How online social ties and product-related risks influence purchase intentions: A Facebook experiment

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Abstract

Drawing on information processing theory and the stimulus–organism–response model, we developed research hypotheses about consumers’ decision-making processes. Specifically, we examined the effects of online tie strength, perceived diagnosticity, and product-related risks on consumers’ purchase intentions. We conducted a field experiment on Facebook to test these hypotheses. We found that the product information and recommendations provided by friends with whom consumers have strong ties are perceived as having a high level of diagnosticity. The latter increases the probability that the consumers will purchase the product in question. Product-related risks moderate the effect of tie strength on perceived diagnosticity. For high-risk products, the information and recommendations provided by strong-tie contacts have a greater effect on purchase intentions than the information and recommendations provided by weak-tie contacts. However, we did not find this effect for low-risk products. We discuss the implications of our findings for both theory and practice.

1. Introduction

Consumers can obtain product information from online sources, which are important to their purchasing decisions. Several studies have discussed the impact of online consumer reviews on the purchasing process (Chevalier and Mayzlin 2006, Dellarocas et al. 2007, Duan et al. 2008a, b, Godes and Mayzlin 2004, Koh et al. 2010, Lee et al. 2008, Liu 2006, Park and Kim 2008, Park et al. 2007). As internet social networking sites (SNSs) have become more popular, they have forged connections among internet users and become important sources of information for users. SNSs have been attracting more attention from both researchers and marketers. In particular, researchers who have recently begun studying this phenomenon regard it as a potential source of interesting and valuable information. For example, Trusov et al. (2009) studied the effect of word-of-mouth (WOM) marketing on the growth of a social networking site and compared WOM marketing with traditional marketing techniques. They found that WOM referrals have longer carryover effects than traditional marketing techniques. Kelly et al. (2010) examined the factors that influence advertising avoidance in SNSs. The researchers showed that users are more likely to avoid advertising in their online social networking environments if the following conditions are true: (1) the users expect that the experience will be negative, (2) the advertising is not relevant to the users, or (3) the users are skeptical about the advertising message. Marketers have also begun to recognize the potential of such sites as effective marketing tools. SNSs allow a company to easily identify its target customers and instantly distribute information to a broad range of people.

Marketers and researchers have realized the importance of social ties with respect to customers’ decision-making processes (Arndt 1967). The different types of social ties have different impacts on purchasing decisions. For example, strong ties (friends) exert more influence over a receiver’s decision making than weak ties (acquaintances) (Brown and Reingen 1987). However, few scholars have studied SNSs because marketing oriented around social networking is a relatively new phenomenon. In SNSs, users interact with one another, share information, gather ideas and opinions, and influence one another’s perceptions (Centola 2010). The information generated by these interactions is subsequently dispersed and updated. This information then impacts consumers’ decision-making processes. SNSs are changing existing marketing practices on a fundamental level because people are relying more on the members of their own networks, such as friends and peers, to guide their decision making instead of relying only on authority figures, experts, the mainstream media, and mass advertising (Brymer 2009). This development supports Watts and Dodds’s (2007) argument that major cascades of influence are not driven by specific opinion leaders. Therefore, marketers must consider a new marketing logic based on the social networking phenomenon. Scholars should examine how the online social interactions among
SNS users affect purchase decision making and whether theories about the influence of social ties in the offline context are applicable to SNSs.

We develop research hypotheses about the effect of online tie strength in SNSs on consumers’ purchase intentions. According to the information processing model and the stimulus–organism–response (S–O–R) model, after consumers receive information about a product, they first process the information before purchasing the product (Bettman 1979, Hoyer and MacInnis 2004, Mehrabian and Russell 1975). We argue that the effect of online tie strength on consumers’ purchase intentions is mediated by their information-processing behavior. Perceived diagnosticity is adopted in this study as a mediator. Perceived diagnosticity represents consumers’ perceptions of their information sources’ capacity to assist them in evaluating the quality of products (Jiang and Benbasat 2005, Kempf and Smith 1998, Mudambi and Schuff 2010). Information sources are a criterion for evaluating the product information. Therefore, in our model, we contend that if consumers receive product information, they first evaluate the information source to help understand the product’s quality and then decide whether to buy it. In addition, product-related risks are important factors that influence how consumers evaluate products and the information sources (Dowling 1999). We believe that online tie strength may interact with product-related risks. Therefore, the objective of this study is to understand how online tie strength, perceived diagnosticity, and product-related risks affect consumers’ intentions to purchase a product. We conducted a field experiment on Facebook, one of the most popular SNSs, to investigate the following three questions. Are the recommendations and information provided by different social ties perceived as having different levels of diagnosticity? Do product-related risks moderate the relationship between online tie strength and perceived diagnosticity? Does perceived diagnosticity have a positive effect on purchase intentions? In addition, the SNSs’ databases can accurately record the interactions among SNS users and thereby create a valuable source of data for social network analysis. In conducting our analysis, we attempt to take advantage of the online interaction data collected from websites as the basis for tie strength. Our work differs from previous studies, which used self-reported data gathered by surveys to measure the strength of social ties (Brown and Reingen 1987, Duhan et al. 1997, Frenzen and Nakamoto 1993, Wen et al. 2009), in that our survey alleviates concerns about the accuracy of the informants’ retrospective reports (Bernard et al. 1984, Marsden 1990).

This paper provides evidence regarding the effect of online tie strength on purchase intentions. Our methodology used data on online interactions to measure the strength of social ties. By using these online interaction data, we took an alternative perspective in defining tie strength, which allows us to first examine the relationships between online tie strength and the behavior variables. Our work also demonstrates that the data collected from websites can be useful to marketing companies. We developed theoretical hypotheses regarding the underlying mechanisms of consumers’ decision-making processes within the context of SNSs. Using empirical evidence, we argue that online tie strength, perceived diagnosticity, and product-related risks play significant roles in the decision-making process. This research is also important from a managerial perspective because it shows that product-related risks can be used as a practical criterion for users attempting to determine from which contacts they should solicit product recommendations.

2. Theoretical background

A social tie is defined as the set of social interactions between two or more individuals. Previous studies have found that social ties are important to individuals’ decision-making processes (Arndt 1967). Social ties can be divided into different types. Granovetter (1973) introduced the concept of tie strength, which refers to the closeness of the relationships among people. 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 each other well. If the tie is defined as a strong tie, then the individuals are friends who know each other well.

Several studies have examined the effects of tie strength on consumer behavior. Brown and Reingen (1987) used retrospective data collected exclusively from successful referrals to analyze WOM-referral behavior. They found that weak and strong social ties played different roles. Consumers generally perceived strong ties to be more influential than weak ties in their decision-making processes. Frenzen and Nakamoto (1993) studied the impacts of consumer decisions to transmit or withhold word-of-mouth information on the flow of information in a market. They demonstrated that consumers are likely to share all types of information with strong-tie contacts.

Duhan et al. (1997) studied the factors that influence the likelihood that a consumer will use recommendations from strong-tie sources and weak-tie sources. The researchers found that consumers rely on both types of sources during the decision-making process. That is, consumers rely on strong-tie sources if the perceived difficulty of the task is high. Conversely, consumers tend to rely on weak-tie sources if the product is more technical. Bruyn and Lilien (2008) observed the reactions of 1100 individuals to receiving an unsolicited e-mail invitation from one of their acquaintances to participate in a survey. The researchers found that, although the characteristics of the social ties influenced the recipients’ behaviors, these ties had different effects at different stages of the decision-making process. For example, tie strength had a positive effect on awareness only during the decision-making process and triggered the recipients’ interest afterward.

Wen et al. (2009) conducted an experiment using SNS pages to investigate the effects of tie strength, endorser expertise, and product type on advertising effectiveness. They found that strong-tie endorsers are more effective than weak-tie endorsers at recommending products with primarily hedonic value, regardless of the strong-tie contacts’ expertise in the endorsed products. However, for products with primarily utilitarian value, the high-expertise endorsers had a stronger positive effect on the consumers’ purchase intentions than the other endorsers, regardless of the tie strength.

There is ample evidence that tie strength influences consumer behavior. Strong ties and weak ties have different effects on consumers’ decision-making processes in different situations. However, because SNS-oriented marketing is a relatively new phenomenon, few of these studies have investigated SNSs. Although scholars such as Wen et al. (2009) have recently shown greater interest in studying SNSs, their studies have not examined the relationship between SNSs and consumers’ decision-making processes in detail. For example, Wen et al. (2009) did not examine how the consumers’ decision-making processes involve their cognitive systems in processing product information and evaluating its sources. Additionally, the study did not consider the effect of product-related risks, which are important factors that influence consumers’ decision making (Dowling 1999).

Prior research has seldom used empirical data sources to assess online social relationships. The data sources used to measure the strength of social ties were essentially self-reported surveys. In Table 1, we summarize previous studies with regard to the sources of data on social ties. We believe that empirical data on online social relationships are particularly important to understanding the processes underlying e-WOM. We measured tie strength with online data, including friend lists and rich interaction histories. One
characteristic of our study is the use of online interaction data as the basis of measuring tie strength. Our methods of examining social ties on SNSs can help address some of the limitations of previous research by utilizing readily available data to track online interactions. In this way, our work also alleviates concerns about the accuracy of the informants’ retrospective reports (Bernard et al. 1984, Marsden 1990).

3. Research model and hypotheses

In the information processing model, consumers' decision-making processes involve cognitive behavior (Bettman 1979, Hoyer and MacInnis 2004). Consumers are no longer passive learners who produce stimulus response reactions. Instead, the model focuses on how inputs from the decision environment are processed through consumers' cognitive systems and how they lead to final response. These processes are similar to the S–O–R model. The S–O–R model posits that environmental and informational cues act as stimuli that affect an individual's cognitive and affective reactions, which, in turn, affect behavioral intentions (Mehrabian and Russell 1975). Stimuli (S) may appear in different formats (Jacoby 2002). Past works have said that website features are important stimuli for the online purchase process (Eroglu et al. 2003, Jiang et al. 2010, Koufaris 2002, Parboteeah et al. 2009). The organism (O) refers to an individual's cognitive systems, including the cognitive network and schema. The response (R) represents the psychological reactions such as attitudinal and behavioral reactions.

Based on the concepts discussed above, we proposed the theoretical framework, which we called the information–cognition–intention model. Information is shown as an input for consumers. Product information recommended by friends is a constituent of the initial information input. The behavioral intentions are consequently generated. Following the information–cognition–intention routes, we hypothesize that after consumers receive product information, they first use this information to understand and evaluate the quality and characteristics of the products. Afterward, depending on their evaluations, the consumers develop different levels of purchase intentions.

More specifically, we operationalize the “information” as product information recommended by different social ties and product-related risks, the “cognition” as perceived diagnosticity, and the “intention” as the purchase intentions of consumers (Fig. 1).

3.1. Tie strength and perceived diagnosticity

Measuring perceived diagnosticity is a particularly important objective of the present study because helping consumers evaluate products is an important goal that affects the purchasing process for marketers. Perceived diagnosticity is defined as the extent to which consumers consider particular aspects of their shopping experiences to be helpful in evaluating products (Kempf and Smith 1998). Jiang and Benbasat (2005) extended this concept by showing that perceived diagnosticity can describe the perceived ability of a Web interface to convey product information that helps customers evaluate the quality and performance of products. Mudambi and Schuff (2010) applied the concept to the context of online product reviews and found that depending on the type of product, the characteristics of product reviews, review rating, and review length have different effects on their perceived diagnosticity. However, Mudambi and Schuff (2010) did not study other characteristics of the reviews, such as product information sources. Source credibility theory suggests that people are more likely to be persuaded if the source is considered to be credible (Hovland et al. 1953, Ohanian 1990). According to this theory, information sources seem to be a criterion for evaluating the truthfulness of the information. We argue that different information sources could have different effects on perceived diagnosticity.

Rogers (1995) argues that strong-tie sources are perceived as more credible and trustworthy than weak-tie sources. In other words, the information derived from strong-tie sources carries less risk. Social exchange theory has shown that strong-tie sources are likely to transmit information of higher economic value than weak-tie sources (Frenzen and Nakamoto 1993, Sahlins 1972). Information is more likely to be considered useful if it comes from close sources, whereas the information from acquaintances is more likely to be seen as less valuable or more suspicious. Consumers can more easily evaluate products if the information about these products is provided by strong-tie sources because consumers trust these sources and the value of the information provided by these sources. In other words, consumers believe that a strong-tie source can help them evaluate the quality and performances.
of products. Based on these arguments, we hypothesize that perceived diagnosticity is higher for the recommendations and information provided by strong-tie sources.

**Hypothesis 1.** The recommendations and information provided by strong-tie sources will have a higher level of perceived diagnosticity.

### 3.2. Product-related risks

The more that consumers have to pay for a product, the higher the perceived risk of purchasing the product will be (Bettman 1973, Dowling 1999). Therefore, choosing a helpful source is an important concern for customers. Consumers collect and consider more information about the sources’ trustworthiness if the product risks are relatively high. Previous studies have noted that the distinction between high-risk products and low-risk products causes consumers to utilize different psychological processes while evaluating a product (Dowling and Staelin 1994, Payne et al. 1993). Because the evaluation process for high-risk products tends to be more careful, consumers focus on their sources’ trustworthiness in these situations. In contrast, consumers are less likely to carefully evaluate low-risk products. In these cases, consumers pay less attention to the trustworthiness of their sources. This finding suggests that the impact of tie strength on perceived diagnosticity is likely to differ across product risk levels (i.e., source and product risks interact with one another). If a product’s risks are high, then the information provided by strong-tie sources has higher perceived diagnosticity than that provided by weak-tie sources. If a product’s risks are low, then the information provided by strong-tie and weak-tie sources do not have significantly different diagnosticity.

**Hypothesis 2.** Product-related risks moderate the relationship between online tie strength and perceived diagnosticity.

### 3.3. Perceived diagnosticity and purchase intentions

From the businesses’ point of view, the ultimate goal of marketing is persuasion (Braun-Latour and Zaltman 2006). Both marketers and academic researchers believe that purchase intentions provide valuable insights into the effectiveness of marketing. Therefore, we chose purchase intentions as the dependent variable, which we used to measure the effectiveness of recommendations derived through SNSs. Previous studies have shown that perceived diagnosticity can alleviate information asymmetry through the signals and incentives, prevent customers to purchase low-quality products (Pavlou et al. 2007), and strengthen customers’ confidence in their purchase decisions (Kempf and Smith 1998). If customers feel that the product information is diagnostic, they are certain about estimating product quality, and more confident about their purchase decisions (Kempf and Smith 1998). Higher perceived diagnosticity, which enables consumers to understand the product more thoroughly, improves customers’ cognitive evaluations of the product. We suggest that if the product information is positive and diagnostic, customers will be convinced that the quality of the product is high, and then their purchase intentions will likely be more positive. Therefore, for positive product information, these improved evaluations lead them to develop higher levels of purchase intentions. If the product information is negative and diagnostic, customers will be convinced that the quality of the product is low, and then their purchase intentions will likely be reduced. The purpose of this study is to create new marketing opportunities based on the social networking phenomenon. We only consider the effects of positive recommendations.

**Hypothesis 3.** For positive recommendations, higher perceived diagnosticity will lead to higher purchase intentions.

### 4. Research method

This study investigates the effects of online tie strength, perceived diagnosticity, and product-related risks on consumers’ purchase intentions. We conducted a field experiment on Facebook to test our hypotheses. Founded in 2004, Facebook has become the most popular SNS. Facebook held an initial public offering (IPO) on May 17, 2012. There are now more than a billion monthly active users worldwide and more than half of whom use Facebook on a mobile device. Facebook features an application platform that allows developers to implement applications and integrate them into the site. The popularity of these Facebook applications allowed us to pursue our research in a realistic setting. We used a Facebook application as the platform for this study. This Facebook application offered several advantages. We could quickly and accurately access information about the interactions among users on Facebook. In addition, we were able to recruit a relatively large sample population in a short period of time.

We used a $2 \times 2$ between-subjects design to investigate the effects of strong vs. weak ties and high vs. low risks. Table 2 shows that there were four possible combinations: strong tie and high risks, strong tie and low risks, weak tie and high risks, and weak tie and low risks.

#### 4.1. Online tie strength

One critical aspect of our study was the procedure we used to quantify the strength of the social ties between the individuals who participated in our experiment and their friends. Previous studies have measured tie strength by using many different metrics. Sometimes the measures have included recency of contact (Lin et al. 1978). Other scholars have used frequency of interactions as a surrogate for tie strength (Gilbert et al. 2008, Granovetter 1973). In the present research, we defined tie strength as the frequency of interactions among contacts on SNSs. We used a measure that we called “interaction frequency”, which we defined as the number of wall posts exchanged between two people. Our Facebook application allowed us to access these data, which we used to estimate the strength of the social ties between each pair of friends. We defined strong-tie friends as the three people with whom a participant had interacted most frequently during the past three months and weak-tie friends as the three people with whom the participant had interacted least during the same period. Because of system limitations, we were only able to retrieve Facebook’s interaction data from the three months prior to the experiment.

#### 4.2. Products described in the experiment

We chose snacks as the product analyzed in our experiment because the use of snacks reduces the need to measure the expertise level of the information source. In addition, information about snacks is often found on Facebook, and most people are potential

<table>
<thead>
<tr>
<th>Table 2</th>
<th>The four experimental treatments.</th>
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<tbody>
<tr>
<td><strong>Online tie strength</strong></td>
<td><strong>Product-related risks</strong></td>
</tr>
<tr>
<td><strong>High risks</strong></td>
<td><strong>Low risks</strong></td>
</tr>
<tr>
<td>Strong tie</td>
<td>Treatment 1</td>
</tr>
<tr>
<td>Weak tie</td>
<td>Treatment 3</td>
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</table>
consumers of snacks. Our study examined snack products at different price levels (i.e., low-priced and high-priced products). Several studies have shown that product price influences consumer behavior. For example, customers tend to search for more information if the price of a product is relatively high (Beatty and Smith 1987). Because product price is a stimulus for customer thinking, high-priced products lead customers to think harder about their purchase intentions (Wathieu and Bertini 2007). Product price is related to perceived risk, to the customers’ perceptions of the probability of an uncertain outcome and the potentially adverse consequences of purchasing a product (Dowling and Staelin 1994). Higher value products are perceived as riskier than products that have fewer such characteristics. We operationalize low-priced products as less risky products and high-priced products as risky products.

We asked some people who did not participate in the main experiment to evaluate the snack products. Based on the results, we selected three existing snack products for each price group. The low-priced snacks ranged from US $2 to $4, and the high-priced snacks ranged from US $30 to $50. Within each group, we chose products that were similar in popularity and flavor and that used similar recommendation words to eliminate possible confounding effects. Each recommendation post contained a message from the friend, a photo of the product, the price, and the product’s description. The recommendation messages were all positive.

4.3. Experimental design

We asked the subjects in each group to imagine a scenario in which a friend invited them to a party and asked them to bring some snacks. While they were pondering which snacks to buy, they noticed that their Facebook wall posts contained relevant information. We used two types of information to construct the wall posts. First, we replicated the 10 most recent posts on the subject’s actual Facebook wall on the day before he or she participated in the experiment. Second, we added three posts containing product recommendations (e.g., the snack is delicious.). The contents of the three recommendations were quite similar for all of the subject groups. The differences lay in the type of contact who had supposedly posted the recommendation and in the price of the product. For example, for the strong-tie and high-risk group, strong-tie friends recommended products with high prices (see Fig. 2).

4.4. Questionnaire items

We measured two key constructs by using questionnaire items with responses on a seven-point Likert scale ranging from “strongly disagree” to “strongly agree”. To measure the perceived diagnosticity, we adopted the questionnaire items developed by Kempf and Smith (1998) and Jiang and Benbasat (2005, 2007) and modified these items to fit the context of our study. In addition, the questionnaire items from Coyle and Thorson (2001) were adopted to measure the participants’ purchase intentions. These questions focused mainly on the subjects’ willingness to purchase, the likelihood of purchasing, and their interest in purchasing the product. The questionnaire items are listed in full in Appendix A.

4.5. Pilot test

We conducted a pilot test with 120 participants to check for 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 thought the experimental procedure had been successfully performed. Their major suggestions and recommended adjustments involved the phrasing of the questions and the design of the Facebook application.

4.6. Participants and procedures

We advertised the Facebook application by using Facebook’s application–distribution mechanism, which introduced random exogenous variation through the participants. We awarded prizes to the respondents as an incentive for completing the experiment. Each Facebook user who chose to participate 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 showed them a customized wall post. Finally, we asked the subjects to complete a questionnaire.

5. Data analysis and results

We conducted a field experiment by inviting randomly selected users on Facebook to participate in a Facebook application created for this experiment. We recruited the 420 subjects by using Facebook. Among the subjects, 216 (51.4%) were female, and 204 (48.6%) were male. Most of the participants (78.5%) were between 21 and 30 years old. Most had been using Facebook for more than a year (74.5%), and a majority (68.1%) checked their Facebook wall messages at least once a day.

5.1. Manipulation checks

To assess our operational definitions of online tie strength and product-related risks, we asked the following two questions in the questionnaire: “Do you think you interact often on Facebook with the friends who provided recommendations?” and “Do you think the price you saw for the snack product is high?” The subjects’ answers were similar to our operational definitions. Table 3 shows the levels of agreement. Our manipulation of online tie strength and product-related risks appears to have been successful.

5.2. Validity of the measurement instrument

We conducted a factor analysis and varimax rotation for the eight items in the two constructs. We performed a Kasier–Meyer–Olkin (KMO) test to determine whether the data were suitable for factor analysis. A KMO value higher than 0.5 is generally considered sufficient (Hinton et al. 2004). The KMO value for the combined construct was 0.88. The factor loading scores for all of the questionnaire items were above 0.6, which indicates that the constructs were valid (Hair et al. 1998).

We adopted a Cronbach’s α coefficient between 0.70 and 0.90 as our criterion for internal consistency (Nunnally et al. 1967). The Cronbach’s α values for both of the constructs were more than 0.8 (i.e., Purchase intentions: 0.870 and Perceived diagnosticity: 0.914), which indicates that each item was related to its respective construct.

5.3. Hypothesis testing

We performed a univariate analysis by using ANOVA to determine the effects of online tie strength and product-related risks on the perceived diagnosticity. The results are shown in Table 4. We found that online tie strength had a significant effect ($F = 6.856, p < 0.01$). We then conducted a t-test to compare the levels of perceived diagnosticity of information from strong- and weak-tie sources. We found that strong ties result in higher levels.
of perceived diagnosticity (M\text{strong} = 5.22 vs. M\text{weak} = 4.96, p < 0.05). This finding confirms hypothesis H1.

In addition, the interaction between online tie strength and product-related risks had a significant effect (F = 4.677, p < 0.05). Table 5 shows the mean and standard deviation for perceived diagnosticity, and Fig. 3 is a graphical representation of the results regarding online tie strength and product-related risks. When the product’s risk was high, the level of perceived diagnosticity was higher when the product was recommended by a strong-tie source than when the product was recommended by a weak-tie source (M\text{strong} = 5.31 vs. M\text{weak} = 4.84, p < 0.01). In contrast, when the product’s risk was low, the difference between the strong-tie and weak-tie recommendations was not significant (M\text{strong} = 5.13 vs. M\text{weak} = 5.09, p = 0.746). This finding supports hypothesis H2.

We analyzed the effects of online tie strength and perceived diagnosticity on purchase intentions by using a regression analysis to test H3. Table 6 summarizes the results, which show that perceived diagnosticity was positively correlated with purchase intentions (β = 0.596, p < 0.01), fully mediated the relationship between online tie strength and purchase intentions, and explained 36.3% of the variance in purchase intentions. This finding supports hypothesis H3.

6. Discussion and conclusions

SNSs can provide a marketing opportunity. Using the information processing theory of consumer behavior, we conducted an experiment on Facebook to investigate the effects of online tie strength, perceived diagnosticity, and product-related risks on consumers’ purchase intentions. Our hypotheses were supported by three experimental results. First, online tie strength is an important factor in consumer decision making. Consumers tend
to perceive the diagnosticity of product information and recommendations to be higher if this information is provided by strong-tie sources. Consumers believe that a strong-tie source can help them understand and evaluate the quality and performances of products. This finding is consistent with those of previous studies. For example, Brown and Reingen (1987) and Rogers (1995) found that strong ties were more influential than weak ties.

In contrast with previous studies, we used the frequency of interactions between pairs of people on Facebook to measure the strength of their social ties, whereas previous studies have mostly used self-reports collected through surveys (Brown and Reingen 1987, Duhan et al. 1997, Frenzen and Nakamoto 1993, Wen et al. 2009). We did so because, although a subject may, for example, answer “Father” in response to a question about strong ties on a self-administered survey, he or she may not have a strong online tie with his or her father. We used the frequency of interactions among friends as an objective measure of tie strength because doing so allowed us to obtain objective online data. Examining online social relationships through SNSs can help address some of the limitations in previous studies by utilizing readily available data to track online interactions. This study provides empirical evidence suggesting that online social relationship data are important and provide an effective means of analyzing consumer behavior. Additionally, the evidence indicates that theories about the impact of social relationships on traditional WOM communication may be applicable to SNSs.

Second, we found that product-related risks moderate the relationship between online tie strength and perceived diagnosticity. A moderation effect is often sought if a causal relationship between an independent variable and a dependent variable is weak or not found empirically (Baron and Kenny 1986, Bennett 2000, Chaplin 1991, Frazier et al. 2004). Results in Table 4 show that the main effect of product-related risks was not significant ($F = 0.136$, $p = 0.713$), and the interaction term was significant ($F = 4.677$, $p < 0.05$). Such results reinforce our argument regarding moderation effect of product-related risks. Therefore, product-related risks should be considered for studies examining the effects of social relationships on consumer behavior. Product-related risks affect how consumers search for and evaluate information. Overall, although a strong tie is considered as more effective than a weak tie, product-related risks matter. If a product’s risk is high, then the information and recommendations provided by strong-tie sources have a more significant effect than the information and recommendations provided by weak-tie sources. However, we did not find this effect when the consumers considered low-risk products. As we expected, when the consumers evaluated products in different risk ranges, they underwent different psychological processes (Dowling and Staelin 1994, Payne et al. 1993). Extant researches suggested that as risk increases, consumers search for more and more information such as word of mouth, advertising, and interpersonal sources to reduce the degree of uncertainty (Dowling and Staelin 1994, Garner 1986, Geminaden 1985). Thus, in a high-risk situation, consumers will be more prone to carefully analyze all the information and, as a result, sources’ trustworthiness may help overcome these fears and form a more confident opinion about products (Zhang and Li 2006). In turn, when risk is low, consumers will be less influenced by sources since they do not need these reinforcements to overcome worry about the possibility of non-desired outcomes (Lian and Lin 2008). This result sheds new light on previous research on tie strength (Wen et al. 2009) because previous studies did not consider the effect of product risks. The present study shows that product risks moderate the effect of online tie strength on perceived diagnosticity.

Third, the mediators of perceived diagnosticity appeared to be powerful elements in explaining purchase intentions based on recommendation sources. Recommendation sources can influence perceived diagnosticity by determining whether a consumer will purchase a product. If consumers perceive the diagnosticity of the positive information that they have about a product to be high, then their purchase intentions are high. Previous studies have shown that perceived diagnosticity influences consumer attitudes, which then lead to purchase intentions (Jiang and Benbasat 2007). In this study, we did not consider the attitudinal variables and focused on the direct impact of perceived diagnosticity on purchase intentions. Indeed, we found that perceived diagnosticity directly influences purchase intentions. This result supports Fang’s (2012) findings, which found that perceived diagnosticity directly influences consumers’ transaction intention with a specific seller from a website.

Table 3
Results of the manipulation checks.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Types</th>
<th>Percent agreement</th>
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<tbody>
<tr>
<td>Online tie strength</td>
<td>Strong</td>
<td>87.3%</td>
</tr>
<tr>
<td></td>
<td>Weak</td>
<td>76.0%</td>
</tr>
<tr>
<td>Product-related risks</td>
<td>High</td>
<td>78.9%</td>
</tr>
<tr>
<td></td>
<td>Low</td>
<td>73.9%</td>
</tr>
</tbody>
</table>

Table 4
ANOVA test results for perceived diagnosticity.

<table>
<thead>
<tr>
<th>Source</th>
<th>$F$</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Online tie strength</td>
<td>6.856</td>
<td>.009*</td>
</tr>
<tr>
<td>Product-related risks</td>
<td>.136</td>
<td>.713</td>
</tr>
<tr>
<td>Online tie strength × Product-related risks</td>
<td>4.677</td>
<td>.031*</td>
</tr>
</tbody>
</table>

* $p < 0.05$.
* $p < 0.01$.

Table 5
Descriptive statistics for perceived diagnosticity.

<table>
<thead>
<tr>
<th>Mean (N, SD)</th>
<th>Online tie strength</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Strong (87.3%)</td>
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<tr>
<td></td>
<td>Weak (76.0%)</td>
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<tr>
<td>Product-related risks</td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>5.31 (107, 0.86)</td>
</tr>
<tr>
<td></td>
<td>4.84 (102, 1.17)</td>
</tr>
<tr>
<td>Low</td>
<td>5.13 (105, 1.05)</td>
</tr>
<tr>
<td></td>
<td>5.09 (106, 0.98)</td>
</tr>
</tbody>
</table>

Fig. 3. The interaction between online tie strength and product-related risks.
This study found that social connections on SNSs can influence role that social ties play in consumers' decision-making processes. We build on Wen et al.'s (2009) study on the effects of tie strength, endorsement expertise, and product type on purchase intentions. The results of their study showed that depending on the type of product being considered, tie strength and endorsement expertise have varying effects on purchase intentions. However, their study did not investigate the psychological dimensions of consumers' information processing behaviors. In contrast, we examined the mediating effects of perceived diagnosticity on the consumer decision-making process. The resulting model is more descriptive than previous models because we consider how a consumer's decision-making process involves his or her cognitive system while he or she processes information about the products and sources of product information (Bettman 1979, Hoyer and MacInnis 2004).

In addition, the results also contribute to the perceived diagnosticity literature. We used the concept of perceived diagnosticity, which represents the extent to which consumers consider particular shopping experiences as helpful for evaluating products (Kempf and Smith 1998). This concept was extended from the concept of Jiang and Benbasat (2005). They noted that perceived diagnosticity reflects the perceived ability of a Web interface to convey product information to customers that helps them understand and evaluate the quality and performance of products. Because Mudambi and Schuff (2010) found that the characteristics of the review have different effects on the information diagnosticity of that review, they link the concept of information diagnosticity to online reviews. Previous studies have only applied the concept of perceived diagnosticity to the information derived from sellers' Web interfaces and online reviews (Jiang and Benbasat 2005, Mudambi and Schuff 2010). Our findings extend the literature (Jiang and Benbasat 2005, Kempf and Smith 1998, Mudambi and Schuff 2010) on information diagnosticity by applying the concepts to recommendations and information provided by SNS contacts that differ from the information examined by existing studies.

### 6.1. Contributions

#### 6.1.1. Theoretical Implications

In this study, we developed a model for investigating the mechanisms underlying consumer decision making in the context of Facebook. We provide empirical evidence showing that online tie strength, perceived diagnosticity, and product risks play significant roles in the decision to accept recommendations. Past studies have examined the effects of tie strength on consumer decision making. We build on Wen et al.'s (2009) study on the effects of tie strength, endorsement expertise, and product type on purchase intentions. The results of their study showed that depending on the type of product being considered, tie strength and endorsement expertise have varying effects on purchase intentions. However, their study did not investigate the psychological dimensions of consumers' information processing behaviors. In contrast, we examined the mediating effects of perceived diagnosticity on the consumer decision-making process. The resulting model is more descriptive than previous models because we consider how a consumer's decision-making process involves his or her cognitive system while he or she processes information about the products and sources of product information (Bettman 1979, Hoyer and MacInnis 2004).

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#### 6.1.2. Managerial Implications

Our findings will increase the companies' understanding of the role that social ties play in consumers' decision-making processes. This study found that social connections on SNSs can influence consumer purchasing decisions. Social ties help increase the perceived diagnosticity of information. The results of this study can be used to develop guidelines for creating more effective marketing strategies.

For marketing companies, our results imply that a message from a strong-tie friend has a powerful influence on consumer decision making. Companies can choose appropriate users to recommend a specific product to their friends. In doing so, it is hoped that these users enhance their friends' purchase intentions. For example, companies can give their new product to the target consumers' strong-tie friends and require them to recommend the product to their friends. In this way, the company can help consumers to evaluate the product and create interest among potential users. In many cases, offering free products to the right group of people may be less expensive than traditional advertising. Our results also suggest that marketers should consider different strategies, depending on whether a product's risks are high or low. For high-risk products, companies should invite individuals who have strong ties with the targeted consumers to recommend the companies' products to these consumers. For low-risk products, social relationships have less influence on consumer purchasing decisions. The recommendations from a weak-tie friend are just as influential as from a strong-tie friend. Furthermore, we found that for low-risk products, perceived diagnosticity of the information from both strong-tie and weak-tie friends is high (mean > 5). According to such results, it would seem that SNSs are the excellent platforms to promote low-risk products because the majority of SNSs' friends are weak-tie friends rather than strong-tie friends. Marketers can use SNS platforms to promote low-risk products.

For SNSs, our results show that social information is valuable data. Social information is important and provides an effective way to analyze consumer behavior. Using such information, companies can make highly targeted, relevant, and social marketing strategies. We suggest that SNSs can gather data on social relationships, such as friend lists and interaction histories, to create social information-based products. Besides, SNSs can also position themselves as a platform for social commerce, allowing it to facilitate social buying on a level never before seen. This could generate money for the company while making the buying process easier for consumers and sellers. Facebook opened its IPO in May, 2012. However, the earnings of Facebook are not as expected so the stock price quickly fell. Analysts worried that too many users are accessing Facebook on mobile devices now, resulting in lower growth rates for ad revenues as well as reduced operating profits. There are a lot of questions about the efficacy and future of Facebook's ad-dominant revenue model. Facebook should monetize through another business model apart from advertising. According to our results, Facebook has plenty of revenue options beyond advertising. Facebook has access to more information about consumers' demographics, interests, and social networks than any other companies. It could create the social commerce platform and sell data analytics products. It is a challenge and an opportunity as well for Facebook in identifying effective ways to generate more revenue streams. In addition, as people are increasingly daunted by the sheer amount of data available on the Facebook, the term “Facebook fatigue” is being mentioned. SNSs should continue to address the issue of information overload that some people sometimes experience. According to our findings, recommendation information issued from a strong-tie friend carries more weight than from a weak-tie friend. We suggest that SNSs should create a

### Table 6

Regression and mediation analysis for purchase intentions.

<table>
<thead>
<tr>
<th>IV on DV</th>
<th>IV on mediators</th>
<th>IV on DV with proposed mediators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purchase intention = a * b Online tie strength</td>
<td>Perceived diagnosticity = a * b Online tie strength</td>
<td>Purchase intention = a * b&lt;sub&gt;1&lt;/sub&gt; Online tie strength + b&lt;sub&gt;2&lt;/sub&gt; Perceived diagnosticity</td>
</tr>
<tr>
<td>Beta</td>
<td>Beta</td>
<td>Beta</td>
</tr>
<tr>
<td>.125&lt;sup&gt;**&lt;/sup&gt;</td>
<td>.126&lt;sup&gt;**&lt;/sup&gt;</td>
<td>.050</td>
</tr>
<tr>
<td></td>
<td></td>
<td>.596&lt;sup&gt;**&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

Note: IV = Independent Variable; DV = Dependent Variable.

*<sup>p < 0.05</sup>  
**<sup>p < 0.01</sup>
mechanism to help consumers filter the usefulness of information and to identify interesting messages from their social circles. Because thousands of messages appear on users' review pages, most of the messages may be ignored. By using social tie data and filter mechanisms, consumers can find the interesting messages quickly, and companies can easily find their target customers.

6.1.3. Methodological implications

Prior research has more often used self-reported surveys instead of real interaction data to measure the strength of social ties (Brown and Reingen 1987, Duhan et al. 1997, Frenzen and Nakamoto 1993, Wen et al. 2009). This study provides a new approach to measuring online tie strength by collecting users’ interaction data from SNSs. SNSs allow companies to easily identify target customers and gather large quantities of information about these consumers (e.g., sex, education level, and age). This method provides new research opportunities (Lewis et al. 2008), allows us to bypass the problem of accuracy that emerges while using retrospective information provided by informants (Bernard et al. 1984, Marsden 1990), and demonstrates that data collected through websites can be useful to marketing companies. In addition, because we pursued our study in a realistic Facebook environment, we were better able to gauge the consumers’ actual reactions and opinions.

6.2. Limitations and future research

This study was somewhat limited by its experimental design. The mental processes involved in assessing information diagnosticity are part of an overall experience. Consumer decision-making may be affected by various factors, such as prior experience, prior attitudes, product preferences, new product information and evaluations of the sources of this information. Future studies should consider the effects of individual characteristics, such as product preferences, product knowledge, and personal involvement. This study demonstrates that perceived diagnosticity has a direct effect on purchase intentions. Future research is encouraged to investigate other possible mediators such as attitudes toward products that may enhance the association between perceived diagnosticity and purchase intention.

Additionally, this study did not examine the effects of negative recommendations and information. Studying the effects of negative recommendations and information would likely provide additional insights. For example, previous studies have shown that positive and negative information exerts distinct effects on consumers’ behaviors (Charlett et al. 1995, Dellarocas 2003). More studies are needed to explore the effect of different recommendations on decision-making processes within the context of SNSs. In addition, we only examine the financial risks for product-related risks. We did not examine the effects on other types of risks, such as psychological risks, social risks, performance risks, and physical risks (Hirunyawipada and Paswan 2006, Jacoby et al. 1974). Future studies could choose different product-related risks to confirm that the results hold.

Finally, we did not distinguish whether the impacts of recommendation on purchase intentions are derived from influence (friends induce to purchase) or homophily (friends have similar backgrounds and tastes). This study focused on the effect of the entirety of the information, including friends’ influence, recommendations, and homophily. Some studies have developed a dynamic matched sample estimation framework to identify peer effects by further distinguishing influence and homophily effects in dynamic networks (Aral et al. 2009). There are important implications for distinguishing influence and homophily. Companies need to develop different marketing strategies in responding to either situation. For example, if consumers purchase a product due to influence, companies might adopt friend to friend methods. If consumers purchase a product due to homophily, companies would just segment the market based on observable preferences. Future studies could emphasize in distinguishing the effect of influence and homophily on purchase intentions.

Appendix A. Questionnaire items in constructs

<table>
<thead>
<tr>
<th>Construct</th>
<th>Sources</th>
<th>Measurement items</th>
</tr>
</thead>
</table>
| Perceived diagnosticity       | Kempf and Smith (1998) and Jiang and Benbasat (2005, 2007) | • The recommendations helped me evaluate the products.  
• The recommendations helped me judge the quality of the products.  
• The recommendations helped me assess the performances of the products.  
• It is likely that I will buy the recommended products.  
• I will purchase the recommended products the next time I need snacks.  
• If a friend called me to get my advice about which snacks to buy, I would advise them to buy the recommended products.  
• I will definitely buy the recommended products.  
• I have strong intentions to purchase the recommended products. |
| Purchase intentions           | Coyle and Thorson (2001)      |                                                                                  |

References


