Information adoption from online review sites for decision making

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1. Introduction

With the advancement of Web 2.0, virtual communities have emerged in which individuals are able to express their views and influence others. Consumers can now exchange their views on products/services in online communities such as group buying sites, discussion forums, social networking sites, and online review sites (Trusov, Bucklin & Pauwels, 2009; Zhang et al., 2014). A recent survey by Brightlocal suggested that online reviews can have a powerful influence on consumers. The survey showed that 92% of consumers read online reviews and that 40% of consumers form an opinion by reading just one to three reviews. As a result, online reviews are becoming an increasingly important source of information for consumers and can enhance the effectiveness of their purchase decisions.

The information systems (IS) literature primarily focuses on the persuasiveness of the information in online review sites (Ho & Bodoff, 2014; Shu & Scott, 2014; Zhu, Chang, & Luo, 2015). According to the elaboration likelihood model (ELM), there are two information processing routes; the central route, which suggests that individuals

use considerable cognitive effort to interpret information, and the peripheral route, which indicates that individuals adopt heuristic and simple decision rules when making judgments (Petty & Cacioppo, 1986; Tam & Ho, 2005). The persuasiveness of the information contained in a review stems from the argument and the reviewer's credibility. Sussman and Siegal (2003) suggested two determinants of information adoption: the quality of the argument as a central influence, and the source credibility as a peripheral cue. They emphasized the effects that the source credibility and argument quality of reviews have on the perceived usefulness of a review, and hence the level of information adoption.

Few IS studies have investigated information adoption for decision making from a reader's perspective. In a seminal study on how purchase decisions are influenced by the perceived social pressure of consumers on group-buying sites, Kuan, Zhong and Chau (2014) found that informational social influence and normative social influence are closely associated with consumers' purchase decisions. In this study, we attempt to extend our knowledge of the effect of the reader's perceived social pressure on information adoption for decision-making. Social influence refers to the social pressure that leads to changes in an individual's thoughts, feelings, attitudes, and/or behavior (Rashotte, 2007). Deutsch and Gerrard (1955) proposed social influence theory (SIT) to distinguish two types of social influence, informational and normative. Informational influence refers to the extent to which people accept the information obtained from another as evidence of reality. In contrast, normative influence is defined as the degree to which the desire to conform to the perceived expectations of the self, another person, or the group influence individual decision-making. Both forms of social influence lead to conformity, which involves a change in attitudes, beliefs, and behavior due to the real or imagined influence of others (Kuan, Zhong, & Chau, 2014; Tsai & Bagozzi, 2014; Aronson, Wilson and Akert, 2010; Hogg and Vaughan, 2005).

Moreover, it remains unclear whether perceived social pressure interacts with the source credibility and argument quality of the reviews in influencing information adoption for decision-making. We further suggest that there is a fit between reviewer and reader with respect to information adoption. The concept of fit emphasizes the importance of the overlap between an individual and the environment (French & Cobb, 1974). Moreover, fit may exist according to the extent to which the person matches the environment (Hardin et al., 2014). According to the routes of elaborating information suggested in the ELM, individuals process information based on the source credibility and argument quality of the reviewer's persuasive message. We believe that information adoption requires matching the reviewer's persuasive message with the reader's perceived social pressure. In other words, the reader's information adoption is reinforced by his or her perceived social pressure. In this regard, we explore the central and peripheral routes of information adoption and investigate the moderating effects of social influence on the two information processing routes.

Accordingly, we address three research questions in this study. 1) What factors underlie the information adoption in virtual communities? 2) How does information fit with decision making from the perspective of the reviewer and reader? 3) To what extent do online review sites influence individuals' decision choices?

Overall, our study makes five contributions to the literature. First, following Sussman and Siegal's (2003) initial exploration of information adoption, scholars have focused on elaborating how information adoption can enhance knowledge acquisition. We contribute to the decision-making literature by examining information adoption for decision making. This phenomenon is related to the increasing use of online review sites for collecting information.

Second, we contribute to the ELM literature by examining the ELM in terms of the extent of the information adopted for decision making on online review sites. A

number of recent studies have used the ELM to predict workplace aggression, television message adoption, and sexual orientation (Douglas et al., 2008; Flynn et al., 2011; Nussbaum, 2006). We elaborate the mechanism by which participating in online review sites influences the information adoption process.

Third, we contribute to the SIT literature. To the best of our knowledge, few studies (Kuan, Zhong, & Chau, 2014) have investigated the effects of informational and normative social influence on the information adoption for decision making. Therefore, this study attempts to fill this gap by postulating two types of social influence as the underlying factors that can affect consumers' purchase decisions, especially the readers of online review sites.

Fourth, we contribute to the literature on the person-environment fit. French and Cobb (1974) first proposed the concept of person-environment fit in their book on coping and adaptation. Since then, a number of models of person-organization fit and person-job fit have been studied. Furthermore, some studies have examined the person-person fit, such as person-supervisor, in an organization (Kristof-Brown, Zimmerman, & Johnson, 2005). Person-supervisor fit specifies the dyadic relationships between individuals and others in the work environment, which are important for work outcomes. In a similar vein, we suggest that there is a reader-reviewer fit with respect to the adoption of information posted on online review sites. By examining the source credibility and argument quality of the reviewer, and hence the fit with the type of social influence that is perceived by the reader, we can explore the idea of reader-reviewer fit. In this study, we specify the moderating effect of social influence on the level of information adoption.

Fifth, with respect to the business environment, we collect our data from the users of OpenRice, which is an online review site for restaurants in Hong Kong. Our findings are important in that they reflect the consumer behavior in selecting a restaurant and

the trend of collecting information from social media in the decision making process. This can help marketing managers to better understand how OpenRice influences Hong Kong people in selecting restaurants and to adjust their marketing strategy accordingly.

2. Theoretical background

Some online platforms such as discussion forums and online review sites allow people to exchange information. Calisir (2003) showed that online communities have a greater influence on individuals' purchase decisions than traditional media such as magazines and televisions. These consumers believe that it is worth searching for information in online communities when making a purchase decision. Appendix A summarises the related studies on the ELM and SIT.

2.1. Elaboration Likelihood Model

In the IS literature, the ELM has been widely applied in the fields of social science and marketing to explain information processing (Chaiken, 1980; Petty & Cacioppo, 1986; Rosen, 2000; Jones et al., 2006; Bhattacherjee and Sanford, 2006; Zhou, 2012; Ho & Bodoff, 2014; Shu &Scott, 2014; Zhu, Chang, & Luo, 2015). The ELM suggests two routes of information processing: the central route and the peripheral route. The central route involves the cognitive comprehension of a message, while the peripheral route depends on simple cues that are readily attainable from a source (Petty & Cacioppo, 1986). Shu and Scott (2014) used the ELM to explore the influence of social media on choosing overseas study destinations, and their results suggest that online reviews can increase the processing of information and generate corresponding beliefs about a study destination. Rosen (2000) used source expertise and argument quality as factors to study individual information processing. Moreover, in a study on information

system acceptance, Bhattacherjee and Sanford (2006) confirmed that people who process information via the central route are more likely to rely on higher quality arguments. These arguments enable consumers to clarify the potential benefits or drawbacks of accepting the information system. In contrast, people who adopt peripheral route information processing are more likely to be persuaded by the credibility of the source. Zhou (2012) used the ELM to examine users' initial trust in mobile banking, and found that initial trust depends on the route used, as suggested by the ELM. He also found that self-efficacy moderated the effect of central cues and peripheral cues on initial trust. In a study on consumer to consumer communication on an online review site, Zhu, Chang, and Luo (2015) found that in addition to argument quality and source credibility, tie strength affected the perceived usefulness of a product, which in turn influenced the consumer's information adoption. In summary, the research on the ELM has identified argument quality as a central cue and source credibility as a peripheral cue for information processing.

2.2. Social Influence Theory

In addition to the information processing factors, individuals' decisions are affected by social influences. Deutsch and Gerrard (1955) proposed SIT to investigate how normative social influence and informational social influence affect the judgment of an individual. They concluded that the judgment of received information and the normative power of others can be explained by these two social influences. Later studies of SIT specifically investigated the role of informational influence on an individuals' reactions and decisions (Cohen & Golden, 1972; Wittenbrink & Henly, 1996; Lee, Shi, Cheung, Lim, & Sia, 2011). Lee, Shi, Cheung, Lim, and Sia (2011) studied the moderating role of informational social influence in online discussion forums. They found that informational social influence significantly moderated the

effect of individual beliefs on attitude, and affected the behavioral intention to shop online. The positive messages in the online communities reinforced the positive beliefs of the users and hence strengthened their attitudes toward online shopping.

Several studies have focused on normative social influence (Nolan, Schultz, Cialdini, Goldstein, & Griskevicius, 2008; Waardenburg, Winkel, & Lamers, 2012). Nolan, Schultz, Cialdini, Goldstein, and Griskevicius (2008) investigated the persuasive effect and detectability of normative social influence and found that normative social influence had a significant effect on group decisions. However, they also found that people deny the importance of normative social influence in their decision making, and suggested that normative social influence can be useful as a persuasion technique, even though its power tends to be underestimated.

Numerous studies have examined both informational social influence and normative social influence (Burnkrant & Cousineau, 1975; Steblay, 1997; Goodwin, Kukucka, & Hawks, 2013; Kuan, Zhong, & Chau, 2014; Chen & Lu, 2015). Kuan, Zhong, and Chau (2014) used a neuroscientific approach to social influence theory to explain the changes in individuals' buying decisions on group buying sites. They concluded that informational social influence and normative social influence significantly affect the attitudes, intentions, and emotions of consumers.

Although the ELM can help predict the effects of source credibility and argument quality on information adoption under the two elaboration likelihood routes, it excludes the characteristics of the readers in the information processing. Yet, the literature on SIT suggests that there is a strong relationship between an individual's perceived social pressure and the individual's behaviour. Therefore, in this study, we integrated the two information processing routes and the role of perceived social pressure to investigate the information adoption for decision making in online review sites.

3. Research model

The ELM is a dual-process model for explaining the phenomenon of social information processing (Zhang et al., 2014; Petty, Cacioppo, and Schumann, 1983). The model suggests that different readers are willing to engage in the elaboration of particular information to different extents, and the difference affects the level of change in attitude, along with other factors. According to Perloff (2003), likelihood refers to the probability that an event will occur and elaboration signifies the extent to which individuals engage with the information contained in a communication. Because of the level of cognitive effort involved in information processing, readers do not elaborate every piece of information, and some readers elaborate the information heuristically.

The ELM states that there are two distinct routes in which the information from messages is processed, namely, the central route and the peripheral route (Perloff, 2003). The central route relates to the elaboration of information from the cognitive understanding of the arguments conveyed (Petty et al., 1983). The readers tend to evaluate and examine the logic of the arguments in detail based on their past experiences.

Due to a shortage of time and effort, many readers do not read the arguments thoroughly (Tang, Jang, & Morrison, 2012). Hence, they rely on the peripheral route, which involves making an inference heuristically without much cognitive effort. These readers depend on simple cues such as the professionalism and popularity of the source for their decision making, instead of evaluating the logical correctness of the arguments.

Alternatively, social influence refers to how the individuals in a social network feel compelled to conform to community behavior patterns as a result of the behavior of others (Venkatesh & Brown, 2001). According to SIT (Deutsch and Gerard, 1955), there are two types of social influence: informational social influence and normative

social influence. Informational social influence refers to the tendency "to accept information obtained from another as evidence about reality," while normative social influence refers to the tendency "to conform to the expectations of another person or group." Social influence can be perceived as the pressure from social networks to make a certain decision (Lu, Yao & Yu, 2005).

In this study, we explore our theoretical model, which is shown in Figure 1, by examining the underlying factors that influence the information adoption for decision making, and the moderating effects of informational social influence and normative social influence.
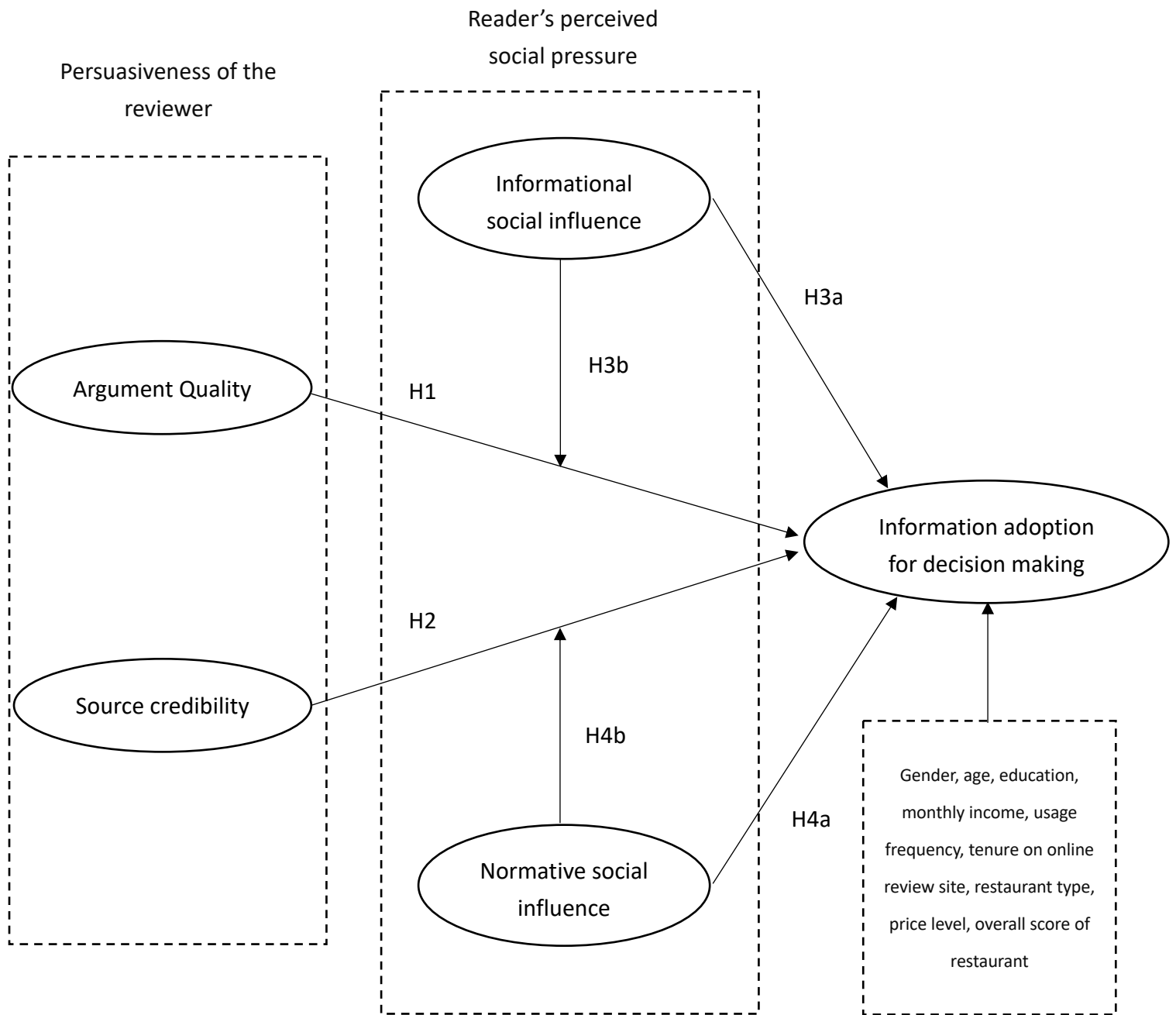
Figure 1: Theoretical framework

3.1. Hypothesis development

Sussman and Siegal (2003) used the ELM to explain information adoption in the context of using email to seek advice, and indicated that there are two routes for information adoption: the central route based on argument quality and the peripheral route based on source credibility. Argument quality, which is defined as the strength of persuasion and usefulness of the information, is based on the content, accuracy, format, and timeliness of the information (Bhattacherjee & Sanford, 2006; DeLone & McLean, 2003; Negash, Ryan, & Igbaria, 2002). For example, a review that provides more photos, descriptions, and persuasive comments about a restaurant will likely be evaluated in detail and adopted.

Via the peripheral route, the reader adopts information based on the source credibility, which depends on the trustworthiness and competence of the reviewer (Chaiken, 1980). Online review sites such as Yelp in the US or OpenRice in Hong Kong allow users to post reviews and rank reviewers according to their contributions. The higher the number of reviews, the higher the ranking of the reviewer. Moreover, the ranking of a reviewer will be higher if his/her reviews are recognized by the host of an online review site. The ranking provides a cue for the source credibility of a reviewer, and reviews tend to be adopted by readers based on their perception of the rank, trustworthiness, and competence of the reviewer.

According to the ELM, the argument quality and source credibility of a review are essential for the reader to decide whether to adopt the information in the review. In this regard, we suggest the following hypotheses:

H1. The argument quality of the reviews posted by reviewers is positively related to the level of information adoption for decision making.

H2. The source credibility of the reviews posted by reviewers is positively related to the level of information adoption for decision making.

Informational social influence is the social pressure that a person perceives from others to search for information when he/she makes a decision (Kaplan, 1989; Clark & Goldsmith, 2006). For instance, informational social influence drives people to collect more information about the successful experiences that members of their social groups have with a product before deciding whether to adopt it (Kim & Ammeter, 2014; Lee et al., 2011). A person may need to consider many factors before making a clear decision. Accordingly, social pressure tends to exist when there is a lot of uncertainty. This kind of social pressure can encourage a person to minimize the possibility of making a wrong decision by searching for large amounts of information from different sources, such as friends, parents, and the Internet. Hence, the greater the social pressure on a person to search for information, the more he/she will use information from different sources. On an online review site, when an individual perceives greater social pressure to reduce the uncertainty about a decision such as choosing a restaurant, he/she will likely use more information from the reviews. Thus,

H3a. The informational social influence perceived by a reader is positively related to the level of information adoption for decision making.

Kaplan (1989) defined informational social influence as the social pressure an individual experiences to search for trusted information from others. This kind of social pressure from others can also serve as a supplement when making a decision. In other words, people may not always trust or follow the suggestions of others. According to the central route suggested in the ELM, the argument quality of a review is positively related to the level of information adoption for decision making. When the quality of the argument in a review is high, the perceived informational social influence of the reader helps to confirm his/her thinking. Hence, the reader will adopt more information for decision making. Thus, we believe that the level of information adoption for

decision making will be strengthened if a person acquires more good quality confirmative information. This relationship will be more obvious if the person perceives that there is greater informational social influence. Therefore, we propose the following hypothesis:

H3b. Higher levels of informational social influence strengthen the influence of argument quality on the information adoption for decision making.

Normative social influence stems from the social pressure to identify with other group members or to elicit positive evaluations from others, and appears when the discussion content presents the positions favored by other group members (Kaplan & Miller, 1987). Normative social influence is positively related to an individual's tendency to conform to and obey authority (Higgins, 2001). When individuals perceive higher levels of normative social influence, they tend to conform to the views of others to maintain their self-defining relationship with the group, receive rewards, or avoid punishment (Clark & Goldsmith, 2006). Similarly, people sometimes make purchase decisions simply because those around them are also buying that product. In this case, an individual may neglect other reasons behind the purchase decision, which may be reflected in his/her habits when making a decision. For example, students who have bought a new series of smart phone will be identified as rich students. If another student wants to identify as a rich student, he/she may buy a new phone to join the "rich student" group. Similarly, when a person using an online review site perceives higher social pressure to identify with others, for instance, an expert on restaurant dining, they are likely to follow the decisions of others and adopt the information provided by the reviewers. Thus,

H4a. The normative social influence perceived by a reader is positively related to the level of information adoption for decision making.

Along the peripheral route of the ELM, the source credibility of a reviewer in an online review site will positively affect the level of information adoption for decision making. For example, when a reviewer has a high rating on an online review site, his/her reviews will be a good proxy for the subjective norm in a community and the reader is likely to adopt the information from the reviews of that highly rated reviewer. This relationship is strengthened when the reader perceives higher normative social influence to follow the reviewer's recommendation. When the reader perceives that there is greater social pressure to conform to the highly rated reviews and to identify with the expert on restaurant dining, he/she is likely to use more information from the reviews that have greater source credibility. Hence, this leads to a high level of information adoption for decision making. Therefore, we propose that normative social influence moderates the relationship between source credibility and the level of information adoption for decision making.

H4b. Higher levels of normative social influence strengthen the influence of source credibility on the level of information adoption for decision making.

4. Research methodology

4.1. Procedure and participants

To examine the theoretical model, we conducted a study using a popular online review site in Hong Kong named OpenRice. As of October 2015, OpenRice had over 1.27 million registered users in Hong Kong, and a database that included 79,645 restaurants and 822,968 reviews. The reviews may include different types of information such as photos of the food, and comments on the service of a restaurant. This information may influence the reader's choice of restaurant for dining in Hong Kong. In this regard, we required that the participants' monthly usage on OpenRice was

at least one time.

The registered users of OpenRice can post reviews on different restaurants. Each restaurant has a unique page with different reviews. In addition to providing a substantial amount of review content, OpenRice calculates the ranking of a reviewer based on the number of posted reviews. From this perspective, a user can judge the overall argument quality and source credibility of these reviewers.

We conducted a questionnaire survey in January 2016 in Hong Kong with the target population who use and reference OpenRice information at least once a month. To start, the research assistants went to various districts among Hong Kong Island, Kowloon and New Territories such as Central, North Point, Kowloon City, Tsim Sha Shui, Tsuen Wan, Sai Kung, Tai Po at different times during a day. The data collection lasted for several weeks as each research assistant could only visit two to three different districts per day. They counted and chose every 10th bypass adults on the street and asked if the respondents have a few minutes to spare for the survey. Once it was verified and confirmed the respondents have used OpenRice for more than once a month, they were asked to name a restaurant that they had recently browsed on OpenRice. The research assistant then used his/her tablet to show the respondents the five latest reviews of the respective restaurants. After finished reading the reviews, the respondents were given a short survey questionnaire covers the argument quality and source credibility of the restaurant review posted on OpenRice as well as other objective data such as whether the restaurant was Chinese, price range, and the overall score of the named restaurant.

The response rate was around 30.0%, meaning every ten people we approached, three were willing to participate in the survey. We adopted the street survey approach for two reasons. First, it allows us to collect reliable and well-round responses by conducting street survey among various districts in Hong Kong, to randomly approach

respondents with different education levels and ages, thus enabling our findings to be more representative. Second, the street survey ensured a high response rate, as people feel that the survey is real and sincere.

The collected data were checked for consistency to minimize the data entry errors. A total of 316 valid responses were collected. Table 1 shows the demographic information of the survey respondents, which fits the general population on OpenRice. From Table 1, the mode statistics show that the regular users of OpenRice are generally aged under 25 (141, 44.6%), graduates (193, 61.1%), have used OpenRice for between 3 and 4.5 years (139, 44.0%), and use OpenRice 4 to 5 times a month (122, 38.6%). The overall sample distribution was satisfactory and good enough to reflect the true population distribution. This even distribution was beneficial to the subsequent research analysis because it enhanced the representative power of the underlying data analysis.

Table 1: Descriptive statistics of the respondents

Gender: Male (160, 50.6%), Female (156, 49.4%)	**Age**: Below 25 (141, 44.6%), 26-30 (64, 20.3%), 31-40 (68, 21.5%), 41-50 (41, 13.0%), 51 or above (2, .6%)
Education: Secondary School (59, 18.7%), Diploma/Higher diploma (51, 16.1%), Graduate (193, 61.1%), Postgraduate (13, 4.1%)	
The number of years that the respondent has used OpenRice: Less than 1.5 (6, 1.9%), 1.5 - 3 (45, 14.2%), 3 - 4.5 (139, 44.0%), 4.5 - 6 (85, 26.9%), 6 or above (41, 13.0%)	
Average usage of OpenRice per month: 1 (11, 3.5%), 2 - 3 (92, 29.1%), 4 - 5 (122, 38.6%), 6 - 7 (62, 19.6%), 8 or above (29, 9.2%)	

4.2. Measurements

All of the constructs defined in Table 2 were measured by a self-report questionnaire using a 7-point scale from 1 (highly disagree) to 7 (highly agree). The items used to operationalize the constructs in our research model were adapted from prior studies, with a few changes in wording to reflect the specific professional context and the technology used by our targeted participants.

We measured information adoption for decision making using five items adapted

from Cheung, Lee, and Rabjohn (2008) and Cheung et al. (2009): "I agreed with the reviews on OpenRice," "Information from the reviews on OpenRice contributed to my knowledge of the discussed restaurant," "The Reviews on OpenRice made it easier for me to decide whether to visit a restaurant," "The Reviews on OpenRice enhanced my effectiveness in making restaurant decisions," and "The Reviews on OpenRice motivated me to make restaurant decisions."

To measure the source credibility of the reviews, four items were extracted from Sussman and Siegal (2003) and Cheung, Lee, and Rabjohn (2008): "The reviewers on OpenRice are knowledgeable," "The reviewers on OpenRice are experts," "The reviewers on OpenRice are trustworthy," and "The reviewers on OpenRice are reliable."

To measure the argument quality of the reviews, five items were adapted from Bhattacherjee and Sanford (2006) and Cheung et al. (2009): "The information in the reviews on OpenRice is informative," "The information in the reviews on OpenRice is helpful," "The information in the reviews on OpenRice is valuable," "The information in the reviews on OpenRice is persuasive," and "In general, the arguments in the reviews on OpenRice provided me with high-quality information."

To measure normative social influence, five items were extracted from Taylor and Todd (1995) and Rucker and Petty (2006): "It is important that my friends think how I perform in making a choice," "I often categorize myself with people by having the same attitude toward a choice," "I like to know that how I choose makes a good impression on my friends," "I follow the suggestions from others under the expectations of my friends," and "I achieve a sense of belonging with my friends by having the same attitude toward a choice."

To measure informational social influence, three items were extracted from Henningsen et al. (2003) and Kaplan (1989): "When I make a choice, I often consult other people for useful information," "When I make a choice, I often search for reviews,"

and "When I make a choice, I frequently gather information from others."

Studies have argued that individual behavior may differ across such personal factors as gender, education, age, and monthly income (e.g., Agarwal and Prasad, 1999; Frankel, 1990; Gefen and Straub, 1997; Venkatesh and Morris, 2000; Venkatesh et al., 2003). We also need to consider the tenure of the reader as a registered user of the online review site and his/her usage frequency on the online review site. Those who have used the online review site frequently for a longer period should be more familiar with its features, which may affect the information adoption for decision making of individual respondents.

In this study, gender is coded 0 for "male" and 1 for "female." Age is coded 1 for "18 to 25," and 5 for "51 or above." Education is coded 1 for secondary school and 4 for postgraduate. Tenure is coded 1 for "less than 1.5 years" and 5 for "6 years or above." Frequency is coded 1 for "1 time per month" and 5 for "8 times or above per month."

We also obtained some objective data on the restaurants that were reviewed. The price level and type of restaurant may affect the information adoption of individual users, because people may be more careful about choosing an expensive restaurant. The overall score of a restaurant indicates the popularity and rating of the restaurant, which may also affect the adoption behavior of individual users. Type is coded 0 for "Chinese restaurant" and 1 for "non-Chinese restaurant." Price level is coded 1 for "less than $50" and 6 for "$801 or above." The overall score of a restaurant is coded with values ranging from 0 to 5.

Table 2: Definition of the essential constructs in the theoretical framework

Argument quality	Strength of persuasion and the perceived usefulness of the argument in a review.
Source credibility	Credibility of the source, and trustworthiness and competence of the reviewer according to the perception of the review reader.
Informational social influence	Perceived social pressure to accept information obtained from another as evidence of reality.
Normative social influence	Perceived social pressure to conform to the expectations of another person or group.
Information adoption for decision making	The behavioral intention of the reader to make decisions based on the information in the review.

5. Analyses and results

5.1. Data analysis

We computed the means, standard deviations, and bivariate correlations for all of the data. To ensure that the instruments used in this study were reliable and valid, we conducted a confirmatory factor analysis on the essential constructs, namely, source credibility, the argument quality of the reviews on OpenRice, informational social influence, normative social influence, and information adoption for decision making. We used regression analysis as the primary statistical technique in our study. We also checked whether the control variables had any significant effects on the model.

5.2. Validity of the data

We tested for sample bias by comparing the key constructs from the earlier (the first 158 surveys) and later respondents (the latter 158 surveys) using the Kolmogorov-Smirnov two-sample test (Siegel and Castellan, 1988). This test assesses whether significant differences exist in the distribution of respondents and non-respondents for a given variable, including differences in central tendency, dispersion, and skewness. The results showed that the data from the first 158 surveys and the latter 158 surveys

were equivalent. We also tested for differences between the earlier and later respondents in the means and distribution of the measured constructs. The results showed that there was little difference between the two groups. Thus, we aggregated the two groups of surveys into a data set for the subsequent analyses.

5.3. Instrument Reliability and Validity

Reliability is defined as the degree to which a construct is free from errors and provides consistent results. We used Cronbach's alpha to measure the internal consistency of the multi-item scales used in this research. As shown in Table 3, the Cronbach's alphas of all of the constructs used in this study were over 0.7. This shows that the sets of items correlated well with each other, and that all of them can thus be deemed to be reliable. In addition, because all of the measure items in the constructs were adapted from past research, the constructs can be considered representative in terms of face validity.

Table 3: Descriptive Statistics and Reliability

Variables	Mean*	Std. Dev.
Source credibility (SC) (Cronbach's alpha = 0.861)	4.13	1.363
The reviewers on OpenRice are knowledgeable. (SC1)	4.16	1.636
The reviewers on OpenRice are experts. (SC2)	4.07	1.589
The reviewers on OpenRice are trustworthy. (SC3)	4.13	1.651
The reviewers on OpenRice are reliable. (SC4)	4.17	1.611
Argument quality (AQ) (Cronbach's alpha = 0.859)	4.97	1.103
The information in the reviews on OpenRice is informative. (AQ1)	4.93	1.359
The information in the reviews on OpenRice is helpful. (AQ2)	4.97	1.416
The information in the reviews on OpenRice is valuable. (AQ3)	4.90	1.453
The information in the reviews on OpenRice is persuasive. (AQ4)	5.00	1.374
In general, the arguments in the reviews on OpenRice provided me with high-quality information. (AQ5)	5.04	1.291
Information adoption for decision making (IA) (Cronbach's alpha = 0.895)	5.56	1.065
I agreed with the reviews on OpenRice. (IA1)	5.45	1.291
Information from the reviews on OpenRice contributed to my knowledge of the discussed restaurant. (IA2)	5.69	1.255
The reviews on OpenRice made it easier for me to decide whether to visit a restaurant. (IA3)	5.69	1.202
The reviews on OpenRice have enhanced my effectiveness in making restaurant decisions. (IA4)	5.70	1.284
The reviews on OpenRice motivated me to make restaurant decisions. (IA5)	5.70	1.332
Normative social influence (NSI) (Cronbach's alpha = 0.884)	4.54	1.155
It is important that my friends think how I perform in making a choice. (NSI1)	4.64	1.353
I often categorize myself with people by having the same attitude toward a choice. (NSI2)	4.48	1.402
I like to know that how I choose makes a good impression on my friends. (NSI3)	4.59	1.419
I follow the suggestions from others under the expectations of my friends. (NSI4)	4.48	1.440
I achieve a sense of belonging with my friends by having the same attitude toward a choice. (NSI5)	4.49	1.374
Informational social influence (ISI) (Cronbach's alpha = 0.881)	4.59	1.564
When I make a choice, I often consult other people for useful information. (ISI1)	4.56	1.633
When I make a choice, I often search for reviews. (ISI2)	4.61	1.770
When I make a choice, I frequently gather information from others. (ISI3)	4.59	1.814

* 1 = strongly disagree and 7 = strongly agree

Considering the standard deviations of all of the constructs, there are enough

variations for the sampled data to represent the population of OpenRice users. Table 3 shows the means of the constructs, which suggest that the respondents perceived the source credibility of the reviews on OpenRice as neutral (mean = 4.13) and that the reviews on OpenRice had high argument quality (mean = 4.97). The respondents also used high levels of information from the reviews on OpenRice in their decision making (mean = 5.56). The respondents' regard for normative social influence and informational social influence was high, with means of 4.54 and 4.59, respectively, which suggests that OpenRice generally provides credible and high quality reviews. In addition, consumers in Hong Kong tend to choose restaurants based on the information on OpenRice. With respect to social influence, the respondents perceived a high level of social pressure to search for information. In this case, the existence of informational social influence may have been caused by the lack of information about the restaurant. However, many people want to identify as gourmets and have excellent dining experiences, thereby creating a high degree of social pressure to conform with others.

Table 4: Factor analysis

	Component				
	1	2	3	4	5
SC1	**.852**	-.045	.192	.048	-.035
SC2	**.782**	-.024	.062	-.002	-.001
SC3	**.833**	.048	.019	.084	-.033
SC4	**.851**	.003	.156	.103	-.070
AQ1	-.038	**.738**	.217	-.011	.161
AQ2	.015	**.782**	.021	-.139	-.005
AQ3	.033	**.777**	.143	.010	-.044
AQ4	-.036	**.785**	.053	-.011	.171
AQ5	.007	**.870**	.075	.038	.069
IA1	.222	.136	**.763**	.131	.210
IA2	.054	.103	**.786**	.075	.177
IA3	.060	.157	**.778**	.213	.231
IA4	.144	.126	**.781**	.158	.147
IA5	.078	.059	**.813**	.156	.215
NSI1	.049	-.038	.144	**.830**	.093
NSI2	.072	-.021	.131	**.773**	-.010
NSI3	.046	-.058	.164	**.788**	-.161
NSI4	.052	.055	.060	**.830**	.024
NSI5	.032	-.065	.109	**.849**	-.120
ISI1	-.092	.115	.277	-.002	**.812**
ISI2	-.040	.114	.293	-.081	**.863**
ISI3	-.025	.090	.326	-.102	**.824**

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in six iterations.

The convergent validity of the measurement scales was evaluated using two criteria (Fornell and Larcker, 1981). First, all of the indicator factor loadings should be significant and exceed 0.70. Second, the average variance extracted (AVE) by each construct should exceed the variance due to measurement errors for that construct (i.e., should exceed 0.5). Table 4 shows the factor loadings of the 22 items. All of the items had a loading value higher than 0.7 on their respective constructs, thus indicating that there is a high degree of correlation between the results of the measurements of each

construct using different instruments. The AVEs of the constructs, as shown in Table 4, were all greater than the variances due to measurement errors. Thus, both conditions for convergent validity were satisfied.

Table 5 shows the correlation matrix of the constructs. We can check whether any constructs potentially overlap using the correlation matrix. According to Fornell and Larcker (1981), discriminant validity of a construct is achieved when the items in the construct do not overlap other constructs to any significant degree (i.e., the AVE of a construct is higher than its squared inter-item correlations with other constructs). The diagonal elements shown in Table 5 (reporting the square root of the variance shared between a construct and its measures) are larger than the correlations between the target constructs without exception. Hence, the discriminant validity of all of the constructs in this study can be considered acceptable.

Table 5: Correlation matrix

	AVE	1	2	3	4	5
1. SC	.688	.830				
2. AQ	.625	002	.790			
3. IA	.615	.252**	.269**	.784		
4. NSI	.663	.149**	-.043	.304**	.814	
5. ISI	.694	-.057	.241**	.521**	-.066	.833

**. Correlation is significant at the 0.01 level (2-tailed).

5.4. Common method bias

There are several sources of common method bias such as the consistency motif and social desirability due to the self-report surveys (Podsakoff et al., 2003). As suggested by Podsakoff and Organ (1986), we conducted the Harmon one-factor analysis to identify whether common method bias is a serious concern in this study. No factors showed that the majority of the covariance in the factor analysis included all of the variables used in this study. Moreover, the results of the regression analysis showed

different levels of significance for the regression coefficients. These results confirm that common method bias is not a significant concern in this study.

5.5. Test of hypotheses

The results of the regression analysis are presented in Table 6. We ran the regression analysis using three models: model one (only the control variables), model two (including the main effects), and model three (including the main effects and the two-way interactions). We also conducted regression analyses with only one of the interactions separately, as shown in models 3a and 3b, to eliminate the possible covariance of the two interactions, and found there was little change in the main effects. In this regard, we focus the subsequent discussion on the regression analysis shown in model 3c, which captures both interaction effects. The R^2 of information adoption for decision making of models 1, 2, and 3c were .095, .492, and .523, respectively. For the interaction effect, the incremental R^2 was significant according to the F-test between model 2 with the direct effects and model 3c with both of the interaction effects.

Some of the control variables had significant effects on the level of information adoption for decision making. Our findings show that information adoption for decision making was especially favorable among frequent users of OpenRice ($\beta = .122^{***}$), older people ($\beta = .177^{***}$), people with higher education ($\beta = .158^{***}$), and for restaurants with a higher overall score on OpenRice ($\beta = .106^{**}$). It is reasonable that older people adopt more information from the reviews on OpenRice, as older people seldom dine out and are more cautious when choosing restaurants because they want to ensure that the quality of the restaurant is acceptable. Moreover, more educated people tended to have a higher comprehension of the content of the reviews on OpenRice. People tended to use the information from restaurant reviews with higher overall scores, because the overall score of a restaurant can support the arguments of its reviews.

Table 6: Regression analyses of the information adoption on decision making

	Model 1 Control variables	Model 2 Main effects	Model 3a Two-way interactions	Model 3b Two-way interactions	Model 3c Both two-way interactions
Control Variables					
Tenure	.053	0.16	.017	.025	0.27
Frequency	.249***	.122***	.112***	.116***	.108**
Gender	-.018	-.043	-.044	-.040	-.042
Age	.055	.177***	.167***	.160***	.151**
Education	.063	.158***	.148***	.141***	.132**
Type	-.088	.005	.004	-.003	-.003
Price level	-.117*	-.029	-.039	-.042	-.051
Overall score	.216***	.106**	.118**	.083*	.095**
Main Effects					
AQ		.139***	.175***	.188***	.219***
SC		.214***	.210***	.232***	.228***
ISI		.520***	.500***	.507***	.490***
NSI		.301***	.283***	.279***	.263***
Interaction Effects					
AQ*ISI			.098**		.089**
SC*NSI				.175***	.171***
Model Information					
R^2	.095	.492	.498	.518	.523
ΔR^2 from previous model		.397	.006	.026	.031

$^*p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$

Note: ΔR^2 of Models 3a, 3b, and 3c are compared with the R^2 of Model 2

Our findings, as indicated in Table 6, show that the argument quality (AQ) and source credibility (SC) are significant factors in predicting the information adoption for decision making (IA). According to the first order effects shown in Model 2, AQ and SC were positively associated with IA and thus hypotheses 1 and 2 are supported. Moreover, informational social influence (ISI) and normative social influence (NSI) were also positively associated with IA and thus hypotheses 3a and 4a are supported. The R^2 of .492 showed an increase of .397, which is a large increase from the variance explained solely from the control variables. This indicates that SC, AQ, ISI, and NSI were the dominant factors in explaining IA. Comparing their influence, the effect of ISI (β = .520***) on IA was greater than that of NSI (β = .301***), SC (β = .214***) and AQ (β = .139***). With respect to the effect of the reader's perceived social pressure, it is reasonable that people search for more information on a restaurant from others as evidence when seeking information for decision making, because the more information they obtain the more they are able to make the most sensible decision. Thus, conforming to the expectations of others is the second reason they adopt information for decision making. With respect to the effect of the reviewer's persuasive message, a review with high source credibility such as higher ranking of the reviewer will have a significant effect on the reader's level of information adoption for decision making. A review with high argument quality such as having a more persuasive and informative message will also have a significant effect on the reader's level of information adoption for decision making.

Hypothesis 3b posits that the positive relationship between AQ and IA is moderated by ISI, such that the relationship is reinforced for a high level of ISI. According to model 3c of Table 6, the significant interaction effect (β = .089**) supports this hypothesis. Thus, when a reader is searching for more information on a restaurant from others as evidence and a reviewer provides a review with high argument quality,

the reader will adopt a high level of information for decision making.

Hypothesis 4b posits that the positive relationship between SC and IA is moderated by NSI such that the relationship is reinforced for a high level of NSI. Our analysis, as shown in model 3c of Table 6, indicates a significant two-way interaction between SC and ISI ($\beta = .171^{***}$). Hence, hypothesis 4b is supported. When a reader conforms to the expectations of another and a reviewer with high source credibility, the reader will adopt more information from the review for decision making.

To explore the form of the interactions, as shown in Figure 2, we plotted the relationship between AQ and IA for both high and low levels of ISI. Following the procedure described by Aiken and West (1991), we added one standard deviation to the ISI and then performed the regression analysis. The positive relationship between AQ and IA was not significant when ISI was at a low level. Similarly, we tested the slope of the relationship between AQ and IA for high levels of ISI by subtracting one standard deviation from the ISI. We found that the slope was significant when the level of ISI was high. Accordingly, the effect of AQ on IA was higher when ISI was high than when it was low. Hence, the moderation effect of ISI can shape the relationship between AQ and IA.

However, the positive influence of SC on IA was significant with respect to different levels of NSI. As shown in Figure 3, when NS was at a low level, the effect of SC on IA was not significant according to the slope test of Aiken and West (1991). The relationship became more salient when NSI was high. Comparing the moderation effects of ISI and NSI, the latter was a stronger moderator. This can be observed from the β values (0.089 versus 0.171) in Table 6. In summary, Figures 2 and 3 depict the results in different situations.

Figure 2: Information adoption for decision making predicted using the two-way interactions between argument quality and informational social influence.
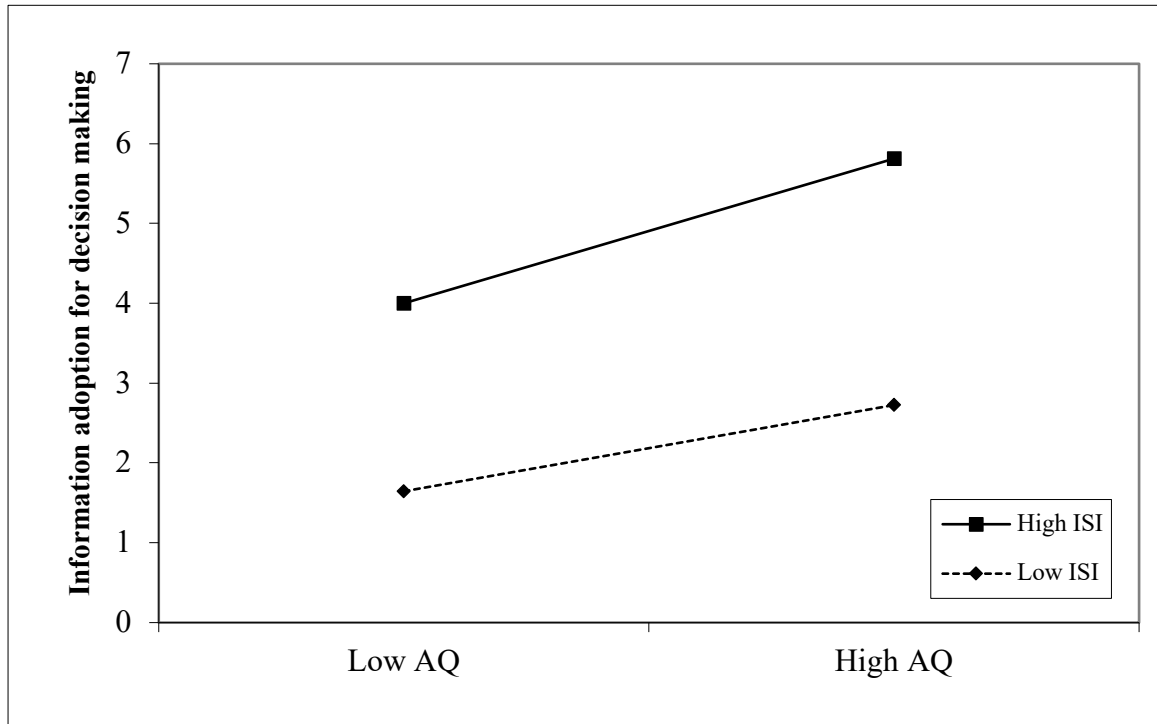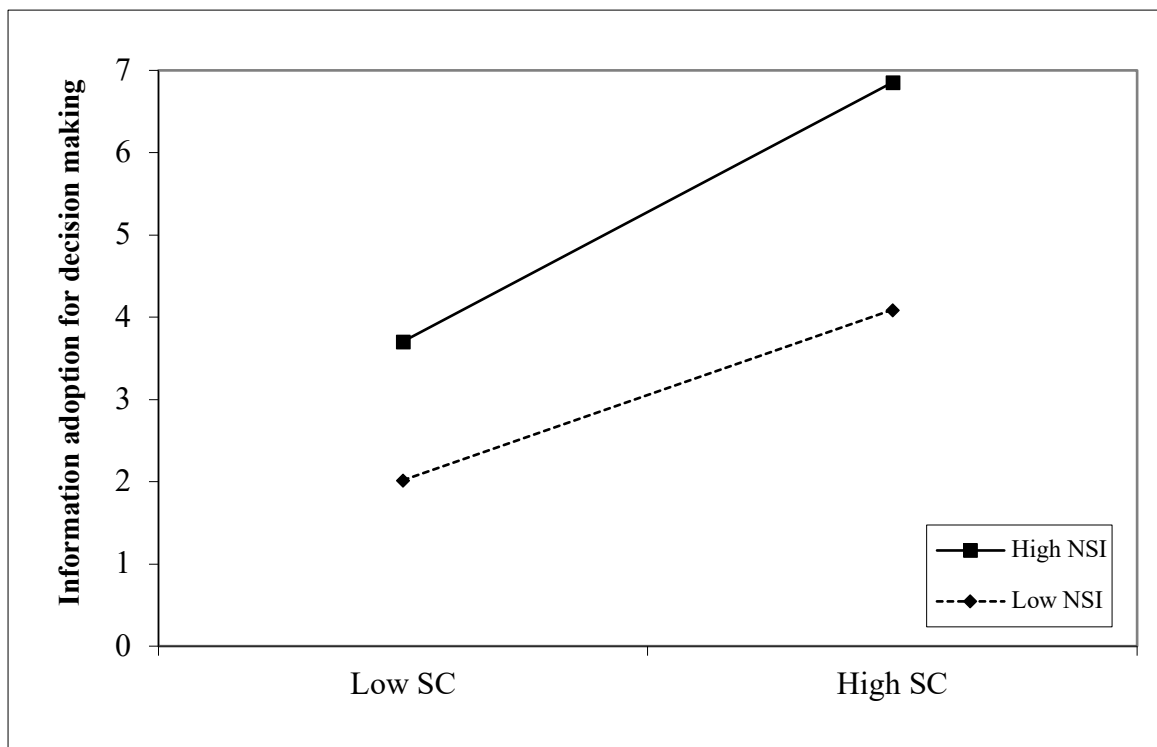
Figure 3: Information adoption for decision making predicted using the two-way interactions between source credibility and normative social influence.

6. Discussion

6.1. Theoretical Implications

This study contributes to the literature by providing several theoretical implications. First, this study combined the ELM and SIT to investigate the predictors of information adoption for decision making. Although the ELM is widely applied to study the influence of online reviews, little research has considered the importance of the characteristics of readers or their perceived social pressure in understanding the critical determinants of the information adoption for decision making. By extending the research on the factors related to the central and peripheral routes of information adoption, this study finds strong support for the effects of argument quality, source credibility, informational social influence, and normative social influence on the information adoption for decision making.

Second, this is one of the first studies to examine the concept of fit between the reviewers and readers in the virtual communities. There are two significant interaction effects between informational social influence and argument quality, and normative social influence and source credibility, which jointly interact to increase the information adoption for decision making. Our findings suggest that consumers tend to adopt more information from reviews for decision making in two conditions: (1) When the reviews are informative and the reader perceives a high level of social pressure to reduce uncertainty, and (2) When the reviews are credible and the reader perceives a high level of social pressure to conform to others. We conceptualize "reader-reviewer fit" according to the perspectives of the reviewer's persuasive message and the reader's perceived social pressure. People who have various degrees of informational social influence and normative social influence will have different levels of information adoption for decision making even though they read the same review from the same

reviewer. This implies that the combinations of high argument quality and high informational social influence, and high source credibility and high normative social influence are critical for increasing the level of information adoption for decision making in this context.

Finally, by considering the control variables, main effects, and interaction effects from the independent variables, the theoretical framework of this study reported a R^2 of .523. This result shows that the information adoption for decision making can be explained by these factors in most cases. It further shows that informational social influence has the strongest main effect on information adoption for decision making, while normative social influence is the second dominant factor in the information adoption for decision making. The findings suggest that the perceived social pressure of readers is more important and has a stronger effect than the reviewers' reviews when considering how much information a reader will adopt from the virtual community in their decision making. As a result, future research should consider the characteristics of the readers by examining the main effects and interaction effects between the factors from the perspectives of readers and reviewers.

6.2. Practical Implications

For practitioners, understanding the factors that underlie the information adoption for decision making from two perspectives is critical for enhancing the reputation of restaurants and capitalizing on the intellectual resources within online communities. Our findings offer insights into the complexity of the persuasiveness of reviewers' and readers' perceived social pressure.

First, marketing managers can develop a marketing strategy of using online review sites as a form of third party persuasion. According to our findings, informational social influence enhances argument quality. Thus, people are likely to

adopt more information from reviews when they actively search for more information as evidence to support their decisions and the information in the reviews is persuasive and informative. In addition, normative social influence can enhance the source credibility, as people tend to conform to authority and the actions of celebrities when making decisions. Therefore, a reader with a higher degree of normative social influence is likely to adopt more information from reviews with higher source credibility. In this regard, if a marketing manager wanted to develop a good reputation for his company on an online review site, an effective approach would be to invite some high-ranking reviewers to try the products and write informative reviews with many photos and details. A review with high source credibility and argument quality will be more likely to influence the decision of a consumer, and the effect will be much greater if the consumer has higher informational social influence and normative social influence.

Second, this study reveals that OpenRice is an influential online review site in Hong Kong, with a high level of information adoption of its reviews in readers' decision making (mean = 5.56). Nowadays, when people in Hong Kong are looking for a restaurant, they are likely to search for reviews on an online review site such as OpenRice. However, the site may contain negative reviews about the service or the food at a restaurant. Because OpenRice provides important information to help consumers choose a restaurant, restaurant owners should pay attention to the reviews and improve the quality of their service and food to avoid more reviews complaining about the same problem. In addition, restaurant owners in Hong Kong may consider developing positive reviews on online review sites such as OpenRice as a promotional tool and a third party persuasion technique.

6.3. Limitations

This study has several limitations that need to be considered. First, the cross-sectional data collection is one of the weaknesses of this study, because most of the measurement items, except the type, price level, and overall score of the restaurant, were collected at the same time from the respondents. Because the investigated constructs are not supposed to remain unchanged over time, this research method may not have fully captured the dynamics of the information adoption for decision making. Subsequently, the problem of common method bias may exist, which is fortunately not a serious concern as confirmed in our analysis. To address the above issues, future research should consider using multiple method and longitudinal research designs. A longitudinal study combining qualitative and quantitative data would enable a process-oriented perspective that cannot be achieved using a variance-based approach, such as the one used in this study.

Second, other factors that may also affect information adoption were not included and measured in our study, for instance, the reader's expertise. If the reader has a high degree of expertise, he/she may be more familiar with the restaurants in terms of their food quality and service. Thus, a knowledgeable reader may adopt less information from a review than a reader without any prior information about the restaurant. Future research can develop a more extensive framework to extend this study.

Third, our findings may be limited because we only examined one online review site (i.e. OpenRice) as the research context. Future research could consider extending this study to other virtual communities. Nevertheless, attention should be paid to the different features, cultural background, and product types of online communities. Specifically, research suggests that the credibility of reviews may vary because some sites include social networking features (Lim & Heide, 2015). Online review sites with social networking features such as Yelp enable users to identify the credibility of a

reviewer more easily, as readers can evaluate the credibility of the reviewers by looking at their number of friends and the information about the reviewers. Because OpenRice lacks social networking features, future research may extend this study to the context of other online communities with social networking features.

7. Conclusion

Consumers' decision making processes in making purchase decisions involve adopting information from others. Nowadays, people are becoming more involved in virtual communities, and it is very common for people to search for information on online review sites before making purchase decisions. We argue that the amount of information an individual adopts depends on two perspectives: the reviewer's persuasive message and the reader's perceived social pressure. Our findings show that the level of information adoption for decision making is enhanced when the nature of the reviewer's message fits the reader's characteristics. Specifically, there is an interaction effect between argument quality and informational social influence such that a high level of informational social influence also enhances the positive effect of the argument quality on the level of information adoption for decision making. In the case of readers with a high degree of normative social influence, our findings show that source credibility is more effective in increasing the level of information adoption for decision making. Thus, marketing managers may consider the characteristics of the target consumers when deciding to use online review sites as a third party persuasion technique.

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Appendix A: Summary of the literature review

Author(s)	Context	Method	Data Collection	Findings
Chen & Lu (2015)	Group buying sites	Survey	650 online group buyers in Taiwan.	1. Social factors (online recommendations, media recommendations, and personal recommendations) positively affect social influence and online group-buying intention. 2. Individual factors (compliance and attention-to-social-comparison-information) positively affect social influence and conformity. 3. Psychological factors (financial risk, performance risk, and social risk) negatively affect online group-buying intentions, and are positively correlated with social influence and conformity. 4. Social influences (informational influence and normative influence) are positively correlated with conformity and online group-buying intentions.
Zhu, Chang, & Luo (2015)	Online review site	Survey	324 students from a large university in China	1. Argument quality, source credibility, and tie strength positively influence purchase decisions through product usefulness evaluation.
Shu &Scott (2014)	Online review site	Laboratory experiment	236 students in particular classes at 3 universities	1. Social media content is an influential factor in determining destination attractiveness.
Ho & Bodoff (2014)	Web personalization	Field experiment	379 undergraduate students in the School of Business	1. Confidence in one's attitude toward the personalization agent has a negative effect on the subsequent breadth of sampling from the personalization agent. 2. Cumulative breadth of sampling from the personalization agent positively influences confidence in one's attitude toward the personalization agent. 3. Attitude persistence moderates the effect of the cumulative breadth of sampling from the personalization agent on attitude confidence.
Kuan, Zhong, & Chau (2014)	Group buying sites	Laboratory experiment	18 undergraduate students from a major university in Hong Kong.	1. Informational social influence and normative social influence significantly affect the attitudes, intentions, and emotions of individuals.
Goodwin, Kukucka, & Hawks (2013)	Conformity and co-witness confidence in eyewitness memory	Laboratory experiment	126 undergraduate students from Towson University.	1. Informational social influence is a likely force behind participants' public and private memory reports. In contrast, normative social influence seems to govern individuals' confidence in their memory reports.
Waardenburg, Winkel, & Lamers (2012)	Online social network: Facebook	Survey	98 Facebook users recruited by sending a Facebook- or e-mail message.	1. Normative social influence can be successfully applied to persuasive technology.
Zhou (2012)	Mobile banking	Survey	240 university students in eastern China city.	1. Initial trust develops along a dual route of the ELM including the central route and peripheral route. 2. Self-efficacy moderates the effects of the central cues and peripheral cues of the ELM on initial trust.

Lee, Shi, Cheung, Lim, & Sia (2011)	Online discussion forum	Laboratory experiment	104 students in a university in Hong Kong via email, posters, and flyers inside the campus.	1. Positive social influence was found to reinforce the relationship between beliefs about and attitudes toward online shopping, and the relationship between attitude and intention to shop.
Nolan, Schultz, Cialdini, Goldstein, & Griskevicius (2008)	Beliefs about energy conservation	1. Survey 2. Field experiment	1. Survey: 810 participants in San Marcos, California. 2. Field experiment: 981 households in the middle-class neighborhoods of San Marcos, California.	1. Descriptive normative beliefs were more predictive of behavior than other relevant beliefs, even though the respondents rated such norms as least important in their conservation decisions. 2. Normative social influence produced the greatest change in behavior compared to information highlighting other reasons to conserve, even though respondents rated the normative information as least motivating.
Bhattacherjee and Sanford (2006)	Technology acceptance	Survey	81 responses from administrators and staff personnel at L'viv City Hall in Ukraine.	1. The central and peripheral routes are both viable ways of influencing users to accept new IT. 2. Both influence routes are moderated by users' motivation and ability to elaborate or process issue-relevant arguments. 3. The central route results in more stable attitude and usefulness perceptions than the peripheral route, and hence is likely to have a longer-term effect on users' acceptance decisions than the latter
Jones et. al. (2006)	Job advertisements effect on individual's decision	Laboratory experiment	112 undergraduate students at a University in Western Canada.	1. Individuals in the lower (vs. higher) elaboration likelihood conditions chose more ads containing cues unrelated to the job (e.g., bolded font), and fewer ads containing higher quality arguments.
Calisir (2003)	Web advertising	Survey	200 undergraduate students in Istanbul Technical University.	1. Consumers believe online communities are useful for guiding purchase decisions.
Steblay (1997)	Eyewitness Recall	Meta-analysis	A computer search of the CD-Rom database PsycLIT provided an initial sample of studies relevant to the hypothesis.	1. Eyewitness vulnerability to normative and informational influences is apparent in the significantly higher level of choosing biased instruction.
Wittenbrink & Henly (1996)	Comparison of stereotypic beliefs and personal beliefs	Laboratory experiment	71 undergraduate students in an introductory psychology course.	1. Comparison information influenced participants' subsequently measured beliefs about the group.
Petty & Cacioppo (1986)	Study about attitude and persuasion	Laboratory experiment	300 undergraduate students.	1. Routes of processing information related to attitude are identified as the central and peripheral routes.
Chaiken (1980)	Persuasive message	Laboratory experiment	207 undergraduates from University of Massachusetts	1. High involvement leads message recipients to use a systematic information processing strategy in which message-based cognitions mediate persuasion, whereas low involvement leads recipients to use a heuristic processing strategy in which simple decision rules mediate persuasion.
Deutsch and Gerrard (1955)	Individual judgement	Laboratory experiment	101 college students from psychology courses at New York University.	1. Types of social influence are defined as normative social influence and informational social influence.