

The Use of Electronic Shelf Labels in the Retail Food Sector

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Abstract—The use of QR (Quick Response Codes) codes for customer scanning with mobile phones is a rapidly growing trend. The QR code can provide the consumer with product information, user guides, product use, competitive pricing, etc. One sector for QR use has been in retail, through the use of Electronic Shelf Labeling (henceforth, ESL). In Europe, the use of ESL for pricing has been in practice for a number of years but continues to lag in acceptance in North America. Stated concerns include costs as a key constraint, but there is also evidence that consumer acceptance represents a limitation as well. The purpose of this study is to present the findings of a consumer based study to gauge the impact on their use in the retail food sector.

Keywords—Electronic shelf labels (ESL), consumer insights, retail food sector.

I. INTRODUCTION

THIS study addresses an apparent gap in the literature as to the role of digital in store operations such as ESL from the consumer perspective. What is clear from the literature is that informative in-store tools have a positive impact on consumer store evaluations, purchase behavior and store loyalty [1]. What is less understood is how emerging technologies such as ESL impact retail service quality and shopper satisfaction.

The objective of the research was to determine the role that ESL plays in terms of consumer perceptions of ESL use, and to provide insights as to potential consumer benefits or concerns, within a grocery retail setting.

II. RESEARCH BACKGROUND

For the most part, every retail store will appear different than any other, whether it is the layout of the store, the products on display, or the color scheme of the interior. These unique characteristics allow each retailer the opportunity to distinguish themselves from their competitors. Russell and Mehrabian [2] claim that a retail environment can be measured independently of the consumer, as the environment is entirely external to a consumer undergoing study. A store's environment is never natural, but is comprised of messages, cues and suggestions in effort to prompt consumers [3]. Retailers make the assumption that by creating positive

attitudes and feelings among consumers will translate into positive consumer behavior, such as increased store loyalty or a higher willingness to pay [4], and thus greater chance of retail success. In essence, retailers strive to project a store environment in a way that will enhance consumers' attitudes towards the store, and the store's image.

A. In-Store Retail Environment

The focus on retail strategy as it relates to the in store environment has been a source of both academic and industry study, particularly as it relates to consumer experiences during their everyday shopping activities [5]. The term "atmospherics" in a retail context pertains to anything within a store that affects a consumer's environment [6]. In addition to the store layout, and the use of color, research has examined the effect of store lighting, music playing, and olfactory variables. Research on environmental cues has resulted in a number of mixed findings in terms of how they affect consumers in a retail setting, and much of the early research in this field is still in its early stages [7].

Environmental cues can become associated by consumers with different types of retail stores and that a unique combination of environmental cues helps to differentiate individual retail stores from their competitors. It is suggested that during each individual shopping experience, the environmental cues can play a role in shaping a consumer's experience, and that these cues will further allow the image of the retailer to be formed in the mind of the shopper [8]. These perceptions can determine the relationship that develops between the consumer and the retailer, such as the consumer's likelihood to purchase at that location in the future, and at what frequency.

Atmospherics can relate to all of the five human senses, including visual, auditory, olfactory, tactile, and taste [9], however, consumer perception is thought to be multisensory, and thus the understanding of how these functions act upon a consumer's behavior is crucial to understanding a consumer's retail experience. Enquiries into this field of study fall within the field of sensory marketing research. Sensory marketing research extends to how a consumer will feel about the prices offered in a shop, as well as to a general image that a shopper has of the store. This transfer of meaning from the atmospherics that are found in a store, to an overall to the reflection of the store itself, and the retail brand is referred to as sensation transference [10]. The significance of these findings results from a greater understanding of how consumer attitudes are developed in response to the store's atmosphere and how these responses will be transferred to the in-store product evaluations and overall store image.

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B. Consumer Perception of Price

One of the most important retail environmental cues, and arguably the most influential factor to a consumer's intent to purchase is price. Consumers may draw conclusions about individual prices of specific products in a store or an overall store price image (OSPI), which transfers their perception of prices to an overall perception of the store [11]. After observing a price label, a consumer may have perceptions that lead to judgments such as the product is; "a bargain"; "too expensive"; "a total rip-off". Findings in the field of numerical information processing research suggests that individuals make meaningful decisions using an overall encoding process of price, as opposed to encoding based solely on actual prices [12]. For example, consumers may perceive that one department store has a higher overall store price image than another, based on the fact that the first store charges higher retail prices for their clothing items versus the other. This perception is then translated into a pricing image for all products sold at the store. With this knowledge, retailers have the ability to attempt to control or shape their OSPI, and even develop a strategy based upon these perceptions. For example, many luxury brand retailers such as Louis Vuitton and Prada may never offer their products at discounted or sale prices in order to maintain their OSPI as a high-end brand.

Retail pricing strategies has received a large amount of attention from researchers, as price is arguably the most readily changeable retail variable. Research on retail pricing has examined a number of different elements in how price is evaluated, including the physical appearance of the price tag, the use of numerical strategies, and how price relates to a consumer's perception of fairness. Examples include the impact of the specific color of the price tag. Research has found that red-colored price tags in comparison to black-colored price tags resulted in males perceiving greater value [13]. The authors suggest that this finding is supported by the theory that heuristic processing differs between genders, resulting in males feeling more positively when exposed to the color red in comparison to females.

With respect to numeric strategies research has demonstrated that the endings of retail prices have the power to communicate meaningful information to consumer, and showed evidence that prices ending in '99' acts as a signal of a low-price appeal [14]. Carver and Padgett [15] later applied this 99-ending pricing to future price attractiveness, concluding that the use of "just below" pricing lessens price attractiveness in comparison to prices ending in '00'. With respect to pricing fairness, findings suggest that consumers have 'mental schema', which determines how they judge the fairness/unfairness of a price.

C. In-Store Retail Technology

Another field of retail strategy that continues to gather interest is the use of technology, and with respect to this study, how technology is being used to shape consumer retail perceptions. The rate of technology use in retail environments mirrors that of other industries, with the added component of technology used by the consumers themselves. Whether it is

using a smart-phone for accessing discount coupons, or in-store information scanning, or having a tablet attached to a shopping cart to help consumers with their shopping experience, technological innovations in retailing continue to rise. Thus, it is no surprise that retailers are implementing more innovative in-store technologies in hopes of improving the quality of the consumer experience. Furthermore, retail store technologies can act as environmental cues, as was the case for pricing, in shaping consumer perceptions about the retail store brands. Depending upon the type of retailer, as store that includes many types of in-store equipment such as barcode scanners, self-checkouts, radio-frequency identification, electronic security tags etc. can have a very different image in a consumer mind in comparison to stores in the same sector that do not. In today's digital age, consumers are becoming more and more tech-savvy and want, and not surprisingly expect, a seamless in-store experience while shopping [16]. This trend of tech-savvy consumers will put new pressures on retailers, and ultimately lead to new definitions for stores, where factors such as size, place and purpose are surpassed in importance by the degree that a store's use of technology more closely aligns with that of their shoppers. These pressures are being reflected in retailers' strategies, as implementing technological advancements into their businesses has been a top priority strategy in recent years. An exemplar of this changing retailer technology is the use of Electronic Shelf Labels (ESL).

D. Electronic Shelf Labels

ESL is a focal consumer variable that conveys a level of innovative technological advancement about a store. Basically, an ESL is device where product prices are displayed digitally as opposed to printed on paper (see Fig. 1). By using ESLs in place of the traditional paper price labels, there is a belief that price integrity will improve (i.e. the price on the label always accurately matches that actual price) which can be a concern of a shopper. For the retailer, the use of ESLs makes the process of changing prices easier (i.e. less labor involved) and is more reliable as every price label is linked to a manageable system. On top of increasing price integrity through the linkage of one wireless system, ESLs also increase in-store efficiency, as changing prices can all now be done through a computer, as opposed to changing them one-by-one through physical labor. Additional features and benefits of ESLs come from the fact that come in a variety of shapes and sizes, and are easy customizable. They can also be used to provide additional information such as sensing environmental data such as temperature, and can send an alert to retailers if their refrigeration levels have reached threatening levels. Thus, the value that ESLs offer retailers is clear, as they improve price change efficiency and improve accuracy between the shelf price, and the register price. As mentioned before, ESLs are easily customizable, allowing the retailer to fill the digital screen with product information. Although it can be argued that paper price tags can include product information as well, ESLs can constantly be changed, which decreases the amount of paper labels being thrown away every

time a price changes. Finally, other features targeted at consumers include buttons that when pressed, will allow the consumer to view their total savings from a product that is promoted as “on sale” [17]. In terms of a store’s image, a study was conducted by KPMG concluded that 64 percent of consumers perceived that a store that uses ESLs offers better customer service than one that does not.



Fig. 1 Examples of Electronic Shelf Labels

What continues to remain less known is the value that ESLs offer consumers which is the main focus of this research.

III. RESEARCH METHODOLOGY

In order to better understand the use of ESL in terms of consumer perspectives, an interactive survey instrument was created. The type of retailing that was selected for study was grocery shopping. Grocery shopping represents a retail sector that is a common activity for the majority of households, but unlike other types of shopping activity, grocery shopping creates a routine form of buying behavior [18]. Grocery shopping is characterized by a set of premeditated purchasing goals that in order to achieve, the consumer must be exposed to, and process, a complex display of stimuli such as products, prices and point-of-purchase information. It is typical for an average consumer to undergo this complex experience at regular time intervals, such as once or twice a week. Lastly, grocery stores hold a large amount of stock-keeping units (SKUs) in comparison to other retail stores, and are also prone to a high frequency of price fluctuations, especially in produce

due to seasonal factors. These factors make grocery stores as an appropriate format for this study.

The survey consisted of a series of general questions such as demographic information (age, gender, etc.), and questions about typical shopping activity and behavior. The participants were then asked to look at a series of images, with each image depicting a retail shelving- unit filled with an assortment of products. Each image was displayed for twenty seconds before automatically moving to the next page of the survey. After viewing each image, the respondent was asked to answer a short series of questions about the image they saw. In pictures 2 and 3 ESL price tags were on the shelves. The image was taken from a slight angle, which allowed the respondents to better see the shape and depth of the actual price tag, as well as a slight glare, which increased the visibility of a digital screen as opposed to a piece of paper.

After viewing all three images, and answering a series of questions for each of them, the participants were then overtly introduced to ESLs, including a description of how they work and close-up pictures of the units. The participants were then asked more in-depth series of short questions based on their familiarity with ESLs, as well as their opinions on the use of ESLs in retail environments. The two key questions were as follows:

- “What do you see are the advantages for you as a shopper, when grocery stores use Electronic Shelf Labels?”
- “What do you see are the disadvantages for you as a shopper, when grocery stores use Electronic Shelf Labels?”

IV. RESEARCH FINDINGS

The text was entered into Text Cloud software [19]. Word clouds (also known as Tag clouds) have been shown to be a helpful qualitative research technique to help visualize data [20], [21]. There were a total of two clouds created one the advantages, and one for the disadvantages (see Figs. 2 (a) and (b)).



(a)



Fig. 2 (a) Advantages (b) Disadvantages

V. RESEARCH DISCUSSION AND CONTRIBUTION

Not surprisingly both answers elicited comments about price. What was interesting was the preponderance of comments about technical issues such as accuracy, malfunction and errors. What was also of interested were in terms of both advantages and disadvantages, a prevalent term was “none”. This relevance of these findings should be taken with caution based on the limited amount of personal exposure that the respondents had had with ESL in stores that they shop.

In terms of contribution, this study contributes to both theory and practice. From a theory perspective, developing a research methodology that can better assess consumer “indifference” to new technology, while from an industry perspective it provides insights as to potential issues that retailers may want to highlight, ignore, or redirect in terms of ESL use. The expectation is that the findings from this study can be used to further develop research studies to address the apparent gap in the literature with respect to ESL use and consumer behavior and shopper satisfaction.

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