

ANXIOUS OR ANGRY? EFFECTS OF DISCRETE EMOTIONS ON THE PERCEIVED HELPFULNESS OF ONLINE REVIEWS¹

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This paper explores the effects of emotions embedded in a seller review on its perceived helpfulness to readers. Drawing on frameworks in literature on emotion and cognitive processing, we propose that over and above a well-known negativity bias, the impact of discrete emotions in a review will vary, and that one source of this variance is reader perceptions of reviewers' cognitive effort. We focus on the roles of two distinct, negative emotions common to seller reviews: anxiety and anger. In the first two studies, experimental methods were utilized to identify and explain the differential impact of anxiety and anger in terms of perceived reviewer effort. In the third study, seller reviews from Yahoo! Shopping web sites were collected to examine the relationship between emotional review content and helpfulness ratings. Our findings demonstrate the importance of examining discrete emotions in online word-of-mouth, and they carry important practical implications for consumers and online retailers.

Keywords: Discrete emotions, anxiety, anger, seller reviews, review helpfulness, online word-of-mouth, electronic commerce, consumer decision making

Introduction

Online reviews have played an increasingly important role in the popularity and success of electronic commerce. Like other forms of online word-of-mouth, reviews help inform future consumers and reduce uncertainty surrounding the shopping experience (Dellarocas 2003). However, it is often the case that a vast number of reviews are available, and their authors are unknown. In theory, the availability of hundreds of reviews provides more information to customers, but it also creates problems such as information overload (Jones et al.

2004). Consumers often require only a small set of helpful reviews, and many online vendors provide mechanisms to identify reviews that customers perceive as most helpful (Cao et al. 2011; Mudambi and Schuff 2010). Given that helpful reviews are weighted more heavily in purchase decisions (Chen et al. 2008), a better understanding of perceived review helpfulness offers clear benefits to online retailers and review providers.

Our research focuses on the connection between the emotional content of a review and its perceived helpfulness. Although past work has shown that emotions can substantially influence the way that reviews are processed (e.g., Kuan et al. 2011), prior research has not adequately addressed the impact of distinct emotions on review helpfulness, nor has it ex-

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plained those effects. As a motivating example, consider the following two (hypothetical) reviews of an online bookseller, both describing the same underlying problem:

Reviewer A: *“Very worried... I ordered the book two weeks ago, but still haven’t received it. At this point I’m extremely concerned!”*

Reviewer B: *“Very upset... I ordered the book two weeks ago, but still haven’t received it. At this point I’m extremely angry!”*

Which of these reviews will be considered more helpful by prospective consumers? The majority of research addressing review helpfulness has focused on determinants that are easily observable, such as ratings and reviewer characteristics (Chevalier and Mayzlin 2006; Forman et al. 2008; Mudambi and Schuff 2010). More recently, scholars have investigated review content directly (Cao et al. 2011; Kuan et al. 2011), showing that both objective and subjective content can influence helpfulness. A common finding is negativity bias, whereby negative reviews tend to be more influential. Importantly, however, prior work has tended to regard *negativity* and *positivity* as global concepts, without taking into account the various specific emotions by which those concepts are conveyed. In contrast to overall ratings, emotions are highly varied and complex, and they cannot be reduced to a simple positive–negative distinction (Lerner and Keltner 2000).

The limitations of this approach are made apparent by comparing the two reviews above. Although the content of both reviews is negative, the specific emotions underlying that content are distinct: Reviewer A might best be described as anxious or worried, whereas Reviewer B might best be described as angry or upset. How do these emotions influence the perceived helpfulness of the reviews? Generally, does the impact of distinct emotions (such as anxiety and anger) differ in systematic ways, and what underlying mechanisms can be advanced to explain the differences? We address these questions by first presenting a framework to examine specific emotions and then applying this framework to the context of online reviews.

Our work adds to a growing body of information systems research highlighting the role of emotions (Zhang 2013). Among recent examples, researchers have (1) supplemented the technology acceptance framework with variables such as perceived affective quality, enjoyment, and computer anxiety (Venkatesh 2000; Zhang and Li 2005), (2) measured the impact of initial affective responses to a web interface on subsequent user behavior (Deng and Poole 2010), and (3) demonstrated the mediating role of customer emotions in the

development of online trust (Hwang and Kim 2007). Extending this perspective to the online review setting, we argue that specific emotions have a crucial impact on the perceived helpfulness of reviews. In contrast to the conventional wisdom of negativity bias, by which negative emotional content might simply be considered more helpful, we propose that the effects of different negative emotions vary due to perceptions of reviewers’ cognitive effort. We focus on the emotions of anxiety and anger, which are prevalent in online reviews, and provide a direct test of our predictions. In particular, we argue that anxiety-embedded reviews are considered more helpful than anger-embedded reviews, because anxious reviewers are perceived to think more carefully about the content they provide. To test our hypotheses, we utilize experiments and a field study using archival data.

Given the prevalence of emotions in online word-of-mouth, our approach offers important theoretical and practical implications. Emotionality is known to play a substantial role in driving online conversations (Berger 2011; Berger and Milkman 2012), but surprisingly little is known about the consequences of emotions in online reviews. By revealing that negative emotions differ in consistent ways, our work deepens understanding of how emotions influence consumer judgment in online environments. We show that the emotions embedded in a review impact perceptions of its helpfulness above and beyond ratings or information content alone, and we demonstrate that generalized, valence-based approaches are not sufficient for explaining this impact. Although our hypotheses concern anxiety and anger, our framework is applicable to a broad range of relevant emotions (e.g., sadness, shame, disgust). Practically, our findings stand to benefit e-commerce participants at multiple levels. Although voting mechanisms can be used to identify “helpful” reviews, the accumulation of votes takes time (Zhang and Tran 2010). If more helpful reviews (especially negative ones) can be identified earlier, then they can be utilized more proactively by manufacturers, retailers, and third-party providers. In addition, a better understanding of the role played by emotions will inform the development of guidelines to elicit more useful reviews.

Literature Review and Hypotheses

Review Helpfulness and Negativity Bias

For purposes of this paper, *online reviews* refer to peer-generated evaluations posted on company or third party websites (Mudambi and Schuff 2010). We focus in particular on seller reviews, which have received surprisingly limited

scholarly attention (e.g., Ba and Pavlou 2002; Pavlou and Dimoka 2006; Qu et al. 2008). Following Mudambi and Schuff (2010), we define perceived helpfulness as the extent to which a peer-generated seller evaluation is perceived by consumers to facilitate their purchase decision process. Vendors that identify and display helpful reviews gain a strategic advantage in consumer attention and “stickiness” (Connors et al. 2011), and they have devoted considerable attention to doing so, often through the use of a voting mechanism. In one prominent example, it has been estimated that Amazon added \$2.7 billion to annual revenues by appending the question “Was this review helpful to you?” to product reviews and promoting those reviews rated most helpful (Spool 2009).

The question of what makes a helpful review has received increasing attention within e-commerce research, and scholars have identified various review and reviewer characteristics that appear to impact perceived helpfulness (Chevalier and Mayzlin 2006; Forman et al. 2008; Mudambi and Schuff 2010). Most relevant for present purposes, a persistent finding is that reviews conveying more negative ratings tend to score higher on measures of helpfulness (Cao et al. 2011; Kuan et al. 2011; Sen and Lerman 2007; Willemsen et al. 2011). This finding is consistent with abundant, cross-disciplinary evidence supporting the existence of a generalized negativity bias in information processing, whereby “bad things will produce larger, more consistent, more multifaceted or more lasting effects than good things” (Baumeister et al. 2001, p. 325). A commonly cited reason is that because negative information is rare or unexpected, it is perceived as more useful for decisions (Fiske 1980). This logic is especially applicable to online word-of-mouth, where negative feedback tends to be much rarer than positive feedback (e.g., eBay, see Resnick and Zeckhauser 2002).

An Emotion-Based Approach

Above and beyond a negativity bias, we argue that the specific affective content in online reviews plays a major role in determining their helpfulness. The term *affect* describes a general category of mental processing that reflects subjective internal feelings (Cohen et al. 2008). Affect-based processing is typically contrasted with cognition-based processing, although the relationship between affect and cognition has been a topic of great debate. On one side of this debate, supporters of Zajonc (1980, 1984) argued that affect and cognition are separate and partially independent processes; in contrast, Lazarus (1982) and his supporters argued that the cognitive process of detecting and evaluating the significance of environmental stimuli necessarily precedes affective response (i.e., affect requires cognition). Subsequent authors suggested

that this disagreement stemmed largely from different conceptualizations of *cognition* and *cognitive process* (Fulcher 2003). For the purpose of this research, we adopt a broader definition of these constructs, embracing the generally accepted position that cognition and affect are interdependent; that is, affect can influence behavior through cognitive processes, and affective processing often incorporates thoughts, judgments, and other cognitive elements (Solomon 2008).

Because *mood* and *emotion* fall into the category of affective processes, it is helpful to distinguish the two terms (Lord and Kanfer 2002). Mood refers to a nonspecific, valenced feeling state that is typically low in arousal (Cohen et al. 2008); emotion refers to “a mental state of readiness that arises from cognitive appraisals of events or thoughts” (Bagozzi et al. 1999, p. 184). For most affective researchers, emotion differs from mood in that emotions tend to be briefer but more intense, context specific, and intentional (Ekman 1992; Frijda 1993a). Emotions have a specific, known source, and they are often associated with specific resulting action tendencies and behaviors (Lerner and Keltner 2000). Although both mood and emotions play a role in word-of-mouth, we focus here on the latter, as the affect expressed in seller reviews is directed toward specific purchase experiences and retailers.

Theories of Emotion

Emotions have been a subject of study across numerous disciplines, using a variety of conceptual paradigms (Brosch et al. 2010). Among psychologists, two prominent approaches have been advanced to characterize different emotions. Dimensional theories assume that all emotions can be shown to vary along a limited number of fundamental, abstract dimensions (Mano 1991; Watson and Tellegen 1985). Although no agreement exists regarding the optimal number or naming of these dimensions (Larsen and Diener 1992; Russell and Mehrabian 1977), two or three have consistently emerged: valence (or pleasantness, evaluation), arousal (or activation, activity), and power (or potency, dominance). Among these dimensions, valence is almost universally accepted, and evidence suggests that valence and arousal are stable within and across cultures (Russell et al. 1989). In the best-known dimensional framework, Russell’s (1980) circumplex model, valence (pleasant versus unpleasant) and arousal (activated versus deactivated) define a two-dimensional space onto which the universe of emotions is mapped (Niedenthal 2008). This and similar models provide a clear delineation between positive and negative emotions of different intensities. For example, a novice consumer presented with product recommendations may report the experience of relief; dimensional theories would explain this experience as a combination of positive valence and low arousal.

However, the dimensional view of emotions has increasingly been challenged (Smith and Ellsworth 1985). An oft-cited weakness of this approach is that global dimensions such as valence and arousal are less useful for capturing emotions that differ little across these fundamental dimensions (Fontaine et al. 2007). For instance, although anxiety and anger are very close to each other in terms of valence and arousal (both emotions are unpleasant and activated; see Russell and Barrett 1999), they involve distinct phenomenology and tend to induce different behaviors (Larsen and Diener 1992). Given the variation and complexity of emotional experience, therefore, other differences are likely to have a nontrivial influence on their development and resolution.

The other prominent approach consists of cognitive appraisal theories of emotion, which focus on the nuanced cognitive bases underlying distinct emotional states (e.g., Scherer et al. 2001; Smith and Ellsworth 1985). This approach argues that emotional reactions to an event are a result of personal interpretations (appraisals) of the event itself and the situational environment (Frijda 1986; Roseman 1984). Therefore, emotions can be differentiated by a set of standard appraisal criteria (Ellsworth and Scherer 2003); each distinct emotion is elicited by a unique pattern of cognitive appraisals, and situations with the same appraisal pattern will induce the same emotion (Roseman and Smith 2001). For example, a consumer presented with product recommendations might appraise the event in terms of the unexpectedness of the advice (leading to surprise), the reduction in required effort (leading to relief), or the loss of personal control (resulting in anger), among other possibilities.

Numerous attempts have been made to identify a parsimonious set of appraisal dimensions (Roseman 1984; Smith and Ellsworth 1985). The resulting frameworks vary considerably but contain a number of common appraisals, including pleasantness, certainty, and control. Pleasantness describes the extent to which an event is interpreted as conducive to one's goals, certainty describes the extent to which it is predictable versus unpredictable, and control describes the extent to which it is brought about by individual agency versus situational agency (Smith and Ellsworth 1985).

Anxiety and Anger

The studies that follow explore the effects of anxiety and anger in online reviews. Although definitions for these two emotions vary, we adopt the adaptive/functional approach suggested by Lazarus (1991). Thus, we define *anxiety* as an emotional state that motivates a person to avoid potential harm arising from ambiguous threat, and *anger* as an emotional state that motivates a person to alleviate personal harm

attributed to others. Anxiety and anger appear to share certain neurological underpinnings and are sometimes linked in psychiatric and clinical discussion (Danesh 1977; Rothenberg 1971); however, evidence for their phenomenological and functional independence is robust in the emotional literature, and they are generally treated as distinct (Oatley and Johnson-Laird 1987). In terms of the appraisal dimensions above, anxiety and anger are both characterized by low pleasantness, but they differ considerably in appraisals of certainty and control. Anxiety arises from situations appraised as unpredictable and dictated by events themselves rather than by individuals; in contrast, anger arises from situations appraised as predictable and dictated by other individuals (Lerner and Keltner 2000).

Our focus on anxiety and anger was driven by three major goals. First, in order to separate the effects of specific emotions from simple positivity/negativity effects, it is important to compare emotions of similar valence. We therefore chose to examine negative emotions, which are better differentiated than positive emotions in relevant literature (Fredrickson 2003), have received considerably more attention, and are especially appropriate given past findings of negativity bias. Second, given the substantive domain of our research, it is important to consider emotions relevant to e-commerce settings. Anxiety and anger are among a subset of emotions commonly encountered in seller reviews (see Table 5 for specific examples); anxiety often stems from ambiguity regarding product quality, shipment times, or refunds/returns, while anger often stems from mishandled transactions, inadequate customer service, or poor product performance.

Third, the appraisal-based approach argues that emotions affect subsequent behaviors to the extent that those behaviors relate to the underlying emotional appraisals. In order to test this approach, therefore, it is important to compare emotions that are differentiated by particular appraisals on behaviors that relate to those appraisals (Han et al. 2007; Lerner and Tiedens 2006). In the section below, we argue that certainty appraisals carry direct implications for reviewer effort and subsequent perceptions of review helpfulness; hence, it is necessary to compare emotions that vary substantially in certainty. This requirement is satisfied by the emotions of anxiety and anger, which are similar in appraisals of pleasantness but differ heavily in appraisals of certainty.

Discrete Emotions and Cognitive Effort

Above and beyond their affective consequences, the appraisals that define an emotion often have carry-over effects on judgment and behavior (Ellsworth and Scherer 2003). In particular, the *appraisal tendency* perspective argues that

emotional individuals are predisposed to interpret subsequent events in line with the appraisal patterns characterizing their emotion (Lerner and Keltner 2000; Lerner and Keltner 2001). For example, one feels sad when a negative event is appraised as situation-controlled (e.g., a natural disaster). Consequently, this sadness triggers a temporary tendency to perceive situational control in logically unrelated domains (e.g., health outcomes, job performance).

For present purposes, an especially relevant finding is that emotional experience has predictable effects on subsequent cognitive effort, depending on the underlying appraisal of certainty (i.e., the degree to which events are predictable and comprehensible, see Lerner and Tiedens 2006). Table 1 provides a sample of emotions that differ in appraisals of valence and certainty (see Roseman 1984; Smith and Ellsworth 1985). Negative emotions characterized by uncertainty (e.g., anxiety) arise from the presence of unpredictable threats (Lazarus 1991). Consequently, individuals experiencing anxiety and its underlying uncertainty are predisposed to feel uncertain in subsequent situations, and, in order to cope with this uncertainty, to employ systematic, “mindful” processing that involves considerable cognitive effort (Tiedens and Linton 2001). In other words, anxious people tend to be more deliberative as a means of reducing their sense of uncertainty (see Lerner et al. 2003; Raghunathan and Pham 1999). Applied to the current setting, therefore, review writers experiencing anxiety can be expected to devote more cognitive effort to the review task.

On the other hand, negative emotions characterized by certainty (e.g., anger) arise when undesirable outcomes are predictable or have occurred repeatedly in the past. Consequently, individuals experiencing anger and its underlying certainty are predisposed to feel certain in subsequent situations. As a result, they are more likely to engage in mindless, heuristic processing that requires little direct thought and rely on rules of thumb (Bond et al. 2008; Chaiken and Trope 1999). For example, angry individuals have been shown to make shortsighted inferences, base judgments on stereotypes, and attend insufficiently to argument quality (see Bodenhausen et al. 1994; Lerner et al. 1998; Tiedens 2001; Tiedens and Linton 2001). In other words, anger prompts reliance on superficial cues rather than careful deliberation. Applied to the current setting, therefore, review writers experiencing anger can be expected to devote less cognitive effort to the review task.

Representation of Emotion Concepts

Our primary argument is that the emotions embedded in a review affect reader perceptions of the cognitive effort

expended by the reviewer, which in turn affect perceptions of review helpfulness. To make this argument, we first claim that review readers will generally recognize discrete emotions in the content of seller reviews, even if they are processing at a relatively superficial level. This claim is consistent with the accepted notion that individuals attend to and utilize emotional expressions as a source of social information (see Van Kleef 2010). Abundant evidence has shown that perceivers rapidly identify emotional cues in facial and bodily expressions (Atkinson et al. 2004; Ekman and Friesen 1971), and more recent work has extended this idea to verbal communication. Research on the language of emotion indicates that, in general, readers can easily perceive and distinguish between writing-embedded emotions (Barrett et al. 2007; Lindquist et al. 2006). Emotional words are processed faster and more efficiently than nonemotional words (Kanske and Kotz 2007; Kousta et al. 2009), and processing can even occur automatically (Gendron et al. 2012; Gernsbacher et al. 1998).

Next, we claim that readers who have identified emotional content in a review will make emotion-consistent inferences about reviewer effort. In the section above, we argued that anxious reviewers tend to engage in more effortful processing than angry reviewers; although this relationship may not always hold, our claim only requires that perceivers assume it to exist. The way in which perceivers interpret and evaluate emotional expressions is determined by their mental representations of emotion concepts (Russell 1991; Siemer 2008). Research in this area suggests that people develop and organize emotion concepts by scripts, that is, the sequence of subevents (beliefs, feelings, facial expressions, actions) by which that emotion typically occurs (Fehr and Russell 1984; Frijda 1993a). Prior investigations have used open-ended probing techniques to develop prototypical emotional scripts; for example, representations of happiness consist of the following script: (1) wanting something, (2) attaining it, (3) feeling pleasure, (4) smiling, (5) being kind to others. Concerning anxiety and anger, most relevant for our purposes are the behavioral consequences associated with each emotion. Research indicates that individuals expect a person who is anxious to be vigilant, seek more information, and calculate the possibility of a negative outcome (Frijda et al. 1989; Shaver et al. 1987). In contrast, individuals expect a person who is angry to become excited, narrow their attention, and vent their feelings through aggressive verbal or physical action. Comparing across scripts, it is clear that behaviors typically associated with anxiety involve more reasoning and deliberation than behaviors typically associated with anger. Applied to our context, therefore, readers should perceive greater cognitive effort from anxious reviewers than angry reviewers.

Table 1. Sample Emotions Characterized by Valence × Uncertainty

		Valence	
		Positive	Negative
Certainty	Low	Hope	Anxiety
	High	Happiness	Anger

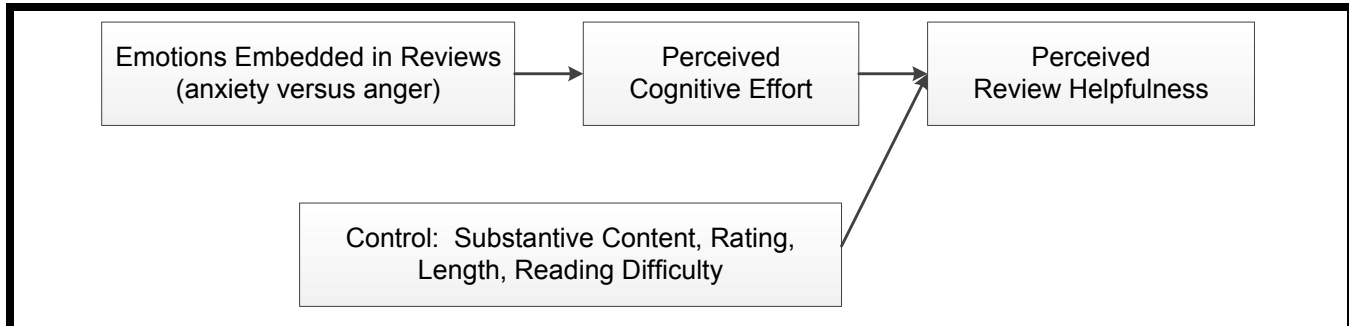


Figure 1. Theoretical Framework

Finally, we claim that readers will perceive a review as more helpful if they believe the reviewer has expended more cognitive effort in constructing it. This claim is consistent with a broad range of findings in attribution theory and performance estimation that show that individuals associate effort expenditure with performance across a variety of contexts (e.g., Skinner et al. 1988; Weiner and Kukla 1970). Moreover, to the extent that writing a helpful review is a challenging task (Mudambi and Schuff 2010), perceived effort is likely to be seen as an indicator of underlying motivation to perform well (Kukla 1972; Nicholls 1984). As above, we note that more effort from a reviewer may not always produce a review that is objectively more accurate, complete, etc., but our framework only requires that readers generally assume this relationship to hold.

To summarize our arguments, reviews that contain content indicative of anxiety (versus anger) will result in a higher level of perceived cognitive effort, which will in turn lead to perceptions that the reviews are more helpful. Our theoretical framework is illustrated in Figure 1, and our hypotheses can be stated as follows:

Hypothesis 1: Anxiety-embedded reviews are perceived to be more helpful than anger-embedded reviews.

Hypothesis 2: Perceived cognitive effort mediates the differential impact of anxiety and anger on the perceived helpfulness of reviews.

To test these hypotheses, we conducted three studies utilizing distinct methodologies. In Study 1, we conducted an experiment in which anxiety and anger were manipulated while controlling for potential differences in objective review content. In Study 2, we replicated the results of the first study while using a different manipulation to rule out alternative explanations. In Study 3, we extended the experimental results by examining actual seller reviews from a popular online platform (Yahoo! Shopping), in order to measure the impact of emotional content on ratings of review helpfulness.

Study 1: Experiment

In this study, we utilized a laboratory experiment to directly manipulate anxiety and anger in seller reviews within a repeated-measures design, while controlling for potential differences in substantive content. As part of a simulated seller feedback scenario, each participant was exposed to reviews of several potential stores; the set included three treatment reviews that were similarly negative in valence but expressed distinct emotions. For each review, participants provided their perceptions of review helpfulness and the cognitive effort of the reviewer. By comparing the perceived helpfulness of the treatment reviews, we were able to identify the differential impact of anxiety and anger. Next, by testing the extent to which this differential impact is explained by perceptions of reviewer cognitive effort, we were able to explore the mediation proposed in our model.

Table 2. Baseline Review Stimuli Used in Study 1

#	Review Content	Anxiety*	Anger
1	I purchased a camera on February 27 for two day delivery and on March 23 I am still waiting for it, plus they billed me for it on February 27.	6.7	6.8
2	Ordered a laptop battery (12 cell) and RAM. I received a 6 cell battery and the incorrect RAM. I returned the products to this merchant three weeks ago (and they were received), but still have not received my refund.	6.8	6.8
3	I placed an order on December 14 using standard shipping because it said if I ordered by the 19th it would be delivered before Christmas. I just received an E-mail saying they shipped it today (December 23) and estimated arrival date is December 30.	6.5	6.2

*Perceived emotions of each review writer, measured by the question "In your opinion, to what extent does each of the following words describe how the reviewer felt when he/she wrote the above review?" Items included *anxious* and *angry*, and were measured on a nine-point scale ("not at all" to "very much").

Stimulus Materials

Preparation of stimuli for Study 1 involved two steps: (1) identification of text reviews that were negative in valence but relatively nonemotional, and (2) addition of emotional content that represented our manipulation. The first step was essential to ensure that the substantive content of the reviews would not interfere with the emotion manipulation in the second step.

In the first step, we targeted merchants selling electronics at the Yahoo! Shopping website. The site classifies merchants into categories based on the type of products sold (books, electronics, software, etc.). To facilitate the collection task, we restricted our focus to stores in the "electronics" category, which sell a range of products including cameras, cell phones, MP3 players, home video, etc. We retrieved all historical reviews for every merchant that had accumulated at least one review on the platform (154,834 total reviews, covering 167 merchants); this dataset was later the basis for the empirical analysis presented in Study 3. For the current study, we screened those reviews with negative ratings (one out of five stars) and selected an initial sample of 37 reviews for further examination. From this set, we first dropped reviews that were extremely short or long, and then revised the rest by removing any sentences that directly indicated reviewer emotions. From the remaining pool, we selected 13 reviews containing content that could reasonably have been written by anxious or angry customers. We then pretested this set to identify reviews that reflected equivalent levels of anxiety and anger. In the pretest, 25 participants read the 13 reviews, one at a time, and rated the perceived anxiety and anger of each review author. Based on the results, we selected the three reviews shown in Table 2. For each of the selected reviews, the difference between perceived anxiety and perceived anger was not significant ($p > 0.8$). Thus, we were confident that

the emotional manipulations in the next step would be equally consistent with the content of each review.

In the second step, emotional expression was manipulated directly by varying the sentence appearing at the beginning of the review. In the *anxiety* condition, the review began with the sentence "My experience with this seller has caused a lot of anxiety." In the *anger* condition, the review instead began with the sentence "I was very angry after everything that happened." The review in the *baseline* (control) condition contained no additional up-front sentence. Applying this process to each of the three selected reviews yielded a final set of nine treatment reviews.

Procedure

Participants were 78 undergraduate students (52 male) from an introductory IS course at a southern U.S. university. Participants received extra credit for their participation, and no one failed to complete the study. Demographic measures indicated that 88 percent were from the United States, 80 percent were juniors or above, and the average age was 21; on average, they had 12 years of experience using the Internet.

As a cover story, participants were introduced to a fictitious third-party review site, OnlineConsumerReview.com, providing consumer reviews of online stores. The cover story explained that the researchers were working with the site to improve its data mining algorithms and that to aid in this process, participants would be evaluating a series of real text reviews collected on the OnlineConsumerReview.com platform.

Participants read and evaluated six text reviews, one at a time, each describing a different online store. Three filler reviews

were presented in positions 1, 3, and 5 of the sequence; filler reviews were one or two sentences in length and positive overall (e.g., “I liked their web site – lots of items with a decent description of each. Received exactly what I ordered in a timely manner...”). The three treatment reviews were presented in positions 2, 4, and 6 of the sequence. Due to the within-subject design, substantive content of reviews across the three conditions could not be held identical without appearing artificial. Therefore, we held the sequence of treatment reviews constant but counterbalanced the order in which the treatments occurred. In this way, each of the three reviews appeared in each of the three conditions (anxiety, anger, baseline) an equivalent number of times.

After reading each review, participants reported their perceptions of (1) the helpfulness of the review, and (2) the cognitive effort expended by the reviewer. Perceived review helpfulness was measured on a nine-point, semantic differential scale, using three items adapted from Sen and Lerman (2007). Perceived cognitive effort was measured on a nine-point scale ranging from “not at all” to “very much,” using three items adapted from Huddy et al. (2007). These measures are presented in the appendix.

Results

Before further analysis, we conducted a manipulation check of the stimulus materials to ensure that emotional content was correctly identified. A separate group of 30 subjects underwent a procedure similar to the main study; however, the dependent measures after each review were replaced with the following question: “In your opinion, to what extent does each of the following words describe how the reviewer felt when he/she wrote the above review?” Response options included anxious, angry, sad, and happy (1 = “not at all” and 9 = “very much”). Analyses were performed using pair-wise comparisons after a repeated-measure ANCOVA controlling for review order. Confirming that the treatment reviews successfully targeted their relevant emotions, reviews in the anxiety condition were more related to anxiety than to anger ($M = 8.27$ versus 7.20 , $F(1, 27) = 7.10$, $p = 0.013$), and reviews in the anger condition were more related to anger than to anxiety ($M = 8.70$ versus 6.27 , $F(1, 27) = 26.00$, $p < 0.001$). Additionally, reviews in the control condition were related to both anxiety and anger to a similar extent ($M = 6.87$ versus 7.17 , $F(1, 27) = 0.93$, $p = 0.344$).

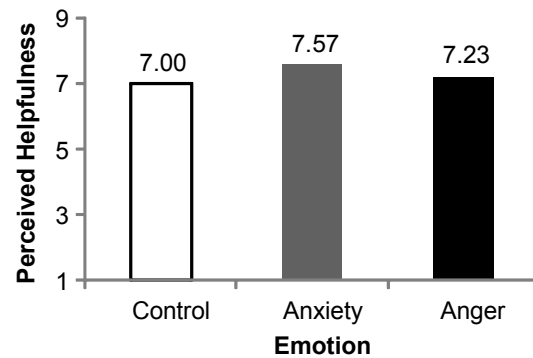
We next examined the reliability and validity of major constructs in the study. Cronbach’s alphas for review helpfulness were between 0.93 and 0.95, and those for perceived effort were between 0.86 and 0.94, demonstrating adequate internal

consistency reliability for both constructs (Nunnally 1967). We conducted an exploratory factor analysis (EFA) to assess convergent and discriminant validity of the two constructs, utilizing the principle components method with Varimax rotation. For each review, EFA consistently provided two factors. Within the rotated component matrix, loadings of items on their corresponding factor were higher than 0.7, higher than loadings of other items on this factor, and higher than the loadings of these items on the other factor (< 0.5) (Straub 1989). Finally, average variances extracted (AVEs) for review helpfulness and perceived effort were above 0.5, demonstrating convergent validity (Fornell and Larcker 1981). In addition, the square roots of AVEs for both constructs were greater than the correlations between them, demonstrating discriminant validity.

Our first important question concerned whether perceived helpfulness varied across anxious versus angry reviews. The pattern of means for perceived helpfulness is illustrated in Figure 2. A repeated-measure ANCOVA was performed to examine the difference in perceived helpfulness across treatment reviews. Emotional condition was entered as a within-subject factor, and the counterbalancing of the three treatment reviews was entered as a covariate. In line with H1, pairwise comparisons revealed that the difference in perceived helpfulness between anxiety and anger conditions was significant ($M = 7.57$ versus 7.23 , $t(77) = 2.59$, $p < 0.05$). Thus, reviews containing anxiety were considered more helpful than those containing anger, despite having the same objective content. Although the magnitude of the effect was not large, it is important to note that our manipulation was subtle in nature (the addition of one emotional sentence); this issue is addressed in Study 2.

In a supplementary analysis, we compared the helpfulness of emotional reviews with that of the baseline review. Pairwise comparisons showed that anxious reviews were considered significantly more helpful than baseline reviews ($M = 7.57$ versus 7.00 , $t(77) = 3.96$, $p < 0.001$), whereas angry reviews were not reliably different from baseline reviews ($M = 7.23$ versus 7.00 , $t(77) = 1.42$, $p = 0.16$). Taken together, these results indicate that negative reviews were considered more helpful if they indicated anxiety, but not if they indicated anger.

Next, we explored whether the differential effects of anxiety and anger on perceived helpfulness were mediated by perceived cognitive effort. The most common methods for testing mediation (e.g., Baron and Kenny 1986) apply only to cases in which the treatment varies between (rather than within) participants. Therefore, we employed the procedure developed by Judd et al. (2001) for testing mediation in within-



Notes:

- The review in the anxiety condition began with the sentence "My experience with this seller has caused a lot of anxiety."
- The review in the anger condition began with the sentence "I was very angry after everything that happened."

Figure 2. Perceived Helpfulness of Seller Reviews Across Emotion Conditions in Study 1

subject designs. The first step requires that the independent variable (i.e., discrete emotions) be significantly related to both the dependent variable (perceived helpfulness) and the proposed mediator (perceived effort). The results above demonstrated that perceived helpfulness was greater for the anxiety condition than the anger condition, and a repeated-measure ANCOVA revealed that this difference was also obtained for perceived effort ($M = 6.27$ versus 5.82 , $t(77) = 2.73$, $p < 0.01$), as illustrated in Figure 3. Thus, the first criterion was satisfied. The second step requires that the proposed mediator be significantly related to the dependent variable at each level of the independent variable. As expected, regression analysis revealed that greater perceived effort was associated with greater perceived helpfulness for both the anxiety and anger conditions ($\beta = 0.488$ and 0.366 , $t = 4.86$ and 3.93 , $ps < 0.001$). The third step requires that differences in the mediator across different levels of the independent variable be predictive of differences in the dependent variable. Therefore, following the steps proposed by Judd et al., we regressed the difference in perceived helpfulness across anxiety and anger conditions on three terms: (1) the difference in perceived effort across anxiety and anger conditions, (2) the sum of perceived effort across anxiety and anger conditions (mean-centered), and (3) an intercept term. Confirming the presence of mediation, differences in perceived effort were predictive of differences in perceived helpfulness ($\beta = 0.302$, $t = 4.14$, $p < .001$). Therefore, criteria for mediation were met. Moreover, the coefficient of the intercept was not significant ($\beta = 0.200$, $t = 1.54$, $p = 0.129$), indicating full mediation. Taken together, these results indicate that the differential impact of anxiety and anger on perceptions of review helpfulness was mediated by perceived cognitive effort.

Discussion

By directly manipulating discrete emotions and measuring perceived cognitive effort, Study 1 provided evidence for both of our hypotheses. Participants considered anxious reviews to be more helpful than angry reviews, and this difference was explained by the perceived cognitive effort of the reviewer.

Although results of the study supported both hypotheses, other explanations may be advanced to account for our results. Two explanations concern the valence and arousal of the treatment reviews. In terms of valence, the existence of a generalized negativity bias suggests that negative information is rarer and thus considered more diagnostic (Baumeister et al. 2001); if so, the anxious reviews may have been rated more helpful simply because they were more negative. In terms of arousal, ample evidence exists that high levels of arousal can impair executive function and induce mindless heuristic processing, characterized by low elaboration and effort (Eysenck 1982; Humphreys and Reville 1984; Mueller 1979; Sanbonmatsu and Kardes 1988). Thus, compared to anxious reviews, the angry reviews may have been associated with less effort due simply to their higher levels of arousal. A third concern involves attribution of reviewer motivations (Sen and Lerman 2007): according to correspondent inference theory (Jones and Davis 1965), perceivers tend to attribute an actor's behavior to stable dispositions, unless the behavior is unusual or unexpected. Hence, if angry reviews are considered more typical than anxious reviews, they may invoke more dispositional attributions (e.g., "the author is easily irritated"), and be considered less helpful as a result. Finally, it is possible that participants felt more empathy toward the authors of the anxious reviews (Lazarus 1991), so that anxious reviews may

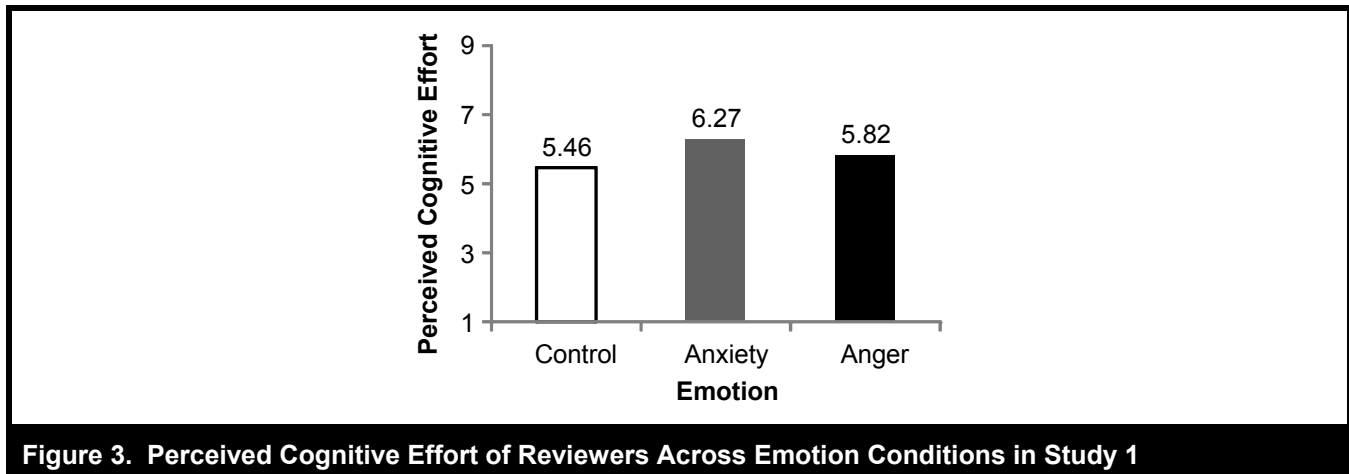


Figure 3. Perceived Cognitive Effort of Reviewers Across Emotion Conditions in Study 1

have been perceived as more helpful due to this empathic response.

To address these alternative explanations, we conducted a follow-up study. A group of 49 undergraduate students underwent a procedure similar to that described above; however, the dependent measures were replaced by a series of questions addressing the valence, arousal, attributions, and empathy associated with each review. All questions were adapted from scales used in prior literature (see the appendix). Analyses were performed through a repeated-measure ANCOVA controlling for the order of reviews. Contrary to a valence-based explanation, results indicated that reviews in the anxiety conditions were rated (marginally) less negative than those in the anger conditions ($M = 1.92$ versus 1.59 , $t(48) = 1.85$, $p = 0.072$). Contrary to explanations based on attributions or empathy with the reviewer, comparisons of anxiety and anger conditions showed no reliable differences in these measures ($p > 0.2$). On the other hand, an explanation based on arousal could not be ruled out, as reviews in the anxiety conditions were perceived to be lower in arousal than reviews in the anger conditions ($M = 6.50$ versus 7.23 , $t(48) = -2.46$, $p = 0.018$). However, given that elevated arousal is a fundamental component of anger but not anxiety (Smith and Ellsworth 1985), this result need not conflict with our arguments, to the extent that the higher arousal of angry reviewers is associated with less cognitive effort. Study 2 investigated these issues further by incorporating an alternative design.

Study 2: Experiment

The primary goals of Study 2 were to explore plausible alternative explanations that could not be ruled out in Study 1 while also testing the robustness of our findings. The use of

a between-subject design in this study made it possible to hold constant the substantive content of the review, strengthen the manipulation of emotion, and control for review valence and arousal in the data analysis.

Procedure

A group of 73 undergraduates (34 male) took part in the study, and there was no attrition. Demographic measures indicated that 79 percent were from United States, 64 percent were in their sophomore or junior years, and their average age was 21; on average, they had 11 years of Internet experience.

Participants were randomly assigned to either the *anxiety* or *anger* condition. The cover story and procedure was similar to that of Study 1, with three major exceptions. First, only one review was evaluated (review #2 in Table 2). Second, the emotion manipulation was strengthened by appending sentences at both the beginning and end of the review. Specifically, the review began with the sentence “I feel so worried (mad) as I’m writing this!” and ended with the sentence “Let me tell you: I’m very nervous (irritated).” Finally, in addition to the dependent measures described in Study 1, participants also provided evaluations of valence, arousal, attribution, and empathy (see the appendix). At the end of the procedure, they completed the same emotion manipulation check described in Study 1.

Results

Analyses of manipulation check items revealed that the review in the anxiety condition was considered more related to anxiety than to anger ($M = 7.86$ versus 4.59 , $t(36) = 7.33$,

$p < 0.001$), and the review in the anger condition was considered more related to anger than to anxiety ($M = 8.56$ versus 4.89 , $t(35) = 15.34$, $p < 0.001$). Thus, the manipulation of emotion was successful.

Next, ANCOVA was performed to examine the perceived helpfulness of anxiety-embedded and anger-embedded reviews, while controlling for the effect of valence and arousal. Replicating the results of the first study, and in line with H1, perceived helpfulness was significantly higher in the anxiety condition than the anger condition ($M = 7.33$ versus 6.26 , $F(1, 69) = 5.67$, $p < 0.05$).

To determine if the effect of emotions on perceived helpfulness was mediated by perceived effort, as predicted by H2, we followed the steps advocated by Baron and Kenny (1986). Valence and arousal were used as controls in each step below. First, perceptions of cognitive effort were significantly associated with emotion condition, such that perceived effort was higher for anxiety than anger ($M = 4.84$ versus 3.83 , $F(1, 69) = 5.23$, $p < 0.05$). Second, emotion condition was significantly associated with perceived helpfulness, as shown above. Finally, when emotion condition and perceived effort were entered together as predictors of perceived helpfulness, the effect of perceived effort remained significant ($F(1, 68) = 31.46$, $p < 0.001$). Thus, all criteria for demonstrating mediation were satisfied. Moreover, the significant relationship between emotion and review helpfulness became non-significant after controlling for perceived effort ($F(1, 68) = 1.60$, $p = 0.210$), indicating the presence of full mediation (Sobel test statistic = -2.12 , $p = 0.034$). Consistent with Study 1 and H2, these findings indicate that the differential impact of anxiety and anger on the perceived helpfulness of a review was mediated by perceptions of the reviewer's cognitive effort.

Finally, we examined evidence for the alternative explanations discussed in Study 1. First, contrary to explanations based on generalized negativity bias, t -tests revealed that the review in the anxiety condition was considered less negative than the review in the anger condition ($M = 2.38$ versus 1.41 , $t(71) = 4.20$, $p < 0.001$). Next, examination of the arousal measure revealed that arousal in the anxiety condition was lower than that in the anger condition ($M = 6.65$ versus 8.32 , $t(71) = -6.47$, $p < 0.001$), suggesting that arousal may indeed play a role in the differential impact of the two emotions. Given that the ANCOVA and mediation analyses above controlled for arousal, this argument cannot account for our findings; however, it is clearly worthy of future exploration. Third, contrary to an account based on attribution, analyses revealed that dispositional attributions were marginally greater for the anxiety review than the angry review ($M = 5.03$

versus 3.97 , $t(71) = 1.81$, $p = 0.074$). Finally, measures of empathy with the reviewer were virtually identical across the anxiety and anger conditions ($t(71) = 0.67$, $p > 0.5$).

Discussion

Study 2 replicated and extended the findings of Study 1 in a between-subject design, which held constant the objective content of the review and controlled for possible effects of valence and arousal. Findings provided evidence supportive of both of our hypotheses, while ruling out a number of alternative explanations.

The principal advantage of the experimental method utilized in Studies 1 and 2 was the ability to manipulate emotion in a straightforward manner. This parsimony enabled us to avoid potential confounds and directly explore the differential effects of anxiety and anger. On the other hand, the design also required a degree of artificiality in both the experimental task and the reviews themselves. We address these concerns in Study 3 by examining real-world seller reviews.

Study 3: Yahoo! Merchant Reviews

The primary goal of Study 3 was to test H1 by exploring the effects of discrete emotions on review helpfulness in a real-world setting. To do so, we collected and analyzed actual review data from the Yahoo! Shopping website, which provides both user ratings and text reviews for online merchants. Yahoo! Shopping was chosen over other possible platforms because (1) our focus was seller reviews rather than product reviews, and (2) the most popular seller review platform, eBay, does not provide helpfulness ratings for reviews. At the time of data collection, Yahoo! Shopping had accumulated over eight years of customer reviews. The Yahoo! platform allows prior customers of a merchant to evaluate that merchant on a scale of one to five stars, and (optionally) to write a text review providing details about their experience with the merchant, as illustrated in Figure 4. The review page for each merchant displays all reviews for that merchant chronologically, and the most recent reviews appear first by default.

Data Collection

Individual reviews were used as the unit of analysis, and data collection took place in April 2011 (see Study 1 for details), creating an initial sample of 187,675 reviews. For each review, we collected the following information: rating, text

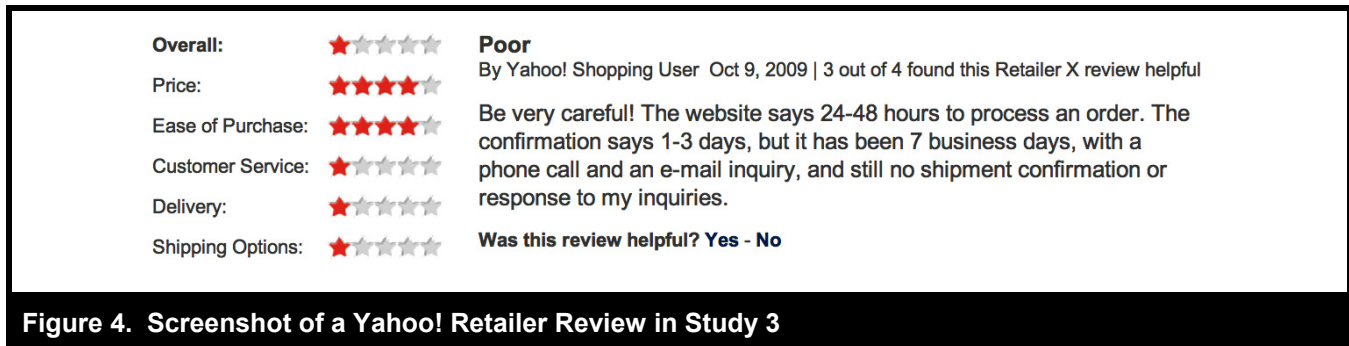


Figure 4. Screenshot of a Yahoo! Retailer Review in Study 3

review content, helpful votes, and total votes. We also collected store-level information, including the average rating and count of all ratings for each store.

In order to reduce noise in the reviews, the following steps were taken. First, 562 reviews which included non-ASCII characters (mostly from non-English languages) were removed. Next, we removed reviews that contained no text content (4,571), reviews that contained only EOM (“End of Message,” 27,708), and reviews that contained only symbols or dates (10). These steps resulted in 154,834 reviews. Of this group, only 7,322 reviews (4.7%) had received any helpfulness votes (see below), which is not unusual in online review settings (Pavlou and Dimoka 2006). Analysis was conducted on this set of 7,322 reviews.

Variables

The dependent variable of interest, review helpfulness, was operationalized as follows. Below each review, Yahoo! Shopping presents the question “Was this review helpful?” along with yes and no options. A review that has received at least one vote will display the number of helpful votes and total votes immediately before the review content. Helpfulness was measured as the proportion of helpful votes out of the total votes a review received (i.e., the number of people who voted yes divided by the total number of people who cast a vote). Therefore, the value of helpfulness ranged from 0 to 1, with a higher percentage indicating a more helpful review. The average helpfulness of the analyzed reviews was 0.68, indicating that they were generally considered helpful. Tables 3 and 4 present a summary of statistics and correlations for this and other variables (described below). Because the data contained no usable measure of perceived cognitive effort, Hypothesis 2 was not tested in this study.

Measurement of discrete emotions in the text reviews was conducted with Linguistic Inquiry and Word Count (LIWC),

a text analysis software program developed by Pennebaker et al. (2007). LIWC was designed to efficiently evaluate psychological and structural components of text samples. The tool has been widely adopted in psychology and linguistics (Tausczik and Pennebaker 2010), and its reliability and validity have been investigated extensively (Pennebaker et al. 2007; Pennebaker and Francis 1996). LIWC includes a psychometrically validated internal dictionary comprised of approximately 4,500 words and word stems, each of which is classified into one or more categories. After receiving a text sample, the software processes each word in the sample, one at a time. As each word is processed, LIWC searches its dictionary file for a match, and if a match occurs, the appropriate category scale for that word is incremented. At the end of this procedure, a final score is assigned to each category, representing the percentage of words in the text sample matching that category. Importantly, the classification system includes categories tapping a variety of emotional dimensions, making it sensitive to differences among discrete emotions, including anxiety and anger (Kahn et al. 2007). Therefore, the software has seen increasing use as a measure of emotional disclosure (e.g., Bantum and Owen 2009; Pennebaker and Stone 2003).

In order to examine the emotional content of our 7,322 merchant reviews, each was submitted to LIWC analysis. The classification categories anxiety and anger represented the key variables of interest. Across all reviews in the set, the maximum value obtained for anxiety or anger was 50, and the average values for both categories were below 0.2. These low values are not surprising given use of a predefined dictionary that does not take context into consideration (moreover, the possibility that reviewers may express their feelings without using explicit emotional words represents a limitation of this approach). Of the reviews, 9.81 percent contained at least one anxiety word, and 11.84 percent contained at least one anger word; however, only 2.57 percent contained both anxiety and anger words. Examples of anxiety-embedded and anger-embedded reviews are presented in Table 5.

Table 3. Descriptive Statistics for Final Review Pool (N = 7,322) in Study 3

Variable *		Mean	Std. Dev.	Min	Max
1	Review helpfulness	0.68	0.40	0	1
2	Rating	3.29	1.81	1	5
3	Length	69.82	70.76	1	707
4	Reading difficulty	10.32	4.25	-10.2	121.5
5	Anxiety	0.17	1.00	0	50
6	Anger	0.19	1.14	0	50

*Refer to Table 6 for operationalizations of these variables.

Table 4. Variable Correlations for Final Review Pool (N = 7,322) in Study 3

Variable		1	2	3	4	5	6
1	Review helpfulness	1					
2	Rating	-0.158***	1				
3	Length	0.182***	-0.376*** ^a	1			
4	Reading difficulty	-0.051***	0.226***	-0.240***	1		
5	Anxiety	0.006 ^b	-0.050***	-0.006	0.068***	1	
6	Anger	-0.002	-0.132***	0.027*	-0.018	0.018	1

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

^aOne possible explanation for the negative correlation between rating and length is that negative stimuli produce more complex and complete cognitive representations than positive stimuli (Ducette and Soucar 1974; Irwin et al. 1967; Peeters and Czapinski 1990). Thus, consumers undergoing a negative experience may interpret it in a more specific and detailed manner.

^bAnxiety and anger were not correlated with review helpfulness in the initial model, suggesting the existence of a suppressor relationship with one or more control variables.

Table 5. Examples of Emotional Reviews at Yahoo! Shopping

#	Anxiety-Embedded Reviews	Anger-Embedded Reviews
1	I had some doubts about the item I purchased, never got an answer neither the store or the manufacturer.	Lied about availability of product for two weeks, indicating that it had been shipped when, in fact, it was on back-order. Customer service? Don't bother!
2	Lost order per customer representative. No explanation. Now I am worried that they will "find" the order and will have to return since I am ordering from another vendor.	These people SUCK. They stalled the order for days trying to get me to buy extra shipping and other crap. Then they screwed up and didn't ship me one of the TV's I ordered. They SUCK.
3	The product was "backordered." It was ordered over a month ago as a gift, good price but never received the item. Said they would refund my credit card in 72 hours, and its been over a week and no refund. Getting a little worried. They are quick to reply to e-mails, but no refund. Seems to be a good company on yahoo, will update if the refund is made. (4th of July Holiday)	Extremely disappointed and offended. My Miele machine broke after 10 uses. When I called the store today, I was told that I was an idiot and that I was wasting 11 minutes of the salesperson's time with my idiocy. Then he hung up on me. I am contacting Miele headquarters to complain as well. I will never do business with this store again, and if you don't want to get ripped off and abused, you shouldn't either.

Following prior work examining review helpfulness scores (Korfiatis et al. 2008; Mudambi and Schuff 2010), our analysis controlled for a series of relevant variables, including rating and rating squared, review length, review reading difficulty, and store characteristics.

- (1) Rating refers to the star rating of a review; the more stars a review received, the more positive the review.² Rating ranged from 1 star to 5 stars, and the average rating for the reviews in the set was 3.29.
- (2) A quadratic term of star rating was included to account for the nonlinear relationship between rating and helpfulness (Mudambi and Schuff 2010).
- (3) Review length was operationalized as the number of words in a review; a longer review often provides more total information, and may thus be considered more helpful. The analyzed reviews had on average 69.82 words.
- (4) To control for review reading difficulty, we calculated the Coleman–Liau Index,³ an estimate of the U.S. grade level that a student would need to have achieved in order to read and understand the text (Coleman and Liau 1975). On average, the reviews in our data set were written at a tenth-grade level.
- (5) We controlled for the effects of store characteristics, including a store’s average rating and the count of all its prior ratings. The former captures the overall reputation of a store, while the latter captures popularity.

The operationalization of all variables is summarized in Table 6.

Data Analysis and Results

Analysis was performed following the approach of Mudambi and Schuff (2010), by using Tobit regression to analyze all

²Although ratings are the standard measure of review valence in prior literature, ratings do not necessarily reflect the emotional valence of review content. For this purpose, LIWC provides the percentage of positive and negative emotional words. When these two measures were also controlled for, all significant results in the analyses still held.

³Alternative metrics for reading difficulty include the Flesch Reading Ease scale and Flesch-Kincaid Grade Level, among others (Dubay 2004). Although each metric has limitations, they have been shown to correlate with the perceived difficulty of reading text samples. Our results did not change when one of these alternatives was used.

reviews meeting the criteria described above ($N = 7,322$). We deemed this approach appropriate because the dependent variable was censored in nature: it was constructed as a ratio, and its value was bounded in range (Greene and Zhang 2003).⁴

Table 7 contains the results of our empirical analysis. The analysis indicates a good fit, with a highly significant likelihood ratio ($p < 0.001$) and pseudo R² value of 0.239 (Veall and Zimmermann 1996).

Tobit regression results involving the control variables were largely consistent with prior literature. Both linear ($\beta = -1.925, p < 0.001$) and squared ($\beta = 0.246, p < 0.001$) coefficients of review rating were significant and in the expected direction: reviews with lower ratings and/or higher extremity were considered more helpful. Additionally, a review was considered as more helpful to the extent that it was longer ($\beta = 0.005, p < 0.001$) and easier to comprehend ($\beta = -0.031, p < 0.001$). Coefficients for average rating ($\beta = -2.039, p < 0.001$) and count of ratings ($\beta > -0.001, p < 0.001$) were significant and negative; that is, controlling for all other variables, reviews of a well-liked or popular retailer were considered less valuable.

To explore Hypothesis 1, we examined the coefficients of anxiety and anger. First, to determine whether emotion measures improved the model, we conducted a partial (or incremental) F-test of the null hypotheses that the coefficient of both anxiety and anger equals zero ($\beta_{\text{anxiety}} = \beta_{\text{anger}} = 0$). Results indicated that anxiety and anger were jointly significant ($F(2, 154826) = 3.66, p < 0.05$) and should therefore be included. Next, to determine whether the effects of anger and anxiety were distinct, we tested the equality of the two coefficients by use of a Wald test. Results indicated that the coefficient for anxiety was significantly higher than the coefficient for anger ($F(1, 154826) = 6.28, p < 0.05$). Therefore, as predicted by H1, review content indicative of anxiety was more strongly associated with helpfulness ratings than review content indicative of anger.

⁴There exists a potential selection bias in this data, because not every reviewer casts a helpfulness vote; more importantly, the probability of a review being voted on might be correlated with explanatory variables. As a robustness check, we analyzed all reviews (including those with no helpfulness votes; $N = 154,834$), by employing Heckman’s (1979) two-step sample selection model (see also Kuan et al. 2011). The first step is a Probit “selection” equation that identifies determinants of a review being voted on. In the second step, determinants of review helpfulness are estimated using only voted reviews, conditional on the first step. The results were consistent with those presented here.

Table 6. Variables and Operationalizations in Study 3

Variable Type	Variable Level	#	Variable	Operationalization	Notes
DV	Individual Review	1	Review Helpfulness	# helpful_votes / # total_votes	Range: [0, 1]
IV	Individual Review	2	Anxiety	(# anxiety-related words / # words in a review) * 100	Range: [0, 100] Coded by LIWC
		3	Anger	(# anger-related words / # words in a review) * 100	
Control	Individual Review	4	Rating	# of stars	Range: [1, 5]
		5	Length	# of words	
		6	Reading Difficulty	Coleman-Liau Index	U.S. grade level necessary to comprehend the text
	Store	7	Reputation	average rating	Range: [1, 5]
		8	Popularity	# of ratings in total	

Table 7. Tobit Analysis Results for Final Review Pool in Study 3 (Dependent Variable: Review Helpfulness; N = 7,322)

Variable	Coefficient	Standard Error	t-value	Sig.
Constant	7.475	0.181	41.40	0.000
Rating	-1.925	0.080	-24.09	0.000
Rating ²	0.246	0.013	19.40	0.000
Length	0.005	0.000	15.28	0.000
Reading Difficulty	-0.031	0.004	-7.69	0.000
Store Average Rating	-2.039	0.039	-51.86	0.000
# of Store Ratings	-0.000	0.000	-40.11	0.000
Anxiety	0.049	0.019	2.55	0.011
Anger	-0.016	0.017	-0.91	0.360

Log likelihood = -32801.424

Likelihood Ratio = 14433.52 ($p = 0.000$, $df = 8$)

McKelvey and Zavoina's (1975) Pseudo $R^2 = 0.239$

Discussion

Utilizing review data from the Yahoo! Shopping platform, Study 3 supplemented the first two studies by providing real-world evidence for our primary hypothesis. Within the actual text content of merchant reviews, words related to anxiety and words related to anger were differentially associated with the overall helpfulness ratings assigned to the reviews.

The use of empirical methods in this study necessitated certain limitations that may suggest alternative interpretations. Most notably, because our design used naturally occurring reviews, it may be the case that anxious reviewers produced

content that was objectively more helpful. Although control variables were included to account for differences in objective informative content, we cannot definitely conclude that they played no role in our findings. Importantly, however, this interpretation is compatible both with our theory, which assumes that naïve theories of reviewers are generally accurate, and with prior research on the effects of anxiety and anger (Tiedens and Linton 2001). Moreover, this concern is not applicable to the experiments of Studies 1 and 2, which held constant the informative content of the reviews and still obtained the predicted differences in perceived helpfulness, along with evidence for the underlying process.

General Discussion

Together, the experiments in Studies 1 and 2 and the real-world investigation in Study 3 provide converging evidence for our framework. Extending traditional, valence-based approaches, these studies demonstrated the differential impact of discrete negative emotions on review helpfulness. Reviews containing content indicative of anxiety were considered more helpful than those containing content indicative of anger, and their differential impact was explained by beliefs regarding the cognitive effort of reviewers.

Theoretical Implications

Prior empirical investigations of online reviews have tended to focus on ratings and observable reviewer characteristics, leaving the textual content of reviews unexplored. Addressing this gap, we contribute to emerging research indicating that the rich information embedded in review text can itself be useful in explaining what constitutes a helpful review (Cao et al. 2011; Pavlou and Dimoka 2006). In contrast to other work focusing on cognitive aspects of review content (e.g., argument credibility, ease of reading, reasons provided), our research is among the first to explore the effects of emotional cues in a review. Utilizing both controlled experiments and content analysis of real-world reviews, we demonstrate that emotions inferred from the text of seller reviews can predict their perceived helpfulness.

Management scholars have increasingly recognized the important role of affect in consumer decision making (Loewenstein and Lerner 2003), and research dealing with emotions has expanded dramatically, most notably in marketing (Bagozzi et al. 1999; Cohen et al. 2008) and organizational behavior (Ashkanasy et al. 2002; Brief and Weiss 2002). Within the IS field, however, affective issues are often overlooked (for a review, see Sun and Zhang 2006b). For example, emotional components play no direct role in such prominent conceptual frameworks as the technology acceptance model (Davis 1989), media richness theory (Daft et al. 1987), and task–technology fit theory (Goodhue and Thompson 1995). On the other hand, a contingent of IS scholars has advocated the study of emotions in IS research (see Ortiz de Guinea and Markus 2009; Zhang 2013), and researchers have begun to incorporate affect into established frameworks (Deng and Poole 2010; Sun and Zhang 2006a; Venkatesh 2000). We contribute to this burgeoning area by exploring specific roles of emotion in online word-of-mouth. Our results raise important issues concerning the application

of negativity bias to online word-of-mouth.⁵ Extending the logic of negativity bias to emotional content, one would assume that reviews with negative emotions would be more helpful. However, this valence-based approach cannot account for the distinct effects of emotions similar in valence (Fontaine et al. 2007). Both anxiety and anger are negative, high-arousal emotions; nevertheless, due to their distinct motivations and behavioral implications, we expected and observed that they would influence perceptions of review helpfulness in distinct ways. Within psychology, there have been loud calls to move beyond valence in examining the effect of emotions (Lerner and Keltner 2000), and within IS, a few scholars have explored the distinct roles of discrete emotions in technology acceptance (Venkatesh 2000), technology use (Beaudry and Pinsonneault 2010), and online trust (Hwang and Kim 2007). In keeping with this movement, our studies offer initial evidence that distinct types of emotional content in a review evoke distinct perceptions among readers, holding constant review valence and objective information. Moreover, we introduce perceived cognitive effort as a mediator, and demonstrate its role in our experimental studies.

Typical research on the effects of discrete emotions examines two or three emotions that are most relevant to the question being examined (e.g., Lerner et al. 2003; Raghunathan and Pham 1999). In keeping with this approach, we restricted our focus to the emotions of anxiety and anger; however, our underlying logic could be used to predict the effects of a wide variety of emotions embedded in reviews on reader perceptions. Moreover, although we targeted review helpfulness, the underlying mechanism we describe should be applicable to numerous other consumer perceptions (reviewer expertise, trustworthiness of retailers, etc.). We see this as an important avenue for further research.

Our research also supplements literature on the representation of emotion concepts. Scholarship in this area tends to focus on the role of emotion within the individual, overlooking the critical interpersonal purposes that emotions often serve (Van Kleef 2010). For example, typical research within the appraisal-tendency framework examines the effects of experimentally induced emotions on subsequent, unrelated tasks (e.g., Lerner and Keltner 2000, 2001; Tiedens 2001; Tiedens and Linton 2001). In online word-of-mouth, however, emotions serve a powerful interpersonal role, as the feelings conveyed in a review may impact generations of future customers who read and make sense of that review for their

⁵As an aside, we note that our pattern of findings was generally consistent with prior literature on negativity bias. In particular, the valence term in Study 3 (i.e., the reviewer's rating of the seller) associated negatively with review helpfulness.

own purchase decisions. Building on the notion of shared emotion representations (Fehr and Russell 1984; Frijda 1993b), we extend the appraisal-tendency approach to interpersonal space, associating reviewer emotions at the time of writing to reader perceptions of both the review and its author. We believe this presents exciting opportunities for other research on the consequences of emotional experience in social environments.

Practical Implications

Although review authors undoubtedly have numerous motivations, one of these is often the desire to assist future customers via helpful information regarding a seller, transaction, or product. Negative reviews have the potential to influence the attitude and behaviors of future customers to a greater extent than positive reviews (Cao et al. 2011; Chevalier and Mayzlin 2006). However, it should not be assumed that a more negative review will be perceived as more helpful; rather, this conclusion must be qualified according to the specific emotions involved. For instance, we observe that an anger-embedded review is perceived as less helpful than an anxiety-embedded review, even if the substantive content of the review is held constant. As a result, ranting about a bad experience may be counterproductive for reviewers seeking to positively influence the choices of other customers. Instead, dissatisfied reviewers would be well advised to either avoid explicit expressions of anger or, alternatively, provide additional informative content to counteract its implications.

At a broader level, review platforms themselves might utilize our findings in developing writing guidelines to encourage more useful seller reviews. For example, the admonition “Do not use offensive language or content” is common among sites providing reviewer instructions (e.g., Epinions.com); while intended to maintain decorum, this guideline is also consistent with our implications regarding anger. Generally, review platforms cannot reasonably expect writers to amplify or suppress specific emotions; instead, they may ask reviewers to freely express their feelings, but think carefully about their tone and content (e.g., by taking the perspective of a future reader).

Various empirical studies have explored the helpfulness of product reviews and provided implications for manufacturers and retailers (Chevalier and Mayzlin 2006; Forman et al. 2008; Mudambi and Schuff 2010). Supplementing these studies, our work focuses specifically on seller reviews, which are increasingly important in the branding and differentiation of online merchants. Generally speaking, merchants are aware of the need to be vigilant and proactive in dealing with

negative reviews, and many third-party sites provide mechanisms for doing so (e.g., BizRate allows vendors to post a public response immediately beneath a review). Assuming that merchants seek to identify (and respond to) negative word-of-mouth that is especially influential, it may often be presumed that angry reviews deserve particular attention. However, our findings suggest that this intuition is erroneous; angry reviews appear to be discounted by readers due to their embedded emotion. In contrast, reviews expressing anxiety may be a more urgent concern.

Limitations and Future Research

Although our studies examined two particular emotions—*anxiety and anger*—that are prevalent in seller reviews, other emotions are also common (disappointment, happiness, surprise, etc.). Based on our results, it is worth considering how the presence of these emotions affects perceptions of helpfulness, and whether cognitive effort or other mediators best explain their effects. An appraisal-based approach offers many intriguing possibilities: for example, despite their opposing valence, both disappointment and happiness are characterized as high in certainty (Smith and Ellsworth 1985). It would be interesting to observe whether the presence of either emotion in a review generates similar effects on reader perceptions.

Our framework emphasizes the mediating role of perceived cognitive effort in explaining the effects of emotions embedded in reviews. However, we acknowledge that a reviewer’s cognitive effort may be driven by factors unrelated to emotional state (e.g., writing conditions), and review readers’ lay theories about these factors may affect their interpretation of the review. Although such factors were held constant in our experiments, they represent an interesting avenue to explore. Furthermore, although Studies 1 and 2 ruled out alternative explanations based on valence, attribution, and empathy, we do not deny that these factors play a role in helpfulness, and future research might consider them directly. Similarly, our Study 2 results suggest that arousal may also play a role in distinguishing the effects of various reviewer emotions, and this possibility is worthy of further exploration. Finally, anxiety and anger differ not only in underlying appraisals of certainty, but also in appraisals of control. Our model assumes that certainty appraisals are more directly applicable when assessing the usefulness of a review. However, control appraisals are likely to be useful in explaining other differential effects of anxiety and anger.

The studies in this paper were conducted exclusively with seller reviews. Although we believe that our underlying arguments apply similarly to product reviews, additional factors

may need to be considered. In the case of a product review, the specific target of a reviewer's emotion may be unclear (the product itself, the manufacturer, retailer, etc.), limiting the ability of readers to draw inferences. Moreover, seller reviewers are generally anonymous, whereas product reviewers are often identifiable in terms of expertise, purchase history, demographics, etc. The availability of this relevant information may weaken or strengthen the extent to which emotional cues affect inferences about the reviewer. Therefore, future research is needed to extend our investigation to a product review setting.

Finally, two assumptions of our framework merit further examination. First, we stress the impact of reviewers' emotional state on their cognitive effort; however, it is also plausible that cognitive cues (such as effort) influence the emotional state of reviewers themselves. In our studies, we assume that the former route is more applicable, because the indicated emotion has already resulted from interaction with the seller. Nonetheless, our main argument—that readers connect anxiety (anger) with more (less) cognitive effort—does not depend on directionality. Second, despite evidence that individuals attend to and recognize emotional cues in verbal communication (Lindquist et al. 2006; Zeelenberg et al. 2006), readers may not always accurately identify the emotional state of the author, or associate it with cognitive effort. Although this concern works against our hypotheses (making our studies more conservative), it suggests the need for further exploration. In accordance with classic psychological frameworks relating depth-of-processing to motivational factors (Cacioppo and Petty 1982; Chaiken and Trope 1999), one possibility is that emotions in a review will be more accurately identified by readers using systematic (versus heuristic) processing. Another possibility is that emotions embedded in reviews will exert greater influence on those processing heuristically, for whom emotional content provides a shortcut to determining helpfulness. These interesting issues merit further examination.

Conclusion

In keeping with recent interest in the integration of affective factors into existing IS frameworks, we suggest that scholars will benefit greatly from a better understanding of the impact of discrete emotions. Our research provides both experimental and real-world evidence that negative seller reviews containing diverse emotions are not created equal, but rather have differential effects on the perceived usefulness of peer information. We believe this work extends current understanding of an understudied but important topic, and we look forward to further research exploring causes and consequences of emotions in online environments.

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Appendix

Variables Measured in the Experiments

Helpfulness: (Sen and Lerman 2007)

Using the scales below, how would you describe the above consumer review?

- not at all helpful/very helpful
- not at all useful/very useful
- not at all informative/very informative

Perceived cognitive effort of reviewers: (Huddy et al. 2007)

- In your opinion, how much effort had the reviewer put into writing this review?
- In your opinion, how much thought had the reviewer given to the above review when he/she wrote it?
- In your opinion, how much time did the reviewer spent writing this review?

Valence: (MacKenzie and Lutz 1989)

Overall, how would you describe the customer's feelings regarding the experience he/she wrote in the review above?

- very bad/very good
- very unfavorable/very favorable
- very unpleasant/very pleasant

Arousal: (Berger 2011)

Using the scales below, how do you think the reviewer was feeling at the time that he/she wrote the review?

- very passive/very active
- very mellow/very fired up
- very low energy level/very high energy level

Attribution about the reviewer: (Sen and Lerman 2007)

There are a wide variety of reasons that customers might write a store review. Rate the extent to which you agree with the following statements.

- The cause of the review was something about the reviewer.

Empathy: (McCullough et al. 1997; Toi and Batson 1982)

- While reading this review, to what extent did you feel like you were experiencing the same emotions as the reviewer?
- While reading this review, to what extent did you feel concerned for the reviewer?
- While reading this review, to what extent did you feel moved by the review?