Online Review Manipulation: Interface Design and Biasing of Numeric Evaluation

Emergent Research Forum Paper

Introduction

Individual purchase decisions rely increasingly on online reviews because they represent third party feedback and are more likely to be relevant to the customer than seller-created information (Chen and Xie 2008). Positive reviews are a driver of business (Park et al. 2007) and lead some organizations to engage in fraudulent behavior, such as the publication of fake positive reviews (Mayzlin et al. 2012).

Fake reviews deceive customers by portraying false information about the product. Despite research and popular attention, fake reviews are not the only means of inflating reputation and deceive customers. Biasing genuine opinions during their generation is another approach to manipulation that has received no research attention. Our work focuses on this gap, and specifically on approaches to biasing the numeric elements of the review. Being able to distort quantitative elements of online reviews would have remarkable effects on users' purchase decisions, because numeric evaluations are what allow users to quickly discriminate between competing products or service (Filieri and McLeay 2014). *Online review systems* (ORS) generally collect numeric evaluations using scales with different designs, such as different interval scales, shapes, colors and labels (Figure 1). We therefore investigate how interface design elements of the scale, color cues specifically, can substantially influence reviewers' numeric evaluation (Christian and Dillman 2004, p. 78).

Figure 1 Three different designs of scales for numeric evaluation. In order (from the top): TripAdvisor.com, Yelp.com and HolidayCheck.com

Theoretical Framework

Online review manipulation

Individuals look at online reviews because they assume them to be written by actual customers in light of a first-hand experience. Users generally consider online reviews trustworthy, and believe that fake reviews are rare (Anderson 2014). Credibility is fundamental to make online reviews relevant to users (Cheung et al. 2012), yet it might lead individuals to overlook manipulation strategies. Manipulation normally occurs when users who pose as real customers post false reviews (Hu et al. 2011). Thus, when an ORS enjoys higher credibility overall, manipulators can free-ride the credibility of the system to enhance the effectiveness of manipulation strategies .

According to Xiao and Benbasat's (Xiao and Benbasat 2011) taxonomy of product-related deceptive information, fake reviews constitutes a *falsification* implemented through a manipulation of *information content*. They are a "direct alteration of the content of product information provided" (p.172). Their work defines "product-related e-commerce deceptive information practices as the *deliberate* manipulation of product-related information perpetrated by online merchants to mislead consumers in order to induce desired attitudinal and behavioral change in consumers – change that are detrimental to consumers […]" (p.172). In this work we broaden the definition of manipulated reviews to include the distortion of authentic first-hand reviews during their generation process.

Priming effect of numeric evaluations

Numeric evaluations are particularly important for users of ORSs. Because humans tend to pay higher attention to peripheral cues (Fiske and Taylor 1984) and readily accessible information (Pennington 2000), numeric evaluations act as a critical filtering mechanism. Peripheral cues are pieces of information that

individuals are more likely to elaborate because they require lower cognitive efforts (Petty and Cacioppo 1986). In this regard, numeric evaluations – and even more their cumulative distribution – are an effective solution to address the issue of customer's cognitive miser (Sparks and Browning 2011).

As a testament to their importance, prior research shows that higher scores positively affect the attitude toward a product. This is true across different industries, from hospitality (Christy M.K. Cheung et al. 2008) to higher education (Otto et al. 2008). Thus, increasing positive reviews and minimizing negative ones is critical for organizations. To avoid negative online reviews is particularly important because negative online reviews affect sales more heavily than positive ones (Chevalier and Mayzlin 2006). The reason is that humans tend to overemphasize negative information when forming an opinion (Fiske 1993).

Color effect

The notion of perceptual fluency suggests that appropriate color-coding may improve the processing of physical stimuli (i.e. the ease with which stimuli come to mind, mirroring the information being displayed). This is because in a semiotic perspective, color can work as a signal (Caivano 1998). While cross-cultural difference might exist (Proctor and Vu 2010), individuals generally share similar interpretation of the signaling value of color (Caivano 1998). Colors such as green or red portrait a strong signaling value that is consistent across multiple contexts and cultures. For example, the signaling value of the colors of the traffic light (i.e. green="go" and red="stop") is consistent across cultures.

In a consumer behavior experiment , participants perceived the same undesirable behavior more negatively when described on a red background, and more positively when described on a green one (De Bock et al. 2013). This supports the claim that embedding color in the design of an interval scale can affect response behaviors.

ORSs implement different designs to collect online reviews, and color is one of the elements that changes (Figure 1). However, because of its signaling value, it is plausible that color might affect the interpretation of the interval scale. For example, in an experiment regarding bilingualism in interval scales, color cues eliminated differences in means when ratings were collected using interval scales with labels in a foreign versus native language (De Langhe et al. 2011).

Hypotheses

H1a. Color red increases the perceived negativity of numerical evaluations

We hypothesize the signaling value of color red to increase the perceived negativity of the score on the scale, thus mitigating extremely negative numeric evaluations.

H1b. Color green decrease the perceived negativity of numerical evaluations

We hypothesize the signaling value of color green to decrease the perceived negativity of the score on the scale, thus emphasizing extremely negative numeric evaluations.

H2. Color cues manipulate users' interpretation of the scale

We expect the *color* treatment to show the highest number of changes in numeric evaluations (from negative to positive ones). Because we hypothesize the color red to increase the negativity of low ratings, we expect to observe more changes towards positive ones, compared to the grey and green treatments.

H3. Color cues increase perceptual fluency

We expect that embedding color cues in the design of the interface would increase user's processing fluency, thus reducing the completion time for the reviewing process.

H4. Color cues equally manipulate males and females

We do not expect gender to be a moderator for numeric evaluations. However, previous research shows that males and females can react differently to color stimuli (Kwallek and Lewis 1990).

H5. The perceived quality of customer service experiences is invariant to gender.

We hypothesize numeric evaluations within each treatment to be equal when controlling for gender. This would corroborate prior research about the absence of within-gender differences in customer experience perception (Sun and Qu 2011).

Experimental Design

Our experiment focuses on the mitigating effect of three different color designs on extremely negative numeric evaluations. Our goal is to determine whether the color red associated with negative scores can increase their perceived negativity, thus discouraging users from recording negative evaluations. The context for the review is of a negative lodging experience.

Design

We test our hypotheses with a three-groups posttest-only laboratory experiment. We excluded the use of archival data (for instance from actual review systems) because this would complicate the isolation of our variable of interest (i.e. the color effect). Different ORSs might differ not only in their design, but also in the composition of their sample of users. Also, the exposure to a familiar brand or logo could generate more favorable attitudes (Janiszewski 1993), which also may bias the results.

We administer the treatments at random, using a custom-built web application: *grey, green,* and *color*. Initially, all the treatments present the exact same graphical scale with grey-contoured buttons from 1 to 5. When users click a number, the buttons display a different color-fill depending on the treatment (Figure 2)

To prevent missing data, we enforce one response for each of the six aspects before subjects can skip to the third section. Also, we track every user click with the corresponding timestamp.

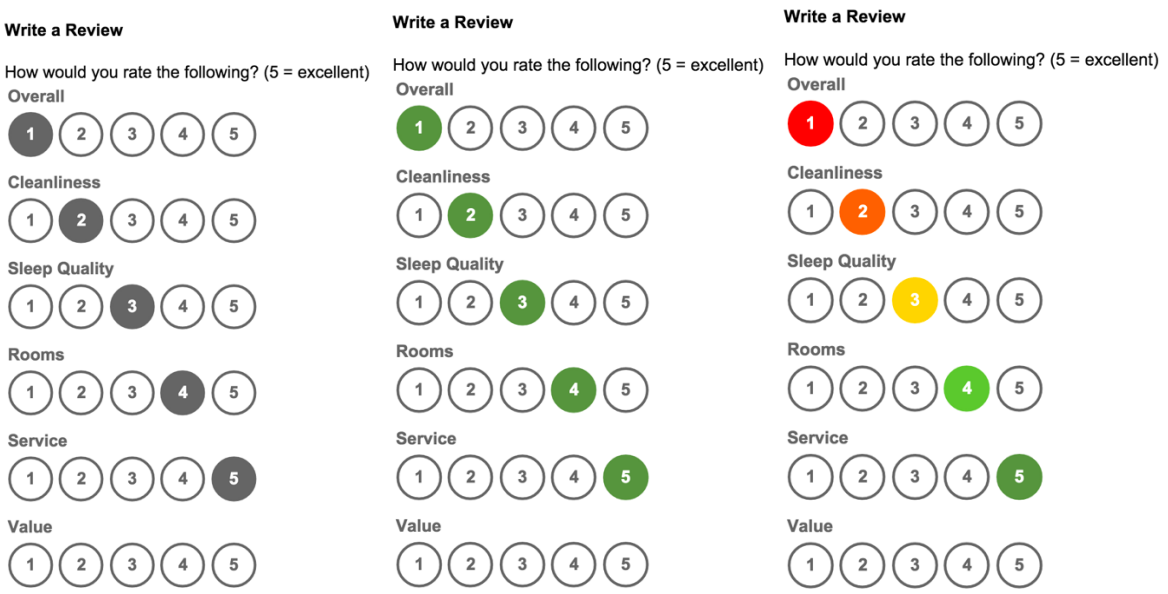

Figure2 From the left to the right: grey, green and color interface design.

Sample

We plan to test a sample of 250 college students from the [omitted] University, who can voluntarily attend the experiment for credits. We believe students constitute a suitable sample because they should react to color stimuli similarly to the rest of the population.

Apparatus

We conduct the experiment using a custom-build web application, in the [omitted] Lab at [omitted]. The fictional lodging experience is presented in a written form at the beginning of the experiment. The experiment consists of three phases:

1. In the first section, the subjects read a negative review of a lodging experience, because we want to test the effect of the color red on extremely negative evaluations. After reading the online review, we ask the subjects to copy and paste into a form the passages that they find more relevant for evaluating each of the six attributes. This serves as manipulation check, to make sure that the subjects retain enough information before they evaluate the experience.

2. In the second section, subjects evaluate the lodging experience using one out of the three interface designs. They use a 1 to 5 interval scale (where 5 corresponds to "Excellent") to evaluate the six attributes. We do not provide other labels for the remaining intervals of the scale to reduce cues and enhance the hypothesized signaling effect of color.
3. In the third section, we test subjects for colorblindness.

Preliminary Results from the Pilot Test

We conducted a first pilot test with the *grey* and the *color* interface designs only. For hypothesis H1, the results of the attributes means are promising, and despite we used a small sample (n_{grey}=21 and n_{color}=18), the one-tailed ANOVA test showed significant higher means ($p<.05$) for the attribute *Service*, and a close to significant level ($p<.1$) for the attributes *Room*, *Sleep Quality* and *Value*.

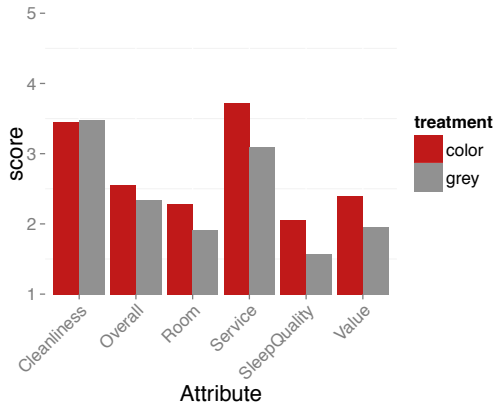

Figure 3 Barplot of the average numeric evaluations for each attribute divided by treatment.

For hypothesis H2, the difference of average number of clicks per treatment is in the expected direction (color=7.28, grey=6.4), and suggests that the color treatment might actually trigger more changes in the numeric evaluation.

Conclusion

In this paper, we test whether color cues can affect numeric evaluations. If the results confirm our expectations, we will identify two major practical implications. The first, is the possibility for systematic manipulation of online reviews using interface design elements. This would allow businesses to mitigate extremely negative reviews, even when facing a high volume of first-hand reviews. This manipulation strategy would be extremely cheap to implement, compared to the generation of fake reviews.

The second, concerns the aggregation and analysis of data streams from different ORSs. If our hypotheses are confirmed, a systematic bias due to color effect might affect any ORSs, eventually affecting the internal consistency of data generated using different interface design.

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