Shoppers' acceptance and perceptions of electronic shelf labels ☆

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ABSTRACT

The emergence of online grocery retailers challenges the pricing strategies of bricks-and-mortar supermarkets. Retailers can use electronic shelf labels (ESLs) to adopt dynamic pricing strategies, to reduce price adjustment costs, and to decrease the error potential associated with wrong prices. To date, no study has investigated consumer perspective on ESLs. The present research employs a field experiment to investigate consumers' acceptance and perceptions of ESLs. In line with the technology acceptance model, the findings reveal that shoppers perceive ESLs as easy to use; however, they are largely unaware of the benefits of ESLs. Furthermore, ESLs provide an easy way to identify a product's price. The results also indicate that ESLs positively influence product quality inferences and store image but do not affect price fairness perceptions.

1. Introduction

The emergence of online grocery retailing challenges bricks-and-mortar stores. The convenience associated with online retailing, lower prices, and a wide product range requires stationary retailers to adapt their retail strategy (Zhou, Tu, & Piramuthu, 2009). A retailer's pricing strategy is an important factor for its ability to compete with online stores (Lewis, 2014). Online retailers can easily employ dynamic pricing strategies without substantial price adjustment costs. As recent figures demonstrate, flexible pricing strategies are relevant for stationary retail as well. Given the importance of pricing, manufactures have begun to develop solutions for easy price adjustments. The introduction of electronic shelf labels (ESLs) enables retailers to adjust prices instantaneously using automatic procedures. ESLs are e-paper displays mounted directly on the shelves. The latest versions of ESLs use e-ink technology (as used in e-book readers) and offer the opportunity to display various colors. Similar to traditional paper price tags, ESLs can display all kinds of information, such as product price, product descriptions, barcode information, unit price information, or country of origin. They connect to the retailers' inventory control system, which allows for automatic price updates. Hence, in contrast to traditional price tags, ESLs enable easy price adjustments by radio frequency or infrared. ESLs thus enable retailers to adopt dynamic pricing strategies and, at the same time, to dramatically reduce adjustment costs (Loebbecke, 2007).

Despite the advantages of ESLs, this new form of price labeling has attracted little research attention thus far. Nevertheless, scholars and practitioners have pronounced the relevance of ESLs for future retail practice. Gedenk, Neslin, and Ailawadi (2010) describe ESLs as a tool that retailers can use to enhance customer service and predict that ESLs might change in-store pricing strategies. In their review of innovations in retail pricing and promotions, Grewal et al. (2011) claim that additional research is necessary to understand consumers' acceptance of ESLs. Consumers' reactions towards ESLs is of high practical relevance because market research studies predict a growth rate of 34% in revenue for the ESLs market (Research and Markets, 2014).

Despite the emphasized relevance of ESLs in stationary retailing in academic and trademark literature, no research so far has investigated consumers' acceptance and perceptions of ESLs. However, ignoring consumers' responses to innovations might result in consumer resistance (Garcia, Bardhi, & Friedrich, 2007). Moreover, the long adoption process for innovations and its associated high costs reflect a common problem for organizations who introduce new developments (Rogers, 2003). Consequently, retailers need to understand whether or not consumers accept ESLs and how they perceive them before deciding if they should implement an ESL system.

For the reasons outlined above, the major objective of the current research is to examine consumers' acceptance and perception of ESLs. In particular, the present study investigates how consumers evaluate ESLs in terms of perceived ease of use, usefulness, and price information prominence (i.e., to determine acceptance of a new technology). Furthermore, in order to explore if shoppers draw inferences based on

ESLs, the conceptual research framework implements broad outcome measures that are highly relevant to retailers (i.e., understanding consumer perception of a new technology). In particular, inferences on product quality, store image, and price fairness are scope of this research (see Fig. 1).

The remainder of this article proceeds as follows: Section 2 presents a brief literature review explaining consumers' technology acceptance and the inferences they make during a shopping trip. Section 3 describes the empirical study and the results. Section 4 presents the theoretical and managerial implications, and concludes with limitations and avenues for further research.

2. Theoretical background and hypotheses

A large supermarket offers up to 25,000 stock-keeping units, with price fluctuations on approximately 4000 units each week. In other words, 16% of all prices change in a given week. Stross (2013) reports even more pronounced price variations: in New York, a typical supermarket runs up-to-date promotions for approximately 5000 items per week and removes the last week's sales prices from another 5000 items. In an average month, Best Buy and Walmart each make 50,000 price changes (Lewis, 2014).

Varying wholesale prices drive price changes, and price adjustments are necessary to guarantee the retailer's profitability (Levy, Dutta, Bergen, & Venable, 1998). On the other hand, the evidence for and against everyday low pricing (EDLP) versus high–low (HILO) pricing is mixed, and therefore managers feel obliged to run price specials. A recent study reveals that shoppers prefer retailers applying an EDLP strategy with frequent small price reductions to retailers adopting EDLP with no price reductions or a HILO pricing strategy (Danzinger, Hadar, & Morwitz, 2014).

However, these price adjustments incur not only administration but also transaction costs (e.g., handling costs for printing tags and fixing them on the shelves). These physical costs of price adjustments account for 0.70% of store revenues in the grocery sector (Levy, Bergen, Dutta, & Venable, 1997). A study conducted in a drugstore confirms these figures: price adjustments account for 0.59% of revenue (Dutta, Bergen, Levy, & Venable, 1999). The authors conclude that these percentages are sufficiently large to form a barrier to price changes. Such a barrier might cause a severe disadvantage for bricks-and-mortar retailers relative to their online competitors.

In addition to a lack of flexibility in price adjustments, pricing bugs cause retailers to rethink their price-labeling system. A mismatch between the prices displayed on the shelves and those stored in the retailer's computerized database impairs a store's reputation and might even trigger penalties, should customers complain (Levy et al., 1998). Stross (2013) finds a failure rate for traditional price tags that ranges between 4% and 5%. Given that price information is one factor that affects consumers' decision to purchase a product (Dickson & Sawyer, 1990), retailers should pay particular attention to the correctness of their price labels.

ESLs address both challenges associated with price labeling. The opportunity of easy price adjustment guarantees flexibility in pricing strategies, while the connection to the store's inventory control system ensures price correctness. Manufactures promote ESLs because they hold the potential to employ dynamic pricing strategies and reduce error (Loebbecke, 2007). The price displayed directly on the ESLs can automatically update whenever the price changes. A database connects the ESLs and the store's cash register, ensuring that the price on the shelf matches the checkout price. Furthermore, ESLs can display not only prices but many other useful pieces of information as well, such as the product's country of origin, unit prices, and promotions (Clodfelter, 2013).

While press releases, newspapers, and textbooks communicate the benefits for retailers well, the scientific literature has paid little attention to the benefits of ESLs for customers. However, considering consumer perspectives on ESLs is important because neglecting them increases the risk of creating consumer resistance (Grewal et al., 2011). In line with this argumentation, Burke (2002) questions the assumption that all new technologies provide clear benefits for consumers, and Meuter, Ostrom, Bitner, and Roundtree (2003) call for a consumer-centric perspective to understand the acceptance and perceptions of technologies.

The current research combines the technology acceptance model (TAM) with innovation diffusion theory (IDT) to offer insights into consumers' acceptance of ESLs (see Section 2.1). Furthermore, inferences on product quality, store image, and price fairness made during a shopping trip serve as determinants of consumers' perception of ESLs (see Section 2.2).

2.1. Acceptance of ESLs

The acceptance of a new technology largely determines its usage. Within recent years, extant literature discusses numerous models in order to explain how and why individuals adopt new technologies (see Venkatesh, Morris, Davis, & Davis, 2003, for a review). The theory of reasoned action (TRA) reflects one of the most prominent models. Introduced by Fishbein & Ajzen, 1975, the main premise of TRA is that individuals' attitudes and subjective norms influence their behavioral intentions, which in turn impact actual behavior. Drawing on this theory, Davis (1986) introduces the TAM to predict and explain future usage behavior of new technologies. However, in contrast to the TRA, it is not attitude and subjective norm but rather perceived ease of use and perceived usefulness of a new technology that are the main constructs of TAM (Venkatesh et al., 2003). The main premise of TAM is that these two factors determine technology acceptance. Perceived ease of use represents "the extent to which a person believes that using a technology will be free of effort" (Venkatesh, 2000, p. 344). Perceived usefulness is a user's belief that using a specific technology will increase his or her performance on a specific task (Davis, Bagozzi, & Warshaw, 1989). In his conceptual model, Davis (1986) postulates that perceived ease of use and perceived usefulness determine attitude towards using a technology, which in turn influences actual use. Within the last decades, several scholars have devoted their research attention to extending and refining the TAM. Venkatesh and Davis (2000) identify determinants as well as moderators of perceived usefulness and introduce TAM 2. Three years later, Venkatesh et al. (2003) offer an alternate perspective by developing the unified theory of acceptance and use of technology. In this theory, the authors replace the two main constructs (i.e., ease of use and perceived usefulness) with performance expectancy, effort expectancy, social influence, and facilitating conditions that directly impact
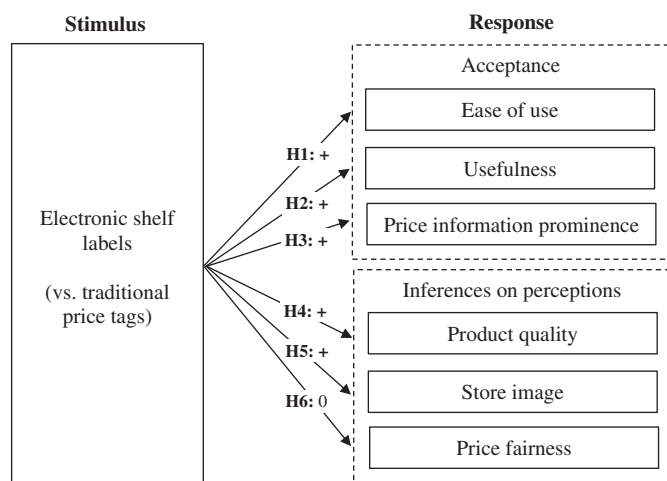

Stimulus

Response

Electronic shelf labels

(vs. traditional price tags)

Acceptance
- Ease of use
- Usefulness
- Price information prominence

H1: +
H2: +
H3: +

Inferences on perceptions
- Product quality
- Store image
- Price fairness

H4: +
H5: +
H6: 0

Fig. 1. Research hypotheses.