Unraveling the Customer Mind

A soft economy and unrelenting margin pressures require retailers to think more proactively about what drives consumer buying preferences and behaviors. Our unique twist on market basket analysis can help retailers create more personalized campaigns that result in greater transactional activity and deeper customer loyalty.

**Executive Summary**

As the economy slowly recovers and a raft of new channels, products and offers emerge, some consumer segments (particularly the affluent) are gradually spending more money at retail stores. It is therefore imperative for retailers to better understand consumer thinking and derive behavioral insights that reveal buying preferences and decisions that take advantage of this rejuvenated willingness to consume.

Consumers are ever-changing. In fact, research (both hard data and anecdotal evidence) shows they are better informed, more nimble, more selective and less loyal than ever before. To win the hearts and minds of consumers, billions of dollars are spent annually on mass advertising and promotional campaigns both online and offline. These campaigns are not targeted to specific customer segments nor are they linked to customers’ online and offline purchasing behavior because most retailers lack an in-depth understanding of consumer preferences and purchasing behavior. This results in campaigns that bombard consumers with offers, discounts and promotions at odds with their interests and needs.

Within this changing landscape, both marketing strategies/options and marketing budgets are highly variable. Thus it is important to understand how budgets are being used, what impact it has on your organization/business and how to ensure success within this changing landscape. Traditionally, retailers spend a significant amount of their campaign budgets on TV, followed by print, online, catalogues, direct marketing, events and outdoor advertising. However, the pattern is shifting toward greater investments in online channels. The retail industry is expected to be one of the biggest spenders on online advertising, according to researchers who follow the space.

The industry is also highly competitive and fragmented globally, so it is increasingly important to capture and analyze every customer interaction. Moreover, with the improved sophistication of data handling and collection technology, retailers have access to a gold mine of POS consumer transactional data across multiple channels.

The struggle for retailers is to differentiate themselves through their product offerings and promotions to customers across all channels. Some smart retailers effectively deploy targeted product offerings, which can generate significant revenues; poorly chosen ones, though, waste money and opportunity. For example, grocery
chain operator Kroger recently refined its direct marketing strategy by using data from its loyalty-card program and sent unique coupon offerings to specific households. In the words of David Dillon, Kroger's chairman-CEO, “We understand and appreciate that no two customers are alike.” The company believes that this level of promotional personalization offers a path toward creating a direct link to its customers that no other U.S. grocery retailer can replicate.1

This white paper lays out new thinking about market basket analysis that can help retailers drive campaign effectiveness in more tailored ways and generate greater per-customer purchases and loyalty.

In Search of Enlightenment

Since the introduction of electronic point of sale, retailers have had at their disposal an incredible amount of data. The sheer volume of data, however, obscures patterns, making it impossible to discern customer preferences and behavior via manual inspection. The initial challenge, traditionally, has been to seek ways to leverage transactional data to produce business value. Most retailers have already figured out a way to consolidate and aggregate their data to understand the basics of the business – what is selling, how many units are moving and the sales amount. However, few retailers are successfully analyzing this data at its lowest level of granularity: the market basket transaction.

In fact, the essence of the analysis lies in the depths of the detail. Thus, a 360-degree view of the customer through integrated online and offline transactional data can ensure retailers that the products they offer and promotions they run match shopper preferences and behavior and deliver maximum return on their marketing spend. The ability to link purchases to individual purchasers can take this even further; for example, tailoring offers to specific customer segments and driving higher returns from more precisely targeted campaigns.

For retailing, this would mean understanding everything possible about the sales transaction, including: What time of day did the customer shop? How long did it take to check out? Was a loyalty card used? Who was the cashier? How long did it take to tend? How many items – by type – were in the basket? What was the relationship among the purchased items? How do other baskets compare?

The reasons why most retailers refrain from a deep-dive analysis is their preconceived notion that analyzing data at this level of granularity is expensive, overly time-consuming and has limited business value.

Solutions Emerge

Effective retailing requires an immediate response to consumer requirements, mandating extremely efficient, agile and responsive business and operational processes. Store operations, merchandising, marketing and advertising must all perform consistently, with little room for error. Due to continually increasing pressure on margins in many industry segments, only the best retailers are surviving; few are thriving.

To execute on all cylinders, retailers must gain an in-depth understanding of their operations and maintain the ability to delve into the operational data to ask (and answer) any and all business-critical questions. Traditional DW/BI systems were designed to handle large amounts of summarized information to address a predefined set of questions. To be agile and adaptable, retailers need the ability to continually measure, track and probe all aspects of their businesses to answer new questions.

This starts with effective market basket analysis. Figure 1 depicts a shopping cart by a typical consumer containing various purchased products. A complete list of purchases made by all customers provides much more information; it describes the most important part of a retailing business – what merchandise customers are buying and when. The analysis uses the information about what customers purchase to provide insight into who they are and why they make certain purchases.

Market basket analysis provides insight into the merchandise by highlighting which products tend to be purchased together and which are most amenable to promotion. This information is actionable; it can be used to:

• Understand new store layouts.
• Determine which products to put on special promotions and bundles.
• Indicate when to issue coupons.

The data-mining technique most closely allied with this analytical approach to market basket
Market Basket Analysis Unravels Customer Purchasing Behavior

In this shopping basket, the shopper placed a quart of orange juice, some bananas, dish detergent, some window cleaner and a six-pack of soda.

Are window cleaning products purchased when detergent and orange juice are bought together?

Is soda typically purchased with bananas? Does the brand of soda make a difference?

What should be in the basket but is not?

How do the demographics of the neighborhood affect what customers buy?

analysis is the automatic generation of association rules. Association rules represent patterns in the data without a specified target. As such, they are an example of undirected data mining.2

In a relational database, the data structure for market basket data has the following key components:

- The order is the fundamental data structure for market basket data.
- Individual items in the order are represented separately as line items.
- Product reference tables provide more descriptive information about each product. This should include the product hierarchy and other information that might prove valuable for analysis.
- The customer table is an optional table and should be available when a customer can be identified.

Association rules were originally derived from point-of-sale data that describes what products are purchased together. The sheer bulk of this transactional data (see Figure 2) — recording, at the item level, every purchase through stores, online storefronts and other channels — makes it very hard to understand the repeated patterns of purchasing that provide insights into customer behavior and preferences.

The basic process for finding association rules is illustrated in Figure 3. There are three important steps for creating such rules:

- Choosing the right set of items.
- Generating rules by deciphering the counts in the co-occurrence matrix.
- Overcoming the practical limits imposed by thousands or tens of thousands of items.

A word of caution regarding association rules: Retailers need clarity and utility of the results, which are in the form of rules about groups of products. There is an intuitive appeal to an association rule because it expresses how tangible products and services group together.

A Co-occurrence Three-dimensional Matrix

Orange juice, milk and window cleaner appear together in exactly one transaction.

Figure 1

Figure 2
Three Basic Steps for Building Association Rules

1. First, determine the right set of items and the right level. For instance, is pizza an item or are the toppings items?

2. Next, calculate the probabilities and joint probabilities of items and combinations of interest, perhaps limiting the search by using thresholds on support or value.

3. Finally, analyze the probabilities to determine the right rules.

Figure 3

We created a market basket analysis (MBA) solution framework to help clients demystify this data and provide actionable insights into customer purchasing behavior and their responsiveness to certain channels/promotions. Although their roots are in analyzing point-of-sale transactions, association rules can be applied outside the retail industry to find relationships among other types of “baskets.” Examples of potential cross-industry applications include:

- Items purchased on a credit card, such as rental cars and hotel rooms.
- Information on value-added services purchased by telecom customers (call waiting, call forwarding, DSL, speed call, etc.) can help operators determine how to improve their bundling of service packages.
- Unusual combinations of insurance claims can be a sign of fraud.

Retailers’ Use of MBA Analysis

Retailers use MBA analysis to explore transaction data to determine the affinities of what people buy to detect changes in basket composition, size and value, and to discover new insights into customer buying behavior. This includes:

- Identifying more profitable advertising and promotions.
- Targeting offers more precisely to improve ROI.
- Generating better loyalty card promotions with longitudinal analysis.
- Attracting more traffic into the store.

- Increasing the size and value of the market basket.
- Testing and learning by using the marketplace as a laboratory.
- Determining the “magic” price points for this store.
- Matching inventory to need by customizing store and assortment to trade area demographics.
- Optimizing store layout.

Thus, pattern analysis can be used to drive decisions on how to differentiate store assortment and merchandise as well as to effectively combine offers of multiple products, within and across categories, to drive higher sales and profits. These decisions can be implemented across an entire retail chain, by channel or, if the data is analyzed at the store level, customized offers can be formulated and deployed at a local level.

It is imperative to understand the critical missing link; traditional basket analysis fails to provide actionable insights. However, when done correctly, MBA can uncover how effective promotion of a given product can increase sales and profit influenced by related products and drive larger baskets or greater transaction volumes. Hence, our approach is aimed at revealing transaction patterns, illuminating key cause-and-effect relationships, to help retailers isolate the incremental impact of any given promotion (i.e., transactions that wouldn’t have occurred but for the promotion). Affinity analysis on its own cannot
accomplish this; however, conducting a test vs. control measurement along with market basket analysis helps to unravel the cause-and-effect relationships related to the incremental impacts of promotions.

The analysis framework links actions to outcomes and empowers the retailers to truly understand the mind of the consumer. The solution framework is tool agnostic and can be deployed as an analytical layer to a vast majority of COTS tools available in the market. Personalization and tailor-made campaigns are all the rage in retail campaigns and promotions. In fact, gone are the days when one-size-fits-all large promotions are applied to increase basket size. With an increase in margin pressures, marketers are trying to focus on getting that extra mile.

MBA analysis will help retailers refine their approach to drive an effective loyalty card scheme or online shopping registration by bringing a personal touch. Combining POS data with other geographical level demographic information, customer interaction information across channels such as e-commerce, loyalty club Web sites or order or service hotlines, as well as attitudinal data captured through surveys at points of interaction, is sifted and analyzed to provide valuable insights to further refine targeting strategy.

Further, predictive models are built on historical purchase data, as well as other attribute data, to add predictability to customer responsiveness to promotions. This empowers retailers to embrace focused targeting. Predictive models help retailers to direct the right offer to the right customer segments/profiles, as well as gain understanding on what is valid for which customer, predict the probability score of customers responding to that offer and understand the customer value gain from offer acceptance.

**MBA Helps Merchandisers**

Merchandisers need to see long-term trends to decide how much to buy and how the assortment fits into the business model. Here are some ways that leading retailers can leverage MBA to empower their merchandisers:

- Can the retailer sell fast enough to cover carrying costs?
- Will the initial markup provide sufficient margins to promote sell-through?

These high-value, high-risk decisions can be significantly improved with the customer insights provided by MBA. For example, a retailer sells milk at an aggressive every-day low price (EDLP); sell-through is high and sales look good. And the company is confident that the sacrificed margin is justified as it must be driving traffic to its stores and generating incremental sales of other items. However, upon looking more closely at the baskets that contain milk, the retailer realizes that those baskets tend to be single-SKU, or otherwise small baskets. In reality, the pricing strategy was not at all efficient, but this would have been impossible to determine without gaining visibility into the market basket. Using this insight, the retailer decides to raise its EDLP on milk. The retailer expects sales of milk to drop, and it may even lose some customers. But those customers were not profitable; the improved margin on the future milk sales will result in profits being net-positive.

**MBA empowers merchants to buy smarter and strengthen their negotiating position with vendors by providing the merchants with better information about customer buying behavior.**

**Integrated Solution Framework for Effective Decision Making**

Our MBA solution offering is coupled with an integrated analytics and BI platform called iTrack™ that integrates multiple stakeholder metrics and views with a robust data model to generate business insights for effective decision making. Together they provide:

- An integrated view of business metrics across dimensions, with embedded roles and privileges.
- A single version of truth.
- An end-to-end platform and process from data acquisition to reporting.
- Multiple data sources integrated to create a comprehensive data mart for mining.
- Visibility to a comprehensive set of business metrics.
- Informed decision making through insights and report comparison.
- Report customization.

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Cognizant Analytics (CA) combines business consulting, in-depth domain expertise, predictive analytics and technology services to help clients gain actionable and measurable insights and make smarter decisions that future-proof their businesses. The practice offers comprehensive solutions and services in the areas of sales operations and management, product management and market research. CA’s expertise spans sales force and marketing effectiveness, incentives management, forecasting, segmentation, multichannel marketing and promotion, alignment, managed markets and digital analytics. With its highly experienced group of consultants, statisticians and industry specialists, CA prepares companies for the future of analytics through its innovative “Plan, Build and Operate” model and a mature “Global Partnership” model. The result: solutions that are delivered in a flexible, responsive and cost-effective manner. http://www.cognizant.com/enterpriseanalytics.

Footnotes

2 Undirected data mining seeks patterns or similarities among groups of records without the use of a particular target field or collection of predefined classes.
3 Affinity analysis, the heart of market basket analysis, determines which potential purchases go together in a single shopping cart. Retail chains use affinity analysis to plan the arrangement of items on store shelves or in a catalog so that related items often purchased together will be seen together. Affinity analysis can also be used to identify cross-selling opportunities and to design attractive packages or groupings of products and services. Affinity analysis is one simple approach to generating rules from data.

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