

THE IMPACT OF ONLINE SOCIAL NETWORK ON CONSUMER LOYALTY: AN EMPIRICAL STUDY OF AN ONLINE DINING COMMUNITY

Completed Research Paper

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Abstract

The dominating assumption in consumer research is that consumers are rational, economic and independent decision makers. In this study, we challenge this assumption by advocating that consumer loyalty in service industry in general and restaurant industry in particular, is a socially constructed behavior. We propose that a consumer's re-patronage of a service firm is affected by the evaluations and preferences of the consumer's online egocentric social network. An empirical study based on more than 5076 consumers in a large online dining community confirms that the preference of one's egocentric network such as their dining occasion preference, their evaluation of a restaurant's environment and food are important determinants of one's loyalty to a restaurant.

Keywords: ecommerce, loyalty, online social network, social identity, service, social influence

Introduction

“Bryan and I came here on a Monday night and it was packed with families, friends and couples. We got the Torta Asada and a variety of Pan Dulce. WOW! The Torta Asada was amazing. My cousin Paul said the Tortas here are amazing and he was right (looking forward to eating dinner with him here).”

a consumer of Bakery Mexico on Yelp.com

Many instances of consumption are essentially social. Consumers learn about restaurants and food from others, dine out with friends, recommend restaurants and food to others, and invite others to dine with them. A survey on Japanese consumers (Japan-Guide.com, 2001) showed that about six out of ten consumers usually dined out with friends, 44% indicated that they usually dine out with family and 13% with co-workers. Consumers not only consume with their friends, they also gather product and service information from each other. A survey by Emarketer.com found that 37% of U.S. adults and 70% of online teens used online social networks every month in 2007 (Williamson, 2007). Another survey (Tarter, 2007) found that 65% of respondents used online reviews for product purchase decision making, 86% of them found customer reviews extremely or very important, 78% of them spent more than 10 minutes to read reviews, and 64% of them used online reviews even though they may purchase from other channels.

The importance of social influence on consumer behavior is gradually recognized in the recent years (Allen, 2002; Arnould & Thompson, 2005; Bagozzi, 2000; Kleine et al. 1993; Muniz & O'Guinn, 2001). In contrast, prior research on consumer behavior has been dominated by the assumption that consumers are rational, economic, and independent decision makers. If consumers' social context, such as their friend networks, family, colleagues, and online social network does exert an influence on their behavior, it is likely that many traditional constructs such as consumer value perception, service quality, satisfaction and loyalty are not only determined by individual preference alone, but also their social context. The advent of information technology in the form of online social networks (e.g., Facebook.com, Yelp.com) makes consumers' social context salient in the digital world. It also weaves consumers into a vast online social network of friends with whom they may or may not maintain a physical contact. Nevertheless, online social networks of a consumer are likely to exert a strong influence on the consumer's product and service perceptions, purchase decision, and loyalty behavior.

The purpose of this study is to investigate how consumer loyalty, a construct of great importance to all firms, is not solely an individual decision, but also a socially constructed decision influenced by consumers' online social networks. Following the tenets of social identity and social categorization theory, with a focus on the service industry in general and restaurant industry in particular, we collected consumers' online social network and offline consumption behavior to demonstrate that both individual preferences and social preferences exert an influence on consumers' loyalty behavior.

This paper is organized as follows. We first review the literature on consumer loyalty. Based on the social view of consumption behavior, we then introduce social influence on consumer loyalty. Hypotheses of consumers' loyalty behavior are proposed based on theories and past literature. After that, we report on an empirical test of the research model. Finally, discussion and implications are provided.

Literature Review and Development of Hypotheses

What is Loyalty

Earlier research defined consumer loyalty as repeated purchases. Brown (1952) forwarded a taxonomy which classified consumers' loyalty into four groups based on consumer's exclusiveness in and stability of patronage behavior. The four groups are undivided loyalty, divided loyalty, unstable loyalty, and no loyalty respectively. Many following studies measured loyalty based on the proportion of repurchase (Cunningham, 1966), purchase sequence (Kahn, Kalwani & Morrison, 1986) and probability of repurchase (Massey, Montgomery & Morrison, 1970). Tellis (1988) summarized consumer loyalty as the repurchasing frequency or relative volume of purchasing for a product type.

Recent research on consumer loyalty has paid attention not only to repurchase behavior, but also consumers' affect with a product or service. Jacoby and Chestnut (1978) argued that repurchasing behavior could be due to situational constraints rather than loyalty, and inconsistent purchasing could mask the true consumer loyalty if consumers are multi-brand loyal. They suggested that psychological measures should also be taken into account in the consumer loyalty research. Their criticism has been supported by many other researchers (Dick & Basu, 1994). Oliver (1997, 1999) forwarded a detailed framework of loyalty development phases. Oliver's (1997) framework characterizes consumer loyalty as built up in cognition, affect and conation phases. He suggested that consumers could be loyal at the cognitive phase first, followed by an affective loyalty, a conative loyalty, and finally a behavioral loyalty which is described as "action inertia". He defined consumer loyalty as a deeply held commitment to repurchase or re-

patronize a referred product/service consistently in the future, thereby causing repetitive same-brand or same brand-set purchasing, *despite* situational influences and marketing efforts having the potential to cause switching behavior.

In this study, we agree with Oliver's (1997, 1999) definition that loyalty is not only behavioral repetitions, but also a commitment based on cognitive evaluation and affective attachment to a product or service. Nevertheless, in a volitional context when there are many competing products or services and when consumers have the freedom of choice, behavior such as repurchases and amount of repurchase still serves as a valid measure of loyalty, because it to a large degree reflects the deliberate choice of consumers and their emotional attachment in face of marketing efforts of competing products. We recognize that re-patronage is the ultimate outcome of loyalty to a firm. Therefore, in consistence with Oliver's definition, we define loyalty as amount of repurchase of a product/service in a volitional context.

The importance of consumer loyalty is well recognized in literature. Loyal consumers are believed to bring more revenues to firms (Reichheld 1996; Schlesinger & Heskett, 1991) and secure predictable sales and profit streams (Aaker, 1992). They generally are willing to spend more on additional goods and services (Heskett, Sasser & Schlesinger, 1997; Reichheld, 1996), easier to be reached and usually act as enthusiastic advocates for their loyal objects (Harris & Goode, 2004). Gremler and Brown (1999) proposed a concept regarding the value of consumer loyalty in the context of service industry – the loyalty ripple effect. They defined the loyalty ripple effect as consumers' influence, including direct and indirect, on a firm through generating interests in the firm by encouraging new consumer patronages or other behaviors that create value for the firm. These behaviors might include repeated purchases, referring new consumers to the firm, co-producing the service, offering social support or benefits to other consumers and employees and mentoring inexperienced consumers. They concluded that "loyal consumers were more than just loyal purchasers". They could benefit the firms much more than the simple financial revenues and profits.

Product Loyalty

Many research models and frameworks have been proposed to explain the formation of consumer loyalty. Dick and Basu (1994) have forwarded an integrated conceptual framework. In their framework, loyalty is a function of attitude one has towards a product in comparison to other products; hence a function of relative attitude. The relative attitude is in turn a function of cognitive, affective and conative evaluation of the product. The key to this framework is the conceptualization of consumer's relative attitude toward a product as an antecedent of loyalty and his/her repeated patronages. Social norms and situational influence are regarded as moderators of the relationship between the relative attitude and a consumer's repeated patronage. The stronger a consumer's relative attitude toward a product or service, the more likely the consumer is to overcome countervailing social norms and/or situational constraints to repurchase.

Consumers' attitude towards a product is often regarded as a function of the product value offered (Oliver, 1999). Product value is a primary motivation for customer patronage. In this regard, customer value regulates behavioral loyalty toward the product provider as long as such exchanges provide superior value (Sirdeshmukh, Singh & Sabol, 2002). Oliver (1999) considers that superior product value as the first step to maintain consumer loyalty. Prior empirical research has confirmed that perceived value has a significant effect on consumer loyalty (Sirdeshmukh et al., 2002).

Service Loyalty

While consumer loyalty research has mainly focused on product and brand loyalty, service loyalty has attracted considerable attention as well. Service industry has its unique characteristics. In service industry, service loyalty is regarded as more dependent on the development of interpersonal relationships as opposed to loyalty with tangible products (Macintosh & Lockshin, 1998). Furthermore, perceived risk has a greater influence in service industry (Bloemer, Ruyter & Wetzels, 1999). On the other hand, loyalty is more prevalent among service customers than among customers of tangible products (Snyder, 1986). In the services context, intangible attributes such as perceived reliability of and confidence in service provider may play a major role in building or maintaining loyalty (Dick & Basu, 1994). As a result, service quality, a well established construct in marketing (Zeithaml, Parasuraman & Berry, 1990) has constantly been found to be important to service loyalty (Bloemer et al., 1999; Johnson & Selnes, 2004).

In summary, both product value and service quality are found to be critical determinants of loyalty in the service industry. Service providers might vary in their product and service combination: Some focus more on service (e.g., counseling service), some more on product (e.g., retailing) and some on both (e.g., restaurants). Consequently, in a service industry that provides both product and service, both product value and service quality would be important to consumer loyalty. In this regard, Harris and Good (2004) further empirically operationalized a framework of consumer loyalty based on Oliver's (1999) framework and proposed a set of antecedents to loyalty. In their framework, service quality and perceived value are evaluations of a service and product offered by a firm. Service quality and perceived value lead to consumer trust which in turn leads to consumer satisfaction as an affective outcome. Perceived value, together with consumer satisfaction and trust, boosts consumers' behavioral loyalty. Their empirical study shows that service quality exerted an indirect influence on loyalty behavior. Perceived value presented both direct and indirect association with loyalty and satisfaction. In short, past studies on loyalty seem to converge on the importance of product value and service quality as starting points of behavioral loyalty.

The development of theoretical underpinning for consumer behavior in the context of service industry has led to a major finding that can be broadly summarized as a theory called attribute-value theory (Johns & Pine, 2002). This theory posits that "consumers view a service such as a restaurant meal in terms of a set of attributes. They weigh up the overall value of an offering in terms of the degree to which each attribute is present and the importance they see the attribute as having" (Johns & Pine, 2002, p121). Therefore, a consumer's evaluation of a service firm can be measured by a weighted sum of product attributes and service attributes.

The service quality literature (Zeithaml et al., 1990) has suggested that the service reliability, responsiveness, empathy, and assurance of service personnel all contributes to consumers' perceived service quality. These dimensions characterize the delivery of a service. The literature (Zeithaml et al., 1990) also suggests the importance of tangibles (i.e., environment and products) on service quality. Correspondingly, the research on restaurant industry have found the service delivery, food quality (e.g., food quality and taste) and environment (Auty, 1992; Clark & Wood, 1998; June & Smith, 1987; Lewis, 1981) to be important considerations in restaurant choice. Among them, food quality and environment are the tangible aspects. Therefore, we hypothesize

H1. A consumer's own perceptions of a service firm's service attributes, in terms of (a) service delivery, (b) service environment, and (c) product quality, have a positive effect on the consumer's loyalty behavior toward the firm.

The consumer loyalty literature focuses on the intrinsic value of a product and service when they are consumed. However, before the formation of product and service loyalty, consumers need to decide whether the products and services are related to their personal needs (Dick & Basu, 1994, Johns & Pine, 2002). To develop loyalty to a firm, consumers need to decide whether the product and service offerings, as an attribute of firm, are relevant to their consumption need. In the restaurant industry, a product match is often known as a menu match (Auty, 1992; Clark & Wood, 1998; June & Smith, 1987; Lewis, 1981) which is defined as how a restaurant's dishes match a consumer's personal dish preference. Besides the need for a product match, consumers often consume services for specific occasions (e.g., dining for celebration or for business). Consumers also have consumption occasion preferences. A good match between the consumption occasions offered by a service firm and the consumer's personal occasion preference is likely to encourage re-patronage. Finally, a good location of a service firm lowers the transaction cost for a consumer (Auty, 1992; Clark & Wood, 1998; June & Smith, 1987; Lewis, 1981), hence increases consumer value. Define consumers' product preference, consumption occasion preference and location preference as elements of a consumer's preference profile, we hypothesize:

H2. A service firm's match to a consumer's own preference profile, in terms of (a) physical location, (b) product preference, and (c) consumption occasion preference, has a positive effect on the consumer's loyalty behavior towards the firm.

Consumer Social Identity

The definition of loyalty presumes an individualistic decision authority in loyalty behavior. Consumers make a re-patronage decision if "I" like the service firm and "I" want to re-patronize. In contrast, a social view of consumer behavior starts with the assumption that consumers are embedded in many communities of various nature (e.g., family, organization, school, community member) and their consumption behavior often reflects their social categorization (Bagozzi, 2000). Therefore, their consumption behavior to a certain degree reflects the intention of the group they are embedded. In other words, re-patronage is not only because "I" like the service firm, but also

because “we” like the service firm, and “we” want to come back again. This is the social nature of consumer loyalty we want to propose.

Theoretical underpinning of the social nature of consumer behavior is gaining acceptance. Bagozzi (2000) sketched a theoretic framework to explain consumer behaviors in group. His framework integrates the goal-directed individualistic behavior with social identity and social categorization theories. Based on this framework, on one hand, the goal-directed behavior theory postulates that individual’s attitudes and feelings towards consumption affect his or her desire and intention to take action. This is in alignment with the traditional loyalty research which postulates that product and service quality are two fundamental drivers of loyalty behavior. On the other hand, social identity is regarded as a main antecedent of consumption intention behavior. The social identity view on consumption (Arnould & Thompson, 2005) is what we want to elaborate here to further explain the social nature of consumer.

A social identity is an individual’s knowledge that one belongs to certain social groups together with some emotional and value significance to oneself of this group membership (Tajfel, 1972). One’s social identity can be easily activated. Mere random assignment of strangers to groups and their awareness of group membership are sufficient to produce a social identity which leads to pro-social actions such as in-group favoritism (Billig & Tajfel, 1973). The process that one identifies oneself to a group is known as the social categorization process (Hogg & Terry, 2000).

Why does social identity affect consumers’ consumption behaviors? The social identity theory proposes a few reasons. First, a social identity helps one to answer the question of “who am I?” (Brewer, 1991; Hogg & Terry, 2000). It is through various social identities one assumes that constitute the concept of self. The need to reduce uncertainty of the self-concept is a basic human desire. Second, consumptions are means to manifest one’s identity (Kleine, Kleine & Kernan, 1993; Bagozzi, 2000). Empirical studies have shown that consumers adopt consumption behaviors that are consistent with their social identity (Kleine et al., 1993; Bagozzi, 2000). In short, the social identity theory posits that consumptions are externalization of consumers’ social identity. Therefore, consumption behavior reflects the group preference and group intention.

Consumer Information Seeking and Sharing

The vast literature on consumer information seeking and sharing behavior complements this view by explaining how social interactions are internalized to produce socially constructed consumption behaviors. Through the process of socialization, consumers gradually become members of different social networks (Moschis & Churchill, 1978; Ward, Klees & Robertson, 1987). Social networks serve as fundamental media for the spread of the information, ideas, and influence from one actor to another (Kempe, Kleinberg & Tardos, 2003). Coleman (1983) has summarized the underlying reason of the social influence on consumers’ purchasing behavior as consumers’ natural tendency to conform to the norms of the social network they belong to because (1) consumers want to be identified by and attain close relationship with their social groups (Goodwin, 1987); (2) consumers have aspiration for the reference group, to whom they look for guidance for their own behaviors (Bearden, Netemeyer & Teel, 1989); (3) consumers want to reduce the perceived purchasing risk (Bearden, Netemeyer & Teel, 1989; Heskett et al., 1997); and (4) word-of-mouth communications are generated between actors in the social network (Sheth & Parvatiyar, 1995).

The first point raised by Colman (1983) defined the consumer psychology as an identification process. An individual wants to establish or maintain a self-defining relationship with another person or a social group by complying with their behaviors or habits. This view is consistent with the social identity theory.

The rest points in Colman’s (1983) summary pertain to word-of-mouth, the basic mechanism that leads to social actions. According to Westbrook (1987, p261), word-of-mouth “consists of informal communications directed at other consumers about the ownership, usage, or characteristics of particular goods and services and/or their sellers”. Gremler and Brown (1999) defined it in the context of service industry as “communication about a service provider offered by someone who is perceived not to obtain monetary gain from doing so” (Gremler & Brown, 1999, p273). Murray (1991) declared that in the service industry, word-of-mouth is the major source of information that potential consumers use while making purchasing decisions. Consumers are interested in word-of-mouth because of the experiential or credential nature of services. Consumers consider the recommender’s experience with a service provider to be a relevant vicarious experience (Day & Barksdale, 1992) and use it as a reference for their own evaluations or experience (Crane, 1989).

In summary, both the sociological research on consumption based on social identity and social categorization theory, and the research on consumer information seeking and sharing via word-of-mouth converged on a similar conclusion that consumption behavior is subject to social influence. This process can be summarized as follows. First consumers are embedded in some natural social networks. Second, when they need product or service information, they seek information from their social networks. Third, they receive not only advices on product and service per se, but also the characteristics that define their social identity, based on which they can evaluate whether the product or service is congruent with their social identity. Finally, depending on the strength of the social identity, consumers adjust their consumption behavior to and comply with the group identity. As Hogg and Terry (2000) summarize it, the consequence of social identification is depersonalization, through which one de-emphasizes one's own individual characteristics and adopts the group prototypical characteristics. The group prototype embodies what a typical group member would act. Bagozzi (2000) suggests that depersonalization leads to a collective and shared intention instead of individual intention. Shared intentions are produced through mutual understandings and communication (Bratman, 1999).

Online Social Influence

The social influence on consumption behavior is prevailing in online social networks. Consumers who join an online social network are subject to the influence of their peers. Based on the structure of one's social network, the personal exposure model (Valente et al. 1997) suggests that the proportion of members in one's egocentric personal network who adopt a product affects one's intention to adopt the product. The personal exposure model is based on Granovetter's (1978) threshold model which posits that an individual will join an activity only after a certain number or proportion of other individuals in the social system has already engaged in that activity. Based on the interaction among social network members, the susceptible-infectious-recovery (SIR) framework in classical disease-propagation framework in epidemiology (Bailey, 1975) has been used to explain the process by which interaction among members spreads a product or service (Xu et al. 2008). More evidences for the social influence on product adoption in online social networks have been accumulated recently (Hill, Provost & Volinsky, 2006; Katona, Zubcsek & Sarvary, 2007; Leskovec, Adamic & Huberman, 2007; Trusov, Bucklin & Pauwels, 2006; Xu et al., 2008), although these studies did not focus on consumer loyalty.

Based on the social view of consumption, service consumption behavior often is not only a function of individual preferences, but also a function of one's social categorization process. Because restaurant dining is often group consumption, the social identity is made salient with the presence of the group (Kleine et al., 1993). Consequently, one's individual intention of consumption is likely to be affected by the collective intention. We define a social perception as the average perception held by a consumer's friends in the egocentric network. We further define a social profile as the aggregated preference profile of a consumer's egocentric network, and social preference as the match of a restaurant to a social profile. We hypothesize:

H3. A consumer's *social* perceptions of a service firm's service attributes, in terms of (a) service delivery, (b) service environment, and (c) product quality, have a positive effect on the consumer's loyalty behavior towards the firm.

H4. A service firm's match to a consumer's *social* preference profile, in terms of (a) physical location, (b) product preference, and (c) consumption occasion preference, has a positive effect on the consumer's loyalty behavior towards the firm.

Research Methodology

Research Context

An empirical study was conducted to test our hypotheses in the context of the largest online restaurant review portal in China, Dianping.com. Similar to other product review web sties, Dianping provided its registered consumers page space to present their personal profile and to post their reviews on restaurants they patronized. Consumers also maintained a list of friends. When a consumer's friends updated their personal profiles or posted new reviews, the consumer was notified. When consumers posted a review of a restaurant, they were encouraged to recommended dishes of the restaurant, which formed the "dish tags" related to the restaurant. They could also recommend suitable occasions (e.g. friends dining, family dining, business dining) to patronize the restaurant. These occasions formed the "occasion tags". Besides these free tagging, consumers reported the average price per person of their

consumption and evaluated the service quality, environment, and taste of food on a scale. Dianping.com provided consumers with a membership card which entitled them certain discounts at restaurants that formed alliance with Dianping. All their transaction data were recorded when membership cards were used.

Data were obtained from Dianping for research purpose. Without the disclosure of consumers' id and sensitive data, the data set contained consumers' review of all restaurants, dish tags, occasion tags, average price per person, evaluation of service quality, environment, and taste of food, and friends. For consumers who had a membership card, their consumptions using the card at restaurants were also made available. We divided consumers' time with Dianping into two periods: the observation period and the prediction period. The purpose was to obtain our independent and dependent variables from different periods to better establish the causality. The prediction period was arbitrarily set to the six months from September 19, 2007 to Mar 18, 2008 (the most recent date in the datasets). Our dependent variable, a consumer's total transaction amount at a restaurant as recorded on membership card, was based on the prediction period. The observation period varied to each consumer. It began on the date a consumer joined the web site and ended on September 18, 2007. The earliest records dated back to the April of 2003. Consumers who registered after September 19, 2007 were excluded. Our independent variables were based on the data in the observation period. We limited our data set to only consumers and restaurants at Shanghai.

Our data set was more like a "within-subject" design. In order to study loyalty behavior which manifests as re-patronages, we are interested in each consumer's transactions (or non-transactions) with every restaurant the consumer had visited or reviewed in the past (i.e., the observation period). Consumers' visits of a restaurant were based on membership card records, and their reviews were based online review posts. However, because of the sheer amount of raw data (about 800 thousand consumers), we narrowed our analysis to a more appropriate and smaller set based on the following criteria. (1) A consumer must have at least one review of a restaurant in the observation period so that we could build an individual profile for the consumer. (2) A consumer must have at least one friend in the observation period and at least one of the consumer's friends must have an individual profile so that we could build a social profile for the consumer. (3) A consumer must have at least one transaction record (not necessarily re-patronage) in the observation period to ensure the consumer was stilling using the card.

As a result, our final sample consisted of 5,076 consumers and 770 restaurants. In total, there were 61,584 records including both reviews and transactions, suggesting each consumer visited or reviewed restaurants 12.19 times on average in the observation period.

Variables and Model

Our dependent variable, loyalty, was measured based on loyalty behavior, i.e., the amount of a consumer's total spending on a restaurant in the prediction period. Those restaurants were the ones the consumer had visited or reviewed in the observation period. The total transaction amount was log-transformed to reduce the influence of extreme values. There were two sets of independent variables: the set related to a consumer as an individual (i.e., the individual perceptions and profiles) and the set related to the consumer's egocentric network (i.e., social perceptions and profiles). They are defined as follows.

Match to Individual Location Profile – Location Preference

A consumer's individual location profile was defined as a frequency-weighted set of locations visited by the consumer. A location was a business district (e.g., a block, a mall) where restaurants resided. Dianping assigned each restaurant to a unique business district based on its location. A frequency-weight was the number of restaurants in a location that the consumer reviewed. The match of a restaurant to a consumer's location profile was defined as:

$$P_l(i, r) = \frac{N(i, r)}{\sum_{r' \in R} N(i, r')}$$

where $P_l(i, j)$ is the location preference of consumer i to restaurant r . $N(i, r)$ is the number of times i reviewed restaurants at the location of r . R is the set of all restaurants i had reviewed in the observation period.

Match to Individual Menu Profile – Product Preference

When posting a review, it was very likely that a consumer would recommend the dishes they tried and liked. Those dishes formed the dish tags the consumer assigned to a restaurant. Similar to location profile, we could define a consumer's menu profile as a frequency-weighted set of dish tags based on the consumer's past review posts. However, rather than using the raw frequency as a weight, the frequency of each dish was adjusted by two factors based on the vector space model. The vector space model is a well established model to measure the similarity of two frequency-weighted item (i.e., tag) vectors (Baeza-Yates & Rbeiro-Neto, 1999). In our case, not only consumers have a set of tags, restaurants had accumulated a rich set of tags from reviews too.

Based on the vector space model, first, the term frequency was divided by the consumer's most frequent dish across all reviews. In other words, the adjusted frequency reflected how much a consumer liked a dish as compared to the dish he or she liked most. Formally:

$$f(i, d) = \frac{N(i, d)}{\text{Max}_{d' \in i's \text{ tag sets}} N(i, d')}$$

where $N(i, d)$ is the frequency that consumer i recommend dish tag d .

Second, each tag was further weighted by its discrimination power to indicate one's idiosyncratic taste. A dish tag is more discriminant if is recommended by fewer consumers than by more. We define the *consumer frequency* of a dish tag as the percentage of consumers who used the dish tag. Since it makes intuitive sense to give a discriminating dish tag a higher weight, we further inverse the percentage and conducted a log-transformation on the inverse consumer frequency. In summary, the final weight of a dish tag is:

$$w(i, d) = f(i, d) \log\left(\frac{N_u}{f(d)}\right)$$

Where N_u is the total number of consumers and $f(d)$ is the number of consumers who used the dish tag d .

A restaurant's dish profile was constructed with the same method. With dish profiles for consumers and restaurants, a match could be calculated based on vector cosine similarity as used for information match in the information retrieval literature.

$$P_m(i, r) = \frac{\sum_{d \in i's \text{ tag set}} w(i, d)w(r, d)}{\sqrt{\sum_{d' \in i's \text{ tag set}} w(i, d')^2} \sqrt{\sum_{d' \in r's \text{ tag set}} w(r, d')^2}}$$

Where $P_m(i, r)$ is the product preference of consumer i regarding restaurant r . $w(r, d)$ is the weight of dish d in restaurant r 's dish profile.

Match to Individual Occasion Profile – Occasion Preference

Similar to product preference, we could build individual occasion profile and the match to a restaurant's occasion profile. Occasion preference is denoted $P_o(i, r)$.

Individual Service, Environment, and Product Quality Evaluations

Dianping allows consumers to evaluate a restaurant' service delivery, environment, and food based on a 5-point scale. These evaluations were used to indicate the subjective perceptions of a consumer for a restaurant. Taste of food indicates the perceived product quality. Service, environment and taste of food evaluations are denoted as $S(i, r)$, $E(i, r)$, and $T(i, r)$ respectively.

Match to Social Location Profile – Social Location Preference

Unlike the model in consumer's individual preference, social location preference measures the match between a restaurant's location and an egocentric network's aggregated location set. We use the following formula to calculate the social location preference.

$$P_{sl}(i, r) = \frac{\sum_{j \in i's \text{ friends}} N(j, r)}{\sum_{j \in i's \text{ friends}} \sum_{r \in R_j} N(j, r')}$$

Where $P_{sl}(i, r)$ is i 's social location preference. The subscript s denotes a social preference. The numerator summarizes the number of times restaurant r 's location appeared in all reviews by all i 's friends. The denominator summarizes the total number of times of all restaurant locations appeared in reviews by all i 's friends.

Match to Social Menu and Occasion Profile – Social Product and Occasion Preference

Similar to the individual product profile, in a social product profile, all dish tags of a restaurant were aggregated for a consumer's egocentric network. After that, the same process was followed to build consumers' and restaurants' social food profile. The cosine similarity was used to obtain the match between a restaurant's product profile and a consumer's. Similarly, social occasion preference could be obtained. Social product and occasion preferences are denoted as $P_{sm}(i, r)$ and $P_{so}(i, r)$ respectively.

Social Evaluation of Service, Environment and Product Quality

Finally, social service evaluation, social environment evaluation, and social taste of food evaluation were calculated based on the average evaluations of one's egocentric network. Social evaluation of service, environment and taste of food are denoted as $S_s(i, r)$, $E_s(i, r)$ and $T_s(i, r)$ respectively.

Besides the dependent and independent variables, a few important control variables were included.

Restaurant Average Price

Restaurant average price was the average spending per person as reported in all reviews of the restaurant. Reviews without reporting spending per person were ignored. This variable controls for the overall price level of a restaurant. Restaurant price is denoted as $Price(r)$.

Individual's Total Dining Count

Individual's total dining count was the total number of restaurant visits across all restaurants in the observation period based on the member card records. This variable represents the person's general tendency to eat out. Individual's total dining count is denoted $Dining(i)$.

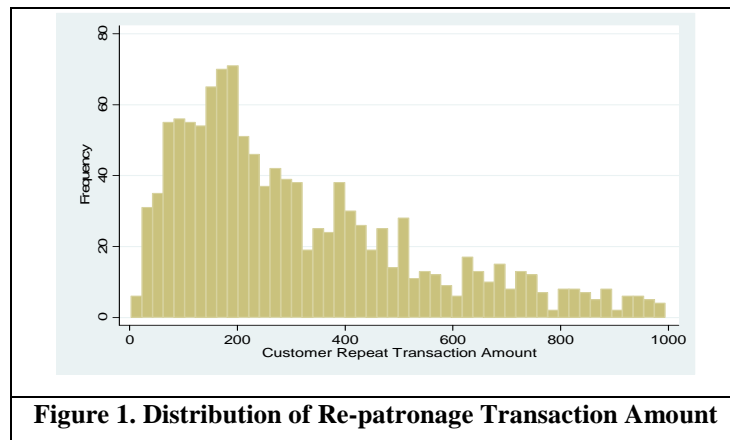
Based on the definition of above variables, a linear model was used to test our hypotheses.

$$\begin{aligned} Y(i, r) = & \beta_0 + \beta_1 P_l(i, r) + \beta_2 P_m(i, r) + \beta_3 P_o(i, r) + \beta_4 S(i, r) + \beta_5 E(i, r) + \beta_6 T(i, r) \\ & + \beta_7 P_{sl}(i, r) + \beta_8 P_{sm}(i, r) + \beta_9 P_{so}(i, r) + \beta_{10} S_s(i, r) + \beta_{11} E_s(i, r) + \beta_{12} T_s(i, r) \\ & + \beta_{13} Price(r) + \beta_{18} Dining(i) + \varepsilon \end{aligned}$$

Data Analysis

Descriptive Analysis.

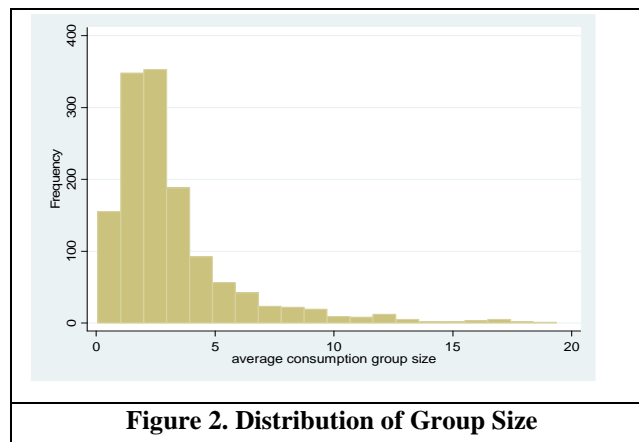
In the data set, there were 5,076 unique consumers and 61,584 transactions and reviews in the observation period. In the prediction period, 1,293 (27.44%) consumers re-patronized at least one restaurant that they visited or reviewed in the observation period. The total consumption of these repeated consumers was CNY 808,500 (1 USD = 6.83 CNY) with an average of CNY 580.40 (sd = 1334.66, median=294) per person. Figure 1 gives a distribution of re-patronage transaction amount for consumers who come back at least once to a previously visited restaurant in the prediction period.



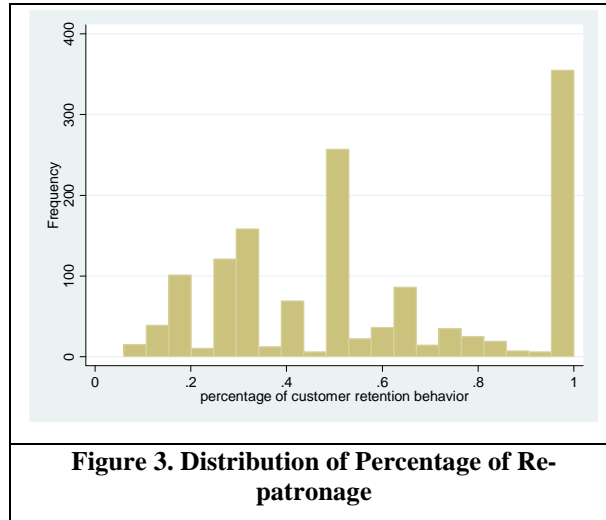
Again focusing on repeated patronages in the prediction period, the average group size of restaurant consumption was calculated as follows. First we calculated the average group size of a consumer i at restaurant r , which is the total transaction amount of i at r divided by the number of transactions and the price per person reported in i 's review of r .

$$G(i, r) = \frac{\sum Trans_amount(i, r)}{Number_of_Transactions \times Price_per_person(i, r)}$$

With that, we then averaged across all the restaurants a consumer visited. The result showed that the average group size was 4.10 (sd=16.34, median=2.56). Figure 2 illustrates the distribution of group sizes. The median of 2.56 indicates that most transactions had a group size of 2 or 3, supporting restaurant consumption as a social consumption.



In order to check how much re-patronage, hence loyalty behavior, amounted to in consumers' overall restaurant transactions, we calculated the percentage of re-patronage (count) over all restaurant visits for the 1,293 consumers in the testing period. The result showed that among consumers who had at least one re-patronage, 57% (median = 50%) of their transactions were allocated to the restaurants they visited in the past. While this result does not generalize to other consumers (i.e., who had no re-patronage at all), it did show loyalty behavior was a significant phenomenon in the current sample. Figure 3 illustrated the distribution of consumers' loyalty behavior measured by percentage of re-patronage.



In summary, the descriptive analysis indicated that both loyalty behavior and social consumption were present in the restaurant context.

Testing of Hypotheses

Before the testing of hypothesis, some additional data processing was done. Some consumers had transactions with a restaurant in the observation period, but did not post any reviews for the restaurant, or they posted a review but did not evaluate the restaurant's service, environment and taste. About 27% records had missing values on some of these attributes. For such instances, we replaced the missing evaluation scores with the restaurant's average scores. In other words, we assumed that consumers agreed on a population-average evaluation of the restaurant if they did not voice an individual opinion.

Table 2. Correlations

	Mean	Stdev	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
(1) Consumption amount	0.176	0.979														
(2) Location preference	0.182	0.199	0.007													
(3) Product preference	0.075	0.110	0.007	0.262												
(4) Occasion preference	0.137	0.182	0.019	0.139	0.386											
(5) Service quality	1.618	0.766	0.030	0.018	0.097	0.054										
(6) Environment	1.755	0.751	0.040	0.031	0.076	0.056	0.556									
(7) Taste of food	1.821	0.704	0.043	0.028	0.205	0.069	0.407	0.406								
(8) Location preference	0.075	0.118	-0.001	0.217	-0.001	-0.018	0.008	0.015	0.010							
(9) Product preference	0.041	0.056	0.003	-0.060	0.067	0.068	-0.004	-0.023	0.027	0.076						
(10) Occasion preference	0.120	0.117	0.014	-0.088	0.032	0.140	0.017	0.030	-0.011	-0.022	0.393					
(11) Service quality	1.616	0.522	0.030	0.007	0.035	0.025	0.359	0.311	0.117	0.023	0.007	0.008				
(12) Environment	1.749	0.540	0.045	0.014	0.0112	0.039	0.304	0.485	0.088	0.022	-0.024	0.039	0.599			
(13) Taste of food	1.807	0.426	0.039	0.0096	0.061	0.004	0.140	0.109	0.227	0.007	0.082	-0.032	0.409	0.353		
(14) Price	81.425	54.338	-0.0118	-0.020	0.012	0.017	0.203	0.304	0.082	-0.007	-0.022	0.018	0.284	0.410	0.127	
(15) Total dining count	12.013	16.987	0.050	-0.149	-0.119	-0.038	-0.001	0.001	-0.016	-0.024	0.042	0.068	-0.002	0.002	-0.030	0.038

Our data were not only panel data, but also had an excessive number of zeros in the dependent variable because of consumers who did not have any transactions in the prediction period. The dependent variable, i.e., their loyalty behavior, was coded as zero for such cases. With such data, it is more appropriate to use tobit regression with random effect than ordinary regression with random effect (Breen, 1996). To test our model, we fitted three models. Model 1 tried to explain loyalty behavior with individual evaluations and preferences alone. Model 2 added the social influence. Model 3 added the control variables. Table 3 reports the fitting result of tobit regression with random effect.

Table 3. Model Fitting Result

Category	Variables	Model 1	Model 2	Model 3
Individual	Location preference	-0.511	-0.120	0.467
	Dish preference	-3.630**	-3.769**	-2.518*
	Occasion preference	2.249***	1.836**	1.938**
	Service quality	0.168	0.054	0.061
	Environment	0.784***	0.374	0.715**
	Taste of food	1.523***	1.484***	1.418***
Social	Location preference	--	-1.408	-1.538
	Dish preference	--	1.344	0.935
	Occasion preference	--	3.574***	3.088**
	Service quality	--	-0.080	-0.008
	Environment	--	1.021***	2.014***
	Taste of food	--	1.443***	1.332***
Control	Price	--	--	-0.037***
	Total dining count	--	--	0.133***
Wald's χ^2		144.48***	206.88***	389.02***
Log Likelihood		-13778.4	-13742.6	-13614.4
σ_u		5.084***	5.076***	4.855***
σ_e		11.305***	11.251***	11.177***
ρ		0.168	0.169	0.159

The results of Model 3 show that individual evaluation of service was insignificant; hence Hypothesis 1a was not supported. Individual evaluations of environment and taste were both significant, lending support to Hypothesis 1b and 1c. Individual location preference was insignificant, lending no support to Hypothesis 2a. Individual product preference turned out to be negatively significant, hence Hypothesis 2b was not supported. Individual occasion preference was significant, lending support to Hypothesis 2c.

A similar picture was observed for social influence. Social evaluation of service was insignificant, lending no support to Hypothesis 3a. However social evaluation of environment and taste were significant, lending support to Hypothesis 3b and 3c. Social location and dish preference were not significant which offered no support for Hypothesis 4a and 4b, but social occasion preference was significant in support of Hypothesis 4c. Both control variables, the average price level of a restaurant and a consumer's past dining frequency across all restaurants were significant.

Across the three models, log likelihood increases substantially from Model 1 to Model 2 and 3, suggesting it was necessary to factor in the social influences to explain loyalty behavior. The confidence intervals of ρ did not include zero for all models, indicating the necessity to employ a random effect model.

Discussion and Implications

Discussion

We set out to test the effect of social influence of a consumer's online social network on the consumers' loyalty behavior in the service consumption context. Our results based on a large restaurant review online social network indicated that restaurant re-patronage was as much a social action as an individual action. Interestingly, the same set of variables was found to be significant from both individual and social profiles: the evaluation of environment, taste of food, and occasion preference. The rest variables were not supported: location preference, product preference, and service quality. Overall, the significance of variables in social profile signified the social nature of loyalty behavior.

Why did some variables turn out to be insignificant? Regarding location, one plausible reason might be the encoding of the data. In our data set, restaurant location was not based on precise latitude and altitude of a restaurant. As a result, we could not obtain the geographic center(s) of a consumer's dining area for a more precise measure of the convenience of a restaurant to the consumer. The coarse measure based on frequency of business district visit might weaken the importance of location preference, leading to the insignificance of location preference in both the individual profile and the social profile.

Regarding product preference, the median of match based on cosine score was found to be low ($r=0.023$). One plausible reason could be the use of cosine-based match as a measure of product preference. Cosine-based match emphasizes the match of whole profiles between a consumer and a restaurant. However, on hindsight, the decision to visit a restaurant should not require an exact match between a consumer's dish profile and the restaurant's; it is sufficient for a consumer to favorably evaluate a restaurant if it serves the dishes the consumer likes. In other words, when a restaurant serves very few preferred dishes, the cosine score is low; when the restaurant serves exactly what a consumer prefers, the cosine score is high; when the restaurant serves more than what a consumer prefers, the cosine score is low again. This quadratic pattern of cosine score might have attenuated the significance of product preference.

Service evaluation turned out to be insignificant. One plausible reason could be that service has become a hygiene factor rather than a differentiating factor. Poor service might lose consumer loyalty, but good service might not contribute much to consumer loyalty.

Limitations

Before we discuss the implications of this study, some limitations of the study have to be pointed out. First, this study was conducted in the context of one city in China and in one industry. Generalization to other industries and geographic areas should be treated with caution. Second, due to the limitation of the data available, our operationalization of variables might not be the best one. As mentioned above, the location preference and product preference might be measured in other ways which are currently under exploration. Third, because of the textual nature of dish tags and occasion tags, different tags might refer to the same thing yet were treated as different based on our exact text matching method. Measurement errors could be introduced in data preprocessing. Fourth, customer loyalty was operationalized as the amount of repurchase. While in a volitional context, such an operationalization sounds reasonable, it is desirable to have other measures that correspond more directly to consumers' psychological commitment. For example, consumers' click-stream data, if available, would reveal if they are single-brand loyal and deliberately refuse the exposure to competitive products (Brown 1952; Jacoby and Chestnut, 1978). Fifth, our study covered only a small portion of users of Dianping who maintained an online social network (5076 out of 800,000). While the narrowing of our analysis to the small set is necessary for a better internal validity, it raised a concern that this sample might not be able to fully represent the whole population. For example, the sample could be particularly interested in online social networking than the average of the population. It is interesting in future research to compare their loyalty behavior with those who did not keep an online social network. Finally, the social networks maintained by consumers were not as complete as other social network web sites such as Facebook. We could only capture a portion of consumer's social network from the web site. The social influence from offline social network was unavailable to this study.

Theoretical Implication

With these limitations, we do believe this study offers a few important insights to consumer loyalty behavior. First, this study extends past theorization of the social nature of loyalty behavior. Extant research considered loyalty as an outcome of superior consumer service, product quality, and consumer satisfaction (Dick & Basu, 1994; Harris & Good, 2004; Oliver, 1999). The basic assumption is that loyalty behavior is a rational individual decision based on utility a consumer expects to obtain from a product or service. Based on the basic tenets of social identity and social categorization theory, we advocate that loyalty behavior is socially constructed as well. While consumer behavior is recently more recognized as an in situ practical experience (Allen, 2002) and socially determined (Bagozzi, 2000; Holt, 1997), we empirically demonstrate that loyalty behavior is indeed social.

Second, this study reveals the impact of online social network on service consumption. Past research on online product diffusion have focused on the adoption of a new service or brand (Hill, Provost & Volinsky, 2006; Katona, Zubcsek & Sarvary, 2007; Leskovec, Adamic & Huberman, 2007; Trusov, Bucklin & Pauwels, 2006; Xu et al., 2008). Loyalty behavior has not been investigated. The adoption of a new product or service and the re-patronage behavior shall not be regarded as the same. After adoption, consumers are likely to have more individuated information about a product or service. Based on the conventional assumption of rational and economic consumers, their behavior shall be more independent in re-patronage. Our study reveals that this is not necessarily the case. Re-patronage still is a function of social influence. In particular, online social network seems to play an important role in shaping consumers' preference even after personal experience. Moreover, this study demonstrates that online social influence can have an effect on offline behavior. While this is intuitively plausible, we provide empirical evidence to show that service firms should actively manage their online community for better offline consumer loyalty.

Third, this study broadens the theoretical exploration in the service research. Extant research has focused on individual utility factors in consumers' service consumption; we suggest that social factors should not be overlooked. In fact, the consistent significance of occasion preference at the individual and egocentric network level suggests that dining is conducted more as a social activity than satisfying a simple biological need or purchase of food with the best economic value. The study suggests that people often go dining in groups; they choose restaurant that match their occasion and their friends' occasion preference. The significance of environment is also consistent with the interpretation that dining has a functional purpose besides food, and an environment that caters to both the individual's and friends' environment preference are of importance. In other words, the fit of a restaurant to a group activity is imperative. A more intriguing finding is: although the evaluation of food is an individual preference, the need to satisfy the taste preference of one's egocentric network is also important. Our finding is somewhat consistent with Rozin's (2006) observation that the acceptance of chili pepper is a socially constructed behavior, given the innate repelling nature of chili pepper. The significant correlation ($r=0.227$, $p<0.001$) between individual taste and social taste evaluation is in support of this.

Finally, methodologically, this is probably the first empirical study to investigate the social influence of a consumer's egocentric network on the consumer's loyalty behavior. Although the idea of building social and community support to boost consumer loyalty has been proposed for long (Oliver, 1999) and anecdotal evidences (Arnould & Thompson, 2005) have been provided, large scale consumer study is scarce. Most extant research adopted an ethnographic and grounded theoretic approach and called for multi-method verifications (Arnould & Thompson, 2005). Adopting the social network analysis method, this study tests the social nature of loyalty behavior in a positivist paradigm. It excels past consumer research on social influence based on constructs like subjective norms. It also avoids the ecological fallacy that plagues the black-box approach adopted by industry-wise diffusion models (e.g., the Bass diffusion model). A mid-level analysis is proposed to identify and investigate the exact influence of egocentric networks on individuals. Therefore, the theoretical claim of the social nature of loyalty behavior is better substantiated.

Practical Implication

The practical implication of this study is also multifold. First, online community is an important venue to manage consumer loyalty. Service firms shall carefully manage the reviewers posted online. Negative reviews shall be actively managed to reduce their social impact. If consumer loyalty has a ripple effect (Gremler & Brown, 1999), it is likely that negative reviews online would have a ripple effect too. Service managers need to actively monitor and

respond to negative reviews. In contrast, active online advocates need to be identified and rewarded because they help foster fellow consumers' loyalty.

Second, with the advent of online social network as an important context for online advertising, our study suggests a way to identify consumers who are more likely to re-patronize a restaurant. Because there is only a limited space for advertising on a consumer's web page, precise marketing to maximize click-through rate becomes a crucial concern for the platform provider. We suggest that in order to identify the most susceptible consumers, not only their personal profile needs to be analyzed, but also their egocentric network which provides additional insight to identify how likely they would re-patronize a restaurant. Targeted promotion can then be designed for such consumers.

Third, our study offers insights on product recommendation agent design. Like many other product review web sites, Dianping currently recommends restaurants based on geographic locations, cuisine types and product associations like "those who visit restaurant X also visit restaurant Y". Our analysis proposes a new type of product recommendation that incorporates both individual preferences and social preferences. This method might be particularly suitable for consumers who already have sufficient transaction records and social connections recorded by Dianping. Our study also suggests that occasion-based recommendation might be a new alternative. Restaurants can even be recommended based on friends' taste evaluation. These new ways of recommendation have not been explored by most restaurant review sites.

In summary, this study suggests that information technologies related to online social community not only create a new venue to build consumer social networks to enhance loyalty, but also poses new challenges to manage the word-of-mouth in the community and new opportunities to leverage the community for targeted advertising and cross-selling.

Conclusion

In conclusion, this study proposes a social perspective on consumer loyalty behavior. With a focus on restaurant industry, we propose that re-patronage is not only determined by individual preferences, but also social preferences of one's online social network. Based on the data from the largest restaurant review web site in China, we test the significance of both personal preferences and social preferences on consumers' loyalty behavior. Our findings suggest that dining is essentially a social activity. Both individual and social occasion preference, environment evaluation, and taste evaluation exert a significant influence on consumers' re-patronage of a restaurant. Our findings provide the first piece of evidence to support consumer loyalty as a social behavior.

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