THE IMPACTS OF ONLINE LIGHTWEIGHT INTERACTIONS AS SIGNALS

Completed Research Paper

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Abstract

This study proposes a model to investigate ‘friends’ and ‘likes’ on social networking sites (SNSs) as signals of product quality and the moderating effects of product risk and product familiarity. The results indicate that ‘friends’ and ‘likes’ influence consumers’ perceptions of product quality, which subsequently affect purchase intentions. Product risk and product familiarity moderate the effect of ‘friends’ on consumers’ perceptions of product quality. Considering high product risk and low product familiarity, recommendations provided by friends are more influential than recommendations provided by friends of friends (derived friends). However, considering low product risk and high product familiarity, recommendations provided by friends or derived friends are similarly influential. In addition, the influences of the total number of ‘likes’ on product quality was similar for different levels of product risk or product familiarity.

Keywords: Social influences, consumer decision making, trust/online trust, social networks, electronic commerce, field experiment, social media
Introduction

Previous studies have demonstrated that signals have a significant effect on how consumers evaluate product quality (Dodds et al. 1991a; Jacoby et al. 1977; Peterson and Jolibert 1976). When consumers possess incomplete information about a product, they make inferences regarding product quality based on cues that are readily available and easily evaluated (Zeithaml 1988). Signaling theory provides a framework for understanding how sellers may use cues to convey product quality information to consumers, thereby reducing uncertainty and facilitating a purchase or exchange (Kirmani and Rao 2000). Signaling theory has been successfully applied in information systems, e-commerce, and marketing research.

Previous empirical research has focused on the effect of cues, such as price, guarantees, advertising, or reputation, on perceived product quality (Biswas and Biswas 2004; Boulding and Kirmani 1993; Rao et al. 1999). In the context of e-commerce, other empirical studies have examined website features, such as presentation flaws, online ads on sites, and website quality, as signals of trust and quality indicators (Benlian and Hess 2011; Everard and Galletta 2005; Gregg and Walczak 2008; Kim et al. 2004; Li et al. 2009; McCoy et al. 2009; Wells et al. 2011). Social-based information has recently become increasingly important in influencing consumers, as individuals often imitate others’ actions (Cialdini 2001; White and Simpson 2013). Several studies have examined the role of social-based information as a signal. For example, Utz et al. (2012) proposed that online store reviews are more important for judging the trustworthiness of an online store than assurance seals or the overall reputation of the store. However, that study did not examine social signals beyond consumer reviews. With the proliferation of social networking sites (SNSs), many additional social signals emerge, such as ‘shares,’ ‘comments,’ ‘followers,’ ‘likes,’ tweets, Google +1s, and online friends. Google has begun integrating social signals on SNSs into its algorithms to create better search results. For example, Google uses the number of ‘likes’ that a page obtains along with the personal connections between the users of SNSs to calculate PageRank. While most social signals on SNSs are lightweight interactions between users, in aggregate these social signals have the potential to be a powerful tool for product or vendor assessment. Therefore, an opportunity exists to extend product quality signaling to a new domain.

The aim of this study is to develop a framework to examine how social signals (‘friend’ cues and ‘like’ volumes) on SNSs affect consumers’ perceptions and purchase intentions. To address this issue, we report the results of a field experiment on Facebook, one of the most popular SNSs, to examine the viability of ‘friend’ cues and ‘like’ volumes as signals of product quality, with a focus on the moderating effect of perceived product risk and perceived product familiarity.

Social Signals

Interpersonal persuasion and conformity are two important factors in shaping consumers’ opinions. Individuals who are embedded in social networks are likely to be influenced by the attitudes held by others in their social environment (Huckfeldt and Sprague 1991; Terry and Hogg 2000). For example, Galletta et al. (1995) discovered the extent to which system training outcomes such as attitudes, behavior, and performance are influenced by peers through word-of-mouth (WOM) communication, rather than derived solely through direct experience. This concept supports the arguments of Cialdini (2001) and White and Simpson (2013). Cialdini (2001) noted six scientific principles of influencing individuals: liking, reciprocity, social proof, consistency, authority, and scarcity. One of these six principles, social proof, demonstrates that persuasion can be extremely effective when it comes from peers because individuals rely on those around them for cues regarding how to think, feel, and act. In addition, White and Simpson (2013) suggested that social norms (i.e., norms reflecting what others are doing) are the most effective way to encourage sustainable intentions and behaviors.

As usage of SNSs became more widespread, individuals began to use SNSs not only to communicate with their social circles, but also to share news, videos, music, and other types of information. Information on SNSs is becoming increasingly important for shaping consumers’ opinions. Metzger et al. (2010) reported that social cues are a common strategy for judging the credibility of online information. Therefore, we believe that social-based cues on SNSs may be important signals for consumer decisions. We classify
social signals on SNSs, such as ‘shares,’ ‘comments,’ ‘likes,’ ‘followers,’ tweets, Google +1s, and online friends, into two types: relation-based (interpersonal persuasion) and crowd-based (conformity) (Table 1).

<table>
<thead>
<tr>
<th>Type</th>
<th>Social signal</th>
<th>Example</th>
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</thead>
<tbody>
<tr>
<td><strong>Relation-based:</strong></td>
<td>‘Friends’</td>
<td>(derived friends, strong-tie friends, and weak-tie friends)</td>
</tr>
<tr>
<td>Individuals follow</td>
<td></td>
<td></td>
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<tr>
<td>others they know.</td>
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<tr>
<td><strong>Crowd-based:</strong></td>
<td>‘Shares’</td>
<td></td>
</tr>
<tr>
<td>Individuals follow</td>
<td>‘Comments’</td>
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<tr>
<td>messages that receive</td>
<td>‘Likes’</td>
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<tr>
<td>recognition from</td>
<td>‘Followers’</td>
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<tr>
<td>others.</td>
<td>Tweets</td>
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<td></td>
<td>Google +1</td>
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Our first class of social signals is relation-based signals, which are signals observed by individuals following others they know. Previous studies have found that social relations and WOM referrals are important in an individual’s decision making process (Arndt 1967). Some studies suggest that online friends exert a strong influence on consumers’ attitudes and behaviors, and that the messages which consumers receive or observe have a powerful influence on decision making (Centola 2010; Farrow and Yuan 2011). We consider ‘friends’ to be an important source of signals in a consumer’s purchase decisions. ‘Friends’ may be divided into different types: derived friends, strong-tie friends, and weak-tie friends. Granovetter (1973) introduced the concept of tie strength, which refers to the closeness of relationships among individuals. Tie strength ranges from weak to strong. If a relationship is defined as a weak tie, then the individuals are only acquaintances and do not know one another well. If the tie is defined as a strong tie, then the individuals are friends who know one another well. In addition, individuals on SNSs may also connect with and be influenced by friends of friends (Adams 2011). We classify these relationships as derived friends. For example, if B is A’s friend, and C is B’s friend, then C is A’s derived friend. Prior to the emergence of SNSs, it was difficult to identify friends of friends. SNSs enable users to efficiently discover mutual ties and thereby associate with derived friends. We believe that relation-based signals exert an important influence on purchasing decisions.

The second category of signals we consider is crowd-based signals, signals observed by individuals following messages which receive a high volume of recognition from others. Previous studies have found that the total quantity of user ratings (volume of ratings) is an important signal to consumers (Hasher and Zacks 1984; Weaver et al. 2007). Volume of ratings is easy for consumers to process and hence is used by consumers as a proxy for overall popularity of an opinion. Volume may have an informative effect on awareness and may influence users’ attitudes (Liu, 2006). Some studies have noted that volume is often the most significant predictive factor with respect to consumer attitudes (Chevalier and Mayzlin 2006; Duan et al. 2008; Liu 2006). We believe that volume is a strong diagnostic cue. In this sense, it may be important to make the volume of ‘shares,’ ‘comments,’ ‘likes,’ ‘followers,’ tweets, and Google +1s available to users as they make their purchasing decision (Chatterjee 2001).
Previous studies examining relation-based signals in SNSs have suggested that positive product information and recommendations provided by strong-tie online friends are perceived as having a high level of diagnosticity and that positive recommendations increase the probability of purchase (Wang and Chang 2013). In this study we seek to expand the analysis to include the effect of signals from derived friends. We take advantage of users’ adoption of SNSs to associate not only with an immediate circle of friends but also derived friends to explore the impact of signals from derived friends on purchasing decisions.

The second purpose of this study is to examine the impact of crowd-based signals. ‘Like’ provides easy way for users to interact on SNSs as pressing the ‘like’ button takes just a split second. Due to the ease of interaction, the ‘like’ button facilitates more frequent engagement on SNSs. In addition, the ‘like’ button is extremely easy for businesses to implement and is therefore in widespread use by businesses seeking to grow web traffic and increase brand awareness. Facebook facilitates the impact of ‘like’ as a crowd based signal by providing open metrics on the total volume of likes. Due to the widespread popularity of ‘likes’ and the ease of obtaining metrics, we chose ‘like’ volumes as our representative crowd based signal.

**Research Model and Hypothesis Development**

The conceptual model and hypothesized paths are depicted in Figure 1. The objective of this study is to understand how ‘friend’ cues, ‘like’ volumes, and perceived product quality affect consumers' intentions to purchase a product. In addition, consumers differ in their information-processing abilities (Henry 1980). The influence of social signals may vary across individuals. We believe that the two social signals may interact with perceived product risk and perceived product familiarity.

**‘Friend’ Cues and Perceived Product Quality**

Nearly everyone in a network spreads messages (Smith et al. 2007). However, different individuals may exert different influences on user behaviors. Consumers trust individuals they know and are more likely to purchase products or services recommended by someone in their network whom they trust (Chiu et al. 2010; Gefen et al. 2003; Jarvenpaa et al. 2000; Lu et al. 2010; Pavlou and Gefen 2004). As Fogg and Tseng (1999) noted, “trust indicates a positive belief about the perceived reliability of, dependability of, and confidence in a person, object, or process.” It follows that if an individual experiences positive feelings
regarding an object's reliability and dependability and has confidence in it, that individual will perceive that object to be of high quality. If customers regard recommenders as trustworthy, they may believe that the recommenders have the ability and goodwill to recommend the product and then will believe that the recommended product is of high quality. We consider an example of transitive trust. The premise behind trust transitivity is that if B trusts C and A trusts B, then A, by transitivity, is more likely to trust C if C mentions B when reaching out to A. This phenomenon is illustrated in Figure 2.

![Figure 2. An Example of Transitive Trust](image)

According to the transitive trust concept, A does not actually know C himself, so A does not trust C to the extent that he trusts B. We recognize that users on SNSs may have more trust in friends than in derived friends. Accordingly, we suggest that users may have higher perceived product quality for the information recommended by friends than for the information recommended by derived friends.

**Hypothesis 1:** Recommendations and information provided by friends will result in a higher level of perceived product quality.

**‘Like’ Volumes and Perceived Product Quality**

Volume is important information for consumers. Individuals are influenced by the majority in their social group because a larger volume of the same opinion is considered more authoritative, diagnostic, and persuasive (Granovetter and Roland 1988). An example of conformity is a scenario in which a consumer makes a decision based on other individuals’ choices. Conformity is influenced by the number of others who have already acted (Granovetter and Roland 1988). The extant research on conformity indicates that a higher number of individuals holding the same opinion implies a greater level of conformity with respect to that opinion. This relationship holds because a high number of individuals making the same choice mitigates the perceived risk of regret after the purchase. The pressure to conform results from the influence of interpersonal information, particularly when an individual accepts information from others as evidence of a product’s true qualities (Cohen and Golden 1972; Lascu et al. 1995). Therefore, a high number of approvals on a product recommendation is likely to reduce the consumers’ risk of accepting this information and increases the consumers trust in the recommendation. In other words, information that several individuals ‘like’ a product or positive product recommendation is likely to induce a perception of high product quality. We suggest that users have stronger perceptions of product quality given a high ‘like’ volume.

**Hypothesis 2:** Recommendations and information featuring a high ‘like’ volume will result in a higher level of perceived product quality.

**Perceived Product Risk**

In this study we focus on potential risk as perceived by consumers rather than true risk. Perceived risk involves the nature and amount of risk perceived by a consumer who is considering a purchase decision (Cox and Rich 1964). Previous studies have addressed the degree of perceived risk as a crucial factor affecting consumer behavior (Bettman 1973; Dowling and Staelin 1994). Various types of risks include financial, performance, social, psychological, and physical risks (Hirunyawipada and Paswan 2006;
Jacoby et al. (1974). The buyer’s subjective assessment of the possibility of an unfavorable consequence determines the total amount of risk in any purchase decision (Dowling and Staelin 1994; Grewal et al. 1994). Due to the uncertainty involved in the purchasing process, all purchasing decisions involve some degree of risk. Berger and Calabrese (1975) suggest that exposing customers to uncertainty lead them to pursue uncertainty reduction strategies. Consumers attempt to reduce uncertainty by finding signals that may be used in decision making (Jacoby et al. 1994). Previous studies have suggested that as perceived risk increases, consumers search for more information, such as WOM recommendations, advertising, and interpersonal sources to reduce risk and uncertainty (Dowling and Staelin 1994; Garner 1986; Gemiinden 1985). In a high-risk situation, consumers are prone to conduct more product research and therefore may rely more heavily on signals to foster confidence about the impending purchase (Zhang and Li 2006). In turn, when the perceived risk is low, consumers will be less influenced by signals, as they do not need these reinforcements to overcome concerns regarding the possibility of non-desired outcomes (Lian and Lin 2008). Therefore, the effect of ‘friend’ cues and ‘like’ volumes on perceived product quality is stronger for consumers who are facing high product risk than consumers who are facing low product risk.

**Hypothesis 3a:** ‘Friend’ cues have greater effects on perceived product quality for consumers with high perceived product risk than for consumers facing low perceived product risk.

**Hypothesis 4a:** ‘Like’ volumes have greater effects on perceived product quality for consumers with high perceived product risk than for consumers facing low perceived product risk.

**Perceived Product Familiarity**

Consumers are generally more confident in their ability to assess signals than product attributes, as signals may be evaluated without any expertise or knowledge of the product (Richardson et al. 1994). Therefore, empirical studies have shown that consumers with low product familiarity rely on signals to a greater extent because of their inability to use and judge intrinsic product attributes (Rao and Monroe 1988). In summary, consumers will rely more on extrinsic product attributes when intrinsic product attributes are not readily available or when the consumers are not confident in their ability to assess these attributes. Consumers with low levels of knowledge relevant to the product are more susceptible to the influence of signals. For these individuals, product attributes are occasionally ignored because they are confusing and poorly understood, whereas consumers with high levels of familiarity with the product have the ability to correctly interpret and evaluate the product’s physical composition (Kardes et al. 1992; Kuusela et al. 1998; Maheswaran 1994; Maheswaran et al. 1996; Siu and Wong 2002). The role of signals is more important for consumers with low product familiarity, these customers tend to rely on signals such as trust and product approval. However, consumers who are more familiar with the product are not likely to be persuaded by these signals. Therefore, the effect of ‘friend’ cues and ‘like’ volumes on perceived product quality is stronger for consumers with low product familiarity than for consumers with high product familiarity.

**Hypothesis 3b:** ‘Friend’ cues have greater effects on perceived product quality for consumers with low perceived product familiarity than for consumers with high perceived product familiarity.

**Hypothesis 4b:** ‘Like’ volumes have greater effects on perceived product quality for consumers with low perceived product familiarity than for consumers with high perceived product familiarity.

**Perceived Product Quality and Purchase Intentions**

Purchase intention has been widely used to predict the usefulness and effectiveness of marketing activities. Therefore, we chose purchase intentions as the dependent variable to measure the effectiveness of recommendations derived through SNSs. Perceived product quality is an important factor affecting purchasing decisions. The concept of perceived product quality has recently attracted considerable interest. Several studies have found that perceived product quality has a strong correlation with purchase intentions (Boulding and Kirmani 1993; Dodds et al. 1991b; Rao et al. 1999). The purpose of this study is to leverage new opportunities generated by the proliferation of social networking to further explore the relationship between perceived product quality and purchase intentions.

**Hypothesis 5:** Higher perceived product quality will lead to higher purchase intentions.
Research Method

To test our hypotheses, we conducted a field experiment within Facebook, one of the most popular SNSs. We deployed a Facebook application as the experimental platform. Users were able to participate in our experiment within a realistic social network environment. We could rapidly and accurately access information concerning the interactions among users and were able to measure the consumers’ actual reactions and opinions on Facebook. The experimental field study is summarized in Table 2.

Table 2. Experimental Studies

<table>
<thead>
<tr>
<th>Design</th>
<th>2×2 field experiment</th>
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<tbody>
<tr>
<td>Method</td>
<td>ANOVA and Regression</td>
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<tr>
<td>Variables manipulated</td>
<td>‘Friend’ cues</td>
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<td>“Like” volumes</td>
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<td>Moderators</td>
<td>Perceived product risk</td>
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<td>Perceived product familiarity</td>
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<td>Dependent variables</td>
<td>Perceived product quality</td>
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<td></td>
<td>Purchase intentions</td>
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The experiment used a 2 (‘friend’ cues: friends vs. derived friends) × 2 (‘like’ volumes: high vs. low) between-subject design, producing a total of four treatments (Table 3). This experiment was designed to investigate the role of ‘friend’ cues and ‘like’ volumes as signals of product quality and the influence of perceived product risk and perceived product familiarity within a ‘friend’ cue and ‘like’ volume signaling context. Measured constructs included perceived product risk, perceived product familiarity, perceived product quality, and purchase intentions, with ‘friend’ cues and ‘like’ volumes measured to test for manipulation.

Table 3. Treatments

<table>
<thead>
<tr>
<th>‘Like’ volumes</th>
<th>‘Friend’ cues</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>High</td>
</tr>
<tr>
<td>Friends</td>
<td>Treatment 1</td>
</tr>
<tr>
<td>Derived friends</td>
<td>Treatment 3</td>
</tr>
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</table>

Measures

All of the measures were adapted from the existing literature. We modified questionnaire items from the existing literature to fit this study. We used a seven-point Likert-type scale for all variables.

Perceived product risk. The measures for perceived risk were designed for this study. The questionnaire items asked whether the recommended product would be a risky purchase.

Perceived product familiarity. We adopted scales for perceived product familiarity from a study by Lichtenstein and Fishhoff (1977). We measured participants’ product familiarity using three items which formed an index. The items focused on the participants’ level of knowledge regarding the recommended product.

Perceived product quality. The measures for perceived product quality were adapted from Kempf and Smith (1998) and Jiang and Benbasat (2007). The items asked whether the participants would be satisfied.
with the product.

_Purchase intentions._ The purchase intention construct was measured using items that focused mainly on the participants’ willingness to purchase, likelihood of purchasing, and interest in purchasing the product (Coyle and Thorson 2001).

**‘Friend’ Cues and ‘Like’ Volumes**

‘Friend’ cues refer to the two different sources of recommendation, namely friends and derived friends. For the “friends” treatment, the recommendation is provided by the participant’s friends. In the “derived friends” treatment, the participant’s friends’ friends provide the recommendation. Friends were obtained from the names listed on the participant’s Facebook friend list. Derived friends were extracted from the friends’ friends who share mutual friends with the participant on Facebook.

‘Like’ volumes were manipulated by distinguishing between high and low ‘like’ volumes. Facebook offers a feature that allows users to click a thumbs-up icon (‘likes’). A thumbs-up rating provides the customer’s feedback after reading messages from other individuals related to that product. Users may use this feature to signal their approval of posts, links, or comments posted by others. Observation and survey methods were used to determine high and low ‘like’ volumes. We randomly selected certain messages and then observed the number of ‘likes’ those messages received. We focused on messages posted by average users. We did not consider messages provided by fan pages, advertising, or news, which tend to receive a high number of ‘likes.’ Based on our observation, we grouped messages receiving ten to fifteen ‘likes’ as messages with high ‘like’ volume and messages receiving zero to five ‘likes’ as low ‘like’ volume. In addition, we asked some individuals who did not participate in the main experiment whether they agreed with the results of the observation based on their experience of using Facebook. All respondents in this group agreed that for average users, a message that receives ten to fifteen ‘likes’ represents high ‘like’ volume, while a message that receives zero to five ‘likes’ represents low ‘like’ volume. As a result of the observation and survey, we determined that fifteen was an appropriate number for high ‘like’ volume and that zero was an appropriate number for low ‘like’ volume. Therefore, at high volumes, at least fifteen individuals clicked ‘like’ regarding product information. At low volumes, no individuals clicked the ‘like’ button.

**Moderating Effects**

To test moderating effects, we measured participants’ perceived product risk and perceived product familiarity. We first calculated the average scores of these variables for each subject and then coded the scores as a dummy variable that formed additional indices. We classified subjects with the commonly used median-split procedure, which effectively dichotomizes the moderator variable (Aiken and West 1991). Scores greater than the median were coded as value one and otherwise as value zero. The median of perceived product risk was four. If the average score of perceived product risk was between five and seven, it was coded as value one, indicating that the subject perceived high product risk. If the average score of perceived product risk was between one and four, it was coded as zero, indicating that the subject perceived low product risk. Perceived product familiarity was coded using the same rule. The median of perceived product familiarity was also four.

**Products Described in the Experiment**

We attempted to choose a wide spectrum of products in various price ranges in hope that the result would be more stable and generalizable. The four products selected were designer clothing, mobile phone applications, automobiles, and mutual funds. Studies have indicated that brand familiarity influences advertising effectiveness (Campbell and Keller 2003; Kent and Allen 1994). To eliminate potential for confounding effects from brand names, we assigned fictitious brand names to each of the four products used in the experiment. Each recommendation post contained a message from an individual, a photo of the product, and the product’s description. The recommendation messages were all positive.
**Experimental Design**

We asked the subjects in each group to imagine a scenario, in which they wished to invest in a mutual fund, purchase apps, buy an automobile, or buy a T-shirt. While they ponder their decision, they notice that their Facebook wall posts contain relevant information (Figure 3). We used two types of information to construct the wall posts. First, we replicated the ten most recent posts on the subject's actual Facebook wall on the day before he or she participated in the experiment. Second, we added one product recommendation post (e.g., “It's a good product.”). The contents were quite similar for all of the subject groups. The differences were present in the individual providing the recommendation and the number of ‘likes.’ In the “friends and high-volume” treatment, the subjects observed that fifteen individuals ‘like’ the message and that the message was posted by friends. In the “friends and low-volume” treatment, the subjects observed that zero individuals ‘like’ the message and that the message was posted by friends. In the “derived friends and high-volume” treatment, the subjects observed that fifteen individuals ‘like’ the message and that the message was posted by derived friends. In the “derived friends and low-volume” treatment, the subjects observed that zero individuals ‘like’ the message and that the message was posted by derived friends.

A: The subject would see the message of a friend (Anne Wells) on his/her wall posts.

B: On Facebook, if one’s friend ‘likes’ his/her friend’s message, one would see the message posted by the friend’s friend on one’s own wall. A subject’s friend (Anne Wells) ‘likes’ a message posted by his/her friend (Gavin Brown). The subject can see the message of a derived friend (Gavin Brown) on his/her wall posts.

C: At high volumes, fifteen individuals have clicked ‘like’ button. At low volumes, zero individuals clicked the ‘like’ button.

Figure 3. An Example: The Facebook Wall Posts Customized
Pilot Test

We conducted a pilot test with twenty participants to identify confounding effects and other problems that could occur during the actual experiment. The respondents were asked to view experimental Facebook pages and to complete a final questionnaire. We obtained feedback and suggestions from the subjects after they had completed the pilot test. In general, the respondents in all four groups believed that the experimental procedure had been successfully performed. Their primary suggestions and recommended adjustments involved the phrasing of the questions and the design of the Facebook application.

Participants and Procedures

A marketing research firm sent e-mail invitations to potential respondents to join the experiment. Each Facebook user who participated in the experiment was randomly assigned to one of the four experimental groups. After the Facebook users signed up to use our Facebook application, we provided them with instructions that explained the procedures. Next, we asked the subjects to provide their demographic information and explained the hypothetical task. Then, the application displayed a customized wall post. Finally, we asked the subjects to complete a questionnaire.

Data Analysis

We recruited 400 subjects. Of these subjects, 231 (57.8%) were female, and 169 (42.3%) were male. Most of the participants (68%) were between 25 and 45 years old. Most had been using Facebook for more than two years (88.6%), and a majority (72.5%) checked their Facebook wall messages at least once a day.

Manipulation Checks

To assess the manipulation of the ‘friend’ cues, three items were evaluated on a seven-point scale (1 = absolutely not, 7 = absolutely), including “Do you know the recommender?”, “Can you recognize the recommender well?”, and “Are you and the recommender friends?” These items were represented by single, reliable factors for the ‘friend’ cues (Cronbach’s alpha: 0.959), the outcome of which produced a significant difference between the friends and derived friends (M_{derived friends} = 1.91, M_{friends} = 6.60, p < 0.001). To validate the manipulation of the ‘like’ volumes, we asked the subjects to recall the ‘like volumes that they observed. We listed the following statement: “More than 10 people clicked the ‘like’ button for the product information provided by the recommender” and asked the subjects whether they agreed with the statement (1 = strongly disagree, 7 = strongly agree). The subjects’ responses were similar to our operational definitions. The results of this assessment indicated a significant difference between low and high ‘like’ volumes (M_{low-volume} = 3.15, M_{high-volume} = 5.95, p < 0.001). Therefore, the ‘friend’ cues and ‘like’ volumes were both successfully manipulated.

Validity of the Measurement Instrument

We conducted a factor analysis and varimax rotation for the six items in the two constructs. We performed a Kaiser-Meyer-Olkin (KMO) test to determine whether the data were suitable for factor analysis. A KMO value higher than 0.5 is generally considered to be sufficient (Hinton et al. 2004). The KMO value for the combined construct was 0.855. The factor loading scores for all of the questionnaire items were above 0.8, indicating that the constructs were valid (Hair et al. 1998). We adopted a Cronbach’s $\alpha$ coefficient between 0.70 and 0.90 as our criterion for internal consistency (Nunnally et al. 1967). The Cronbach’s $\alpha$ values for both of the constructs were greater than 0.9 (i.e., purchase intentions: 0.956 and perceived product quality: 0.923), indicating that each item was related to its respective construct.

Hypothesis Testing

We used an ANOVA to test H1, H2, H3a, H4a, H3b, and H4b and a regression to test H5. ANOVA was
The analysis indicated the presence of a significant main effect of the ‘friend’ cues (F = 16.699, p < 0.001). Participants in the “friends” group perceived higher product quality than participants in the “derived friends” group (M_{friends} = 4.98 vs. M_{derived friends} = 4.23, p < 0.001). The main effect of the ‘like’ volumes was also significant (F = 12.458, p < 0.001). We also conducted a t-test to compare the levels of perceived product quality from the recommendations with high- and low-like volumes. We found that high-like volumes result in higher levels of perceived product quality (M_{high-volume} = 4.56 vs. M_{low-volume} = 3.95, p < 0.001). Therefore, Hypotheses 1 and 2 were accepted.

The ‘friend’ cues × perceived product risk interaction had a significant effect (F = 3.913, p < 0.05). The effect of ‘friend’ cues was significant in the high-risk condition but not in the low-risk condition. When the product’s risk was high, the level of perceived product quality was higher when the product was recommended by a friend than by a derived friend (M_{friends} = 5.07 vs. M_{derived friends} = 3.90, p<0.001). In contrast, when the product’s risk was low, the difference between the friend’s and derived friend’s recommendations was not significant (M_{friends} = 4.92 vs. M_{derived friends} = 4.54, p = 0.061). Thus, Hypothesis 3a was accepted. However, the ‘like’ volumes × perceived product risk interaction effect was not significant (F = 1.142, p = 0.286). That is, the effects of ‘like’ volumes were significant for both high- and low-risk conditions, and the impacts of the ‘like’ volumes on perceived product quality did not differ regardless of the level of product risk. Thus, Hypothesis 4a was rejected. The results are shown in Figure 4.
The ‘friend’ cues × perceived product familiarity interaction had a significant effect (F = 7.069, p < 0.01). The effect of ‘friend’ cues was significant in the low-familiarity condition but not in the high-familiarity condition. When familiarity was low, the level of perceived product quality was higher when the product was recommended by a friend than by a derived friend (M<sub>friends</sub> = 4.86 vs. M<sub>derived friends</sub> = 3.91, p < 0.001). In contrast, when familiarity was high, the difference between the friend’s and derived friend’s recommendations was not significant (M<sub>friends</sub> = 5.13 vs. M<sub>derived friends</sub> = 4.89, p = 0.325). Thus, Hypothesis 3b was accepted. However, the ‘like’ volumes × perceived product familiarity interaction effect was not significant (F = 0.290, p = 0.590). That is, the effects of ‘like’ volumes were significant for both high- and low-familiarity conditions, and the impacts of the ‘like’ volumes on perceived product quality did not differ regardless of the level of product familiarity. Thus, Hypothesis 4b was rejected. The results are shown in Figure 5.

To test the relationship between perceived product quality and purchase intentions, we analyze ‘friend’ cues, ‘like’ volumes, perceived product quality, and purchase intentions in a regression. We also examine the mediating effects of perceived product quality. The results of the analysis are presented in Table 5. We followed the method proposed by Baron and Kenny (1986) to test the mediation model. First, we assessed the coefficients of the dependent variable on the independent variable, the mediators on the independent variable, and the dependent variable on both the independent variable and mediator. These
three regression equations test the links of the mediation model. The independent variables (‘friend’ cues and ‘like’ volumes) affect the dependent variable (purchase intentions) and also affect the mediator (perceived product quality.) The independent variables (‘friend’ cues and ‘like’ volumes) have a weaker effect when controlling for the mediator (perceived product quality). Consequently, perceived product quality partially mediates the relationship between the independent variables (‘friend’ cues and ‘like’ volumes) and purchase intentions.

In addition, as shown below, perceived product quality had a positive and significant effect on purchase intentions (b = 0.607, p < 0.001) and explained 48% of the variance in purchase intentions. Therefore, H5 can be accepted.

<table>
<thead>
<tr>
<th>Table 5. Regression/Mediation Analysis for Purchase Intentions</th>
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<tbody>
<tr>
<td>Variables</td>
</tr>
<tr>
<td>IV on DV</td>
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<tr>
<td></td>
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<tr>
<td>IV on Mediator</td>
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<tr>
<td>IV on DV with Proposed Mediator</td>
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<td></td>
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<tr>
<td>Perceived product quality to Purchase intentions</td>
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</tbody>
</table>

Note. IV = Independent Variable; DV = Dependent Variable

A summary of all of the outcomes of the hypotheses testing is presented in Table 6.

<table>
<thead>
<tr>
<th>Table 6. Summary of Results</th>
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<tbody>
<tr>
<td>H1: ‘Friend’ cues ➔ Perceived product quality</td>
</tr>
<tr>
<td>H2: ‘Like’ volumes ➔ Perceived product quality</td>
</tr>
<tr>
<td>H3a: ‘Friend’ cues × Perceived product risk ➔ Perceived product quality</td>
</tr>
<tr>
<td>H4a: ‘Like’ volumes × Perceived product risk ➔ Perceived product quality</td>
</tr>
<tr>
<td>H3b: ‘Friend’ cues × Perceived product familiarity ➔ Perceived product quality</td>
</tr>
<tr>
<td>H4b: ‘Like’ volumes × Perceived product familiarity ➔ Perceived product quality</td>
</tr>
<tr>
<td>H5: Perceived product quality ➔ Purchase intentions</td>
</tr>
</tbody>
</table>

**Discussion and Conclusions**

Our main goal in this study was to determine how social signals contribute to perceived product quality and purchase intentions. We examined social-based cues on SNSs (‘friend’ cues and ‘like’ volumes) as potential signals of product quality under varying levels of perceived product risk and perceived product familiarity. Several major findings emerge from this research.
First, the hypothesized relationship between ‘friend’ cues and perceived product quality was significant. Consumers tend to perceive higher product quality if information about the product is provided by friends. Consumers believe that a friend may help them understand and evaluate the quality and performance of products. This finding is consistent with those of previous studies. For example, Fogg and Eckles (2007) found that recommendations from a friend are perceived as more credible than those made by someone who is not a friend, with close friends having the greatest influence (Adams 2011; Brown and Reingen 1987; Rogers 1995).

Second, perceived product risk was found to moderate the effect of ‘friend’ cues on perceived product quality. Consumers who were evaluating products at different risk levels underwent different psychological processes (Lian and Lin 2008; Zhang and Li 2006). When risk was high, consumers tended to evaluate products carefully by focusing on the trustworthiness of their sources. When risk was low, consumers were less likely to evaluate the products carefully and paid less attention to their sources' trustworthiness.

Third, product familiarity also moderates the effect of ‘friend’ cues on perceived product quality. For low product familiarity, the information and recommendations provided by friends have a greater effect on purchase intentions than the information and recommendations provided by derived friends (Rao and Monroe 1988). However, we did not find this effect for high product familiarity.

Fourth, we found that perceived product quality increases with the number of ‘likes.’ A high volume of ‘likes’ has a greater impact on the purchase decision than a low volume of ‘likes.’ Previous studies have shown that review volumes and ratings have a positive effect on persuasiveness (Chevalier and Mayzlin 2006; Duan et al. 2008; Liu 2006). With the proliferation of SNSs, the volume of ‘likes,’ ‘comments,’ ‘shares,’ ‘followers,’ ‘tweets,’ and Google +1s is becoming more important for consumers. Furthermore, we found that the volume of ‘likes’ on SNSs affected consumers' purchase decisions. This finding is consistent with evidence reported by Muchnik et al. (2013) that a user ‘likes’ a comment on a site, friends who also read the comment are likely to approve the comment.

Finally, an interesting finding is that perceived product risk and perceived product familiarity had no moderating effect on ‘like’ volumes. We did not observe any boundary conditions. ‘Like’ volumes are equally useful at all levels of perceived product risk and perceived product familiarity. The effect of ‘like’ volumes is powerful. One factor that might be able to explain this finding is the ease of information processing. A message that is ‘liked’ by a high number of individuals is difficult to ignore. In addition, the number of likes is an easy signal for users to process. When users see a message with a high number of ‘likes,’ they can immediately determine that the post was approved by numerous individuals. Thus, consumers are affected by this information automatically. Therefore, users do not differ in their weighting of ‘like’ volumes, irrespective of their levels of perceived product risk and perceived product familiarity.

**Theoretical Contributions**

This study applies a theoretical signaling framework to provide a foundation for understanding how social signals affect online consumer behavior. We considered two social signals, namely, ‘friend’ cues and ‘like’ volumes on Facebook. This study is the first to consider these two signals. Based on the study outcomes, we argue that ‘friend’ cues and ‘like’ volumes may be viable signals. In addition, we identify important boundary conditions for the effects of ‘friend’ cues. ‘Friend’ cues are most effective under conditions of high product risk and low product familiarity. From an e-commerce perspective, we posit that signaling theory provides a fresh and robust theoretical foundation for explaining how online social signals affect consumer behavior. This study also contributes to the signaling literature by validating social-based cues as signals of quality that are distinct from other existing social signals, such as online consumer reviews (Utz et al. 2012).

**Managerial Contributions**

Our experiment has several practical implications. First, the results illustrate the growing power of consumers. SNSs have provided a platform through which consumers are able to express their opinions. Social network signals have become an important strategy to recognize product quality and enhance consumers’ purchase intentions. Therefore, it is important for marketers to enable social network
signaling. Enabling lightweight interactions is an easy way for marketers to enable social network signaling. Marketers may place buttons ('likes' or 'shares') on product websites to allow users to quickly share information about the products with friends. For example, American Eagle Outfitters reported a 57% increase in sales after allowing consumers to share information on the clothes they liked with their Facebook friends (Adams 2011). A positive nudge can set off a bandwagon of approval (Muchnik et al. 2013). In addition, marketing companies should select the appropriate strategy when using friends to convey product quality. When creating recommendations, it is important to consider individual differences among consumers. Marketers are more likely to see benefits when using friends to communicate product benefits to consumers who perceive high risk and low familiarity with products. When risk is high or familiarity is low, companies should invite individuals who are friends with targeted consumers to recommend products to their consumers. Consumers care about their friends and thus care about what their friends like, which is critically important for unfamiliar and high-risk products. When risk is low or familiarity is high, 'friend' cues do not enhance the ability of posts to affect consumer purchase decisions.

Limitations

As with all research, this study has some limitations. The signaling model presented in this paper may be amplified to observe the relative influence of social signals on perceived product quality when other factors are introduced. One potential extension of this research is to study social signaling when other well-accepted signals, such as price, brand, and IT features, are manipulated. Other known determinants of behavioral intentions, such as affective variables and trust, may be integrated into the signaling model, as these variables may be influenced by social signals and play a mediating role (Gefen et al. 2003; Van der Heijden 2004). We examined the impact of 'lightweight' signals such as friends, derived friends, and 'likes.' Future studies may choose to examine the effect of other social signals on SNSs.

References


