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Display signs and involvement: the visual path to purchase intention

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Retailers, merchandisers and suppliers go to great lengths to display merchandise so that it captures the eye of the customer. Attention requires eye movement. Our eyes move (saccade) and pause (fixate) to direct attention. Cognitive processing of visual items requires the eyes to attend to an object. Eye movement can measure attention, and attention increases mental processing of an object (e.g. word, image, object, and product). Both the characteristics of the person (top-down factors) and the stimulus (bottom-up factors) contribute to attention and influence the meaning derived from the stimulus. For the current study, we integrated involvement theory and the elaboration likelihood model with eye-tracking technology to evaluate customer attention to merchandise displays and their likelihood to buy (purchase intention). We recruited 344 subjects in six North American locations to view images of 32 live plant displays. Visual data were collected using a Tobii X1 Light eye-tracking device. To date, few investigations using eye tracking have been conducted on merchandised displays. Our hypothesis was that the more highly involved customers would view the merchandise (live plants) longer than required for identification, information or price signs. Results show differential 3-D patterns of involvement, likelihood to buy, and total visit duration. Involvement moderated the relationship between the time spent looking at the merchandise and their likelihood to buy.

Keywords: eye-tracking technology; retail customers; merchandise displays; method; horticulture

Introduction

All suppliers, merchandisers and retailers seek to arrange the best possible displays in-store. A merchandise display can use a variety of cues, such as color, lighting, music and movement, shelf talkers, information signs, and price tags, to gain the attention of customers. However, little is known about what elements of merchandise displays actually attract customer attention and for how long. One way to collect information relating to customer attention to displays and merchandise is the use of eye-tracking technology (ETT). Eye-tracking technology has found its way to the consumer research arena with the availability of light, portable, and less expensive equipment. Most peer-reviewed studies using ETT investigated the reading process (see Rayner [1998] for a 20-year review of this subject), but only one was conducted in a retail setting (Huddleston et al. 2013). In the consumer research arena, ETT peer-reviewed studies are sparse (see Wedel and Pieters [2008] for the most comprehensive consumer research review), and those authors called for research foci beyond reading, suggesting that topics such as merchandising are ripe for investigation.

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Several ETT studies focused on various aspects of package labels. For example, Bix et al. (2009) investigated the prominence of package warnings on over-the-counter medicines and showed they were not readily viewed. Sorensen, Clement and Gabrielsen (2012) confirmed that a product name on a label attracted the most attention, six times greater in fact than any claims about organic production. Again, illustrations captured more attention than health claims, even if the illustration had nothing to do with the product. Patalano, Juhasz, and Dicke (2009) documented that consumer indecisiveness was related to both time spent viewing purchase information and time spent looking away from information directly related to that choice task.

While ETT has been used extensively in investigations pertaining to reading, studies conducted with merchandise displays or in the retail setting have been less common. One study recruited participants from US and Australian retail garden centers to view merchandise images (Huddleston et al. 2013). They found that product rather than price information was more likely to motivate likelihood to buy for both groups of customers. It was one of the first published studies conducted in the retail environment where consumers viewed merchandise on an actual display fixture. The contribution of the present study is to build upon Huddleston et al.'s (2013) work by relating involvement to purchase intentions using ETT. The product investigated here is live plants; arguably, plants are a visually attractive product category to many, but are also representative of many types of visually stimulating products. Garden plants have different characteristics that must be considered by retailers, and are more akin to the fresh produce. They need regular care in store and are rarely 'packaged' to prevent damage. A visually stimulating plant has the potential to attract significant customer attention and lead to high customer involvement.

Involvement theory

Involvement is defined as an 'unobservable state of motivation, arousal or interest' (Rothschild 1984, p. 216) and is recognized as the perceived importance of the stimulus (Mittal 1995). According to Rothschild (1984), high involvement results in information searching, processing, and decision-making. Involvement theory has been adopted in different fields such as education and consumer behavior, and, in the context of higher education, Astin (1999) defines involvement as the amount of physical and psychological energy the student devotes to the study activity. He showed that students learned better when they were more involved in the collegiate experience. From the consumer behavior perspective, involvement has frequently been measured by a product's perceived importance to the consumer (Kapferer and Laurent 1985). The meaning of involvement can be looked at from different perspectives, for instance, high involvement indicates great relevance and product importance (Greenwald and Leavitt 1984); involvement is a motivational state of mind with regard to certain activities and is goal-oriented (Park and Mittal 1985). From an empirical analysis of 14 product categories, Laurent and Kapferer (1985) argue that consumer involvement could stem from the following possible antecedents: interest, perceived risk (importance and probability), the rewarding nature of the product, and the perceived ability to express one's brand identity (sign). In consumer decision-making, the higher the level of involvement with the product or purchase process, the more attention and importance is given to the decision.

Elaboration likelihood model

The elaboration likelihood model (ELM) (Petty and Cacioppo 1984, 1986) suggests that consumers process information through two different routes – central and

peripheral. In the central route, consumers process information consciously and use relevant cues to evaluate a product. By contrast, the peripheral route is less deliberate. Consumers use readily available cues (e.g. color) whether or not they are relevant to the product or brand. In the peripheral route, there is scant elaborative information processing. Consumers with the motivation and knowledge to process information are more likely to process information through the central route (MacInnis, Moorman, and Jaworski 1991). Research revealed that consumers with high involvement tend to utilize the central route such as content-relevant information, whereas consumers with low involvement tend to utilize the peripheral route such as the surface characteristics of the product (Petty and Cacioppo 1984). There is no research-based evidence to demonstrate which information processing route consumers use to evaluate merchandise displays. Peripheral cues, such as color or the merchandise itself, might attract consumer attention, or, an attractive display design (relevant cue) might also capture attention. Our study builds on reading activities research by investigating the ability of sign cues to capture consumer attention and draw him/her to the display for further product consideration/choice.

Price is nearly always a readily available attribute and requires less effort to process than other cues such as design or ingredients (Zaichkowsky 1988). For consumers with higher involvement, content-related information may outweigh the price cue in making a purchase decision. Consumers who are highly involved in a product category place less emphasis on the price cue than consumers who are less involved (Zaichkowsky 1988). Since consumers with low involvement tend to process information through the peripheral route, whereas consumers with high involvement tend to process information through the central route, we can infer that consumers with higher involvement in merchandise (e.g. plants) will be less likely to be influenced by price, whereas consumers with lower involvement in merchandise (e.g. plants) will begin by looking at peripheral cues, including price. We hypothesize that:

H1: The higher a consumer's involvement with merchandise (plants) is, the longer the time to first fixation (TFF) on the price sign will be. In other words, highly involved consumers will look at price last.

Consumers who are less knowledgeable about the product or who lack the motivation to comprehend salient information tend to process information through the peripheral route, such as noncontent cues (Park, Lee, and Han 2007). In the present study, consumers with high plant involvement are perceived to have extensive knowledge about plants. Therefore, they are more likely than those with low involvement to recognize the plant without looking at the identification sign. Accordingly, it should take longer for them to fixate on the identification sign. In comparison, consumers with less knowledge about the merchandise (i.e. lower involvement with plants) may need to look at the identification sign first in order to gain knowledge about the merchandise. Hence, they should tend to fixate on the identification sign faster. We hypothesize that:

H2: The higher a consumer's involvement with plants is, the longer the TFF on the identification sign will be. In other words, they will readily identify the type of plant without needing to look at that information.

Although the physical appearance of a product can be identified as a peripheral cue in many cases, a knowledgeable consumer could assess the quality of the merchandise (in this case, plants) faster than novices. Here, we argue that the actual merchandise serves as a central cue. Accordingly, consumers who are more knowledgeable about plants are able

to recognize the merchandise and acquire relevant information by looking at the product itself, and not at signs. We hypothesize that:

H3: The higher a consumer's involvement with plants is, the shorter the TFF on the plant will be. Their first glance will be captured by the interest in the plants themselves.

In the current study, the product information sign provides information on how the plant was grown. Attention to the descriptive message requires extensive knowledge and specific concerns about plants and the growing method. We expect that only consumers with high involvement would be interested in and pay attention to such a description. Therefore, we hypothesize that consumers with higher involvement with plants will fixate on the product information sign in a shorter time, whereas consumers with lower involvement with plants will fixate on the product information sign for a longer time. We hypothesize that:

H4: The higher a consumer's involvement with plants is, the shorter the TFF on the product information sign will be.

Total visit duration (TVD) on a plant and content-relevant information reflects a consumer's interest in the plant. The length of time that a consumer looks at a display should be an indicator of interest, and thus involvement, with the product. Literature suggests that a higher level of involvement reflects a higher purchase intention (e.g. Lin and Chen 2006). Therefore, we argue that consumers who spend more time looking at the plant itself tend to develop interest in the merchandise and are more likely to buy the product (See Figure 1).

H5: A higher TVD on the plant will have a positive impact on likelihood to buy.

H6: A higher TVD on an identification sign will have a positive impact on likelihood to buy.

Research shows that consumers' familiarity with a brand influences purchase intention (Laroche, Kim, and Zhou 1996). This is because familiarity reduces the perceived risks associated with the purchase. Accordingly, consumers who are familiar with plants will be more confident in purchasing plants. Literature confirms that consumers' involvement moderates their reaction to marketing stimuli (Kapferer and Laurent 1985). Petty,

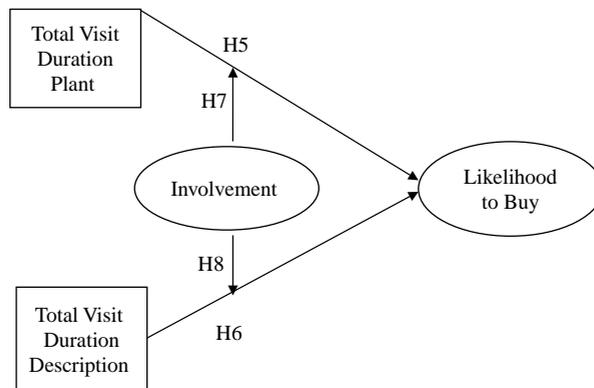


Figure 1. Study framework.

Cacioppo, and Schumann (1983) suggest that the quality of an advertising argument has a greater impact on attitudes for those with high involvement than those with low involvement. Ko et al. (2008) demonstrated that intention to purchase is positively related to involvement. Similarly, Lin and Chen (2006) find that consumers' involvement with the product has a positive impact on their information search intention and purchase intention, and that, as consumers' involvement increases, their product knowledge has a stronger impact on their information search intention and purchase intention. Involvement with a certain product enables the consumer to process product-relevant information that requires more knowledge about the product. As mentioned, evaluating a plant by its physical appearance requires extensive knowledge about the plant. Therefore, consumers with high involvement with plants are able to assess the quality of the plant by looking at it, rather than reading the price and the identification signs. Therefore, when the consumer is highly involved with plants, his/her TVD of a plant will translate into a higher likelihood to buy. We hypothesize that:

H7: Consumer's involvement with plants will moderate the relationship between TVD of a plant and likelihood to buy, that is, the relationship will be stronger when the consumer is more involved in plants.

A content sign describing how the plant was grown represents a specific attribute that may only attract the attention of high-involvement consumers. We hypothesize that when a consumer spends more time looking at the product information sign, she/he tends to be more likely to make the purchase, since the attention to a product information sign reflects one's specific interest in the product. Under high involvement, we expect that the TVD on a product information sign will have a stronger impact on likelihood to buy, since highly involved consumers are more likely to comprehend the product information sign correctly and efficiently. We hypothesize that:

H8: Consumer's involvement with merchandise will moderate the relationship between TVD of a product information sign and likelihood to buy, that is, the relationship will be stronger when the consumer is more involved (in plants).

Methods

Display construction

The research team constructed displays with one type of plant¹ and three blank signs and digitally photographed the display. Images consisted of one display of each of the five plant types categorized into two groups: herbaceous (herbs, annual flowers, vegetable seedlings) and woody (perennial flowers and shrubs). Images were manipulated using PowerPoint software to add text to the blank signs using the same type and size of font (see Figure 2). Text included an identification of the plant type (five types, always the central sign) and price (1-2 price points, randomly assigned to the left or right sign), and production information (four methods, assigned opposite price). Five of the final visuals were intentionally duplicated for a total of 32 test slides, but the duplicates were removed for our analyses. Images were randomly presented to the study participants.

Two scale measures, involvement (INV) and likelihood to buy (LTB), were collected. To calculate involvement, we asked the respondents three questions and averaged the responses by equally weighting each question. First, they identified the range of money spent on plants in the past six months. These responses were coded from 1 to 12 (1 = spending no money and 12 = \$500 or more). Second, the respondents selected the types of stores from



Figure 2. Example of plant display with price, plant, and grown signage.

which they purchased plants and gardening supplies. Based on the number of store types, responses were coded from 1 to 6. Third, out of five categories, respondents selected the types of plants they had purchased in the past six months. Based on the number of plant types purchased, responses were coded from 1 to 6. Each indicator was equally weighted and averaged for a calculated INV score. Likelihood to buy was a single-item indicator based on a 10-point scale (1 = not at all likely to buy, to 10 = highly likely to buy).

Subjects were recruited to the study by various means (Craig's list, newspaper advertisements, and flyers posted proximate to the study locations) in six North American university or research center venues including: Apopka, FL; College Station, TX; West Lafayette, IN; East Lansing, MI; St. Paul, MN; and Vineland Station, Ontario. Respondents totalled 344, of whom 50 were from FL, 63 from TX, 48 from IN, 69 from MI, 47 from MN, and 67 from Ontario.

After being informed about the study's purpose and signing an informed consent form, subjects completed the demographic portion of the questionnaire. They were subsequently seated at the Tobii X1 Light eye-tracking device, and their eye movements were calibrated to the equipment. Subjects were encouraged to sit as still as possible during this portion of the study. They viewed a sample plant display to become familiar with the study protocol. Verbal responses were collected for LTB while viewing each image. After viewing the 32 images, subjects completed supplementary questions about past plant purchases and other attitudinal and behavioral data. Each session combined took approximately 20 min per respondent. Of the 344 respondents, the eye movements of 327 could be calibrated, or between 89% and 100% of participants per location.

Areas of interest (AOIs), or sections within the display images, were selected for eye fixation analysis using Tobii Studio 3.0.2.218, licensed through Tobii Technology

Table 1. Descriptive statistics.

	N Statistic	Min Statistic	Max Statistic	Mean Statistic	SD Statistic	Skewness		Kurtosis	
						Statistic	SE	Statistic	SE
TFFGROW	5571	0	23.68	1.42	1.62	3.33	0.033	21.82	0.066
TFFID	5995	0	20.83	1.26	1.62	3.07	0.032	16.90	0.063
TFFPLANT	8215	0	13.82	0.83	1.28	2.34	0.027	7.97	0.054
TFFPRICE	5529	0	25.07	1.56	1.87	2.90	0.033	15.64	0.066
TVDGROW	8829	0	16.21	0.71	0.99	3.05	0.026	20.48	0.052
TVDPLANT	8829	0	39.34	2.41	2.56	3.12	0.026	19.21	0.052
LTB	9143	1	10	6.28	2.39	-0.42	0.026	-0.54	0.051
INV1	9261	1	12	5.67	2.81	0.65	0.025	-0.11	0.051
INV2	9288	2	12	6.21	2.12	0.37	0.025	-0.16	0.051
INV3	9288	2	12	7.20	2.76	-0.18	0.025	-0.67	0.051

(www.tobii.com). One image of each of the five plant types was used to outline four AOIs, one around each of the three signs and one around the foliage display. Close fitting AOIs were drawn using the Tobii rectangle tool for the signs, and the polygon tool for the foliage, and labeled. To maintain consistency in AOI size and position between similar images, the AOI drawings were copied and pasted in place over each similar image in the test. The four metrics – TFF, first fixation duration, TVD (all three measured in seconds to the millisecond), and fixation count (as a count) – were calculated by the Tobii Studio Statistics tool. The output data for the participants was exported and converted to a Microsoft Excel 2007 file to be combined with the manually entered survey and the likelihood to buy rating data. The data file contained 8829 observations for each metric, or 327 calibrated participants, 27 images, and 4 AOIs.

Results

Preliminary analysis

Before hypotheses testing, the distribution of each variable was examined. Involvement (INV) indicators and LTB were normally distributed, with very low kurtosis and skewness values (Table 1), whereas all the time measures were skewed to the left side and had long tails on the right side. The Cronbach’s alpha for INV indicators showed acceptable reliability of the INV scale (Cronbach’s alpha = 0.676).

Hypotheses testing

Hypothesis 1 states that TFF on price sign has a positive relationship with consumers’ involvement, meaning that a consumer highly involved with plants will take longer to fixate on the price sign, since price will be a less important issue for such a consumer. We found no significant correlation between TFF on price and involvement (Pearson correlation = 0.008, $p = 0.558$), and are therefore unable to reject the null hypothesis associated with Hypothesis 1. A possible explanation for this finding is that the measures of involvement were not as strong as they could have been. Better measures of involvement with the different product categories (plants) may produce different results, and we suggest this as a possible limitation of the study.

Hypothesis 2 states that TFF on a plant identification sign has a positive relationship with consumers’ involvement, meaning that a highly involved consumer will take longer

to look at the identification sign because she/he could recognize the plant just by looking at the plant itself. We found no significant relationship supported by the data and therefore fail to reject the null hypothesis associated with Hypothesis 2 (Pearson correlation = 0.017, $p = 0.192$). Ataly, Bodur, and Raslofoarison (2012) found that the central brand/product choice was preferred in both horizontal and vertical orientations of several products. Thus, the centrally located plant identification sign may have been more visually conspicuous with a shorter TFF, regardless of involvement.

Hypothesis 3 proposes a negative relationship between TFF on plant and involvement, indicating that the merchandise, in this case live plants, tends to attract immediate attention of those who are highly involved in plants. Results show that the correlation coefficient is not significant, and therefore the null hypothesis relative to Hypothesis 3 may not be rejected (Pearson coefficient = -0.017 , $p = 0.123$).

Hypothesis 4 proposes a negative relationship between TFF on the product information sign and INV. Again, results show that the relationship is not supported by the sampled data and the null hypothesis relative to Hypothesis 4 may not be rejected (Pearson coefficient = 0.017, $p = 0.204$). Thus, Hypotheses 1–4 are not supported by the data. Although the direction of the relationships, as shown by the sign symbols, is as predicted, the relationships were not shown to be significant.

Hypotheses 5–8 were tested using a generalized linear model (GLM) with Poisson distribution and log function in SPSS 20 (Table 2). The GLM provides analysis for nonnormal response variables, and allows an arbitrary link function to the response variable for linear variation with the predicted values.

Based on the model, LTB is the dependent variable; INV, a scale-type variable, is treated as a factor. Total visit duration on plants and the information sign are the covariates. To test the moderation effect, two interaction terms were added to the model. Hypothesis 5 proposes a significant impact of TVD on plants on LTB (i.e. respondents who spend more time looking at the plant have a higher intention to purchase a certain plant). Results show that this relationship is significant ($p < 0.001$), thus supporting Hypothesis 5.

Hypothesis 6 proposes a significant impact of TVD on the information sign on LTB, meaning that respondents who spend more time looking at the method-grown sign have a higher tendency to purchase a certain plant. However, the data do not produce enough evidence to state that Hypothesis 6 is true at the 95% confidence level; therefore, the null hypothesis may not be rejected ($p = 0.760$). A moderation hypothesis specifies an interaction term as a predictor and can be tested only when both the independent variable and the moderator are significant predictors of the dependent variables. Since TVD on the display plant is significant, and INV is significant ($p < 0.001$), we examined the interaction term and found that it is significant ($p < 0.001$). Therefore, Hypothesis 7 is supported. Since TVD on the method-grown sign does not have a significant impact on LTB, we are not able to argue for a moderation effect. Therefore, Hypothesis 8 is not supported.

We elected to visually look for data patterns to help understand why the hypotheses were not supported. To visualize the responses, we fixed INV at certain values and plotted LTB with regard to TVD on plants and TVD on the information (grown) sign on a 3-D response surface. Figure 3 shows the response surface by fixing INV at 2 (low), and Figure 4 shows the response surface by fixing INV at 10 (high). As shown in the figures, an increased level of INV tends to strengthen the relationship between TVD on the grown sign and LTB. The figures imply that information on the grown sign becomes more influential on purchase intention when the consumer is highly involved in plants.

We observed a difference in the distribution or visual pattern in the data between low-involvement and high-involvement individuals. We observed that the response surface in

Table 2. Generalized linear model.

Source	Wald χ^2	df	p
(Intercept)	30,876.106	1	0.000
INV	176.627	28	0.000
TVDPLANT (H5)	33.297	1	0.000
TVDGROW (H6)	0.094	1	0.760
INV*TVDPLANT (H7)	93.306	28	0.000
INV*TVDGROW (H8)	140.584	28	0.000

Note: Dependent variable: LTB.

Figure 4 had a longer and higher tail on the right side compared to the same area in Figure 3. This suggests that the relationship between TVDGROW and LTB does vary by level of involvement because Figure 3 reflects the relationship among low-involvement study participants and Figure 4 reflects the same relationship among high-involvement participants.

Discussion

We found that TVD on merchandise (plants) increased the likelihood to buy and that this relationship was moderated by involvement, thus supporting Kapferer and Laurent (1985). More involved consumers spent more time looking at the merchandise, which resulted in a higher purchase intention. By contrast, involvement did not influence TFF or TVD for

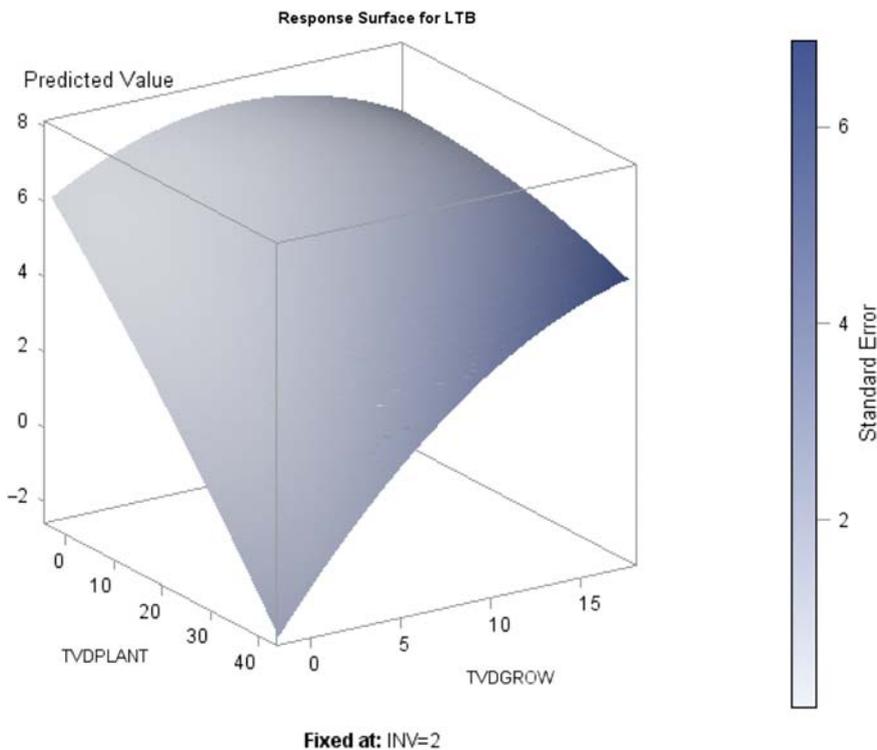


Figure 3. Response surface for low INV.

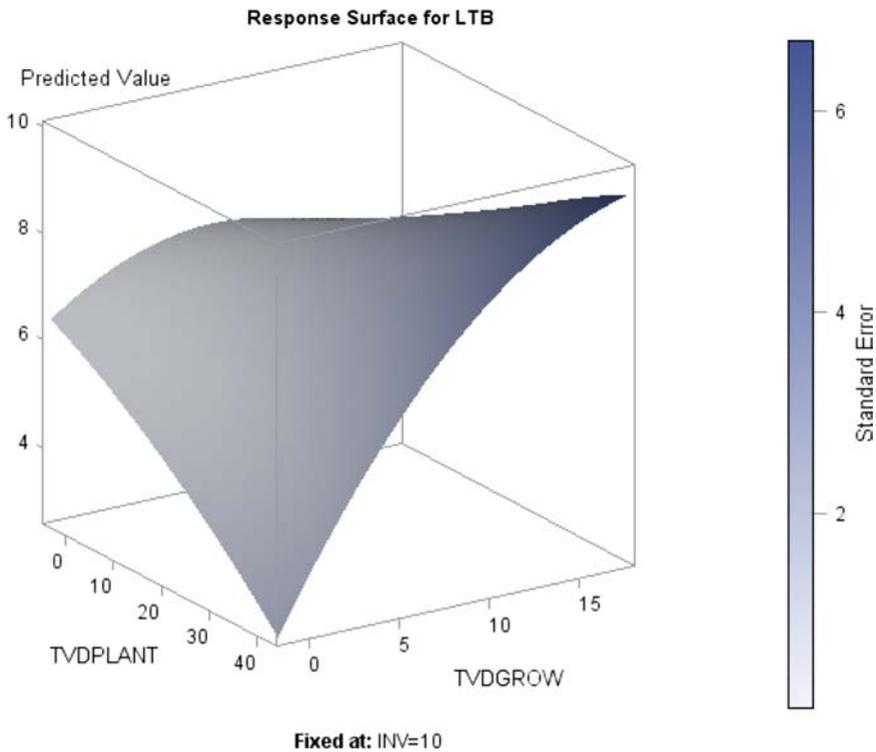


Figure 4. Response surface for high INV.

price or information signs. Thus, it is possible that more involved consumers are truly more interested in the merchandise itself and are perhaps not price sensitive. We propose that future studies include measures of price sensitivity to test this assumption.

We propose several explanations for these nonsignificant findings. First, there is a large pool of data and a wide demographic range (e.g. 19–91 years old), thus we may find differences within demographic groups or segments in their response to merchandise displays and signage. For example, Dennis and Behe (2007) showed that age, gender, income, and ethnicity contributed to different levels of purchase and participation (measures of involvement). Further, we included four different types of plants. Involvement could vary by merchandise (plant) type and the aggregated analysis could not delineate this variation. Possibly, the measures of involvement should be stronger to determine not just past purchases but expertise and product knowledge.

Conclusions and future research

The study aimed to use ETT to help understand the different responses of high-involvement customers compared to low-involvement customers when looking at garden plants displayed with information content and price signs. Using involvement theory and the ELM of information processing (Petty and Cacioppo 1984, 1986), we constructed a model to understand TVD (plant), TVD (signage), and INV on the LTB.

The results showed that both groups took an equal amount of time to attend to the price signs, the plant identification sign, the plant, and the product information. These results clearly demonstrate that involvement is not relevant to signage.

However, the results do demonstrate the importance of involvement when considering TVD and likelihood to buy. The results demonstrate that the more time spent looking at a plant, the higher the likelihood to buy. This is an important finding for retailers as it demonstrates that providing displays that engage the customer and allow them to linger at the display will contribute positively to the customer decision-making. We note that the TVD on the signs relating to the merchandise reveals, again, that the signage did not increase the likelihood to buy. Once again, retailers and suppliers might consider the amount of investment made in signage compared to other elements of merchandise displays.

In this research, we computed involvement from money spent, the variety of store types from which purchases were made, and the number of plant types purchased. Future research might consider manipulating respondents' involvement by having them self-evaluate their involvement in certain product types.

Subsequent studies need to investigate for whom signs are central cues or peripheral cues. Plants are a highly visual form of merchandise and should attract more visual activity from individuals who are at least interested, if not involved, with the product category. Merchandise that relies on its visual appeal to attract attention is inherently different from packaged goods (e.g. Aspirin) or staple products (e.g. yogurt) and, thus, should be more visually stimulating to consumers. Because the merchandise itself served as the central cue, we need to understand precisely what captures visual attention and how manipulation of the merchandised environment can enhance this effect.

Further investigation of the role of merchandise signage on visual attention and purchase intention is warranted, given that signs are ubiquitous in retail settings.

Note

1. Plants typically are merchandised in a relatively homogenous display. For example, herbs tend to be merchandised with other herbs, vegetables with other vegetables, and annuals with other annuals. We followed this convention in constructing the displays, merchandising only one type of plant in each separate display.

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