

# Heart over Heels? An Empirical Analysis of the Relationship between Emotions and Review Helpfulness for Experience and Credence Goods

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**Abstract.** According to current scholarly and practitioner thinking, one way of enhancing the perceived helpfulness of reviews is by encouraging the use of emotional language. Yet, studies on review helpfulness have paid little attention to studying this effect as it applies to different product types, namely experience and credence goods. Using data from amazon.com, we conduct an empirical test using a natural language understanding algorithm. Our results suggest that for both experience and credence goods, fear, joy, and sadness are correlated with an increase in review helpfulness, whereas anger is negatively correlated with it. These emotions are perceived as more helpful for experience goods than for credence goods.

**Keywords:** Helpfulness, Emotions, Experience Attributes, Credence Attributes

## 1 Introduction

Human-Computer Interaction (HCI) between online shoppers and online review systems has led to the creation of massive amounts of data. Due to the rapidly growing volume of product reviews on review websites, customers often face information overload so that finding particularly helpful reviews can be like searching for a needle in a haystack [1]. To alleviate this problem, online review systems attempt to identify reviews that customers perceive as most helpful [2]. Consequently, research has investigated the features of helpful reviews [3-5], such as emotions conveyed by review texts. One way of eliciting this knowledge is to nudge reviewers towards using particularly helpful emotional language by presenting them with review templates with suggestions on how to craft a helpful review.

Research suggests that emotions expressed in reviews significantly influence perceptions of helpfulness [5, 6]. Emotions are a common and important reason for electronic word of mouth because consumers often write reviews when they are either extremely satisfied or extremely dissatisfied [7]. For instance, if a reviewer expresses lots of joy about a film, this is perceived as very helpful [5], whereas reviews of products like printers are perceived as more helpful when written in a more neutral tone [6]. Existing research on the topic focuses on products that have either search or

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experience attributes [5, 6]. However, to the best of our knowledge, research has not yet examined the difference between the impact that emotions have on review helpfulness for goods with experience attributes (those that can more easily be assessed after purchase) vs. goods with credence attributes (which are difficult to assess even after purchase). In this paper, we refer to experience (credence) goods, when a good has a high share of experience (credence) attributes. For both of these product types, reviews seem to be particularly valuable because the degree of uncertainty before purchase is high [5]. Hence, we aim to answer the following research questions:

1. *What impact does the degree of emotionality in online reviews for experience and credence goods have on their perceived helpfulness?*
2. *Does the relationship between the emotional content of a review and its perceived helpfulness differ depending upon the type of goods reviewed?*

Our preliminary results suggest that emotional content in reviews is associated with an increase in perceived helpfulness. Counter to our intuition and second hypothesis, this relationship is more pronounced for experience than for credence goods. Our work thus provides research implications, in particular for HCI, and practical implications for online review system designers who can use our results to improve their review templates by suggesting to reviewers to express discrete emotions in their reviews.

## **2 Related Literature, Theoretical Background, and Hypotheses**

An earlier study has employed a latent semantic analysis (LSA) to identify discrete emotions in reviews [8]. This study finds that emotions like hope, happiness, anxiety, and disgust express certainty and have differential implications for a review's helpfulness. Another study employs a bag of words approach to analyze the association between overall emotional content in online reviews for movies and a review's helpfulness [5], finding a positive relationship between overall emotionality and movie review helpfulness. Finally, another study employs a lexicon- and an expert dictionary-based approach to measure a general relationship between discrete emotions and review helpfulness [9], presenting evidence that emotions are conducive to review helpfulness. However, they do not investigate differences in this relationship across product types.

Our study aims to disentangle the relationship between emotions and experience and credence attributes. Experience attributes can only be inspected after purchase, so the consumer must first have bought the product or service, such as a restaurant meal [10]. Credence attributes are characterized by an even higher level of uncertainty, such that the attribute of the product or service can hardly be assessed even after purchase (e.g., the effectiveness of cosmetics or of a medical treatment) [11]. However, reviews of goods whose assessment involves a significant element of either experience or credence attributes can be especially helpful given the high degree of uncertainty prior to purchase (compared to search goods, for example). Finally, in line with prior literature [9], we choose the discrete emotions of anger, disgust, fear, joy, and sadness as the emotions of interest. Expressing emotions has been demonstrated to be conducive to the helpfulness of reviews [5, 9]. Given the high level of uncertainty for experience and credence goods prior to purchase, we expect to find a positive relationship between

emotional review content, especially when the emotions are negative [12], and a review's helpfulness. We hypothesize: *Hypothesis 1: Emotions in online reviews for both experience and credence goods are positively associated with a review's perceived helpfulness.*

After consumption, a customer of a credence good is left with more remaining product uncertainty than a customer of an experience good. Thus, when writing a review, a credence good customer can provide less factual information but arguably has to resort to their feeling about the good after consumption. Therefore, to enhance review helpfulness, reviews for credence goods should provide more emotional content, compared to experience goods. Thus, we hypothesize: *Hypothesis 2: The relationship between emotions and perceived helpfulness of a review is moderated by the product type, with emotions in reviews of credence goods being more helpful than in reviews of experience goods.*

### 3 Research Setup and Empirical Analysis

We obtained a data set from amazon.com containing 53,218 single online reviews of experience goods (video games, digital cameras, in line with [13, 14]) and of credence goods (health- and fitness apps, health and personal care products, in line with [15, 16]). All the reviews had obtained at least one helpfulness vote. They had been collected in July 2014 and contain all reviews since May 1996. To identify expressed emotions in online reviews, we employ the natural language understanding service of IBM Watson. This service can extract features of unstructured content, such as emotions of online reviews. For each review we obtained data related to anger, disgust, fear, joy, and sadness, as well as an overall emotion score.

To test our hypotheses, we conducted a linear regression model with *HELPFUL* as dependent variable. In line with existing literature [3, 4], *HELPFUL* is measured as the proportion of helpful votes out of the total votes a review has received. Review-related *Control Variables* (vector  $X$ ) comprise the rating (1 to 5), squared rating, the average rating, the number of ratings, word count, review age, and the average readability index. The variable *OVERALL\_EMO* controls for the overall emotional review sentiment and is defined between -1 (negative sentiment) and +1 (positive sentiment). Formally, estimation equation 1 displays our model for review  $i$  and product  $j$ :

$$HELPFUL_{ij} = \beta_0 + \beta_1 ANGER_{ij} + \beta_2 DISGUST_{ij} + \beta_3 FEAR_{ij} + \beta_4 JOY_{ij} + \beta_5 SADNESS_{ij} + \beta_6 OVERALL\_EMO_{ij} + \gamma X_{ij} + \epsilon_{ij} \quad (1)$$

The coefficients for all dimensions of emotions are consistently larger for experience goods than for credence goods (Table 1). Thus, we find support for H1 (emotions are generally conducive to review helpfulness) but we have to reject H2. We tested the statistical significance of coefficients (*Differences*) using the Chow test and find significant differences for all but one coefficient. For robustness, we tested consumer goods and digital goods separately, implemented product fixed effects, and ran Tobit regressions to account for the truncation of *HELPFUL*. Acknowledging that some studies classify digital cameras as a search product [2], we also ran our regressions again without cameras. Our results remain qualitatively unchanged after all these tests.

**Table 1.** Linear Regression Results

<i>Model Variable</i>	<i>Experience Goods HELPFUL</i>	<i>Credence Goods HELPFUL</i>	<i>Differences HELPFUL</i>
<i>ANGER</i>	—0.05***(0.01)	—0.06 (0.04)	$\chi^2=8.96^{***}$
<i>DISGUST</i>	0.00 (0.01)	—0.05 (0.04)	$\chi^2=1.07$
<i>FEAR</i>	0.13*** (0.01)	0.08** (0.04)	$\chi^2=4.47^{**}$
<i>JOY</i>	0.14*** (0.01)	0.11** (0.03)	$\chi^2=25.6^{***}$
<i>SADNESS</i>	0.23*** (0.01)	0.08** (0.03)	$\chi^2=41.95^{***}$
<i>OVERALL_EMO</i>	0.09*** (0.01)	0.04*** (0.01)	$\chi^2=30.30^{***}$
<i>Control Variables</i>	✓	✓	-
<i>Observations</i>	46,463	6,531	-
<i>R<sup>2</sup></i>	<i>0.1739</i>	<i>0.0854</i>	-

Note: Robust standard errors are in parentheses. \*p < 0.1; \*\* p < 0.05; \*\*\* p < 0.01.

#### 4 Preliminary Conclusions and Future Research

This study provides preliminary indication that discrete emotions, namely, fear, joy, and sadness, are associated with an increase in review helpfulness for both experience and credence goods. More interestingly, our empirical results also show that these emotions are perceived as more helpful for experience goods than for credence goods, indicating that reviews for products with credence attributes should be written in a more neutral tone, compared to reviews of experience goods. Following the call of prior literature [3-5], review systems can use our approach to improve review templates for their customers by suggesting to reviewers that they should express certain discrete emotions or by discouraging them from using certain other emotions (such as anger or disgust). Ultimately, the preliminary insights from this study provide a first step to improving the design of online review systems. Moreover, this work strengthens current scholarly understanding of how to craft a helpful review [2, 3, 4, 13, 17].

Naturally, as our study is based on observational data, it carries limitations which require extended investigation as follows. First, we plan to further validate the identification of emotions by using another natural language understanding algorithm as well as human coders, since text mining techniques such as IBM Watson should always be used with caution. Second, we plan to conduct additional experiments to rule out confounding factors such as reviewer-review self-selection and factors such as the review reader's perception of the review writer's effort. Third, in order to obtain a more holistic picture, we intend to analyze the impact of emotions for digital and non-digital products, as well as for hedonic and utilitarian goods.

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