

Narrowcast Pricebook-Driven Persuasion:

Engagement at Point of Influence, Purchase and Consumption in Distributed Retail Environments

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Abstract—The integration of information systems with advertising over wireless and broadband communications opens opportunities for sophisticated services to be delivered to small and medium sized organizations which often do not have the telecommunications, data management or integrated operations infrastructure and staff that are often maintained by many large organizations. This study of the effectiveness in retail locations of a narrowcast price book-driven video messaging system documents the impact of the marketing messages in influencing consumer attention, perception and behavior. Results point to increased category and brand purchases, as well as improved perceptions of store benevolence and staff effectiveness. Product marketers, brand managers, retailers, engineers, and academicians can draw actionable insights for the use of price book-driven video messaging system by understanding the dynamics of engagement in persuasive technologies. The participation of information scientists is needed in order to develop valid and actionable analytics that serve both the information sciences and retail communities.

Index Terms — narrowcast, pricebook, engagement, automation, retail, data-driven, advertising, persuasion

I. INTRODUCTION

The integration of information systems with advertising over wireless and broadband communications opens opportunities for sophisticated services to be delivered to small and medium sized organizations that often do not have the telecommunications, data management or integrated operations infrastructure and staff that are maintained by many large organizations [10]. Competing against an ever-rising bar for meeting customer expectation, digital signage systems appeals to retailers' desire to delight their customers and encourage return visits, sell more products, and encourage larger spend at each visit. Competing against an ever-increasing consolidation in distribution and supply services, hard data on item-level sales is imperative for retailers' judicious negotiations with their suppliers. Retailers and suppliers are both cooperating and competing in a continuous improvement cycle of ubiquitous personalized consumer messaging technologies. Security and privacy are concerns of both customers and retailers.

Strategic direction and tactical information resulting from the mining of price book data used in point-of-sale systems are of particular interest for inventory management in small and medium retailers. The incorporation of diagnostic and predictive modeling tools

into retail integrated operations systems permits an advanced level of service to the retailer at the store, regional, and enterprise management levels, even when resident staff does not include computer programmers and procurement analysts.

“Data-mining technologies are within the grasp of many organizations. Commercially available data-mining packages make it relatively easy for firms to transform their data resources into predictive models. Yet, despite technological advances, the potential of incorporating data-mining into an organization's decision-making processes is still relatively untapped” [4]. This is especially true when the information from the data-mining systems transcend several areas of expertise. For example, an expert marketing system could provide strong value to retailers wanting additional information about their stores and their customers in order to negotiate favorably with distributors and suppliers.

Large organizations, such as Wal*Mart [2], have the critical mass of technology and personnel to employ or bring in-house the entire range of information systems, procurement, store management, marketing, and advertising specialists needed to integrate consumer marketing, product promotion, stock management, warehousing and procurement their many international retail locations [3]. They can create the entire system within their organizations. Smaller companies, such as convenience retailers, often do not have this range of expertise – across a group of employees or within a single employee. The complex range of advertising, promotion and marketing strategies and tactics needed by small and medium sized companies, convenience retailers for example, means that these functions are often outsourced to a marketing specialist, further extending the demands on data security. Marketing consultants often lack the information systems know-how required to securely optimize a narrowcast messaging system with real-time sales results.

As depicted in Figure 1, a digital signage network allows content to be delivered as a narrowcast to each individual digital sign location. Components include network providers, display OEMs, component vendors, software developers, bandwidth providers, content providers, system integrators, value-added resellers, and a variety of customers. In addition to these capabilities, the System deployed in this study, communicates with each convenience store's point-of-sale (POS) system to collect all transaction data.

Narrowcasting has traditionally been understood as the dissemination of media to a narrow audience, segments defined by values, preferences, demographic attributes, or location, as differentiated from the general public. In the context of out-of-home advertising, narrowcasting may rely on a digital signage network. The narrowcast System in this study consisted of media played on in-store video screens, installed in a network of convenience stores, talking directly to a network server, instructed by a system server, with desktop interface through a proprietary software application. Figure 2 shows the network of the System used in this study.

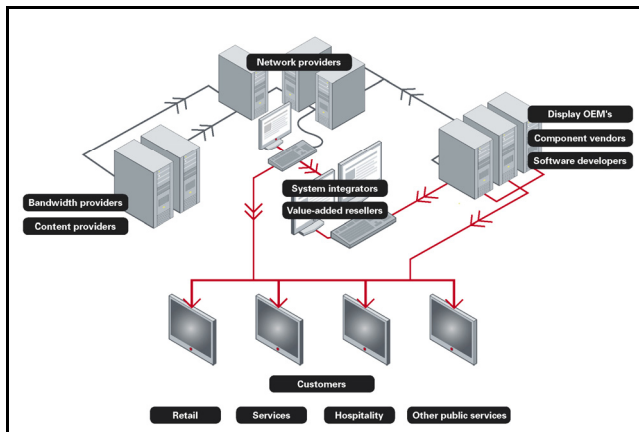


Figure 1: Structure of the Digital Signage Industry

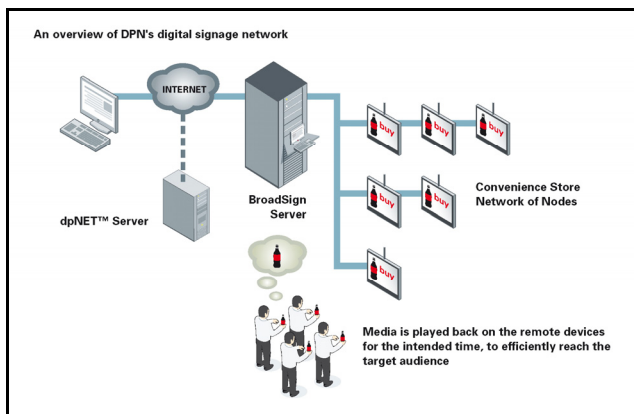


Figure 2: Overview of a Digital Signage Network

The business operating unit in this System was developed so that it could be remotely installed and compatible with the wide variety of POS systems configured for convenience stores; it provided for almost complete automation. Another cornerstone of this business model was a fully integrated feedback system to measure the effects of point-of-purchase advertising for the industry. Rather than rely on temporary trials for measurement, the management information system collected POS transaction data on a full time basis, enabling long term analytics across hundreds of discrete retail businesses. This capability is of great interest to advertisers who increasingly seek accountability for their investments in advertising.

“Half the money I spend on advertising is wasted; the trouble is I don’t know which half.”

John Wanamaker | US department store merchant 1838 – 1922

The installed System used in this study consisted of a point-of-sale digital signage system that created and distributed advertising content in individual stores under a subscription contract. The installations consisted of the following:

- A 32 inch flat panel LCD display permanently mounted in a high traffic area in the convenience store (most commonly a ceiling mounted unit near the coffee bar or beverage cooler)
- A digital media player wired to the LCD display and the internet via a modem or router
- Advertising content delivered over the internet to the solid-state media player (a store-forward device) which plays the content in a continuous loop until the playlist is modified by the central control
- Advertising content that was automatically matched to the products and price carried in each individual convenience store location.
- Online dashboard interfaces made available to the convenience store owners to give them options on monthly playlists selections as well as the ability to customize ads for products such as prepared foods.
- Automation of these business process by the software systems.

Another key feature of the operating system used in this study permitted the advertising content is matched to the stores’ inventory and the software dynamically and automatically renders the price of the item into the ad. In this System, all unique product codes (UPCs) for an AD are batch-loaded into a repository; this process identifies and loads associated UPCs to those provided via the POS process to ensure all UPCs associated with an AD are included. The UPC and price in the database are updated using data provided by the point of sale data, the AD price selection process, and those prices manually entered into the database. The POS data comes full circle at the retail location – where collected POS data is used to display prices during playlist selection and to exclude advertisements for products that are not carried by the store.

One of the biggest challenges to building a scalable digital signage business to serve the highly fragmented smaller retailers is the development of the software to communicate with a nearly infinite number of POS systems configurations. The great potential of a narrowcast system is that it can not only collect granular transaction information but can use this data to dynamically insert the correct sales price into product advertisement for each individual location, making it possible for the digital signage system to be completely hands-off for the retail owner if desired.

Because this process is completely automated by software, a small and independently operated retail chain can choose to implement a playlist selection for each individual store or any groupings of stores. Convenience

In today's attention economy [7] getting and managing consumers' attention is paramount for both retailer and supplier. To harness the potential of engagement on sales, retailers and marketers using persuasive technologies in retail environments are asking two questions:

What if – messages to engage prospects' interest could be delivered to motivated shoppers in the context of the purchase opportunity? An opportunity to purchase implies that the customer has access to the exchange (location) and that the product is in stock and discoverable by the customer (selection).

What if – persuasive messages could be delivered when prospects are engaged with the brand, and they would not only be able to buy it [transaction] but also be able to consume it [consumption] at that moment? An opportunity to purchase implies that a transaction can be completed. An opportunity to consume implies that the product is in a consumable form.

In the retail environment, convenience has been described using the four dimensions that are reflected in these two considerations: location, selection, transaction and consumption [22]. Over the past ten years, consumers' expectations for all dimensions of convenience have escalated as more and new offers of convenience have established new thresholds for customer expectations and as retailers compete to meet and exceed these expectations and, in fact, continue to raise the bar [21].

Insights about the size of the impact and the factors that influence effectiveness of persuasive technologies in convenience retail environments are closely held by the private entities that track and measure such factors because of the very strong competitive business value of such insights.

Dollars placed in alternative out-of-home media grew 27.0% in 2006 to \$1.69 billion and are projected to grow at an accelerated 27.7% rate in 2007 [24]. Alternative out-of-home advertising is one of the fastest-growing segments of the media industry, expanding at double-digit rates every year from 2001 to 2006 and posting compound annual growth of 22.6% [24]. Point-of-sale messaging results in an increase of 5 to 13% on product purchase in convenience stores [16]. However, few published studies have explored the effect or the effectiveness of in-store video media in retail environments.

The experiment reported here employs the definition of persuasive technologies as interactive computing system designed to change people's attitudes and behaviors [9] and extends it to include computer-driven messaging systems that deliver messages either to groups of people or to individuals, or both.

Measures of effectiveness used in this study encompass the shaping and reinforcing aspects of change and include both brand-linked emotional associations and brand-linked rational associations (beliefs) acknowledged the hierarchy-of-processing model of persuasion in advertising [11]. Along the continuum of intentions to influence and control what people think and do, persuasion differs from conditioning by evoking, either

physically or virtually, the presence of or reference to other people as social agents [9]. In this study relational exchanges are explored using a model of consumer trust, value and loyalty in relational exchanges [23].

The consumer feedback components of study were designed [5] to test the effectiveness (changes in recall and purchase behavior) of persuasive technology (data-driven networks of digital video messaging) at the point of purchase using measures of engagement (unaided and aided awareness), and relational exchange (perception of the store, staff and in-store messaging.)

III. METHOD

To better understand the effectiveness of in-store video messaging in engaging consumers and impacting both their perceptions of product brands and store experiences as well as their purchase decisions, this study compared consumer awareness and attitudes at convenience stores before and after in-store video display messaging was introduced. Following installation of video messaging at the test stores, purchase activity was compared across test stores and control stores.

The pre and post measures, acquired in this study via exit interviews, were constructed to validate the foundational concepts of marketing effectiveness: awareness, attention, recall, and purchase behavior. Measures were also constructed to capture customers' perceptions of in-store communications, as well as of the store experience, using indicators of proven drivers of customer satisfaction in convenience stores [13].

Unaided and aided awareness of the video screens were used as measures of engagement. Recall or purchase of the brand or product advertised in the video message was used as measures of effectiveness. Staff and store perception were used as measures of relational exchange. Concepts of engagement, effectiveness and relational exchange were operationalized as shown in Table 1.

TABLE 1: OPERATIONALIZATION OF TEST CONCEPTS

Concepts	Test Measures
Engagement	Unaided / Aided Awareness
Effectiveness	Recall, Purchase
Relational Exchange	Staff Perceptions, Store Perceptions, Video Perceptions

A. Consumer Feedback

Four convenience stores, in the same locale, with the same socio-economic characteristics, the same square footage and with the same planogram were selected for this study. Two stores were test stores; a video screen playing advertising, promotion and informational messages in a split-screen format was introduced into each test store. The other two stores were control stores and had no video display screens. Printed in-store messaging in all stores was seasonal and unchanged during this study.

Immediately upon exiting the convenience store, shoppers were invited to participate in a five-minute interview about messages, products, brands and

experiences. All exiting consumers were invited to participate. Three weeks following introduction of the video displays, exit interviews were again conducted at each of the stores.

At all stores, the interviews were conducted on the same day during two high traffic times of day: 6 to 10AM and 4 to 8PM. The interviews were conducted without incentive and included open-ended as well as closed-ended questions. Open-ended responses were coded for analysis.

A total of 400 interviews were conducted. One hundred twenty-five interviews were conducted in the test stores before the video displays were introduced, and one hundred twenty-five interviews were conducted in the test stores after video displays were placed in the those stores. Seventy-five interviews were conducted in control stores during the pre-installation phase. Seventy-five interviews were conducted at control stores during the post-installation phase.

The 5-minute exit interviews included questions to measure three dimensions: brand idea (purchase and intent to purchase/visit); engagement (awareness, recall); and relational exchanges (perceptions of the messages, the store environment and the staff.)

B. Product, Category and Brand Sales

Over a one month period, after installation of the System, sales data were analyzed in 75 stores with installed screens and 50 control stores without installed screens. Comparable data for the same period one year earlier were obtained for both test and control stores. Monthly averages were used in comparisons.

IV. RESULTS

The analysis of results revealed that advertisements on in-store video displays are effective. Sales of the advertised products increase; additionally, positive spillover effects were observed for both the brand and the category. The messages on the video displays had shopper impact, increased shopper attention to other in-store messaging, increased sales of advertised products, added value for shoppers, and increased high impact dimensions of customer satisfaction.

Messages on the video displays had the intended impact of shopper engagement with the message, product, category, and brand. Shoppers noticed the video displays. Shoppers liked the displays. Shoppers recalled the ads. Shoppers purchased the advertised products. Interestingly, the presence of the video displays also had an impact on shoppers' increased engagement with other in-store messaging.

A. Engagement

Unaided and aided awareness were all positively influenced by the video displays and their advertisements.

Unprompted, over one quarter (28%) of the shoppers in test stores noticed the video displays, shown in Figure 5. Prompted, over half of shoppers in test stores (58%) said they noticed the displays, as shown in Figure 6.

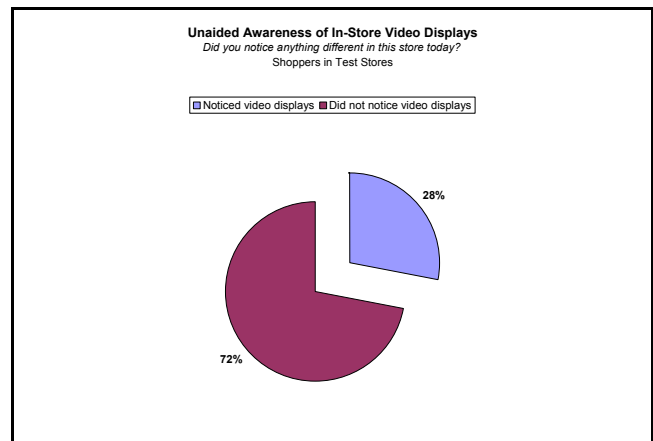


Figure 5: Unaided Awareness of In-Store Video Displays

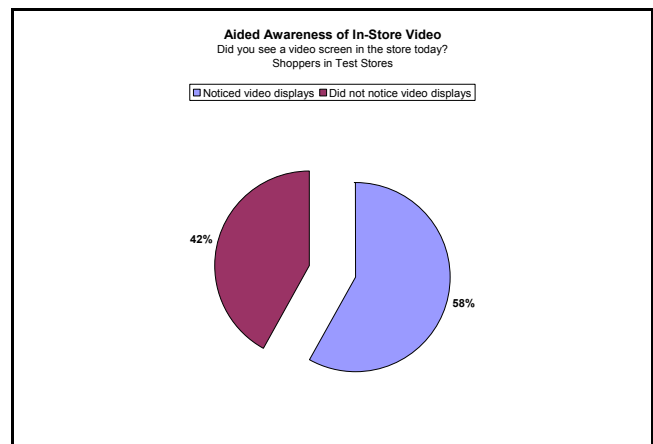


Figure 6: Aided Awareness of In-Store Video

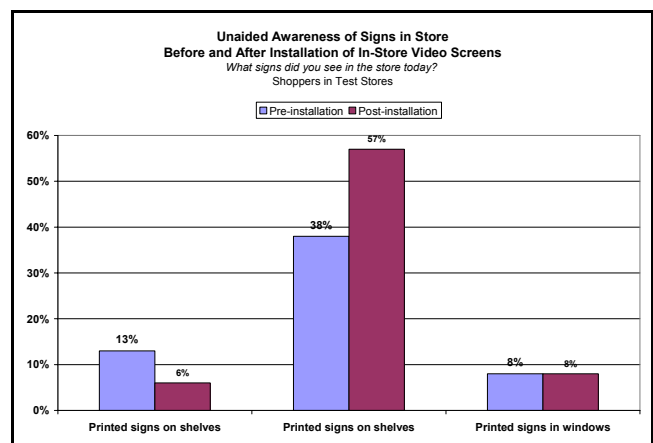


Figure 7: Unaided Awareness of Signs in Store Before and After Installation of In-Store Video Screens

Shopper attention to other in-store messaging, in particular the hanging signs, was elevated following installation of the video displays. Figure 7 shows that the proportion of all shoppers who recalled printed signs hanging in the store increased from 38% to 57% following the installation of the video displays.

B. Effectiveness

Most shoppers recalled the content of the video displays, mentioning the images (14%), the ads themselves (48%), the brands (59%), and the products (66%) that were shown. Only 17% of shoppers who noticed the displays said they did not recall the content on the video displays. Figure 8 displays these results.

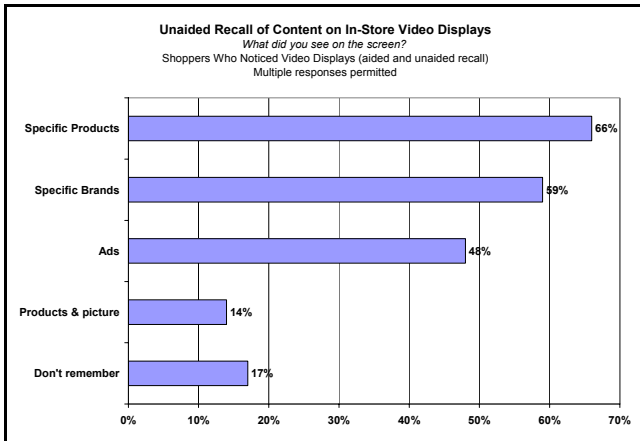


Figure 8: Unaided Recall of Content on In-Store Video Displays

Purchase of advertised products and brands were positively influenced by the in-store ads. Figure 9 shows the percentage increase of one energy drink UPC, 2008 compared to 2007, comparing stores running ads on the video screens compared to like stores in which there were not video screens. Across the industry, the energy drink category grew from 2007 to 2008 [14]. In test stores, with video screens running ads for this product, sales of the advertised energy drink increased 56% during the 30 day ad cycle in 2008, over the average monthly sales in 2007. In control stores with no video screens running ads for this energy drink, sales in the same month averaged only 34% over last year. In stores running ads on video screens for the energy drink, sales of the advertised energy drink product increased 24% more than for control stores in which no screens were installed.

Sales benefits of the ads on the video displays were not limited to the advertised products. The product category itself enjoyed increased sales as well. During the 2007 to 2008 period, sales in the beverage category grew for the convenience retail industry [14]. In stores with no video displays, sales of the beverage category increased 26%. In stores with video displays, the beverage category as a whole grew 34%; the growth was nearly doubled (77%) for those beverage products that were advertised in the video displays, measured for a 30-day period.

Some benefits of product advertising accrued to a brand, as shown in Figure 11, which compares increases from 2007 to 2008. During this period, sales in the gum category grew in convenience stores [14]. Stores with no video screens averaged an 11 % increase in sales in the gum, candy and mint category, while stores with video screens carrying ads for a gum product averaged an increase of 18% in the same category. Sales in stores with video screens showing ads for a particular branded gum product grew 23%. The spillover effect was stronger for the category than for the brand, however. Sales for all

products carrying the brand of the advertised product grew only 15%, compared to the increase of 18% for the advertised category.

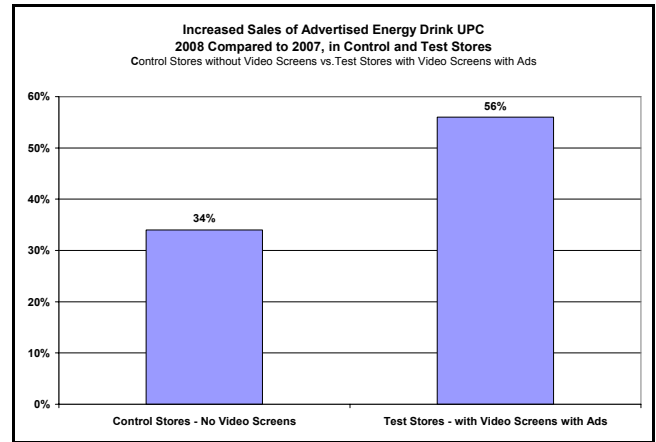


Figure 9: Increase Sales of Advertised Energy Drink UPC 2008 / 2007

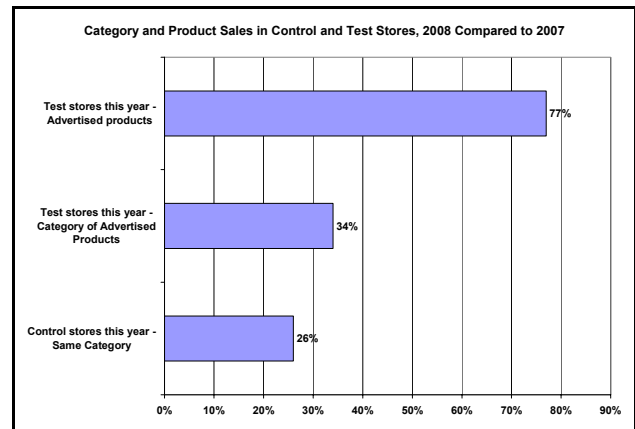


Figure 10: Category / Product Sales in Control / Test Stores, 2008 / 2007

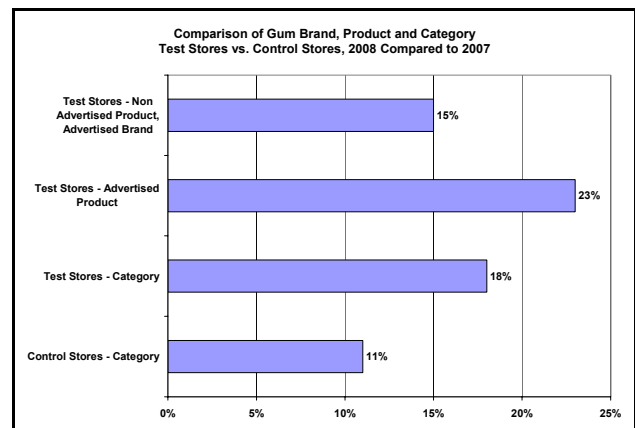


Figure 11: Comparison of Gum Brand, Product and Category in Test and Control Stores, 2008 / 2007

In addition to increases in sales of advertised products and their categories, the video displays in test stores resulted also in increased customer satisfaction and positive perception of the store and its staff.

C. Relational Exchanges

Only 10% of shoppers who noticed the video displays said their shopping was not influenced by them. Other responses, shown in Figure 12, indicated the displays offered a positive value proposition. In open-ended responses shoppers attributed benevolent motives to the store for operating the video displays. Nearly half (48%) of the shoppers who saw the displays said they believed the screen content provided money-saving information; over one quarter (28%) said their shopping was influenced by the entertainment value of the displays. Fourteen percent noted that the displays provided information.

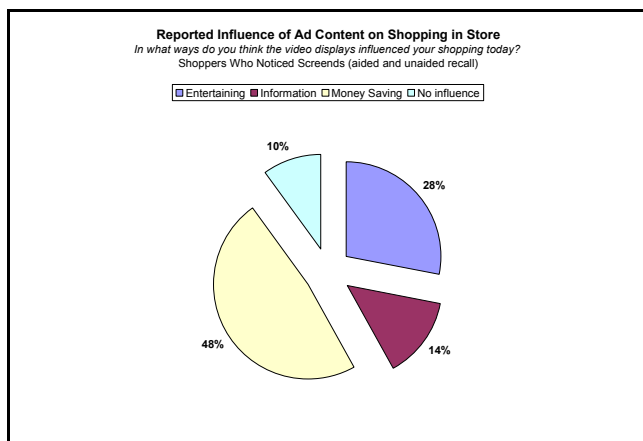


Figure 12: Reported Influence of Ad Content on Shopping in Store

Measures of customer satisfaction that have been developed specifically for convenience stores and tracked over nearly ten years show erosion in customers' perceptions of convenience and continued low ratings on price and service quality. Indicators used to measure these perceptions include staff friendliness, helpfulness and attractiveness [19].

Shoppers in test stores rated their shopping experiences higher after the video displays were introduced. Figure 13 shows that after screen installation, shoppers rated the store higher on three key customer satisfaction indicators: speed of service (up 0.7), staff friendliness (up 0.6), and employee attentiveness and attractiveness (up 0.4), all significant differences on the 10-point scale at the $p < .005$ level. No significant differences were noted in pre and post conditions or between test and control store for other indicators of customer satisfaction, which included cleanliness, store layout, motorist services, product selection, convenience of parking, access to location, and quality of prepared food.

Additionally, the video displays had an impact on shoppers' perception of their surrounding context by adding value to products advertised as well as to the shopping experience. Figure 14 shows these results. Among shoppers who noticed the video displays, there was strong agreement (4.7) that the video displays were more likely to be noticed than printed signs in the store. There was strong agreement that products advertised on the displays were a better value than non-advertised products (4.5). Shoppers also agreed that their shopping

experience was more enjoyable because of the video displays and their content (4.1).

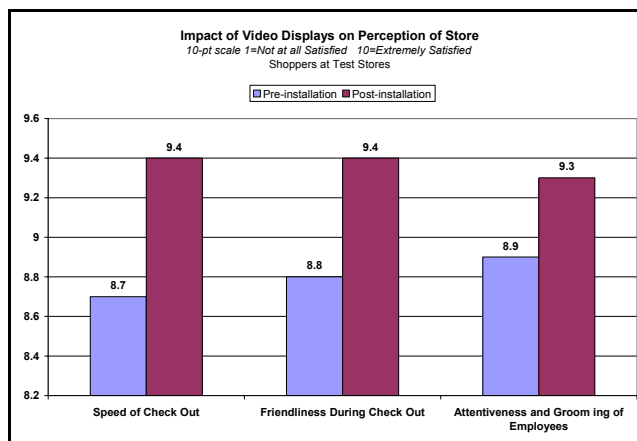


Figure 13: Impact of Video Displays on Perception of Store

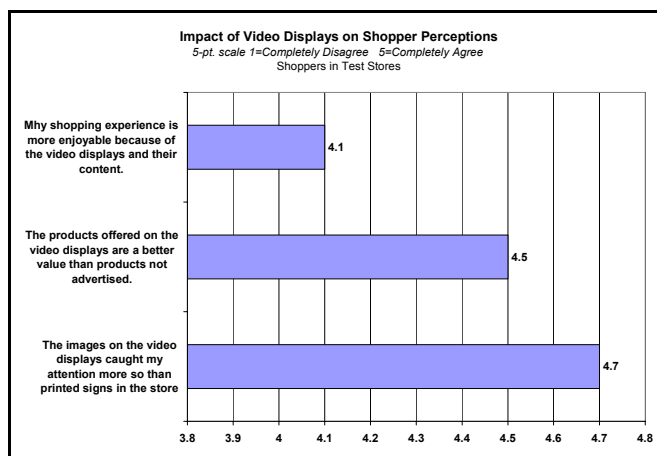


Figure 14: Impact of Video Displays on Shopper Perceptions

V. V. DISCUSSION

Results of this study provide insights on how in-store video messaging can be used to persuade shoppers. Opportunities for persuasion are not limited to the products advertised in the video displays. Opportunities for persuasion also include spillover effects for the category and, to a lesser extent, spillover effects for the brand. Additionally, in-store video messaging provides positive enhancement of the relational exchanges reflected in consumers' attitudes toward the store and its staff.

Results of this study support the effectiveness of using in-store video advertising to provide return on investment to product sales, as well as brand-building and relationship-building initiatives. Video displays boost shopper attention to point-of-purchase advertising located elsewhere in the store. Video displays improve shoppers' perception of store and its employees as well as their perceived value of the advertised products. Shoppers like savings and entertaining content and remember it. Shoppers buy more of the advertised products. Persuasion can be delivered conveniently, consistent with the context, and customer satisfaction is increased.

In response to increasing competition and to consumers' dissatisfaction, retailers are searching for ways to elevate consumers' perceptions of convenience, add value to the experience, and leverage brand engagement for store loyalty [20]. Results of this study point to opportunities to leverage consumers' in-store engagement to improve satisfaction with the retail environment as well as create brand and product demand.

Results of this study showed that in convenience stores in-store video contributes to both brand awareness and brand demand at the point-of-purchase. Messages can be delivered to motivated shoppers in the context of purchase opportunity. When engaged with a brand idea, shoppers have the opportunity to purchase and consume. Engagement with a brand idea boosts both purchase and perception.

Results of this study also point to the potential for further advances in automated analytics in information systems to expand and enhance the range of price book-driven, consumer-facing messaging systems in retail settings, raising a third question:

What if – the choice of messages could be based on the real-time feedback from prospects' behavior? Dynamic optimization of choice and content in messages requires ongoing feedback that is specific to that market, retailer and location.

The ability to automate the distribution of content and to provide real time measurement of the effects on sales gives the System unprecedented capabilities to adjust advertisement strategy and tactics in order to optimize results. Variables can be manipulated across selected portions of the network or the entire network in planned experiments or stochastically. From a business perspective there are several optimization questions that frame the next generation of product and service enhancements:

- What is the most effective length of the ad spot? Should this type of medium use six seconds, ten seconds, or perhaps 15 seconds lengths? How does the type of product, time of day, or the characteristics of the ad affect the optimal time?
- What is the difference in effectiveness by showing or not showing the product price? Does this truly affect the call to action?
- Are brand ads (ads showing multiple products) as effective in the aggregate as ads showing only one specific product?
- Does the inclusion of entertainment or information increase customer engagement? If weather or traffic is shown should it be displayed in a side bar that is always visible or intermittently as a full screen display?
- What factors influence customers' acceptance of out-of-home digital narrowcast advertising systems that deliver personalized messages? Is the convenience appreciated?

- What are customers' concerns about privacy and security? Do younger customers feel differently about privacy and security than older customers?

There are likely many queries that researchers could investigate, given hundreds of retail locations representing many business variables using the data and analytic capabilities represented in this digital signage network.

Results of this study support business value of deploying narrowcast out-of-home advertising using information systems that link point of sale to price book and inventorying systems. Plans announced September 2008 by Wal*Mart to launch Smart Network, their second generation retail digital signage network, across 27,000 video displays in 2700 stores in the US by 2010 attest to the perceived value for large companies. Measurement and analysis tools in this system will track audience impact of the systems and optimize the messages to ensure a continual process of improvement for both shopping, customers and advertising partners [1]. This decision implies that Wal*Mart's \$10M investment in testing has also yielded positive results.

While Wal*Mart's system includes intelligent and differentiated screen placement, detailed and actionable analytics, and dedicated creative resources [3] its developers acknowledge that Smart Network must embrace interactivity, deliver personalized experiences, and avoid overload. Optimization of the network will require collaboration between Wal*Mart and their suppliers to share and use detailed sales information, jointly develop communications strategies, and cooperatively develop marketing strategies and tactics. The activation of Smart Network will again raise the bar on consumer expectations. Medium and small sized retailers motivated to compete with those expectations will look for tools and insights available to them.

Studies on the relative effectiveness of diverse media – for specific categories and with specific markets – are now underway [6] and are likely to lend important insights to decisions that have the potential for high rewards. Additional capabilities of narrowcast pricebook-driven messaging systems will harness real-time response data – at the store and for their brands – that will provide both retailers and advertisers opportunities to optimize all aspects of customer engagement with their brand messages and product promotions, in ways that are specific to the location, relevant to the surrounding context, and personalized to the customer.

Further studies comparing message effectiveness at various times of day, as well as experimentation with different technology designs – impact of multiple screens and with screens placed at various locations in the store – are needed in order to establish rational pricing for media buys on the in-store networks. Further studies on creative content are needed to provide an actionable understanding of how low attention or high attention message strategies can be used in retail setting to optimize behavioral and attitudinal changes and how personalization and co-creation can further enhance the relational exchanges present in retail experiences.

Additionally, further experimentation with various persuasion approaches, as well as with the format and sequencing of messages, will help to inform how marketing strategists, media and account planners, creative developers and retailers use tools such as the System used in this study and others like it.

The potential of narrowcast, data-driven in-store video advertising also includes improving shoppers' perceptions of the staff effectiveness and their perception that the store is acting on behalf of consumers. Consumer perceptions of the store experience and the products' value provide validation for the important role that engagement plays in developing the relationships on which loyalty is based. In-store video advertising has strong potential to deliver return on investment to both retailers and advertisers. The return-on-investment of these systems is likely to be based on insights about media engagement that come from analysis tools that optimize all data-driven processes. It is imperative that systems designers and computer application developers address the efficiency, control and choice demands of retailers, as well as the consumer thresholds for engagement and attention. Important frontiers in information system design are fueled by the new analytics made possible by new narrowcast data-driven video messaging networks.

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