Show Me The Goods:
The Warranting Effect of User-Generated Photographs in Online Auctions

Benjamin K. Johnson*

Mao H. Vang

Brandon Van Der Heide

School of Communication
The Ohio State University
3016 Derby Hall
154 N Oval Mall
Columbus, OH 43210 USA

*Corresponding Author (b.k.johnson@vu.nl)

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Abstract

Consumers using online auction websites face the challenge of appraising products at a distance. Sellers and buyers in online auctions navigate this challenge by displaying and evaluating various cues, a critical one being use of photographs. Warranting theory predicts that cues less subject to control and manipulation by the presenter will be more influential in impression formation. Therefore, user-generated photographs which display the actual item should be more effective in generating successful auctions, more bidders, more bids, and higher prices, compared to stock photographs. A field experiment tested this prediction by systematically manipulating photographs for eBay auctions. User-generated photographs were found to have a positive effect on likelihood of selling and the number of auction bidders. Findings indicate that attracting more bidders is a possible mechanism for higher sale prices and also show a moderating role of bidder experience.

Keywords: warranting, signaling, photographs, e-commerce, online auction, field experiment
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With nearly 40% of home-based businesses using online marketplaces such as eBay instead of a website of their own (IDC, 212), online auction websites host an extensive inventory with wide duplication and variation. For example, an eBay search (www.ebay.com) for “golf balls” can generate over 80,000 active listings. Interested consumers must therefore find ways to sift through the available inventory, assessing the credibility of sellers and the authenticity and quality of items for purchase.

Previous research has investigated parameters involved in making various online evaluations. Not only have researchers documented auction features that influence bidder behavior (Kauffman & Wood, 2006; Song & Baker, 2007) and individual differences in purchasing behavior (LaRose & Eastin, 2002), but theory about computer-mediated impression formation can be brought to bear on the question of what facilitates success in online auctions. Specifically, warranting theory (Walther & Parks, 2002) suggests an inverse relationship between how much control the sender of a computer-mediated message is perceived to have over a cue and how much validity a receiver will assign to a message. For example, other-generated statements about an individual have more influence on impressions than the individual’s own statements (Walther, Van Der Heide, Hamel, & Shulman, 2009).

An earlier study, employing a content analysis of eBay auctions, found that user-generated photographs of products demonstrated more warranting value, thus yielding more bids and higher prices than stock photographs (Van Der Heide, Johnson, & Vang, 2013). The present study seeks to verify those findings through use of a field experiment, allowing for a more
controlled test of the user-generated photograph hypothesis by systematically varying photographs while holding other cues constant.

After reviewing relevant literature, results are presented for a field experiment that tested the effects of a stock photograph versus a user-generated photograph on an auction’s likelihood of selling, number of bids, number of bidders, and sale price.

**Seller Factors in Online Auctions**

In online auction systems, seller-controlled factors often influence consumer behaviors. Buyers must compare sellers and their goods, making decisions about whether and how much to bid. Seller factors can include starting price set by the seller (Kamins, Dreze, & Folkes, 2004; Kauffman & Wood, 2006), auction duration (Song & Baker, 2007), and presence of a picture (Kauffman & Wood, 2006). For example, a high starting price tends to increase the final selling price (Kamins et al., 2004; Song & Baker, 2007), while also decreasing the likelihood of any bids at all (Gilkeson & Reynolds, 2003). Pictures may be less critical when items are authenticated, such as collectible coins accompanied by professional certifications of quality (Hou, Kuzma, & Kuzma, 2009), yet photographs are generally associated with higher selling prices (Song & Baker, 2007).

Photographic content also matters; researchers demonstrated buyer bias on Craigslist by varying the race of a person’s hand visible in an advertisement for an mp3 player (Doleac & Stein, 2010). Similarly, Bente, Baptist, and Leuschner (2012) manipulated seller photographs in an e-commerce setting to convey low or high trustworthiness. Participants made more purchases in a lab-based trust game from sellers with a profile photograph rated more trustworthy, compared to sellers with untrustworthy or no photographs. This effect of profile image was independent of a second manipulation of seller reputation (Bente et al., 2012). However, the
findings do not directly address the influence of product photographs, or differences in warranting value between photograph types.

Other factors possibly influencing a person’s willingness to bid in an online auction include the number of other potential buyers (Kaufman & Wood, 2006; Song & Baker, 2007) and the seller’s reputational score (Houser & Wooders, 2006). Individuals with a higher reputation score see a higher likelihood of sale than sellers with lower scores (Resnick, Zeckhauser, Swanson, & Lockwood, 2006). These cues generally carry high warrant, as they are machine-generated or generated by third parties and therefore typically immune to seller manipulation (Van Der Heide et al., 2013).

**Signaling Theory**

Many of these online auction factors take the form of cues, or signals, about sellers and goods that are intentionally or unintentionally displayed to potential bidders (Li, Srinivasan, & Sun, 2009). Not only does e-commerce reduce the consumer’s ability to evaluate the quality and condition of a product, the prevalence of individuals and smaller businesses in the online auction marketplace also introduces uncertainty regarding integrity and service. Thus, buyers in online auctions are especially reliant on information available to them in the form of signals about sellers and products and should seek out uncertainty-reducing information during initial interactions (Berger & Calabrese, 1975; Gibbs, Ellison, & Lai, 2011).

Signaling theory (Spence, 1973) distinguishes between two kinds of attributes: *conventional signals*, which are agreed-upon symbols displayed to convey the presence of an attribute, and *assessment signals*, which are latent indicators of the attribute’s actual presence (Donath, 2007). As purely symbolic gestures, conventional signals are easier to falsify, allowing deceptive signaling. For example, in an online auction, a seller of a collectible coin could claim it
meets criteria for a standard quality grade (e.g., “About Uncirculated”). The buyer has no means for verification, and the listed grade may be incorrect or misleading.

In contrast, an assessment signal is contingent on possession of the trait it indicates. So, for the collectible coin example, evidence of a professional’s certified rating as “About Uncirculated” is a strong signal, because it is that professional rating that dictates the official condition of the coin for the collectible market. Likewise, a close-up, high-resolution photograph of the coin revealing its specific flaws also functions as an assessment signal, because it betrays those very characteristics a rating is based upon.

Some assessment signals go so far as to actually deplete the characteristic they refer to. These are known as handicap markers. In the natural world, the expenditure of resources involved in otherwise non-functional displays such as a peacock’s feathers indicates the animal has an excess of resources and is able to devote resources to superfluous display (Zahavi, 1975). Biting a gold coin to demonstrate malleability is a roughly analogous example of the kind of litmus test that depletes yet provides strong evidence that a characteristic is present.

For the presenter, whether a potential mate, job candidate, or seller in a marketplace, decisions about using signals are made via cost-benefit analysis. For the recipient, assessment signals may be preferred when available, especially to the extent that presenter deception is a concern. Signals inherently demonstrating a characteristic should have more influence, a point addressed more fully in the field of computer-mediated communication by warranting theory.

**Warranting Theory**

The distinction between signals and their verisimilitude is taken a step further by warranting theory (Walther & Parks, 2002). In computer-mediated settings, signals perceived by observers to be beyond presenter control carry more weight in impression formation. Because
these cues are seen as less subject to manipulation, they have more expected veracity. Even conventional signals may carry warrant, to the extent that they are immune from impression management.

Tests of warranting theory have demonstrated that interpersonal cues generated by third parties (Walther et al., 2009) or technological systems (Tong, Van Der Heide, Langwell, & Walther, 2008; Utz, 2010) were more influential in impression formation. For example, on social networking sites, friends’ statements were more influential than individuals’ statements about their extroversion or attractiveness (Walther et al., 2009). Warranting theory can also account for a visual primacy effect in computer-mediated impression formation. Photographs implying introversion or extraversion show greater effects on person perception than textual cues (Van Der Heide, D’Angelo, & Schumaker, 2012). In the social networking site context, crafting deceptive self-presentation is presumably more challenging through photography than through textual statements. This should hold true in e-commerce as well.

Not only can online photographs convey more warrant, the type of photographs and how closely they correspond to—or reveal information about—offline reality matters. In an application of warranting theory to online auctions, a content analysis (Van Der Heide et al., 2013) demonstrated that user-generated photographs, showing the actual product to potential bidders, fostered higher prices and more bids among various products. User-generated photographs, ostensibly of the actual item for sale, should provide stronger warrant for the implicit claim that a product is as described. A stock photograph for most products is only a Google search away, and warranting theory (Walther & Parks, 2002) suggests that consumers will judge it more challenging to falsify an actual product photograph than an easily obtained stock image. Many user-generated auction photographs are unattractive, with poor lighting and
unappealing backgrounds. Although these attributes could conceivably harm seller credibility, signaling theory suggests that they may actually function as handicap markers, and more generally contribute to a perception of authenticity and honesty.

The present study employs a highly controlled field experiment to test predictions that user-generated photographs will be more effective, as they more clearly warrant the claim that a product exists as described. Moreover, we expect this to increase consumer attention to and confidence in online auction products. The use of a field experiment avoids possible confounds associated with a content analysis of completed auctions, while allowing confirmation of findings about the warrant of different photographs types. To that end, we propose the following hypotheses to examine buyer interest and confidence in online auctions.

H1: Auctions with user-generated photographs will have a greater likelihood of selling than auctions with stock photographs.

H2: Auctions with user-generated photographs will have more bids than auctions with stock photographs.

H3: Auctions with user-generated photographs will have more unique bidders than auctions with stock photographs.

H4: Auctions with user-generated photographs will end with a higher final sale price than auctions with stock photographs.

Warranting theory predicts that harder-to-falsify cues such as user-generated photos will positively affect judgments. In addition, uncertainty reduction theory (Berger & Calabrese, 1975) predicts that interactants will strive to reduce uncertainty about each other via information-seeking behavior. Within the e-commerce context, warranting effects could occur through several mechanisms. Two that are measurable in the present experiment are the extent to which
this cue captures the attention of potential bidders, and the extent to which it decreases bidder uncertainty in the auction. The number of individuals who bid and the number of bids made may capture these two mechanisms, as they respectively indicate consumer interest and confidence. Therefore, we might expect these variables to mediate the relationship between a photograph and an auction’s sale price.

RQ1: Will bidding activity (the number of bidders or the numbers of bids) mediate the relationship between photograph type and final sale price?

Finally, high-warrant cues may have differential impacts on different types of bidders. For example, bidders with greater online auction experience may respond differently to user-generated photographs than those with little experience. Indeed, a study of online review community Yelp.com found that users were more sensitive to system-generated cues about reviewer credibility (e.g., number of reviews written), while those unfamiliar with the site relied on more generic heuristics to judge credibility (Lim & Van Der Heide, 2013). On eBay, one indicator of familiarity is the reputation bidders themselves have amassed; this familiarity may influence whether purchase decisions are affected by photograph type.

RQ2: Will the reputation scores of bidders moderate the effect of photograph type on the number of bids, number of bidders, or final sale price?

**Method**

A field experiment was conducted in which items were placed for sale on eBay, manipulating only the image used to represent the product—either a user-generated photograph or a stock image of the product. Field experiments have previously been used to test the effects of e-commerce cues on behavior while maximizing validity (Doleac & Stein, 2010; Resnick et al., 2006). A product, 3-pack golf ball sleeves, was chosen for a high-volume auction category
where both types of photographs were commonly used. The researchers posted auction listings, attracting bidders through eBay’s listing and search functions. Data, including sale price and bidding activity, were gathered from 38 auctions over a 4-month period.

**Procedure**

A new, unique eBay account was used to post 3-day auctions for Callaway Warbird 2.0 golf balls (brand new 3-packs). Auctions were systematically assigned to either user-generated or stock photograph conditions. Four auctions were posted a week, Monday-Thursday, closing on Thursday-Sunday. All auctions started and ended at 10 p.m. Eastern Time, a relatively high-volume time of day for eBay auctions. The condition assignment was alternated weekly, so that two auctions from separate conditions were never active simultaneously. Instead, four auctions were posted for the stock photograph condition one week, followed by four auctions for the user-generated photograph condition the next week. Due to monthly restrictions on new seller accounts, no Sunday auctions were conducted during weeks 3 or 4. Auctions ran from July to October 2012.

Each 3-pack of golf balls was posted as a 3-day auction, specified as in “New” condition, with starting price set to the minimum of $0.01. Winning bids were shipped first class via the U.S. Postal Service, at a cost of $3.65 to the buyer. Therefore, all bid prices were above and beyond this stated shipping cost. Upon completion of each auction, sales data were recorded.

**Stimuli**

Two photographs were used—one for each condition. The first was a stock image of the Callaway Warbird 2.0 3-pack, a professional photograph with an all-white background. The second photograph was created by the researchers, closely matching the composition of the stock image, but taken with a camera phone, everyday lighting conditions, and carpet background (see
Figure 1). This image is typical of the user-generated photographs used in many eBay auctions (Van Der Heide et al., 2013).

Measures

After each auction, bidding and sales data were collected. The first outcome was whether or not any winning bids were placed (i.e., a successful auction). Next, the number of bids and individual bidders (as indicated by distinct usernames) were captured. Additionally, the price of the winning bid was recorded. Finally, the bidders’ own seller scores in each auction bid was recorded. These scores provide a latent measure of bidder experience with online auctions. Scores were averaged to form a measure of bidder experience for each auction.

As the study account accumulated successful transactions over time, buyers left feedback. This affected the account’s seller rating (percentage of positive feedback) and seller score (absolute number of positive comments). While reputation scores are an important assessment signal in online auctions (Resnick & Sami, 2008; Van Der Heide et al., 2013), the inability to experimentally manipulate these cues precluded their analysis in this study (cf. Resnick et al., 2006). However, seller reputation does present a possible confound that must be controlled for. Although seller rating is not an especially useful predictor, suffering from low variability (most ratings sit just below 100%), seller score is a good predictor of bidder activity (Van Der Heide et al., 2013), and was therefore used as a statistical control in all analyses.

Results

Descriptive Statistics

Across all auctions ($N = 38$), 81.58% ended with bids, and the average sale price was $0.87 (SD = $2.53). The average auction had 2.92 (SD = 3.27) bids and 1.55 (SD = 1.08) bidders,
and the average bidder reputation for each auction was 190.96, \(SD = 394.81\). The seller score for the study account rose from 0 to 14 over the study period, closing with a 94% rating. Seller score did not differ by experimental condition, \(t(36) = -0.53, p = .60\), \(M_{user-generated} = 8.21, SD = 4.81\), versus \(M_{stock} = 7.37, SD = 5.05\).

**Hypothesis Testing**

The first hypothesis predicted that auctions with user-generated photographs (\(n = 19\)) would be more likely to sell than their stock photograph counterparts (\(n = 19\)). To assess this hypothesis, a logistic regression model tested the effect of photograph type on whether the item sold or not. Seller score was included as a covariate in the statistical model. There was a significant effect of condition (user-generated vs. stock photographs) on likelihood of sale. Auctions with user-generated photograph (100% sold) were more successful than stock photograph auctions (63.16% sold), \(b = 1.83, SE = 0.81, Wald = 5.04, p = .025, \Delta Nagelkerke R^2 = .16\), providing support for H1.

The second hypothesis predicted more bids on auctions with user-generated photographs. This was tested with an ANCOVA, controlling for seller score. No significant effect of photograph type was evident for the number of bids, \(F(1, 35) = 0.73, p > .10, \eta_p^2 = .02\), although the mean number of bids on user-generated photograph auctions (\(M = 3.26, SD = 3.38\)) was higher than for stock photograph auctions (\(M = 2.58, SD = 3.22\)). H2 was therefore not supported.

Next, H3 predicted an effect of condition on number of bidders and was supported. As with H2, an ANCOVA controlling for seller score was used. There was a significant effect of photograph type on number of bidders, \(F(1, 35) = 4.52, p = .04, \eta_p^2 = .11\), in the direction
predicted, with more bidders for user-generated \((M = 1.84, SD = 0.83)\) than stock auctions \((M = 1.26, SD = 1.24)\). Thus, H3 was supported.

Finally, an ANCOVA controlling for seller score found no effect on price, \(F(1, 35) = 0.68, p > .10, \eta_p^2 = .02\); although at a descriptive level, user-generated auctions averaged a higher price in dollars \((M = 1.19, SD = 3.51)\) than stock auctions \((M = 0.55, SD = 0.77)\). Thus, H4 was unsupported.

**Mediation and Moderation Tests**

Number of bids and bidders were each modeled as mediators in the relationship between photograph type and sale price, controlling for seller score. The PROCESS macro for SPSS (Hayes, 2013) generated 1,000 bootstrap samples to test the indirect effect of photograph type on price. An indirect effect via bids was not different from zero, \(b = 0.51, se = 0.87, 95\% CI [-0.16, 3.03]\). However, mediation by number of bidders was demonstrated. A mediation test with 1,000 bootstrap samples showed that user-generated photographs indirectly affected sale price through the number of auction bidders, \(b = 0.67, se = 0.70, 95\% CI [0.08, 3.09]\). Figure 2 illustrates these mediation models.

Next, to test the moderating role of bidder experience, hierarchical regression models (controlling for seller score) tested the interaction between average bidder score and condition and its effect on bids, bidders, and sale price. A significant interaction predicted number of bidders, \(b = -0.007, se = 0.003, p = .018, \Delta R^2 = .12\). The PROCESS macro (Hayes, 2013) probed the interaction with the Johnson-Neyman technique, revealing that for auctions where the average bidder score was < 79.99 (63.16\% of the sample), user-generated photographs had a significant positive effect on number of bidders. In contrast, auctions with an average bidder
score > 617.52 (10.53% of the sample) saw fewer bidders for user-generated photographs. There were no moderated effects, however, on number of bids ($p = .54$) or sale price ($p = .37$).

**Discussion**

This study examined the effect of photograph type on bidding activity and sales for online auctions. Using a field experiment to rule out confounds, we tested the proposition, derived from signaling theory and warranting theory, that user-generated photographs will be more successful in online auctions than stock photographs. Photographs of actual goods provide warranting evidence as to a product’s true appearance. In this way, user-generated photographs establish trust by demonstrating consistency between offline reality and online representation (Walther & Parks, 2002). Given the influence that high-warrant signals such as third-party evaluations (Tong et al., 2008; Utz, 210; Walther et al., 2009) have on impression formation and judgments, user-generated photographs should positively impact judgments, compared to textual descriptions (Van Der Heide et al., 2012) or stock photographs (Van Der Heide et al., 2013).

The first hypothesis, that auctions with a user-generated photograph would be more likely to sell than auctions with stock photographs, was supported. Next, H2 and H3 predicted positive effects of user-generated photographs on the numbers of bids and bidders. Although H2 was not supported, H3 was. User-generated photographs attracted more individual bidders. Finally, H4, the prediction that user-generated photographs would solicit higher final prices, was not supported. However, at a strictly descriptive level, user-generated outperformed stock photographs on all four auction outcomes. This consistent results pattern and support for H1 and H3 demonstrates that posting a user-generated photograph in an online auction has a substantial effect on consumer behavior.
Mediation tests evaluating the first research question indicated that having more bidders mediated an effect on price, suggesting that high-warrant cues work in the e-commerce context by attracting attention from many bidders, rather than by reducing further uncertainty and encouraging repeat bids. This attention-gaining mechanism of the high-warrant photograph is also consistent with the effect on likelihood of sale. The implication for warranting theory is that a cue indicating correspondence between offline and online characteristics is more effective because it orients more initial attention. Alternatively, this mechanism may be specific to contexts such as auctions where impression formation cues are presented all-at-once, rather than through “incremental increases in warrant” (Walther & Parks, 2002, p. 556) as occurs in online relationship formation (Gibbs et al., 2011). Increasing certainty and the number of bids may require sequential cues rather than a single high-warrant cue at the outset. Future work could test the potential of incremental cuing systems in e-commerce, and should also directly examine attention versus certainty as mechanisms for warranting in various computer-mediated contexts.

Regarding the moderation research question, the high-warrant cue was shown to be effective for attracting larger numbers of relatively inexperienced bidders. Highly experienced bidders may have less need for cues with high warrant, as their experience may provide more confidence in when and how to bid. Or, they may be more likely to rely on precise information such as system-generated cues (Lim & Van Der Heide, 2013) instead of rich cues like photographs. In this way, the vivid user-generated photograph and calculated reputation system could represent different types of warrants that appeal to different type of evaluators. Another way in which these cues differ is that although user-generated photographs hold high warrant, they are self-generated rather than generated by third parties, and thus have a qualitatively different warrant from that provided by a reputation score. These distinctions point toward the
potential for a typology of high-warrant cues and their relevant strengths among different impression targets. Another explanation for moderation is that the entry of bidders with high scores may have discouraged other bidders from entering the auction when the photograph displayed high warrant. A more controlled experimental setting could disentangle the influence of other bidders from responses to cue types.

A number of limitations should be acknowledged. First of all, the sample size is modest. A larger sample would allow for more powerful statistical tests. Next, with regard to internal validity, the use of a field experiment rules out confounds associated with other approaches like content analysis (Van Der Heide et al., 2013). However, one confound that can threaten a field experiment is a history effect. For example, golf balls may experience more demand during particular seasons. To address this, condition assignments alternated weekly, so that both conditions covered the full range of seasonal change during the study. Also, we were able to maintain the independence of the conditions—no bidders saw treatment and control auctions at the same time. However, within a condition, auctions did overlap to an extent, which could be considered a possible design limitation. Yet given the nature of a competitive marketplace like eBay, no single auction exists in a vacuum free of competition and comparison. Finally, the use of a single product category (golf balls) may limit generalizability of the results. However, previous content analysis found a robust warranting effect of user-generated photographs across a diverse product set (Van Der Heide et al., 2013).

One product characteristic that may influence findings is product value. Inexpensive items such as a 3-pack of golf balls may represent less uncertainty and less need to “inspect” the goods through a high-warrant cue. Thus, inexpensive products may provide a conservative test. Future work should test product value (e.g., average sale price) as a possible moderator of
effects, as well as other aspects of purchase risk such as quality gradation. Another possible moderator of photographic effects is the volume of auctions within a product category. Sellers are more reliant on the use on quality-signaling cues such as descriptions, images, and auction features when competition is high and reputation scores cannot differentiate sellers (Bockstedt & Goh, 2012). Future studies should also conduct more direct tests of attention, certainty, and psychological other mechanisms for warranting effects in e-commerce settings. Finally, future research could explore photographic features beyond type (i.e., user-generated vs. stock) that carry high warrant. Photographs specifically showing flaws, photographs displaying all sides of a product versus one side or just packaging, and the use of multiple photographs (see Song & Baker, 2007, for mixed evidence on the multiple photograph hypothesis) are examples of seller techniques that might enhance the warrant of user-generated photographs.

By demonstrating the benefits of user-generated photographs for eBay sellers, this study provides practical guidance to e-commerce websites, sellers, and buyers. Using images that convey the quality and nature of a product improve online transactions. Additionally, the present results are a valuable contribution to findings regarding warranting theory, and more broadly, signaling theory, by suggesting that attention acts as a mechanism of the warranting effect and that the effect was moderated by buyer experience. By “showing the goods” to prospective buyers, user-generated photographs provide not only an assessment signal, a candid indicator of what they represent, but also a cue relatively free from seller manipulation, which carries more weight with message recipients. In a computer-mediated marketplace, the value of high-warrant cues shows that the adage still holds: “seeing is believing.”
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Figure 1. Stock and user-generated photographs used for auctions.
Figure 2. Mediation of condition on final sale price via number of bids and number of bidders.

Indirect point estimates with bias corrected confidence intervals were created with 1,000 bootstrap samples. Models include seller score as covariate. For number of bids, overall model $R^2 = .53$, $F(3, 34) = 12.85$, $p < .001$. For number of bidders, overall model $R^2 = .17$, $F(3, 34) = 2.26$, $p = .099$. All paths are labeled with unstandardized coefficients, plus total effects in parentheses. *$p < .05$, ***$p < .001$. 