stock and offered at a fair price. Product information will help reduce consumer confusion and highlight important new benefits. New and complementary items will be featured in attractive and engaging ways. Sales associates will be available to assist shoppers when and where they need help. Checkout and returns will be quick and convenient. In general, stores will do a better job of connecting supply and demand for the benefit of both consumers and retailers.

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