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Mitigating risk in ecommerce transactions: perceptions of information credibility and the role of user-generated ratings in product quality and purchase intention

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Abstract Although extremely popular, electronic commerce environments often lack information that has traditionally served to ensure trust among exchange partners. Digital technologies, however, have created new forms of “electronic word-of-mouth,” which offer new potential for gathering credible information that guides consumer behaviors. We conducted a nationally representative survey and a focused experiment to assess how individuals perceive the credibility of online commercial information, particularly as compared to information available through more traditional channels, and to evaluate the specific aspects of ratings information that affect people’s attitudes toward ecommerce. Survey results show that consumers rely heavily on web-based information as compared to other channels, and that ratings information is critical in the evaluation of the credibility of online commercial information. Experimental results indicate that ratings are positively associated with perceptions of product quality and purchase intention, but that people attend to *average* product ratings, but not to the *number* of ratings or to the combination of the average and the number of ratings together. Thus suggests that in spite of valuing the web and ratings as sources of

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commercial information, people use ratings information suboptimally by potentially privileging small numbers of ratings that could be idiosyncratic. In addition, product quality is shown to mediate the relationship between user ratings and purchase intention. The practical and theoretical implications of these findings are considered for ecommerce scholars, consumers, and vendors.

Keywords Ecommerce · Credibility · User-generated content · Amazon · Product ratings · Electronic word of mouth · Information credibility · Purchase intention · Product quality · User ratings

People are increasingly relying on web-based commercial information for electronic commerce (“ecommerce”) transactions that range from small personal items to home purchases [45]. Retail ecommerce sales in the U.S. currently constitute roughly 4 % of total retail sales, which translates to almost 40 billion dollars annually [10]. The number of Americans who have purchased a product online has steadily increased since 2000, and a majority (66 %) now report having made at least one online purchase [46]. An even larger percentage (93 %) has used the Internet for ecommerce-related activities, including researching information about a product they are thinking of buying, with more than a quarter of Americans reporting they do this on a daily basis [49]. In fact, over the last decade the number of people either researching or buying a product or service online has nearly doubled, a trend that holds true across a wide range of ecommerce-related activities [45].

Despite its popularity, online commercial transactions often lack elements that have traditionally served to ensure trust and credibility among exchange parties. Indeed, varying “patronage modes” embody different levels of risk for the consumer, which increase the more the consumer is separated from the physical presence of the retail store [43]. Faced with such risks, consumers engaging in ecommerce transactions must assess the credibility of information provided online, as well as the trustworthiness of the Internet as a commercial medium. Moreover, because consumers operate in an environment that includes other common and well-established information sources, they must assess the relative credibility of commercial information sources on the web, as compared to more traditional, offline venues.

To assuage consumers’ fears, many ecommerce sites provide features designed to promote greater trust among parties, such as security seals, help buttons, and personalization features [6, 64]. Two frequently studied risk-mitigating features are user ratings and product reviews [3, 15, 16, 19, 20, 24, 30, 40, 82]. However, the extent to which consumers attend to online ratings as compared to other information cues, and how they influence perceptions of product quality and subsequent purchasing intentions, remains unclear.

The purpose of this study is therefore to assess (a) how individuals perceive the credibility of web-based commercial information in comparison to more traditional sources, (b) the extent to which people feel that ratings are an important factor for evaluating the credibility of ecommerce information, and (c) the effects of, and relations between, various levels of average product ratings and ratings volume on the critical ecommerce outcomes of perceived product quality and purchase intention. To evaluate these issues, we conducted a nationally representative survey of Internet users, and

conducted a separate experiment in which the average rating and volume of ratings were experimentally manipulated, and their effect on perceived product quality and purchase intention were assessed.

1 The role of risk and information seeking in consumer behavior

Early research on consumer behavior suggested that when choosing to purchase a product or procure a service, consumers are faced with uncertainty about the consequences of their decisions [5,86]. For example, consumers might feel unsure that they have selected the right product, brand, vendor, or mode of purchase [8,22,84], which can contribute to consumers' perceived risk.

Dramatic increases in the variety of information sources available in recent decades may in many ways have amplified consumer perceptions of risk and uncertainty, rather than alleviated them. Online consumers are concerned about information asymmetries between buyers and sellers, privacy concerns, system security shortcomings, immature legal protection mechanisms, low investment in infrastructure, the inability to sufficiently inspect goods prior to purchase, and fraud [58,68,80]. Given these concerns, consumers are increasingly required to assess the trustworthiness of vendors and the quality of products without many of the cues present in more traditional commercial transactions [1,59,62]. For example, online consumers cannot easily inspect the products they are about to purchase or meet with the vendor before the transaction, which may create a high degree of uncertainty about the outcome of the purchase. This level of ambiguity surrounding commercial transactions signals the elevated risk and uncertainty inherent in contemporary commercial transactions, and suggests the importance of locating and relying on commercial information that consumers judge to be credible.

As networked communication and information sharing technologies have proliferated, accurately determining credible sources and information has become increasingly complex. Networked digital media, for example, increase "disintermediation" [35] between information sources and consumers. For instance, customers often buy products directly from web-based businesses without the aid of sales clerks or agents who might help them navigate the complexities of the consumer landscape. Accordingly, several scholars have noted the enhanced need for effective evaluation of information sources [23,39,67,81], and the variety of contexts of information assessment. The credibility of information sources is no longer necessarily a function of sustained, face-to-face interaction, nor is it established solely through the endorsement of those whom one knows personally or directly. Nonetheless, source credibility remains a key component of persuasion in consumer choices.

Although commercial transactions and the information guiding them are increasingly migrating online, information seeking can take several forms, across both more traditional and online venues. Consumers rely on a variety of informal information sources to evaluate goods, manufacturers, and vendors, often soliciting advice in person from friends and family members [7,61,83,86]. They also rely on established information channels predating the Internet, such as television, books, magazines, newspapers, and radio. Although research shows that people perceive differences in

the credibility of various media (e.g., television, newspapers, and the Internet) across a variety of information types (including health, news, reference, and entertainment; [37]), no research to date has examined the ways in which consumers evaluate the credibility of commercial information online, relative to other common and well-established offline information sources. To address this need, and to better understand which medium consumers are most likely to use when seeking credible product information, the following research question is proposed:

RQ1: Relative to other sources of commercial information, how credible do users believe web-based commercial information to be?

2 Electronic word of mouth as a risk mitigation mechanism

An important method of gathering commercial information is through word-of-mouth, which is the informal transmission of knowledge about goods, stores, and brands from consumer to consumer. Word-of-mouth was first examined in a marketing context by [2] in a study of the diffusion of product information through housewives living in an apartment complex. He found that word-of-mouth was most influential to high-risk perceivers, and that negative word-of-mouth discouraged purchase, while positive word-of-mouth encouraged purchase. Since then, research has indicated that dissatisfied consumers are more likely to distribute information through informal, word-of-mouth channels [81]; that face-to-face word-of-mouth information transmission can be highly effective in building or changing a consumer's opinion of a product [44]; and that word-of-mouth channels are most often relied upon when consumers perceived high risk in a purchase decision or when there are few formal recommendation channels [42].

The emergence of digital technologies enabling greater information dissemination has created new forms of "electronic word-of-mouth" via peer-to-peer information sharing (for a review see [19]). Through a host of tools now commonly available on the web, including blogs, interactive product information websites, electronic bulletin boards and groups, and a wide variety of ratings and assessment systems, consumers can now readily share their ideas, experiences, and opinions with others from around the globe, immediately and at low cost. One outcome of this contemporary information environment is that it can serve to mitigate risk in commercial transactions by enabling consumers to rely on recommendations from other consumers [48]. Indeed, electronic word of mouth has been shown to be as important as direct personal experience [85], and customer referrals through digital word of mouth affect product sales, even more than traditional measures such as customer satisfaction [77].

2.1 The use of commercial product ratings to evaluate information

Commercial product ratings are a particular instance of electronic word-of-mouth whose use has skyrocketed in recent years [45,51]. Although ratings span a host of venues, and have been applied to everything from assessments of whether messages are spam to ratings of fellow raters, their predominant usage in ecommerce is to assess product quality. Vendors hope that if consumers leave positive feedback and if others

believe the ratings to be a credible indicator of product quality, they will influence individuals' product purchase decisions.

Yet, many argue that ratings on the whole are biased, and are therefore not a credible source of information about product quality [48], even though the influence of electronic word-of-mouth depends on its perceived credibility [17]. Indeed, there is evidence suggesting that ratings information may not be credible, since much of the feedback appears to be skewed or untruthful. For example, research suggests that when ratings are too positive, users do not find them to be credible [29]. Mackiewicz [63] examined the ratings of 640 online products and found that more than 48% of all products rated received 5 stars (i.e., the highest ranking), suggesting a positivity bias in ratings. Similarly, several researchers have noted that eBay user feedback is overwhelmingly positive and that net feedback ratings reported by eBay may encourage overly optimistic assessments of others [25, 58, 80]. Furthermore, [48] found that 53% of products show a bimodal ratings distribution, indicating that ratings are only very positive and/or very negative for most products. This suggests that the average rating of a product does not necessarily reflect its true quality, but rather the opinions of consumers who were either very pleased or very disappointed with the product. To ensure that ratings information can be trusted, [72] proposed a system that requires both parties in an ecommerce transaction to provide feedback in the form of ratings, with mechanisms for punishment in the case of a discrepancy. However, this system has not been widely adopted.

Nevertheless, research indicates that ratings are important in people's purchasing decisions [18], and such information gives people a framework for organizing commercial information [52]. For instance, users (particularly females) find negative reviews very helpful in evaluating products and services (Bae & Lee 2011), higher ratings or reviews are positively associated with product sales [15, 20, 24], and although consumers are somewhat ambivalent about whether to trust ratings and reviews, expressing concern that such information can be easily skewed, they paradoxically find them useful in evaluating product claims [65].

Taken together, research on ratings paints a conflicted picture of the degree to which people find ratings to be a credible cue about commercial information online. On the one hand, ratings may not be a particularly good indicator of the quality of commercial information, and users seem to be aware of this. Yet, users also rely on ratings in consequential ways, suggesting that they feel ratings provide reliable commercial information. To directly assess consumers' perceptions of the importance of ratings information in evaluating the credibility of commercial information online, we pose the following research question:

RQ2: Relative to other indicators, to what extent do users feel that ratings are an important factor for evaluating the credibility of ecommerce information?

2.2 Effects of ratings on perceived product quality and purchase intention

Past research has examined how factors such as price and brand recognition can mitigate risk and influence perceptions of product quality [28, 76, 79]. In online consumer environments characterized by high risk stemming from reduced information about

products and vendors, it is likely that perceived product quality is also influenced by features that can mitigate that risk. Under conditions where individuals' opinions are routinely collected, widely tabulated, and readily available—such as those existing with ratings data on the web today—risk can be functionally reduced through ratings' role in helping to reliably evaluate product quality. Nonetheless, although studies confirm that higher ratings or reviews are positively associated with sales [15, 20, 24], it is unclear whether higher ratings are similarly related to perceptions of product quality, although this would seem reasonable.

In addition, a growing body of research has explored the relationship between product quality and purchase intention in the context of ecommerce, and found that ratings (e.g., [15, 20, 27, 74, 89]), website quality [41], and the perceived credibility of electronic word-of-mouth messages [17] all positively impact purchase decisions. Moreover, the perceived valence and credibility of product recommendations have been shown to have a significant impact on purchase intention, across a variety of consumer goods [38]. Positive electronic word of mouth messages with higher source credibility predict higher purchase intention [88], and electronic word of mouth is a critical driver of purchase intention [50]. Finally, higher perceived credibility of online customer recommendations has been linked to greater purchase intention [56] and, among other factors, the trustworthiness of a website positively affects the perceived credibility of electronic word of mouth messages, which in turn amplifies purchasing decisions [17]. In light of these findings linking ratings to perceived product quality and purchase intention, we hypothesize that:

H1_{a–b}: Higher average product ratings will result in greater (a) perceptions of product quality, and (b) purchase intention.

In addition to the influence of product ratings there is ample evidence that the *volume* of ratings, as well as their valence, influences people's assessment of product quality and their purchase intention. For instance, [31] found that readily-available web-based information might lead to individual product adoption decisions that are dictated more by popularity than by quality. Furthermore, the intensity of electronic word of mouth has been shown to both predict opening weekend box office movie success better than traditional indicators [49] and to drive box office movie revenues, suggesting the influence of a strong "awareness effect" on the part of consumers [30].

Several theoretical perspectives support the general notion that people are heavily influenced in their attitudes and beliefs by the actions of others. *Informational social influence*, for instance, is the tendency to "accept information obtained from another as *evidence* about reality" ([26], p. 629; emphasis in original), and is a compelling form of persuasion through conformity. Demonstrating the effects of informational social influence online, people viewing movie ratings online tend to rate movies consistent with the ratings they have been shown [21], people's choices online are swayed by others' views in recommender systems [91], and musically-induced emotions even conform to others' emotional ratings [33]. In a similar vein, *information cascades* [32] and so-called *bandwagon effects* [9] have been shown to exert significant influence on people, by virtue of people's tendency to conform to others' actions and opinions, particularly in large numbers. In the context of commercial transactions, evidence

suggests that a high volume of user ratings is associated with greater purchase intention [57,60,74,90].

In theory, *average product ratings* and *ratings volume* are necessary, but insufficient, indicators of product quality. For example, one disgruntled consumer has a very large impact on the overall rating of a product when there are only four ratings but a very small impact when there are over 1,000. Thus, decoupling the number of ratings from the average rating could reflect a critical deficiency in people's ability to correctly interpret the meaning of online ratings. Yet, although examining the independent effect of average ratings on product quality and purchase intention makes sense (as in H1; because even in low numbers high average ratings indicate quality), the same is not true for ratings volume, which is fundamentally yoked to the average ratings value (e.g., a high volume of ratings can be an indicator of high *or* low quality, depending on whether the average rating is high or low). Therefore, ratings volume is best understood in the context of ratings valence. Accordingly, [34] found that high ratings volume whose valence (average rating) was perceived positively by consumers had a significant positive effect on product sales, while high ratings volume whose valence was perceived negatively by consumers had the opposite effect.

Interestingly, little research has focused on consumers' *understanding* of ratings information, though its *effects* are occasionally explored. Based on the underlying logic of informational social influence processes, information cascades, and bandwagon effects, we propose looking at the influence of ratings volume. However, as noted above, volume is most appropriately considered in conjunction with the valence of ratings information, with which it is fundamentally connected. Consequently, we propose the following hypothesis, which extends H1 by addressing the *interaction* between average ratings and their volume:

H2_{a–b}: The *combination* of higher average ratings and higher rating volume will result in higher (a) perceptions of product quality, and (b) purchase intention.

Product quality is also likely to be associated with higher purchase intention, since people are more likely to purchase products they assess as higher in quality. Indeed, perceived product quality has been found to be positively correlated with purchase intention in offline commercial transactions (e.g., [14,54,69–71,73]), suggesting they should be related online as well.

In addition, past research has shown that ratings of “quality goods” (i.e., those whose quality can for the most part be objectively assessed) moderate the relationship between product quality and purchase intention, such that the relationship is more pronounced when average ratings are lower [55]. Although this finding suggests the important interplay of ratings, quality, and purchase intention, it does not address the direct linear relations among these factors. Because we frame commercial product ratings theoretically as a critical factor in risk mitigation via mechanisms of consumer endorsement, we propose that product ratings act on perceived product quality, which in turn affects purchase intention. Thus, rather than suggesting that ratings act on the relationship between product quality and purchase intention, at either high or low average ratings, we propose that product quality acts as a mediator between ratings and purchase intention. Therefore, H3 is:

H3_{a–b}: (a) Perceptions of product quality will be positively related to purchase intention, and (b) perceptions of product quality mediate the relationship between average product ratings and purchase intention.

3 Method

A multi-method approach was used to evaluate the research questions and hypotheses in this study. A nationally representative survey of adults in the United States to address RQ1 and RQ2. This survey was designed to assess the perceived credibility of web-based ecommerce information generally and across various channels of commercial information. An experiment was conducted to address H1–H3. This experiment assessed the extent to which ratings, as a specific risk-reduction mechanism, are perceived to affect perceptions of product quality and purchase intention. Together, results from the survey and the experiment combine to paint a portrait of the perceived credibility of web-based ecommerce information among Internet users, and the degree to which ratings information affects key ecommerce outcome variables.

3.1 Survey: sample, procedure, and measures

Survey data were collected online by the professional research firm Knowledge Networks, which maintains a probability-based panel of participants that is representative of the entire U.S. population. The sample from this study was drawn from a combination of random digit dialing and address-based sampling methods, which allows Knowledge Networks to reach cell-phone only homes, do-not-call listed homes, and homes that use call-screening that normally would be missed by random digit dialing methods alone.

The survey included adults in the U.S. who use the Internet. Participants took the survey online from wherever they typically accessed the Internet, at their leisure, in order to maintain as naturalistic an environment as possible. In order to balance errors due to panel recruitment methods and panel attrition, and to adjust for the study's sample design and survey non-response, responses were weighted by (a) a post-stratification adjustment using demographic distributions from the most recent U.S. Census Bureau's Current Population Survey data, and (b) study-specific post-stratification weights. Survey results are thus generalizable to all adult Internet users in the United States.

To assess RQ1, which asked about the credibility of the Internet as a source of commercial information relative to other options, 3,991 respondents were asked to indicate which of several information sources (specifically: the Internet, television, books, magazines, newspapers, radio, or someone they talk to in person) they would believe *most* for information about something they might want to buy. To evaluate RQ2, which probed the relative importance of ratings information in helping users establish the credibility of commercial information online, 758 respondents were asked to imagine they were buying something on the Internet and then to assess the importance of various factors (e.g., "the information is very complete," "others recommend the website or information source," and "there are high ratings, positive comments, or

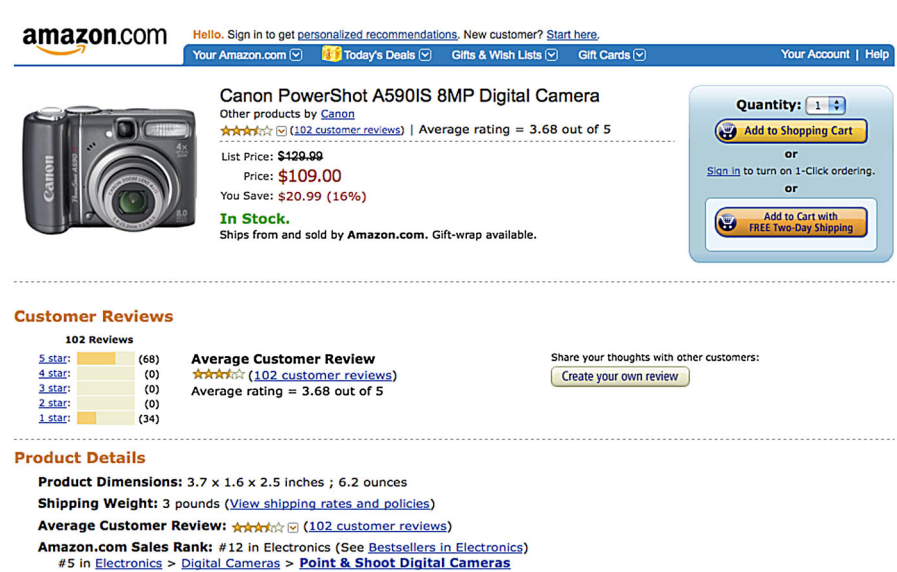
good reviews”) for determining the credibility of the information they found, on a 5-point scale ranging from “not at all” to “very” important. Respondents also had the option of indicating they “do not know what this is or what this means,” if they were not familiar with the factor in question.

3.2 Experiment: sample, procedure, and measures

2,139 participants, recruited by Knowledge Networks in the same manner as survey respondents, participated in an online experiment, which directly assessed the effects of user-generated ratings of commercial information online on consumers’ product quality perceptions and purchase intentions. Each subject was presented with one randomly selected screenshot from a set of product pages on Amazon.com, followed by questions about the page they had viewed. Product pages were modified to maintain comparability across items and to meet technical requirements for inclusion in the survey. In order to enhance stimulus generalizability, and to improve on prior research that has examined only a single product at a time (the findings of which may therefore be swayed by the specific product selected), three different products were shown (a digital camera, an electric toothbrush, and rolling luggage). Following past work, we opted to use “quality” products, whose value is primarily a function of objective factors like their attributes, rather than more subjectively assessed “preference” products. Because people’s interest in each product might logically vary, interest in the product was statistically controlled for in all subsequent analyses (with responses to the question “How interested are you in buying this type of product?”).

In addition to the product, the two factors represented in the study’s hypotheses—the *number* of ratings provided about the product and the *average* rating of the product—were varied systematically by altering information on the web page screenshots used in the study. Specifically, the pages showed (a) the number of user ratings as 4, 16, 102, or 1002, and (b) average “star” ratings (on a 1–5 scale, where 5 is the best rating) of 1.6, 2.23, 3.0, 3.68, 4.4, 4.84, or 5.0. These values were selected based on their representativeness of a wide range of possible values, and the breadth of values typically found in user rating data. In this manner, 84 different page image stimuli were presented in the experiment, representing each possible combination of number of ratings, average ratings, and product. All other content was held constant across all pages. Figure 1 shows an example page with a digital camera presented as receiving an average rating of 3.68, across 102 total ratings.

The experiment thus took the form of a 4 (*number* of ratings: 4, 16, 102, or 1002) by 7 (*average* rating: 1.6, 2.23, 3.0, 3.68, 4.4, 4.84, or 5.0) factorial design, for each of the three product types (digital camera, electric toothbrush, or rolling luggage). Subjects were randomly assigned to one condition. The dependent variable *product quality* was assessed by the question “On a scale of 0 to 10, how would you rate the quality of this product?” with response categories ranging from 0 = “The quality is *much worse* than average” to 10 = “The quality is *much better* than average,” with the scale midpoint of 5 defined as “The quality is *about average*” ($\bar{X} = 6.79$, $SD = 2.31$ across all three products). The dependent variable *purchase intention* was assessed by the question “If you needed a digital camera [rolling carry-on luggage / an electric



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Canon PowerShot A590IS 8MP Digital Camera
 Other products by [Canon](#)
 ★★★★★ (102 customer reviews) | Average rating = 3.68 out of 5

List Price: ~~\$429.99~~
 Price: **\$109.00**
 You Save: \$20.99 (16%)

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 Ships from and sold by Amazon.com. Gift-wrap available.

Quantity: 1
 Add to Shopping Cart
 or
 Sign in to turn on 1-Click ordering.
 or
 Add to Cart with FREE Two-Day Shipping

Customer Reviews
 102 Reviews

5 star	(68)
4 star	(0)
3 star	(0)
2 star	(0)
1 star	(34)

Average Customer Review
 ★★★★★ (102 customer reviews)
 Average rating = 3.68 out of 5

Share your thoughts with other customers:
 Create your own review

Product Details
Product Dimensions: 3.7 x 1.6 x 2.5 inches ; 6.2 ounces
Shipping Weight: 3 pounds ([View shipping rates and policies](#))
Average Customer Review: ★★★★★ (102 customer reviews)
Amazon.com Sales Rank: #12 in Electronics (See [Bestsellers in Electronics](#))
 #5 in [Electronics](#) > [Digital Cameras](#) > [Point & Shoot Digital Cameras](#)

Fig. 1 Example product web page

toothbrush], how likely would you be to purchase this particular one?" with response categories ranging from 1 = "Not at all likely to buy this one" to 5 = "Very likely to buy this one" ($\bar{X} = 2.17$, $SD = 1.17$ across all three products).

4 Results

4.1 Survey results

RQ1 asked about the degree to which people find commercial information online to be credible compared to information obtained via other means. Results showed that, when comparing the Internet to other information channels, people indicated higher relative trust in the Internet for commercial information than all other sources ($\chi^2 = 5456.42$, $df = 6$, $p < .001$). Just under half (49%) of the respondents indicated that they believe web-based information the most for information about something they might want to buy, compared to 30% who indicated they would believe someone they talk to in person most, 8% who indicated newspapers, 6% who indicated magazines, 5% who said television, and 1% or less who indicated books or radio information about commercial products was the most believable.

RQ2 probed the relative importance of ratings information in helping users establish the credibility of commercial information online. Repeated measures ANOVA tests indicated significant differences among the importance of various factors for determining information credibility (Wilks' lambda = .29, $F(22, 629) = 69.91$, $p < .001$, partial $\eta^2 = .71$). Pairwise comparisons demonstrated specific differences among the factors, as detailed in Table 1. Results show that among the various factors people could choose from, they indicated that others recommending a website or informa-

Table 1 Means and standard deviations for cues used to determine credibility of commercial information online

	<i>M</i>	<i>SD</i>
The website seems safe and secure	4.25	.86
The information on the website is up-to-date	4.06	.84
The information is very complete	3.95	.86
There are high ratings, positive comments, or good reviews	3.75 ^a	1.00
The information seems reasonable to you	3.74 ^a	.82
The website is easy to use	3.72 ^{ab}	1.05
The website does not try to convince you to do something or buy something	3.65 ^{bc}	1.01
The information is well written and you see no typing mistakes	3.64 ^{bde}	1.13
You get more than just one person's opinion	3.60 ^{cefg}	1.00
You have heard good things about the information source or website creator	3.54 ^{dghij}	1.01
Experts believe the information (like your doctor, teacher, etc.)	3.53 ^{gikl}	.99
The information is from an expert on the topic	3.49 ^{jlm}	1.01
Others recommend the website or information source	3.47 ^{hkm}	.99
There is information about the source's or author's education or training	3.36 ⁿ	1.09
The information on the website is similar to information on other websites	3.32 ⁿ	1.06
You ask an expert (like your doctor, teacher, etc.) who you know in person	3.32 ^{pq}	1.19
You have heard of the source or information creator before	3.30 ^{no}	1.05
People you know, such as friends and family, believe the website or information source	3.29 ^{op}	1.10
The information you find is similar to what you already think	3.23 ^{opq}	1.04
A lot of other people use the website	3.12	1.19
The website looks good	3.03 ^f	1.13
The website address has a certain ending (like .gov or .edu or .com)	2.94 ^f	1.16
You just like the website	2.64	1.11

Note Table means with common superscripts do *not* differ significantly from one another

tion source was somewhere between “somewhat important” to “important” in their decision ($\bar{X} = 3.47$, $SD = .99$; on a 5-point scale ranging from “not at all” to “very” important), while the existence of “high ratings, positive comments, or good reviews” about the product was even more important in determining credibility ($\bar{X} = 3.75$, $SD = 1.00$). Relative to several other credibility cues, ratings were ranked highly, below only website security and the currency and completeness of the information given on commercial websites in helping users establish information credibility. Ratings were judged to be significantly more important than such credibility cues as source reputation and expertise; familiarity with and popularity of website; and webpage design, accuracy, and a website's domain name extender. Thus, user-generated information is a critical cue to people when evaluating the credibility of commercial information online.

4.2 Experiment results

In order to assess the degree to which people attend to the relevant and appropriate cues (i.e., the number and nature of ratings) when determining product quality and purchase intention as posed in H1 and H2, three separate 4 (*number of ratings*) by 7 (*average rating*) MANCOVA analyses were performed (one for each type of product), with interest in buying the product as the covariate, and the perceived quality of the product and purchase intention as the dependent measures.

Analyses indicated no significant multivariate effects for the *volume* of ratings, in the case of any of the three product types (digital camera [Wilks' lambda = .99, $F(6, 1344) = 1.11$, $p = .35$], rolling luggage [Wilks' lambda = .99, $F(6, 1298) = 1.49$, $p = .18$], and electric toothbrush [Wilks' lambda = .99, $F(6, 1424) = 1.33$, $p = .24$]) but showed a significant multivariate effect for *average star rating* for each of the three product types: digital camera (Wilks' lambda = .58, $F(12, 1344) = 34.76$, $p < .001$, partial $\eta^2 = .24$), rolling luggage (Wilks' lambda = .62, $F(12, 1298) = 29.42$, $p < .001$, partial $\eta^2 = .21$), and electric toothbrush (Wilks' lambda = .67, $F(12, 1424) = 26.36$, $p < .001$, partial $\eta^2 = .18$). More specifically, there was a main effect for average star rating on *perceived product quality*, for all 3 product types (camera: [$F(6, 673) = 78.19$, $p < .001$, partial $\eta^2 = .41$]; luggage: [$F(6, 679) = 64.77$, $p < .001$, partial $\eta^2 = .37$]; toothbrush: [$F(6, 742) = 55.79$, $p < .001$, partial $\eta^2 = .32$]), with high variance explained in each case.

As the average ratings increased, generally so too did subjects' assessment of product quality, with ratings ranging from a mean value of approximately 4 when the average star rating was 1.6, to approximately 8 when the star rating was 5.0. Pairwise comparisons indicated that nearly all mean values of product quality across the seven individual star ratings levels were statistically different from one another at the $p < .001$ level. The exceptions to this occurred only at the high end of the star ratings scale, where ratings of 4.4, 4.84, and 5.0 did not differ on perceived product quality from one another for both cameras and luggage. For the toothbrush the same general pattern adhered, although ratings of 3.68 did not differ from 4.84 as well. Overall, this indicates that average star ratings are highly influential on perceived product quality, in support of Hypothesis 1a. In addition, the data suggest a robust "ceiling effect," whereby ratings have diminished positive effects on perceived product quality as they approach the top of the ratings scale. Differences among mean values on perceived product quality (as well as on purchase intention, as discussed next) are contained in Table 2, and results for Hypothesis 1a are also illustrated in Fig. 2.

There was also a main effect for average star rating on *purchase intention*, again for all 3 product types (camera: [$F(6, 673) = 18.32$, $p < .001$, partial $\eta^2 = .14$]; luggage: [$F(6, 679) = 6.75$, $p < .001$, partial $\eta^2 = .06$]; toothbrush: [$F(6, 742) = 16.62$, $p < .001$, partial $\eta^2 = .12$]). As a general rule, as the average star ratings increased, so too did subjects' purchase intention, from a mean value of approximately 1.5 when the average star rating was 1.6, to between 2 and 3 when the star rating was 5.0.

As shown in Table 2, pairwise comparisons indicated that the vast majority of mean values of purchase intention were statistically different from one another, at least the $p < .05$ level, although star ratings that abutted or were near one another were less likely to differ significantly, throughout the range of the scale. For the most part, the

Table 2 Mean values on perceived product quality and purchase intention, across product types, by star ratings levels

	Product quality			Purchase intention		
	Camera	Toothbrush	Luggage	Camera	Toothbrush	Luggage
1.6 stars	4.11	4.54	4.14	1.51	1.80 ^a	1.46 ^{a,d}
2.32 stars	5.54	5.51	5.13	1.83 ^a	2.07 ^{a,b}	1.56 ^{a,b}
3.0 stars	6.59	6.38	6.10	2.09 ^{a,b}	2.22 ^b	1.65 ^{a,c}
3.68 stars	7.35	7.30 ^a	6.68	2.34 ^{b,c}	2.43 ^{c,d}	1.68 ^{b,c,d}
4.4 stars	8.14 ^a	7.91 ^{b,c}	7.63 ^a	2.42 ^c	2.67 ^{c,e}	2.11 ^{e,f}
4.84 stars	8.40 ^a	7.74 ^{a,b}	8.06 ^a	2.61 ^{c,d}	2.66 ^{d,e}	2.13 ^{e,g}
5.0 stars	8.32 ^a	8.51 ^c	7.80 ^a	2.79 ^d	3.20	2.06 ^{f,g}

Note Mean values within columns that share superscripts are *not* significantly different from one another

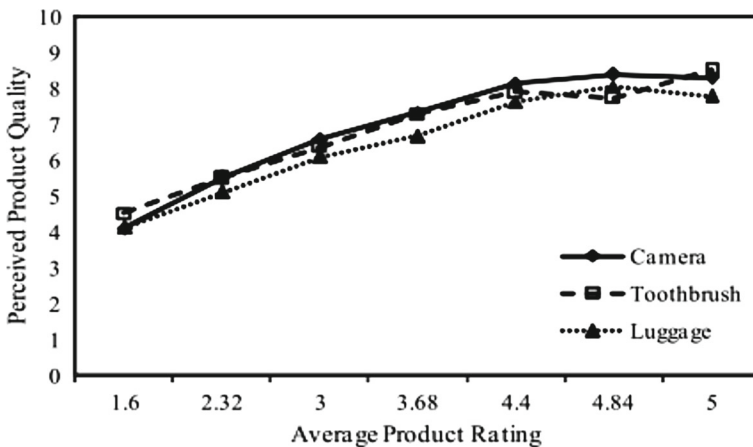


Fig. 2 Perceived product quality by average product rating, across product types

pattern of findings did not vary by product, although rolling luggage purchase intention showed less variation across the scale, and slightly more volatility within it. Overall, findings indicate that average star ratings are highly influential on purchase intention, in support of Hypothesis 1b. Results for purchase intention are illustrated in Fig. 3.

Contrary to Hypothesis 2, no interaction effects between average ratings and ratings volume were found on product quality or purchase intention, across any of the three product types (digital camera [Wilks' lambda = .94, $F(36, 1344) = 1.14, p = .27$], rolling luggage [Wilks' lambda = .96, $F(36, 1298) = .79, p = .81$], and electric toothbrush [Wilks' lambda = .93, $F(36, 1424) = 1.39, p = .06$]), indicating that the average rating and the number of ratings do not operate in combination for people, in contrast to the optimal situation in which both factors are considered in conjunction.

Finally, Hypothesis 3_a posed that perceptions of product quality and purchase intention are positively correlated. The Pearson product moment correlation between these variables was $r(2,2133) = .32, p < .001$, and a regression analysis of product quality

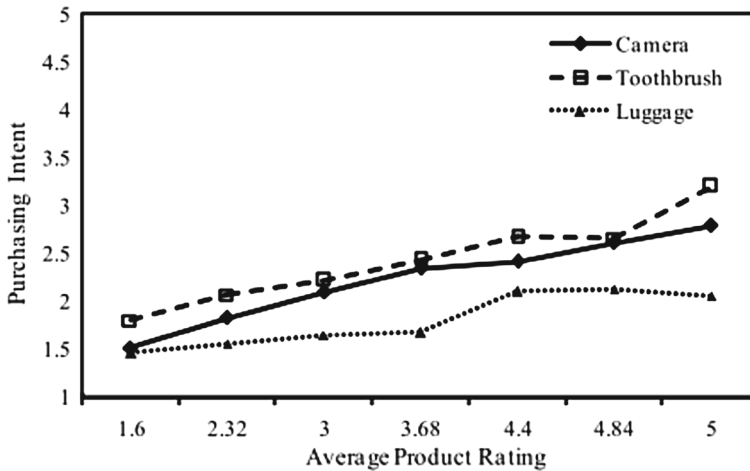


Fig. 3 Purchase intention by average product rating, across product types

and review rating on purchase intention revealed a model where product quality (but not review rating) predicts purchase intention ($F[1, 2125] = 950.26$, $R^2 = .31$, $\beta = .56$, $p < .001$), both of which support H3_a. H3_b, which proposed that product quality mediates the relationship between product ratings and purchase intention, was tested by sequential regression analyses following [4]. Results supported a full mediation model, demonstrating that product quality mediates the effect of product rating on purchase intention (Sobel test statistic = 22.23, $p < .01$).

5 Discussion

Despite the risks associated with online commercial transactions, results of this study indicate that people not only tend to believe the commercial information they find on the Internet, but they also privilege that information above alternative, and often more traditional, information sources. People also report that ratings and recommendations from others are important to them in their credibility assessments, although experimental evidence from our study suggests that such information is often used sub-optimally. Moreover, findings indicate that product ratings are used as a barometer of product quality, and that higher perceived product quality is associated with greater purchasing intentions. This, by extension, confirms that ratings are seen as a highly credible form of product information to ecommerce consumers since ratings information should co-vary with perceived product quality and purchase intention only if it is seen as credible. Overall, it appears that user-generated product ratings serve to mitigate the risk inherent in the reduced-cues environment in which ecommerce transactions take place, although they are not always utilized in the most effective manner.

More specifically, results of the first research question demonstrated that people find web-based commercial information to be credible, in comparison to information

originating from other channels. In fact, about half of survey respondents indicated that they would trust the Internet the most for information about products they might want to buy. Nonetheless, it is important to distinguish between information seeking and the actual purchasing of products online. Prior research has demonstrated that individuals are concerned with the safety and security of their online transactions [56,68,80]. It is therefore plausible that although individuals find the Internet to be a more convenient and complete resource for product information than other media, such as newspapers and magazines, they may still feel uncomfortable buying products online. Although other findings from this study clearly link online ratings data to purchase intention (both directly and through product quality), future research should examine the distinction between people's attitudes toward ecommerce information and actually purchasing products online, in order to clarify the connection between information seeking and online purchasing behaviors.

Results for the second research question showed that information from other consumers—including user-generated product ratings—is important in helping people determine the credibility of commercial information online. The presence of product quality cues (star ratings, comments, reviews, etc.) ranked behind only website security, information currency, and information completeness in people's assessment of a commercial website's credibility, and ahead of credibility cues like expert endorsement and recommendations from friends and family. This finding suggests that even in the face of problems associated with user-generated commercial cues people value ratings information provided by fellow consumers. From the perspective of online vendors, this implies that they might be able to boost their website's credibility by providing opportunities for users to rate and review products. For online consumers, this suggests that people should pay careful attention to the *nature* of the ratings information provided in order to arrive at valid assessments of product quality and to usefully inform their purchase intention, a phenomenon we discuss next.

Confirming Hypothesis 1, the experiment showed that higher average user-generated ratings of products increased both perceived product quality and purchase intentions. This was true across all three products used in the study, and provides insight into the positive relationship between ratings, perceptions of product quality, and purchase intention in light of past research, which has shown mixed results [55]. In support of Hypothesis 3, product quality and purchase intentions were positively related, consistent with research offline [14,54,69,73], and a specific mediational model was confirmed, whereby user ratings affect purchasing intentions by influencing perceptions of product quality. Together, these findings demonstrate the importance of user ratings, which act on perceived product quality, which in turn influences purchase intention. Theoretically, this highlights the social influence and cognitive power of user-generated information online, and the potentially critical role of information and source credibility in this equation. From a practical standpoint, because high average ratings are associated with consumers' purchase intention, this finding suggests that the presence of a ratings system on a website can be advantageous for consumers (who benefit from access to user-generated information when making purchasing decisions). The benefit to sellers goes beyond the boost to credibility mentioned above, in that ratings systems can facilitate the sale of more products and, as a result of successful transactions, increase visitor traffic.

Interestingly, findings from this study ran contrary to Hypothesis 2: While people carefully attend to average product ratings when evaluating product quality and making purchasing decisions, they do not focus on the number of ratings provided. In fact, even when the number of ratings was hugely disparate (i.e., 4 ratings compared to 1,002) for the same average rating, there was no difference in perceived product quality and purchase intention. This is clearly sub-optimal for consumers, as users appear to be neglecting a great deal of relevant information useful in making informed ecommerce decisions.

This finding is inconsistent with prior research by [66] that employed focus groups to understand consumers' perceptions of online reviews. In that study, consumers reported that the number of reviews was an important factor in their product evaluations. To some extent, the difference in methodology may account for the disparity in findings such that focus groups may have elicited users' more "ideal" strategies for evaluating information, whereas the experiment better captured users' actual strategies. Indeed, the current results are consistent with another finding from the same study showing that users routinely employ cognitive heuristics, or mental shortcuts, in judging the credibility of information online as a way to cope with the overwhelming task of methodically evaluating all of the informational cues available on a website or set of websites returned from a given search query. This perspective is consistent with [87], suggesting that these results are not anomalous.

Another potential explanation for the lack of support for H2 comes from models of cognitive processing. Consistent with dual process models of credibility assessment, based on the elaboration likelihood model [75] and the heuristic-systematic model of information processing [11–13], under conditions of high motivation, online information seekers will likely pay more attention to information quality cues and perform more rigorous information evaluation than when motivation is lower. Stated in dual processing terms, Internet users will be more likely to use "central" or "systematic" processing to establish the credibility of information they encounter online when motivated and able to do so and will likely rely on more "peripheral" or "heuristic" credibility cues and processing strategies when motivation or ability to judge the quality and trustworthiness of online sources or information is low. In this manner, although both average star ratings and the number of ratings can be viewed as heuristic cues that enable consumers to efficiently process information indicative of product quality, it may be the case that the star ratings are a more easily accessible or readily available heuristic cue, and that the number of ratings requires more cognitive effort or care, resulting in their relative neglect. Additional research, however, is required to test this hypothesis directly.

Data from this study also show that once the average rating for a product reached a certain level (4.4 stars in this case), a ceiling effect was evident, such that ratings above the threshold did not translate to greater perceptions of product quality. This again suggests that information consumers are neglecting information that could help them to better discern product quality. The link between product ratings and purchase intention is therefore a mixed blessing for online retailers. If customers neglect to discount a high rating derived from only a small sample of other consumers, they may errantly purchase products that will leave them dissatisfied and then feel deceived by the seller. Given the apparent risk to seller credibility posed by the misinterpretation

of ratings, it is important for online stores to encourage consumers to attend to the number of ratings in addition to the average rating.

Sellers might increase consumers' attentiveness to the quantity of ratings in any number of ways. For instance, websites could include features designed to make the gaps between an average rating and the number of ratings more salient, for example by increasing the size of the average rating on the web page based on the number of ratings from which it is derived, such that ratings from a larger pool of reviews appear more prominent, thereby drawing consumers' attention to a gap if one exists. Similarly, websites could institute a credibility system, as suggested by [65], where products that have not yet received a critical mass of reviews would be flagged, in order to warn consumers that the credibility of information about the product may be suspect, similar to Wikipedia's flagging of short entries (i.e., "stubs") and entries that lack adequate citations. Such measures would help prevent consumers from placing too much faith in ratings derived from a small number of raters, and could in turn bolster the vendor's credibility by reducing poor choices on the part of the consumer.

6 Conclusion

Results from a nationally representative sample of U.S. Internet users show that online consumers find ecommerce information to be highly credible, and rely on it regularly when assessing product quality and making purchasing decisions, particularly in comparison to other information channels. User-generated ratings information in particular appears to be highly valued by online consumers. Indeed, this relatively new form of "electronic word-of-mouth" via peer-to-peer information sharing appears to serve as an effective means of mitigating the perceived risks associated with ecommerce transactions. However, results also demonstrate that people may not always use this information optimally, as evidenced by their reliance on average user ratings to the exclusion of the number of ratings, which should ideally be considered in conjunction with one another.

Overall, results of this study corroborate prior research on ecommerce, but also extend our understanding of these processes in meaningful ways, by (a) demonstrating that consumers rely heavily on web-based information as compared to other channels, (b) showing that ratings information is relied upon heavily to evaluate the credibility of online commercial information, relative to other strategies, (c) documenting the association between perceived product quality and purchase intention in online commerce, and clarifying the meditational role of product quality in the relationship between user ratings and purchase intention, and (d) isolating the importance of average ratings and the number of ratings in this process. Future research can fruitfully expand on these contributions by probing deeper into the ways in which commercial decision-making may be influenced by aspects of heuristic processing. As commerce progressively migrates online, further understanding of these phenomena is increasingly warranted, and critical.

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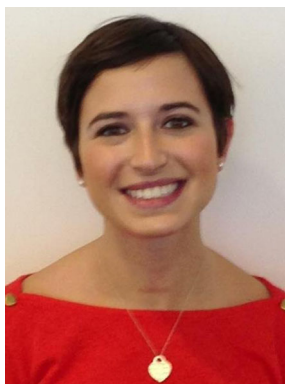
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