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# Behavioral Effects of Digital Signage

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Digital signs have become an important new channel for communicating with consumers in retail shopping environments. An analysis of academic and commercial experiments reveals that in-store advertising effectiveness depends on both the content of the message (appeal type and product category) and the context and quality of exposure (audience need state, traffic speed and direction, message frequency and duration). Shoppers are most responsive to messages that relate to the task at hand and their current need state, and least responsive to traditional brand messages.

## INTRODUCTION

As media channels and audiences continue to fragment, interest grows in bringing advertising messages into retail stores. Recent research suggests that between 30 and 40 percent of category and brand decisions are made in store (Ogilvy-Action, 2008), and there are many opportunities to improve communication at the point-of-purchase. A national survey of over 5,000 grocery shoppers in 2008 discovered that only about half of shoppers believed that store shelves provided sufficient product information; 34 percent believed that the benefits and value of products were clearly communicated, and 23 percent believed that the benefits of new products were highlighted (Burke and Morgan, 2008).

Manufacturers and retailers have found that in-store marketing can affect shopper behavior powerfully, and this potential has fueled a rapid growth in shopper-marketing spending. A 2008 study reported that nontrade marketing activities at the point of purchase were more likely to deliver a meaningful return on investment than television, radio, print, or outdoor advertising (GMA/Deloitte, 2008). The study also noted that more than 60 percent of retailers and manufacturers planned to increase spending on nontrade in-store programs in the following year. This growth rate was second only to investments in interactive/web marketing and came at the expense of such traditional media as television, radio, and billboards as well as out-of store couponing and free-standing inserts.

Although there are a variety of options for communicating with shoppers at the point of purchase, this article focuses on digital signage. Digital signs are large (greater than 30 inches diagonally) flat panel monitors that show a continuous loop of advertising and editorial material. The signs often are positioned throughout the store and are controlled by a centralized computer server. The signs are ideal for marketing experiments because their content can be manipulated in real time, and shopper behavior can be measured using point-of-sale scanners and/or video cameras.

There has been very little academic research on this topic (Burke, 2006), but manufacturers and retailers, in collaboration with marketing-research firms and consultants, have conducted a number of unpublished studies. This article attempts to summarize the empirical generalizations gleaned from this research. (The author gratefully acknowledges the support of dunnhumby, Video Mining, and DS-IQ for contributing research findings to this article.)

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## EMPIRICAL GENERALIZATIONS

In-store digital signage featuring "newsworthy" information (e.g., new items, seasonal offers, promotions) has a markedly favorable impact on sales. This effect is stronger for hedonic (food and entertainment) products.

### EMPIRICAL GENERALIZATIONS

#### Message characteristics

EG1: Shoppers are most responsive to "news" (new items, promotions, seasonal information) and least responsive to traditional brand messages.

#### Product characteristics

EG2: Shoppers are most responsive to messages for hedonic (food and entertainment) products.

EG3: Featured products with higher category penetration have higher absolute sales uplift, but lower relative (percentage) uplift.

### SUPPORTING RESEARCH

From January 2005 through June 2007, Tesco plc, a British-based international grocery and general merchandising retail chain, tested 102 different advertising campaigns on a 100-store "Tesco Screens" network. Each store in the network had 40+ digital signs (plasma and LCD screens) positioned in several zones throughout the store (e.g., health and beauty care; entertainment products; beer, wine, and spirits). Customers viewed content directly related to the products in each zone. The content included a mix of editorial material (e.g., news and sports), advertisements, promotional offers, and customer information. In August 2006, dunnhumby, a retail consulting firm, assumed responsibility for Tesco Screens and conducted research to determine the factors that drive sales uplift and consumer awareness.

Each advertising campaign was coded on several dimensions, including the department and category of the promoted product, campaign length (typically two to four weeks), message type, product characteristics (private label or national brand, price, frequency of purchase, expandable consumption), above-the-line advertising support, and other promotional support (price offer, feature advertising). The sales uplift of each campaign was measured by comparing sales of the promoted product in test (screen) and control (nonscreen) stores during and immediately after the campaign. Sales were captured using Tesco's Clubcard and electronic POS data.

The database included a variety of different product and campaign types. Fifty percent of the campaigns were for Tesco branded products, 57 percent had a seasonal tie-in, 57 percent were in expandable consumption categories, and 29 percent were for new products. In terms of promotion, 57 percent of the campaigns were for brands with a price offer, 36 percent had some level of feature advertising, and 36 percent had above-the-line advertising support.

A comparison of the various message types revealed that seasonal, promotional, and new-product messages produced a higher percentage lift in short- to mid-term sales than traditional brand messages (see Table 1). These in-store advertising effects were in addition to any other advertising or price effects observed across the test and control stores. It appeared that shoppers were most interested in messages that addressed the task at hand ("What do I need?" "What's on sale?" "What's new?") and less responsive to the typical brand-building messages shown on conventional television.

A 2000 test of digital signage conducted by Indiana University and Eddie Bauer produced a similar result (Burke, 2006). The study installed four digital signs in the windows of a specialty apparel store and tested two advertising campaigns over a two-month period. The first month featured a new line of leather jackets that were unique to Eddie Bauer. The second month promoted wardrobe staples: denim jeans at everyday prices. When new products were featured on the digital displays, store traffic jumped 23 percent and sales increased 10 percent relative to three

## TABLE 1

Advertising Campaign Effects as a Function of Message Type

| Message Type | Average £ Uplift | Average % Uplift | SCR[a] |
|---|---|---|---|
| Tesco seasonal[b] (5) | £44,040 | 9.6% | 5.7 |
| Tesco promo (12) | £11,106 | 6.1% | 2.2 |
| Tesco new (6) | £7,543 | 11.5% | 1.5 |
| Brand (24) | £8,580 | 4.7% | 1.2 |

[a] *SCR = incremental retail sales in activity stores divided by campaign media cost.*
[b] *Tesco seasonal includes Christmas, Easter, and Mother's Day.*

matched control stores with conventional paper signs. When wardrobe staples were featured, however, there were no significant differences in the traffic or sales of the test and control stores.

The Tesco analysis also revealed significant effects of the product category on sales lift (see Table 2). Snacks (candy, gum), beverages (soft drinks, beer, wine, and spirits), and entertainment items (DVDs) had significantly higher lift than nonfood items (dishwashing detergent, soap, razors, shampoo). Neo Media POSTV, a Dutch company, recently reported a similar result. In studies conducted using the firm's "Supermarket TV" digital signage network, the research found an average sales lift of 14 percent across all advertisements, but a 25 percent lift for advertisements for sweets and snacks. In-store advertising for hedonic products seemed to appeal to shoppers' latent needs and desires, stimulating discretionary purchases, while shoppers tended to be less responsive to advertisements for planned purchase items.

Product category penetration also played a role in consumer response to Tesco's in-store digital advertising. Promotional messages for existing products with high category penetration had a higher absolute lift in sales; messages for new products (low category penetration) had a higher relative (percentage) uplift and attracted more customers. (Seasonal campaigns performed well on both dimensions.) A separate regression analysis revealed that a 1 percent increase in category penetration produced a +£140 increase in sales revenues, but a 0.10 percent decrease in the percentage sales lift.

## MODERATING CONDITIONS

### Need state of the shopper

MC1: Message receptiveness varies by time of day and day of the week.

### Quality and frequency of exposure

MC2: Shopper response is a function of sign location, orientation, and visibility.

MC3: Shorter messages deliver higher lift per unit of screen time.

### Scope of measurement

MC4: Advertising effects extend beyond the featured product, driving sales of the family of brands, and the entire product category.

## SUPPORTING RESEARCH

The results of various field experiments suggest that the effectiveness of in-store digital advertising may depend on several factors, including the need state of the shopper (MC1), the quality of message exposure (MC2 and MC3), and the scope of response measurement (MC4). The supporting research for each of the identified moderating variables is limited, so these propositions should be treated as hypotheses in need of further testing rather than definitive conclusions.

The first study, conducted by VideoMining Corp., tested the effectiveness of digital signs in attracting consumer attention to a kiosk that displayed paint products and color samples in the main corridor of a shopping mall. The study used an automated video-tracking system to record the number of shoppers who walked past the kiosk and paused to examine the video display screens and products. Over the three-month test period, the study tracked approximately 100,000 shoppers. During weekdays, the highest levels of customer traffic occurred in the afternoons (46.4 percent), with lower counts in the morning (20.2 percent) and evening (33.3 percent). The percentage of "engaged shoppers" (people who stopped to look at the signs and products), however, steadily increased over the day—from 9.6 percent (morning) to 12 percent (afternoon) to 14.6 percent (evening). Weekends scored particularly high on engagement, sometimes by a factor of 10.

These differences appeared to be due to variations in shoppers' goals by time of day and day of the week. A survey of 365 mall shoppers revealed that consumers are more task oriented when shopping earlier on weekdays and become increasingly interested in browsing and socializing with friends in the evening and on weekends (Burke, 2006). (For example, the

**TABLE 2**
Advertising Campaign Effects as a Function of Product Category

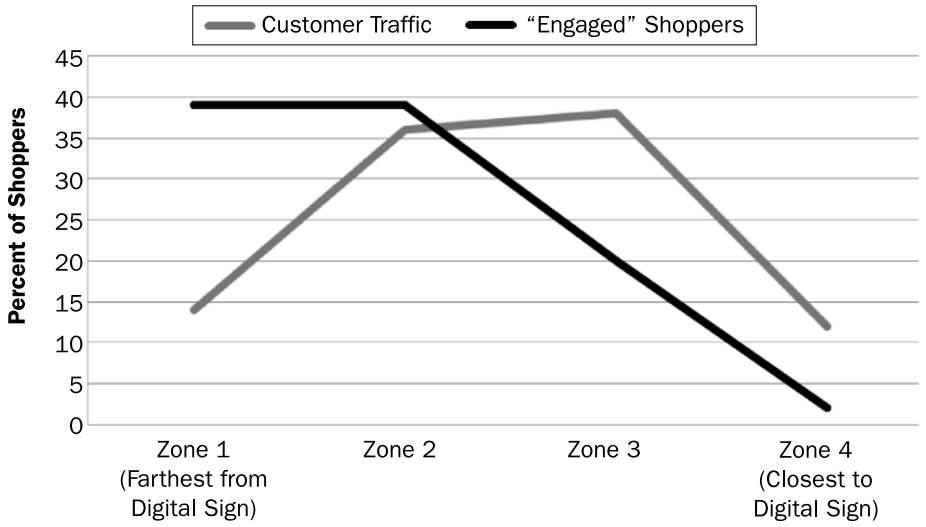
| Category | Average £ Uplift | Average % Uplift |
|---|---|---|
| Beer, wine, and spirits (3) | £46,850 | 12.9% |
| Entertainment (6) | £25,256 | 9.2% |
| Impulse (11) | £18,267 | 10.0% |
| Grocery (4) | £13,280 | 7.1% |
| Household (3) | £5,017 | 3.2% |
| Health, baby, and beauty (10) | £2,813 | 0.7% |

percent of self-reported browsers jumped from 31 percent in the morning and early afternoon to 52 percent in the evening.) Additional research is needed to determine if these differences in browsing and shopper engagement translate into higher sales response to in-store advertising messages.

A second study by VideoMining measured the effectiveness of a mall-based digital signage network. The test was conducted over a three-month period in five designated market areas. Each mall kiosk had two large flat panel displays on either side that ran a loop of video material to attract passers-by. Below the large displays were small interactive touch screens. Once again, a computerized video tracking system was used to record shopper traffic and engagement.

Approximately two million shoppers were tracked during the measurement period. Of the average daily traffic of 4,281 shoppers, 17.1 percent paused to look at the displays, 5.3 percent spent more than 5 seconds examining the kiosk, and 0.42 percent stopped for 1 min or more to interact with the kiosk. While the overall levels of attention were low, the degree of engagement varied depending on the shopper's angle of approach and proximity to the display screens. Customers who were traveling in the lanes farthest from the kiosk (zones 1 and 2) were more likely to stop and notice the signs, even though zones 3 and 4 had roughly the same passer-by traffic, and these shoppers were physically closer to the displays (six feet or less; see Figure 1). It appears that shoppers in zones 1 and 2 had a better line of sight and could view the signs for a longer period of time, increasing engagement. In general, one would expect that shopper response to digital signs would be a function of the quality and duration of exposure.

Two additional moderating variables (MC3 and MC4) were identified in a study




Note: There were four zones on each side of the digital signs. Each zone represented a lane of traffic approximately three feet wide.

**Figure 1** Shopper Traffic and Engagement as a Function of Relative Sign Position

conducted by DS-IQ, a technology company that provides shopper-response measurement and campaign optimization for in-store media networks. An advertising campaign was run on digital signs for an eight-week period and featured three different treatments: (a) a 30-s taste message, (b) a 30-s product line message, and (c) two 15-s advertisements [short versions of (a) and (b)]. The play schedule was designed so that each store acted, in part, as its own control, and each loop had the same amount of campaign play time: one 30-s play per loop, or two 15-s plays per loop, with those 15-s spots separated by other advertising content. Sales lift results for each content treatment were normalized against the amount of play time and reflect additional sales generated solely due to the digital media campaign run in-store.

For this campaign, both 30-s spots drove additional sales above control periods (when the content did not play) by 8 to 9 percent. But running two 15-s treatments in the same loop—doubling the opportunity to see—increased sales lift by more than 50 percent, as compared to a single 30-s spot (see Figure 2). There were also significant halo effects, where the campaign lifted sales beyond the scope of the featured product. In this case, the family of brands experienced a volume uplift nearly seven times that of the featured product; overall category lift was greater than 11 times that of the featured product (see Figure 3). It appears that in-store product advertising can stimulate the consideration and purchase of the entire product category.

## MANAGERIAL IMPLICATIONS

The research revealed that in-store advertising effectiveness depends on both the content of the message (appeal type and product category), and the context and quality of exposure (audience need state, traffic speed and direction, message frequency and duration). Shoppers were most responsive to messages that relate

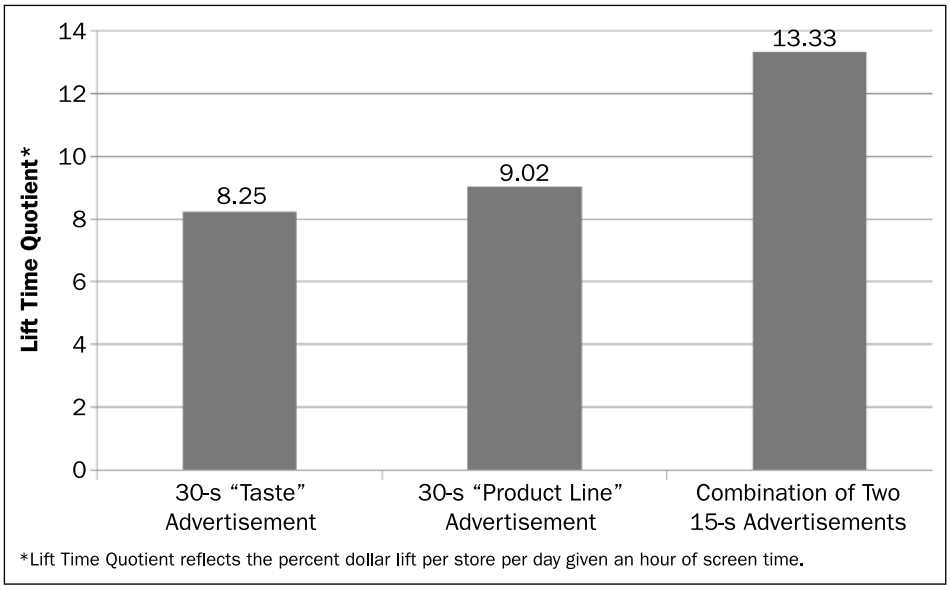



**Figure 2** The Effects of Advertising Content and Duration/Frequency on Sales Lift

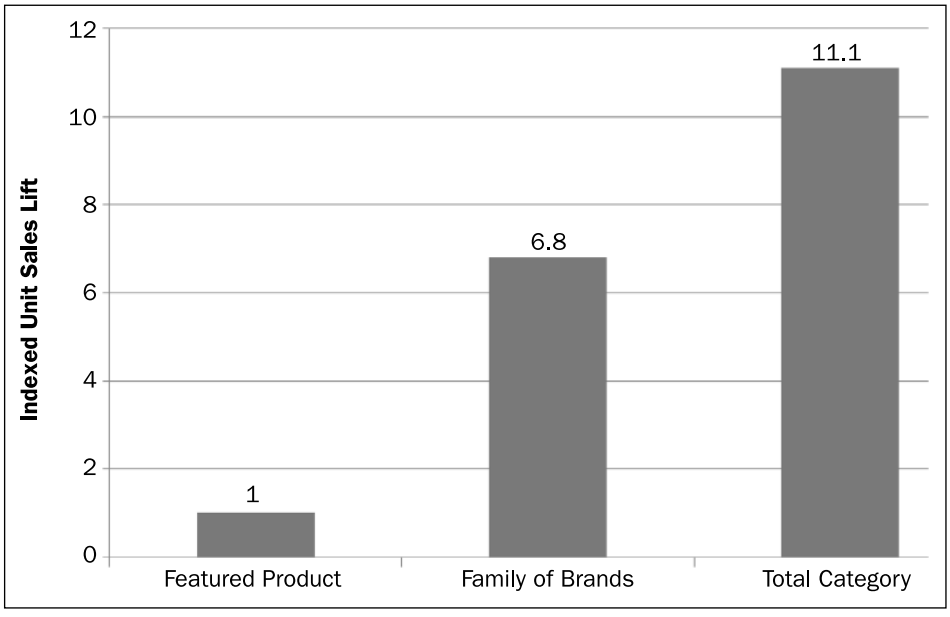



**Figure 3** Halo Effects of Featured Product Advertising

to the task at hand, and the right message can drive incremental sales of 5 to 25 percent. The findings suggested that digital signage is not like at-home television advertising. Instead, it is more like conventional point-of-purchase displays, where a simple, direct, and relevant message produces the greatest response. Dunnhumby's Joel Hop-wood noted, "You can forget about the idea that the audience is going to put anything like the cognitive effort they put into a 30-second TV spot when they're in-store" (Page, 2007).

An advantage of in-store advertising for developing empirical generalizations is the temporal and physical proximity of choice: it is possible to manipulate the presentation and content of advertising messages and measure the direct effect on shopper attention and sales. Note that this tends to favor short-term communication goals, such as stimulating product trial and incremental sales. It is also important to track shopper perceptions and behavior over the longer term to capture the effects of these in-store campaigns on brand equity, customer satisfaction, and loyalty.

The dynamics of in-store advertising suggest that it would be beneficial to continuously monitor the effectiveness of messages and adjust the schedule of programming accordingly. Different advertisements tend to "wear in" and "wear out" (increase or decrease their effectiveness) over different periods of time. There is no guarantee that the four-week advertising flights that are typically used on retail networks would be ideal for all advertisements. For example, DS-IQ reported that an advertising campaign for a confection product saw a steady increase in unit sales lift through the fifth week of the campaign, but that a juice campaign reached its maximum potential during the third week of advertising.

There are several other potentially important variables that may moderate consumer response to in-store advertising. When shoppers are exposed to digital signs, they usually are involved in another primary activity (navigating, searching, choosing, checking out), and

**Shoppers were most responsive to messages that relate to the task at hand, and the right message can drive incremental sales of 5 to 25 percent.**

the type of task may affect their message receptiveness. For example, shoppers waiting for an order to be filled at the deli may be more attentive to new-product or usage information than people navigating through the aisles. Other variables that may affect response include the levels of physical and visual clutter in retail stores, display interactivity (e.g., using touch-screens or mobile devices), user-generated content (e.g., from surveys), and dynamic personalization (e.g., using video recognition of shopper demographics to target messages). These present a number of promising opportunities for future research. JAR

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