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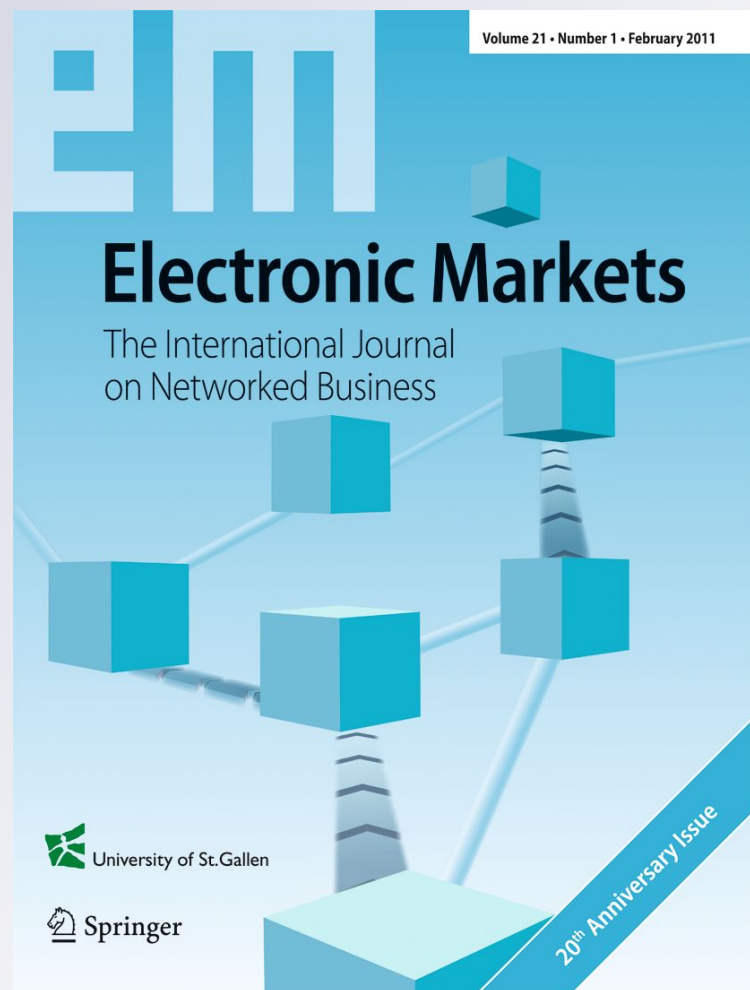
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Business engagement on Twitter: a path analysis

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Abstract Social media services, such as Twitter, enable commercial businesses to participate actively in online word-of-mouth communication. In this project, we examined the potential influences of business engagement in online word-of-mouth communication on the level of consumers' engagement and investigated the trajectories of a business' online word-of-mouth message diffusion in the Twitter community. We used path analysis to examine 164,478 tweets from 96,725 individual Twitter users with regards to nine brands during a 5-week study period. We operationalized business engagement as the amount of online word-of-mouth messages from brand and the number of consumers the brand follows. We operationalized consumers' engagement as the number of online word-of-mouth messages from consumers both connecting to the brand and having no connection with the brand as well as the number of consumers following the brand. We concluded that the business engagement on Twitter relates directly to consumers' engagement with online word-of-mouth communication. In addition, retweeting, as an explicit way to show consumers' response to business engagement, indicates that the influence only reaches consumers with a second-degree relationship to the brand and

that the life cycle of a tweet is generally 1.5 to 4 hours at most. Our research has critical implications in terms of advancing the understanding of the business's role in the online word-of-mouth communication and bringing insight to the analytics of social networks and online word-of-mouth message diffusion patterns.

Keywords Twitter · Social network · Electronic word-of-mouth · Advertising · Information diffusion

JEL M3—Business administration and business economics · Marketing · Accounting—Marketing and advertising

Introduction

Electronic word-of-mouth (eWOM) communication can have huge influences on commercial businesses. Research has shown that exposure to eWOM messages can generate more interest in product category than can exposure to information produced by marketers (Bickart and Schindler 2001). EWOM messages have strong influences over online brand trust (Ha 2004). Moreover, eWOM messages highly correlate with companies' sales (Bharati and Tarasewich 2002; Davis and Khazanchi 2008; Lleti et al. 2004). Therefore, commercial businesses need to consider eWOM messages when developing and managing their advertising, branding, and marketing strategies.

Moreover, successful commercial businesses must go beyond simply being aware of or taking into consideration eWOM messages and instead must engage in the eWOM communication process as both communication initiators and active participants. While noting differences between online and offline environments, de Chernatony (2000)

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highlights the importance of interacting with consumers, engaging consumers in the branding process, and participating in consumers' conversations. The Internet empowers consumers to gain access to information sources, enabling them to be the "active co-producers of value" (de Chernatony 2000, p. 191). Building on this idea, our research focuses on how a business can engage in eWOM communication, how engagement creates consumers' eWOM communication, and how consumers respond to the business's engagement.

We chose Twitter as the word-of-mouth communication platform to study because it is a typical, functional, parsimonious, and popular social media service, which makes it a good starting point for businesses to enter the social media arena and one of the best social tools empowering the brand to connect with customers. It provides the basic social media functions, such as owning a profile page, connecting with people, and sharing text and multimedia information. A business can get started on Twitter easily because the registration process is simple and the concept of the system is intuitive. Moreover, it is a very popular service with considerable media spotlight, which in turn makes it even more popular. Therefore, it is appropriate and timely to study Twitter for this eWOM research.

Twitter was founded by Jack Dorsey, Biz Stone, and Evan Williams in 2006 (Sagolla 2009). It is a micro-messaging service enabling one to share messages with up to 140-characters. The message is referred as a *tweet*. On Twitter, one can follow other people to receive their tweets, and these people are called his/her *followers*. On the other hand, one can be followed by other people, who will receive one's updates. These people are called as his/her *followings*. Twitter has the following five major characteristics.

First, Twitter is a real-time and flexible communication platform. Tweets are updated instantaneously in the system. The system supports one-to-one, one-to-many, and many-to-many communications.

Second, the system is simple and intuitive. When registering, people do not need to fill in lengthy forms on their backgrounds and preferences. They only need to answer a couple of basic questions to finish the registration. They can start using the system immediately since the concept of the system is very straightforward and the learning curve is short.

Third, the affordance of Twitter is lower than most of the services or systems on the Internet. Micro-messages are easy to craft and consume. It also encourages people to craft and consume the messages in a real-time fashion.

Fourth, Twitter is a very open system. It can be openly accessed in three different ways: Web interface (its own Website, MySpace, Facebook, AIM), via third-party application (desktop application and mobile phone application), and cell phone short message.

Fifth, Twitter is a network on many different levels. It is a social network that can grow many companies, forming a pseudo-corporate network with Twitter in the center. Twitter's openness and flexibility allow others to develop application programming interfaces (API) freely, which creates a number of small companies and forms a Twitter ecosystem. These companies all depend on the mother company (Twitter), so the fate of Twitter is not just its fate. It is also relevant to all those small companies. Twitter reportedly had 50,000 applications built by using Twitter (API) by December 2009 (Wauters 2009).

Jansen et al. (2009) researched word-of-mouth communication on Twitter and found that about one fifth of all tweets contain the name of a brand, product, or service. Among these WOM tweets, about one fifth express some sentiments. More than half of the branded tweets with sentiments are positive tweets, and only one third of them are negative tweets. Their study showed that the linguistic structure of tweets is similar to the linguistic patterns of natural language expressions. They concluded that Twitter is a potentially rich WOM venue for companies to explore as part of their overall branding strategy. It is a key application in the attention economy and a competitive intelligence source.

Our research extends the work of Jansen et al. (2009) by focusing on the interaction aspect of business and consumer engagement in the eWOM communication platform. We are particularly interested in studying eWOM communication from the business's perspective and investigating overall eWOM communication based on the engagement of business, the exchange of eWOM between businesses and consumers, and the consumers' reaction to a business's engagement. It brings insight on how active businesses should be on Twitter. Should they engage as often as they can, at least once a day, or whenever they have news to release? In addition, can a business's engagement cause consumers' to engage in eWOM communication on Twitter? If so, in what way? These are some of the questions motivating our research.

In the remainder of this paper, we review WOM communication with the focus on how companies can manage WOM communication. We present the model tested in this project and explain the approach to tackle the problem. Then we report the results by using path analysis and conclude by discussing research and managerial implications.

Literature review

With the introduction of the Internet, forum, online review, and social media services, traditional WOM communication, defined as "oral, person-to-person communication between a perceived non-commercial communicator and a

receiver concerning a brand, a product, or a service offered for sale” (Arndt 1967, p. 190), has been evolving into eWOM communication, defined as “any positive or negative statement made by potential, actual, or former customers about a product or company, which is made available to a multitude of people and institutions via the internet” (Hennig-Thurau et al. 2004, p. 39). EWOM communication is perceived as spreading faster, reaching out to a larger audience, and having deeper and wider influences when compared with traditional WOM communication. Companies, then, must find ways to harness the potential of eWOM.

There are several ways that companies can possibly develop WOM communication management strategies. The company can manage consumers’ WOM communications by leveraging the motivations for consumers to become involved in WOM communication. Sundaram et al. (1998) identified eight motives for consumers to engage in WOM communication. They further differentiated factors motivating consumers in positive WOM communication, including altruistic, product involvement, and self-enhancement reasons from factors motivating consumers in negative WOM communication including altruistic, anxiety reduction, vengeance, and advice seeking reasons. Overall, motives to engage in WOM communication are significantly related to consumers’ consumption experiences. Building on the work of Balasubramanian and Mahajan (2001), Hennig-Thurau et al. (2004) developed one of the most comprehensive frameworks of factors motivating people to express themselves and engage in eWOM communication. Their framework basically identifies five utilities motivating consumers to engage in eWOM communication. The first is the focus-related utility, which consumers receive when making contributions to the community, especially those with added value. The second, consumption utility, refers to consumers obtaining value through direct consumption of other consumers’ contributions. In contrast, approval utility comes when one’s contributions are consumed or approved by other consumers. Moderator-related utility is achieved when a third party makes the complaint act easier because consumers hope the platform operator will serve as an intermediary between them and the company. The last one is homostate utility, which is a balanced state that individuals strive to restore after they lose the original equilibrium according to the balance theory (Hennig-Thurau, et al. 2004, p. 44). After a satisfying or dissatisfying consumption experience, consumers can restore their balance by expressing either positive or negative sentiment toward the brand.

The company can influence eWOM via its own marketing channel. Keller (2007) argued that traditional media and marketing channels still drive eWOM. Roughly 50% of branded conversations include a reference to some kind of media or marketing that is consumed by at least one of eWOM communication participant. These media and

marketing references include advertising, editorial and programming from various types of media, company websites, and marketing materials at the point of purchase, coupons, and other promotions.

The company can manage WOM communication by playing different roles in the communication process. Godes and fellow researchers (Godes et al. 2005) described four WOM management strategies for business: the company can be an observer, moderator, mediator, or participant in the WOM communication. As an observer of WOM communication, the company only collects information and learns the ecosystem. It can know how its consumers think about it and what its competitors are doing. As a moderator, the company goes beyond listening to actually foster the conversation. It usually realizes the moderator role by establishing a platform to allow consumers to exchange information or adopting a customer recommendation program. As a mediator, the company takes control of the eWOM message and disseminates it by itself. It tries to manipulate the communication content and channel. The company can be more active and serve as a participant in the WOM communication directly. Social media sites like Twitter can enable the company to play this role. In this research, we argue that business participation in WOM communication can also be a driving factor for WOM communication, which can be viewed as an approach for business to manage WOM communication.

Our model We developed our model based on the research work from Keller (2007) and Godes and fellow researchers (Godes et al. 2005). Keller’s (2007) research indicates that media and marketing materials are the driving factor of WOM communication. Twitter is an emerging social media platform, on which commercial businesses can maintain brand presences and communicate with the consumers. The businesses’ tweets can be viewed as media and marketing materials, so they are the driving factors of eWOM communication based on Keller’s (2007) theory. Due to proximity to the source, business tweets are likely to be the major driving factor for eWOM conversation on Twitter. The business plays a role as the active eWOM communication initiator or participant in the process as shown in Godes, et al. (2005).

Business can influence consumers in the eWOM communication process on Twitter like ripple in water. Because businesses establish their Twitter accounts, they are able to manage eWOM communication. Businesses try to form a brand community by getting consumers to follow it and, in turn, by following the consumers. Broadcasting tweets is an important part of this process. The more tweets a company sends out and the more consumers it follows, the bigger impact it has in the Twitter community. The impact is reflected by greater brand awareness and increasing number of followers; more consumers connect-

ing to it learn more about the brand from the tweets and have more things to share about the brand. These consumers, in turn, influence other consumers who are connected with them but who are not connected to the brand. These relationships are modeled in Fig. 1.

Research question

This study is motivated by previous research on different strategies companies use to manage eWOM communication, and thus, our research question is “what are the influences of business engagement in online word-of-mouth communication on consumers’ level of engagement in word-of-mouth communication on Twitter?”

Internet and social network sites are changing the way eWOM messages diffuse and enable businesses to participate actively in eWOM communication. However, there is general lack of empirical research on businesses as participants in managing eWOM communication. Understanding the business role as eWOM participant has strategic meaning to management. It brings insight on how influential the business can be on Twitter, how proactive the business should be in eWOM communication process, and how many resources the business should allocate on eWOM advertising.

There are two ways to address our research question and operationalize our model (Fig. 1). One way is to assume that business engagement can create cues and associations in consumers’ minds, that it is a mind-sharing process (Holt

2004). From this perspective, consumers tend to engage more in the eWOM communication as they become more aware of the brand. A second way of addresses our research question is to stick strictly to the explicit influence of business engagement by investigating consumers’ behavior of retweeting messages from business Twitter accounts. Retweeting is the action of forwarding one’s tweet with the acknowledgment of its source in the message

Using the first approach to address our research question, we can measure business engagement on Twitter by how active the business is in sending tweets by estimating tweet frequency ($WOM(Business)$). We can also evaluate how active the business is in listening to consumers and in trying to understand them by measuring the number of consumers it follows ($Business’ Following Number$), which may be the precursor for delivering high quality eWOM messages.

The consumers’ engagement is evaluated on two levels based on the distance of the relationships consumers have with the business. The immediate influence the business can have is on consumers with direct connection to it, either the business’ followings or followers. So one way is to measure how actively these consumers participate in the eWOM communication process by branded tweet frequency ($WOM(Consumers Connecting to Business)$). Another way to operationalize consumers’ engagement is to measure the number of a business’ followers ($Business’ Follower Number$), which shows the intention of the consumers to receive up-to-date brand information. Since Twitter is a social network, business influence can permeate through the layer of consumers connecting to it and then penetrate through the network and in turn potentially affect all the consumers in Twitter. Therefore, another level to operationalize consumer engagement is to measure the branded tweet frequency among consumers having no connection with the business ($WOM(Consumers Not Connecting to Business)$).

The descriptions above and the model (Fig. 1) tested in this research can be specified by the following path equations and demonstrated by path model (Fig. 2):

$$\begin{aligned}
 &WOM(ConsumersNotConnectingToBusiness) \\
 &= a_1 + b_{11}WOM(Business) + b_{12}BusinessFollowingNumber \\
 &\quad + b_{13}WOM(ConsumersConnectingToBusiness) \\
 &\quad + b_{14}BusinessFollowerNumber + e_1
 \end{aligned}
 \tag{1}$$

$$\begin{aligned}
 &WOM(ConsumersConnectingToBusiness) \\
 &= a_2 + b_{21}WOM(Business) + b_{22}BusinessFollowingNumber + e_2
 \end{aligned}
 \tag{2}$$

$$\begin{aligned}
 &BusinessFollowerNumber \\
 &= a_3 + b_{31}WOM(Business) + b_{32}BusinessFollowingNumber + e_3
 \end{aligned}
 \tag{3}$$

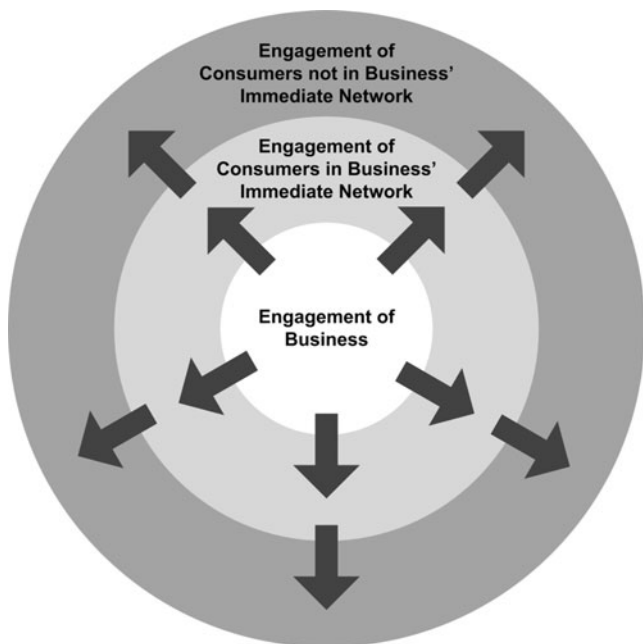
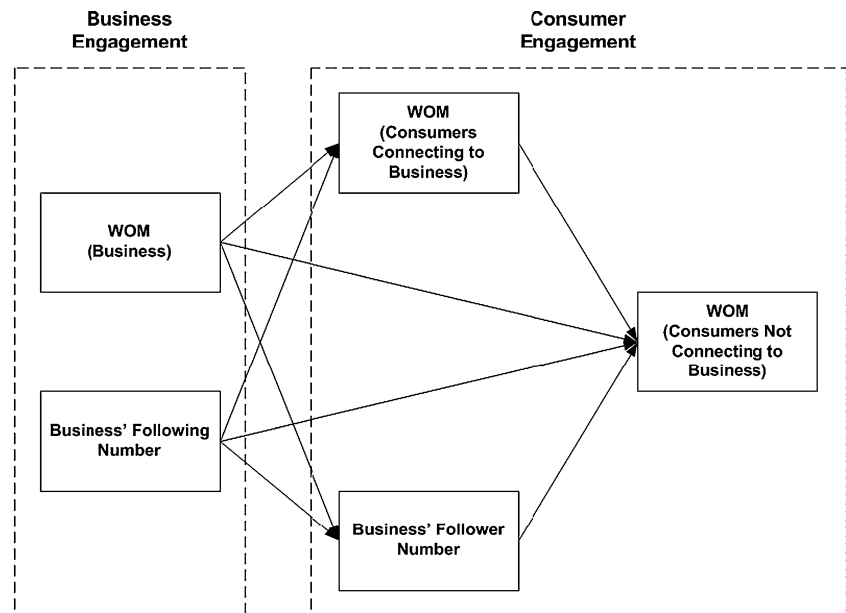


Fig. 1 Business engagement in eWOM communication

Fig. 2 Path model



In the second approach to address our research question, we measure how tweets from the business diffuse throughout the Twitter network. The business sends out tweets from its Twitter account. Some of the messages are retweeted by consumers who received the tweets directly from the company. Those retweeted messages are subsequently read and retweeted by consumers connecting to consumers having direct connection with the brand. In such a fashion, consumers pass along the messages, potentially spreading them throughout the whole Twitter community. We model this process to evaluate the explicit influence of business engagement in the eWOM communication process.

Methodology

In order to answer our research question, we collected tweets from both businesses and consumers as well as the follower and following information of the businesses. We performed path analyses to investigate the relationship between all variables and assessed the contribution of each predictor on the overall eWOM communication in the Twitter community. We also investigated trajectory of retweeting the message from the business.

Data collection

We selected nine businesses' Twitter accounts (Table 12), their tweets, and their consumers' WOM messages to study. These nine businesses include Coffee Goundz (@CoffeeGroundz), Comcast (@comcastcares), Home Depot (@HomeDepot), H&R Block (@HRBlock), Kogi BBQ (@kogibbq), Naked

Pizza (@NAKEDpizza), Starbucks (@Starbucks), Whole Foods (@WholeFoods), and Zappos (@zappos).

We made a diversified business selection to increase the generalizability of this study. These businesses are for products and services closely related with everyday life. In addition, all these branded Twitter accounts are very active on the platform in terms of tweeting, following customers, and letting customers follow them, so that they can be either representative for the business presences on Twitter or exemplars for other businesses to learn from. They are good cases for WOM study on Twitter.

These nine businesses represent two broad business categories on Twitter. Coffee Goundz (@CoffeeGroundz), Kogi BBQ (@kogibbq), and Naked Pizza (@NAKEDpizza) represent small local businesses. The rest are nationwide or worldwide businesses that represent different industries. Coffee Goundz (@CoffeeGroundz), Kogi BBQ (@kogibbq), Naked Pizza (@NAKEDpizza), and Starbucks (@Starbucks) are from the fast food industry. Coffee Goundz (@CoffeeGroundz) and Starbucks (@Starbucks) are coffee houses. Kogi BBQ (@kogibbq) is a food truck business. Naked Pizza (@NAKEDpizza) is a take-out and delivery pizza restaurant. Comcast (@comcastcares) is a cable and Internet provider. Home Depot (@HomeDepot) is a home improvement retailer. H&R Block (@HRBlock) is a tax service provider. Whole Foods (@WholeFoods) is a grocery supermarket. Zappos (@zappos) represents the online store.

We used a stratified sample approach and selected data during 5 weeks between May 1, 2008, and May 31, 2009. To make sure the 5 weeks were not clustered and representative, we first had a stratified sample of 5 months, which were May 2008, August 2008, November 2008,

February 2009, and May 2009. For each of the first 4 months, we selected different weeks in which to capture the business's and consumer's behaviors in response to the potentially different marketing strategy in different periods of a month. So we chose the first week in May 2008, second week in August 2008, third week in November 2008, and fourth week in February 2009. For May 2009, we chose the last week to represent the latest branded tweet trend of the period we studied. Given that not all of the brands used Twitter from May 1, 2008, we identified 33 cases in total for nine brands in the 5-week research period.

We have three data sets about the nine brands. First, we gathered the user names of all who were followers and followings of these businesses as of May 31, 2009. Second, we collected the tweets from branded Twitter accounts during the 5-week period as well as the time stamp, which includes 25,601 tweets. Third, we collected all the tweets mentioning these nine businesses during the 5-week study period along with the time stamp and the sender's user name, which includes 138,877 tweets. The queries we used to gather the WOM tweets are presented in Table 13. We tried to include as many variants of brand names as possible.

Data processing

All the data were processed at the week level since previous research found a strong weekly pattern of Twitter usage. Users tweet more in the middle of the week and less during weekend and the beginning of the week (Jansen, et al. 2009). Therefore, it is comparatively stable and more comparable to measure by week. Thus, we measured, by week, the number of tweets from the business and the number of the businesses' new followers and followings.

For all the tweets mentioning these nine businesses during 5-week study period, we differentiated the tweets based on whether the sender of the message connects to the business, which can be following the business and/or letting

the business follow him/her. We then categorized the tweets as those sent by consumers connecting to the business and those sent by consumers having no connection to the business. These tweet volumes are summarized at the week level.

Our data, however, is not multivariate normal, but rather it has a power law distribution. We transformed data to the normal distribution via the Box-Cox power transformation, using $\lg(\text{variable} + 1)$.

Retweet formats have many different variations. In order to guarantee the rigor of our research methods and validity of our research results, we manually evaluated all the tweets sent by consumers and picked out the messages originating from the business.

Path analysis

The major statistical approach we used to test our model (Fig. 1) is path analysis, "a statistical technique that uses both bivariate and multiple linear regression techniques to test the causal relations among the variables specified in the model" (Olobatuyi 2006, p. 32). We want to emphasize that path analysis itself can only show the existence of correlation. Causal relationship can be indicated on top of correlation based on other data and/or theoretical supports. One specialty of path analysis is that it reveals the direct and indirect effects that predictor variables have on responding variables (Olobatuyi 2006).

Results

Descriptive analysis of business' followers and followings

Tables 1, 2, and 3 summarize the follower and following information by May 31, 2009, for all of the nine businesses we studied. Given that all of the businesses we studied are popular and well-known in the Twitter community, the odds

Table 1 Breakdown of followers and followings by number of businesses they connect to

Number of business	Follower (n)	Follower (%)	Both (n)	Both (%)	Both (% within follower)	Both (% within following)	Following (n)	Following (%)
1	1,173,504	83.25%	685,244	84.01%	58.39%	90.75%	755,099	83.78%
2	208,893	14.82%	112,445	13.78%	53.83%	89.24%	125,996	13.98%
3	20,540	1.46%	13,263	1.63%	64.57%	89.18%	14,873	1.65%
4	4,757	0.34%	3,378	0.41%	71.01%	89.58%	3,771	0.42%
5	1,355	0.10%	984	0.12%	72.62%	91.36%	1,077	0.12%
6	463	0.03%	328	0.04%	70.84%	91.88%	357	0.04%
7	97	0.01%	70	0.01%	72.16%	85.37%	82	0.01%
8	12	0.00%	1	0.00%	8.33%	50.00%	2	0.00%
Total	1,409,621	100.00%	815,713	100.00%	57.87%	90.51%	901,257	100.00%

Table 2 Breakdown of followers and followings within business

Business	Coffee Groundz	Comcast	Home Depot	H&R Block	Kogi BBQ	Naked Pizza	Starbucks	Whole Foods	Zappos
Total follower (n)	6,124	20,867	8,241	3,021	26,644	3,475	198,152	724,284	691,458
Unique follower (n)	477	579	1,558	268	25,473	2,153	61,619	300,581	318,737
Unique follower (%)	7.79%	2.77%	18.91%	8.87%	95.61%	61.96%	31.10%	41.50%	46.10%
Overlap (n)	5,647	20,288	6,683	2,753	1,171	1,322	136,533	423,703	372,721
Overlap follower (%)	92.21%	97.23%	81.09%	91.13%	4.39%	38.04%	68.90%	58.50%	53.90%
Overlap following (%)	98.36%	98.20%	89.87%	98.74%	87.00%	39.76%	96.23%	89.30%	89.33%
Total following (n)	5,741	20,659	7,436	2,788	1,346	3,325	141,886	474,495	417,235
Unique following (n)	94	371	753	35	175	2,003	5,353	50,792	44,514
Unique following (%)	1.64%	1.80%	10.13%	1.26%	13.00%	60.24%	3.77%	10.70%	10.67%
Follower following Ratio	1.07	1.01	1.11	1.08	19.79	1.05	1.4	1.53	1.66

Table 3 Breakdown of consumers by the order of becoming business' follower and/or following

Order of becoming business' follower/following	n	%
Follower first	953,786	88.73%
Following first	17,035	1.58%
Just following	104,090	9.68%
Total following	1,074,911	100.00%
Follower first	953,786	56.70%
Following first	17,035	1.01%
Just follower	711,445	42.29%
Total follower	1,682,266	100.00%

of consumers connecting with multiple businesses is very high. However, Table 1 tells us that about 84% of these consumers with connections to the businesses on Twitter connected to one and only one brand as the business' follower and/or following, and approximately 14% connected to 2 brands. Therefore, consumers generally connect with a small handful of businesses rather than a large number of businesses, which indicates the special preference consumers have for the businesses they connect to.

Table 2 presents the detailed breakdown of followers and followings within the business. The follower/following ratios for eight out of nine businesses were around 1, but the ratio for Kogi BBQ was about 20. Interestingly, 60% to 98% of consumers with connections to Coffee Groundz, Comcast, Home Depot, H&R Block, Starbucks, Whole Foods, and Zappos were both their followers and followings. For Kogi BBQ, roughly 95% of followers were just their followers. Naked Pizza had about 40% of consumers with connections to it as both the brand's followers and followings. Thus, for most businesses, the consumers connecting to them are both their followers and followings, with follower/following ratios very close to 1.

Table 3 shows the breakdown of the consumers connecting to the business based on whether they were a business' follower first or following first. If the consumer connects with the business before the brand reaches out to the consumer, it means the consumer initiates the connection and is engaging with the business. If it is the other way, it means the business inclines to connect with the consumer and is active in the eWOM communication.

Among the businesses' followings, about 90% of the consumers requested to follow the businesses first. Only a very small portion (1.58%) was followed by the businesses first. About 10% of the consumers among followings were just the businesses' followings, and they did not follow the business. Among the businesses' followers, about 60% of the consumers requested to follow the businesses first. Only 1% of consumers who were followed by the businesses first

Table 4 EWOM volumes before and after the businesses launched branded Twitter accounts

Business	EWOM volume 1-Week before business Twitter account launched ^a	EWOM volume 1-Week after business Twitter account launched ^a	After/before-connection ratio
Coffee groundz	8	32	4.00
Home depot	356	577	1.62
Kogi BBQ	16	553	34.56
Naked pizza	2	508	254.00
Starbucks	4,148	5,949	1.43
Whole foods	451	830	1.84

^a The eWOM messages are from consumers without connection to the branded Twitter account

then followed back to the business. About 40% of the consumers among followers were just the followers and did not have the businesses follow them. Therefore, most of the time, consumers initiate the connection with the business, and the business follows back to more than half of the consumers requesting to follow it.

To sum up, the majority of consumers connecting to the business connect to one and only one business. Most of the time, consumers who connect to the business do so as both the business' followers and followings. Most of the businesses have a balanced number of followers and followings. In addition, connecting to the business is predominately the consumers initiating activity. This tells us that the brand community on Twitter is a tight community with loyal brand advocates.

Path analysis

Table 4 shows the eWOM communication volumes outside of the business' immediate social network increased dramatically

immediately after the businesses launched their Twitter accounts. The weekly eWOM message volumes after/before-connection ratios range from 1.43 to 254.00.

Table 5 presents the descriptive statistics of all variables for path analysis including means and standard deviations before and after transformation. On average by week, the businesses sent out 117.21 tweets and followed 2,988.48 consumers. The consumers connecting to the business sent out 775.79 tweets mentioning the name of the business they connected to. There were 5,389.30 consumers who started following business. Among those consumers not linking with the business in the Twitter community, there were 3,432.61 tweets mentioning one of the nine businesses researched in this study. After transformation, the variables follow multivariate normal distribution.

Table 6 presents the Pearson correlations between all transformed variables. Most of the correlations are significant except two pairs as expected, which are the correlations between the WOM messages from the business and the business' follower number ($\gamma=0.08$) and the business' following number ($\gamma=0.17$). The largest correlation is between business' follower number and the amount of WOM from consumers connecting to the business with statistical significance at the level of 0.01 ($\gamma=0.80$). The second largest correlation is between business' following number and business' follower number with statistical significance at the level of 0.01 ($\gamma=0.78$). Business' following number also has statistically significant correlation with the amount of WOM from consumers connecting to the business at the level of 0.01 ($\gamma=0.77$), which is the third largest correlation. The volume of WOM messages from consumers having no connection with the business correlates with statistical significance with all four predictors: the amount of WOM messages from the business ($\gamma=0.35, p \text{ value}<0.05$), business' following number ($\gamma=0.51, p \text{ value}<0.01$), the amount of WOM messages from

Table 5 Descriptive statistics of variables

Variable	Mean	Standard deviation	Minimum	Maximum
Before transformation				
WOM (Business)	117.21	166.59	2	604
Business' following number	2,988.48	8,931.20	6	39,977
WOM (Consumers connecting to business)	775.79	1,409.67	0	6,912
Business' follower number	5,389.30	12,304.21	11	40,822
WOM (Consumers not connecting to business)	3,432.61	7,820.87	4	42,189
After transformation				
WOM (Business)	1.70	0.60	0.48	2.78
Business' following number	2.41	0.95	0.85	4.60
WOM (Consumers connecting to business)	2.25	0.95	0	3.84
Business' follower number	2.71	0.95	1.08	4.61
WOM (Consumers not connecting to business)	2.81	0.94	0.70	4.63

Table 6 Correlations among variables

Variable	1	2	3	4	5
1. WOM (Business)	1.00	0.17	0.42 ^b	0.08	0.35 ^b
2. Business' following number	0.17	1.00	0.77 ^a	0.78 ^a	0.51 ^a
3. WOM (Consumers connecting to business)	0.42 ^b	0.77 ^a	1.00	0.80 ^a	0.66 ^a
4. Business' follower number	0.08	0.78 ^a	0.80 ^a	1.00	0.62 ^a
5. WOM (Consumers not connecting to business)	0.35 ^b	0.51 ^a	0.66 ^a	0.62 ^a	1.00

^a Correlation is significant at the 0.01 level (2-tailed)

^b Correlation is significant at the 0.05 level (2-tailed)

consumers connecting to the business ($\gamma=0.66$, p value < 0.01), and business' follower number ($\gamma=0.62$, p value < 0.01). The correlation between the amounts of WOM messages from the business and the consumers connecting to the business is significant at the level of 0.05 ($\gamma=0.42$). In addition, the scatterplot matrix (Fig. 3) shows the obvious linear relationships between all the variables except

for those two pairs with insignificant correlations. However, the path analysis will provide more insight on the relationships between variables in the model.

We conducted the path analysis employing maximum likelihood in Amos 18 developed by SPSS Inc. The full path model with estimated path coefficients is presented in Fig. 4. According to Byrne (2010), the test statistic used in

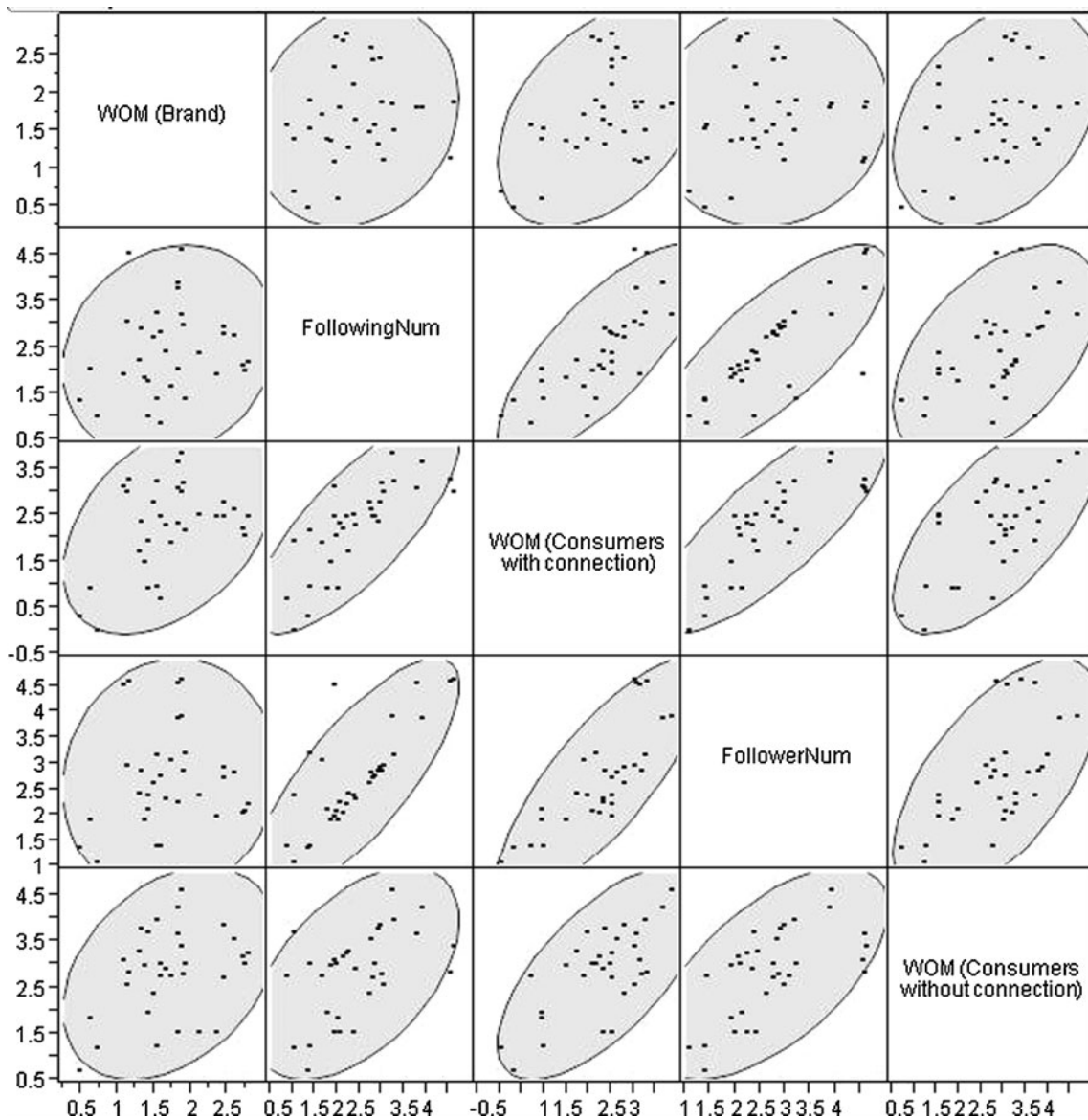
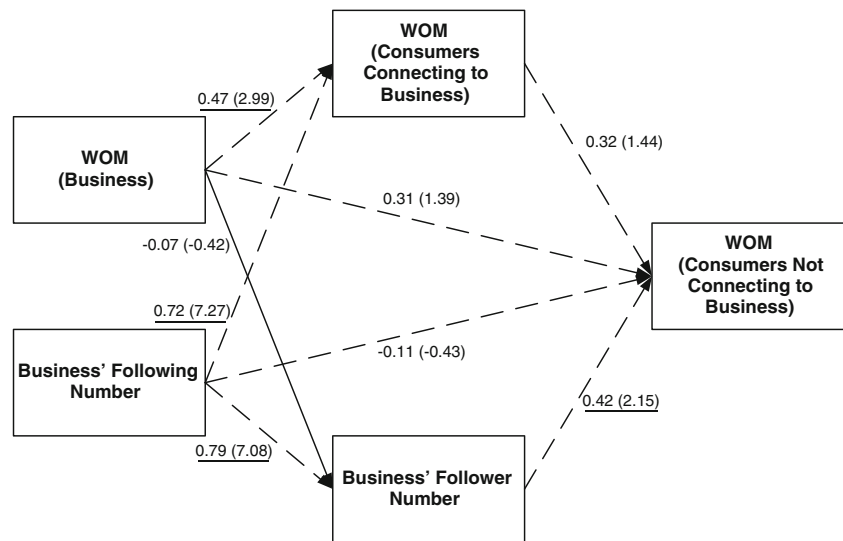


Fig. 3 Scatterplot matrix

Fig. 4 Full path model tested with path coefficients. Note: *Dashed line* denotes the correlation between the two variables is statistically significant. *Solid line* denotes the correlation between the two variables is not statistically significant. The value not in the parentheses is the coefficient and the value in the parentheses is the critical ratio. The value underlined denotes the statistical significance of the coefficient at the level of 0.05



Amos is the critical ratio (C.R.), which is the parameter estimate divided by its standard error. Therefore, it operates as a z-statistic in testing. At the level of 0.05, the test statistic needs to be larger than 1.96 or smaller than -1.96 in order to reject the null hypothesis. Thus, there are four statistically significant relationships.

The follower number has a significant direct effect on the amount of WOM from consumers having no connection with the business ($b=0.42$, $C.R.=2.15$). The following number has a significant direct effect on business' follower number ($b=0.79$, $C.R.=7.08$) and the amount of WOM messages from consumers connecting to the business ($b=0.72$, $C.R.=7.27$). The amount of WOM messages from the business has a significant effect on the amount of WOM messages from consumers connecting to the business ($b=0.47$, $C.R.=2.99$), but it does not have a significant effect on business' follower number ($b=-0.07$, $C.R.=-0.42$). The business' following number does not have a significant effect on the amount from consumers having no connection with the business either ($b=-0.11$, $C.R.=-0.43$). Interestingly, both the amounts of WOM messages from the business ($b=0.31$, $C.R.=1.39$) and the consumers connecting to the business ($b=0.32$, $C.R.=1.44$) have no significant effect on the amount of WOM messages from the consumers not connecting to the business at the level of 0.05, but the p values are around 0.15.

Table 7 presents the direct, indirect, and total effects of all 4 predictor variables on the volume of WOM message

from consumers not connecting to the business. The amount of WOM messages from the business has about 2.5 times stronger direct effect (0.31) than the indirect effect ($=0.12$). The amount of WOM messages from consumers connecting to the business has a much bigger direct effect ($=0.32$) and indirect effect (<0.01).

The business' following number has a larger indirect effect ($=0.57$) than direct effect ($=-0.11$), whereas the business' follower number has a much larger direct effect (0.42) than indirect effect (<0.01). This explains why, in the path model, the coefficient for the following number is not statistically significant while the follower number is statistically significant. The business' following number influences the amount of WOM message not connecting to the business via the business' follower number.

Retweet

We had 1,142 tweets retweeted by consumers, which were originally from 243 tweets sent by the brand, 0.95% (243/25,601=0.95%) of all tweets sent by the brand. We had 5 retweet styles in our data, but RT and via were the predominate styles accounting for 96.93% of all the retweet (Table 8).

For the retweet frequency (Table 9 and Fig. 5), 50% were retweeted no more than twice, 75% were retweeted no more than 4 times, and the majority were retweeted no more than 8 times. But the retweet frequency distribution has a long tail. The maximum retweet frequency is 77 times in our

Table 7 Effects of predictors variables on WOM (Consumers not connecting to business)

Variable	Direct effect ^a	Indirect effect ^a	Total effect
WOM (Business)	0.31*	0.12	0.43
Business' following number	-0.11	0.57*	0.46
WOM (Consumers connecting to business)	0.32*	<0.01	0.32
Business' follower number	0.42*	<0.01	0.42

^a Value with asterisk symbol denotes the stronger effect between direct effect and indirect effect

Table 8 Retweet style

Style	<i>n</i>	%
RT	1,013	88.70%
Via	94	8.23%
Retweeting	19	1.66%
Retweet	14	1.23%
R/T	2	0.18%
Total	1,142	100.00%

data. The average retweet frequency is 4.70 times. Thus, it is very rare that the tweets from a brand become viral; selecting messages to retweet is a highly personalized behavior. We manually evaluated the theme of top retweeted tweets (Table 14) and classified them into 6 groups: humorous (*n*=9), anecdotal (*n*=5), philanthropic (*n*=4), news (*n*=3), philosophical (*n*=2), and promotional (*n*=2). Zappos is the major contributor of these top retweeted messages (*n*=10), most of which are humorous messages. Starbucks and Whole Foods also have the second largest amount of top retweeted messages (*n*=5), most of which are anecdotal for Starbucks and philanthropic for Whole Foods.

In terms of time, 50% of retweeting happened within 21.26 minutes after the original message was sent, 75% happened within 99.50 minutes, and almost all of retweeting took place within 238.77 minutes (Table 10 and Fig. 6). These findings indicate that tweets are read within 1.5 or 4 hours at most assuming that users consume tweets and in the meantime make decision to forward the messages or not immediately.

As for the participants of retweeting (Table 11), 63.13% were both the business' followers and followings; 28.81% of the consumers were just the business' followers. Therefore, 91.94% of consumers retweeting the business' tweets were the direct receivers of these messages. Only 8.06% consumers were the indirect receivers, among which 6.83% had no connection with the business at all. Thus, retweeting is mainly performed by consumers having direct connection with the business.

Discussion

In this project, we studied the role of business as an active participant in the WOM communication by correlating the brand engagement in WOM communication with the level of consumers' engagement and by investigating the

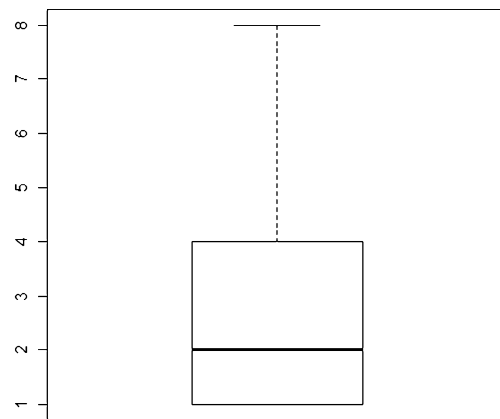


Fig. 5 Boxplot of retweet frequency (without outliers)

trajectories of a business' WOM message diffusion in the Twitter community. We used path analysis to examine 164,478 tweets from 96,725 individual Twitter users with regards to nine businesses during a 5-week study period. We operationalized business engagement as the amount of WOM messages from a business and the number of consumers the business follows (*Business' Following Number*). We operationalized consumers' engagement as the amounts of WOM messages from consumers both connecting to the business and having no connection with the business as well as the business' follower number.

We found major jumps in the WOM messaging volumes after the business launched branded Twitter accounts (Table 4), which indicates the dramatic influences of business' engagement in WOM communication on the consumers' engagement in messaging that matters to the brand and business. We found the statistically linear correlations between all these five variables except two pairs: the business' following number with the amounts of WOM messages from both the business and the consumers connecting to the business (Table 6 and Fig. 3). Path analysis shows that both the amount of WOM messages from the business and the business' following number are statistically significant predictors for the amount of WOM messages from the consumers connecting to the business (Fig. 4). The business' following number is a statistically significant predictor for the business' follower number, but the amount of WOM messages from the business is not (Fig. 4). Only a business' follower number is the statistically significant direct predictor for the amount of WOM messages from consumers without connection to the business, and the business' following number is absolutely not a statistically significant direct predictor, but it has huge

Table 9 Five-number summary of retweet frequency, mean, and standard deviation

Minimum	Q1	Median	Q3	Maximum (Adjusted)	Maximum	Mean	standard deviation
1	1	2	4	8	77	4.70	10.37

Table 10 Five-number summary of time difference (in minutes) between retweet time and original tweet time, mean, and standard deviation

Minimum	Q1	Median	Q3	Maximum (Adjusted)	Maximum	Mean	Standard deviation
0.07	5.75	21.26	99.50	238.77	287,031.85	1,416.41	15,858.88

indirect effect seemingly through the business' follower number (Table 7 and Fig. 4). The amounts of WOM messages from the business and the consumers connecting to the business are not statistically significant direct predictor, but their C.R. values are close to the significance standard (Table 7 and Fig. 4), on the other hand they both have statistically significant linear correlation with the amount of WOM messages from consumers without connection to the business (Table 6 and Fig. 3). This may be due to the size of our sample ($n=33$).

Path analysis is recommended for the sample size to be generally 10 times or ideally 20 times the number of the parameters, and at least 5 times for significance testing of model effects (Kling 1998). We have 5 parameters here so the sample size is recommended to be 50 to 100 cases ideally but definitely more than 25 cases. We have 33 cases which is more than required but not the ideal situation either. This impacts the significance testing leading to the insignificance of the amounts of WOM messages from the business and the consumers connecting to the business, which are obviously close to being statistically significant. In other words, with a larger sample, the relationship could very possibly become significant.

We have several insights from path analysis results and other related analysis. First, business' engagement as an active participant in the WOM process motivates consumers' engagement. We proved the correlations exist between businesses' engagement and consumers' engagement based on Pearson correlation and path analysis. In addition, our data shows the weekly WOM volumes jumped at least 40% with the introduction of branded Twitter accounts. On the theoret-

ical side, marketing and advertising materials from business are major sources for WOM communication (Keller 2007). Together, these results indicate that the brand's engagement in the WOM communication is the major cause of the consumers' engagement in the WOM communication.

Second, proximity to the communication channel plays a central role in WOM message diffusion. Before businesses launched Twitter accounts, they definitely owned accounts on some other social media platforms. However, with their presences and participations on Twitter, their WOM message volumes got a major boost. This indicates that getting close to the communication channel can have major influence over the communication that exists in the channel. With conversations happening in multiple places, businesses, whether they want to do or not, have to engage in these medium to influence the dialogue. Therefore, the business should have the brand presence on many different social media sites to potentially an influence larger audience. Moreover, it should be active on the social media site with high density of its target audience.

Third, the business should be as active as possible on Twitter. One very common question that businesses always ask is how often it should tweet. The answer is at least once every 1.5 to 4 hours. Given that our research shows the causation of business' engagement in WOM communication to the consumers' engagement, the business should actively participate in WOM communication. What "tweets" around comes around. Moreover, almost all retweets happen within 1.5 or 4 hours at most, which indicates the life cycle for the tweet.

On the analysis of retweet, we found about 1% of tweets from the business are retweeted by the consumers, who are mainly the business' followers (91.94% of all consumers involved in the retweet). 50% of retweeting actions take place within 20 minutes after the messages are sent out and 75% happen within 1.5 hours. The quickest retweeting happens in 42 seconds, which is close to real time. The majority of retweeted messages are

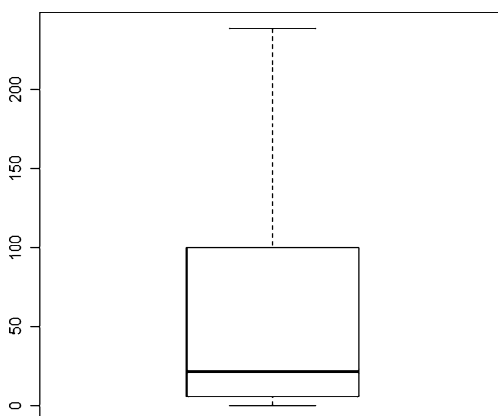


Fig. 6 Boxplot of time difference (in minutes) between retweet time and original tweet time (without outliers)

Table 11 Retweet breakdown by sender's relationship with the business

Business' follower	Business' following	<i>n</i>	%
Yes	Yes	721	63.13%
Yes	No	329	28.81%
No	No	78	6.83%
No	Yes	14	1.23%
Total	1,142	100.00%	

forwarded between 1 and 8 times, which shows that retweeting behavior is a very personal decision. However, the distribution of the retweet frequency has a long tail. The top retweeted messages are mostly humorous and anecdotal, which is in accordance with previous research from Phelps et al. (2004). Their research shows that messages sparking strong emotion—humor, fear, sadness, or inspiration—are likely to be forwarded. Therefore, they recommended that businesses crafting messages sparking the appropriate emotion for the appropriate causes. The same recommendation also applies for businesses owning Twitter account. Only a very small portion of tweets gets forwarded. Thus, businesses should think of composing tweets with their unique brand styles and embedding the appropriate emotion.

On the other hand, the retweeted messages do not seem spread out through the whole Twitter community. Almost all of them only reach consumers following the business and are forwarded by these consumers. There is no doubt that consumers following the business belong to the core consumers group based on this phenomenon. It means this group is the appropriate audience for the business. But the more important question the business may want to ask itself is what they can do to break the wall, get the messages forwarded by consumers not having a one-degree separation relationship with it on Twitter since these messages can have strategic or marketing meanings. The brand Twitter account associates may consider reposting the important messages after 1.5 to 4 hours in order to increase the WOM message exposure.

In the end, we want to highlight three actionable managerial implications we have discussed throughout this paper. First and foremost, the business should maintain brand presence on Twitter if it wants to maximize the influence and/or its target audience is on Twitter. It may have other media or marketing channels to deliver the message and influence audience. However, this research shows that there is a major boost in the eWOM volume concerning the brand on Twitter immediately after a brand launches its account. The research demonstrates the dramatic influence of the brand by getting close to the channel. Second, the business should go beyond simply having a presence on Twitter to actively engaging on

the Twitter platform. Our research results show that business engagement is the driving factor for consumer engagement and the formation of brand community. Third, in terms of active engagement, the business should tweet every 1.5 to 4 hours and tweet in a way to spark strong emotions by using humor or inspiration. Our research shows that 75% of retweeting activity happens within 1.5 hours and almost all of retweeting takes place within 4 hours, indicating that tweet consumption happens within 1.5 to 4 hours. Therefore, businesses that wish to stay active on Twitter should tweet at least every 1.5 to 4 hours in order to seize the consumers' attention. Businesses should also delay Tweeting new material by 1.5 to 4 hours to give current content the maximum amount of time to traverse the network. In addition, we performed content analysis on a list of highly retweeted messages, which are mostly humorous, anecdotal, and philanthropic. These are the popular tweet themes and suggest that these are the most effective ways to craft tweets.

Conclusion

We conclude that the business' engagement in the WOM communication on Twitter enhance the consumers' engagement in the WOM communication. In addition, retweeting as a way to show consumers' response to business engagement indicates that the influence only reaches consumers with a second-degree relationship to the business. Our research makes critical contribution to the field. It advances our understanding of businesses' roles as an active participant in the WOM communication process. Commercial business Twitter users can leverage the findings in this study to develop effective advertising, marketing and brand management strategies.

In future research, we will continue this line of research on the WOM communication in Twitter and develop a comprehensive model of the WOM message diffusion process by applying both quantitative and qualitative analyzing methods. We will aim to uncover the Twitter community dynamics, which potentially can shed light on business' marketing strategy development.

Appendix

Table 12 Businesses' Twitter accounts on May 31, 2009

Business	Twitter	Date of first tweet	Account location	Biography on profile	Follower (<i>n</i>)	Following (<i>n</i>)	Tweet (<i>n</i>)
Coffee Groundz	@CoffeeGroundz	August 26, 2008	Houston, TX	I am a strong cup of coffee and by night I am a Belgium beer.	8,761	5,963	5,503
Comcast	@comcastcares	Before May 1, 2008	Philadelphia, PA	Comcast Director of Digital Care Email: We_Can_Help@cable.comcast.com	31,702	23,001	29,062

Table 12 (continued)

Business	Twitter	Date of first tweet	Account location	Biography on profile	Follower (<i>n</i>)	Following (<i>n</i>)	Tweet (<i>n</i>)
Home Depot	@HomeDepot	May 16, 2008	Atlanta, GA	I'm a spokesperson, I moonlight on Twitter to offer another way for customers to ask about their projects and our stores. information@homedepot.com	12,171	8,645	1,665
H&R Block	@HRBlock	Before May 1, 2008	Kansas City, MO	Your tax people.	4,048	2,904	1,013
Kogi BBQ	@kogibbq	November 21, 2008	Los Angeles, CA	Korean BBQ Taco Truck	56,947	1,365	1,724
Naked Pizza	@NAKEDpizza	March 6, 2009	New Orleans, LA	an all natural and good for you pizza joint in new orleans. doing it 1 day at a time. we care. we really do.	7,073	4,914	1,702
Starbucks	@Starbucks	August 12, 2008	Seattle, WA	Freshly brewed tweets from Brad at Starbucks in Seattle, WA.	375,695	146,562	1,820
Whole Foods	@WholeFoods	June 20, 2008	Austin, TX	Fresh organic tweets from Whole Foods Market HQ in Austin, TX.	1,396,748	487,444	2,701
Zappos	@zappos	Before May 1, 2008	Las Vegas, NV	www.zappos.com blogs.zappos.com twitter.zappos.com	1,318,834	417,426	1,349

Table 13 Queries to collect tweets mentioning about businesses

Business	Query
Coffee Groundz	coffeegroundz OR #coffeegroundz OR @coffeegroundz OR coffee groundz
Comcast	comcastcare OR #comcastcare OR @comcastcare OR Comcast OR #comcast OR @comcast
Home Depot	homedepot OR #homedepot OR @homedepot OR home depot
H&R Block	hrblock OR #hrblock OR @hrblock OR hr block
Kogi BBQ	kogibbq OR #kogibbq OR @kogibbq OR kogi bbq OR #kogi OR @kogi
Naked Pizza	naked pizza OR #nakedpizza OR @nakedpizza OR nakedpizza
Starbucks	starbucks OR #starbucks OR @starbucks OR sbux OR #sbux OR @sbux
Whole Foods	wholefoods OR #wholefoods OR @wholefoods OR wholefood OR #wholefood OR @wholefood OR whole foods
Zappos	zappos OR #zappos OR @zappos OR zappo OR #zappo OR @zappo

Table 14 Top retweeted tweets

Rank	<i>n</i>	Sender	Tweet	Type
1	77	@WholeFoods	#twitterforfood Skip a meal June 1st and donate the savings to world hunger. http://trim/m1Pq	Philanthropic
2	77	@zappos	Trying to reduce my email inbox is like trying to lose weight. The number always seems to creep back up to where it was before.	Humorous
3	74	@zappos	Anonymous donor giving @lancearmstrong foundation \$25 k when @LIVESTRONGCEO "hits" 25 k followers. Hope he doesn't actually hit me	Humorous
4	55	@zappos	Those who can laugh without cause have either found the true meaning of happiness or have gone stark raving mad. -N Papernick	Philosophical
5	47	@zappos	I've been wondering about this for awhile... Now I finally know who moved my cheese (thanks @missrogue): http://bit.ly/zcheese	Humorous
6	36	@zappos	Proper etiquette when you see clothes on a stranger w/tag hanging out? Somehow I don't think "Tag! You're it!" is appropriate.	Humorous
7	34	@zappos	Dropped my laptop on floor this morning. I usually drop my phone, so good to know I'm moving on to bigger and better things.	Humorous
8	26	@Starbucks	RT @RGreenberg: http://twitpic.com/64z5h —Take a look at this @starbucks in Paris. Can you believe it?—>looks like a great store	Anecdotal
9	25	@kogibbq	oh, dear lord: http://tinyurl.com/qp2yew	Anecdotal
10	24	@Starbucks	Here they are in action ... I stayed out of the way. http://twitpic.com/623yo	Anecdotal
11	22	@CoffeeGroundz	If you are a local musician or in a band; let us know if you would like to be apart of a full day concert series. Pls RT	Promotional

Table 14 (continued)

Rank	<i>n</i>	Sender	Tweet	Type
12	18	@zappos	RT @ChrisKnight Strong company culture exists when your team responds favorably b/c of personal alignment to organization values	Philosophical
13	16	@WholeFoods	Our flagship store is pedaling the good stuff—just launched bicycle delivery for downtown Austin. More info: http://bit.ly/sBb49	News
14	15	@zappos	In between phone calls, Zappos employees are forced to eat marshmallows to keep speaking skills up— http://bit.ly/chubbybunny	Humorous
15	15	@Starbucks	RT @craftyasparagus: Reading: “12 Clever Ways to Reuse Coffee Grounds—The Green Gathering” http://twitthis.com/ba89tp	Anecdotal
16	13	@WholeFoods	Have you entered for your chance to win 2 tickets to Bonnaroo 2009? We pick a winner tomorrow, so enter today! http://tr.im/bonnaroo	Philanthropic, promotional
17	13	@WholeFoods	Learn about entrepreneurs who lift themselves & their communities out of poverty w/loans from Whole Planet Foundation. http://tr.im/wpfe	Philanthropic
18	13	@Starbucks	We're having listening parties all over the country for the new DMB album @davejmatthews @larasweetworld more here: http://bit.ly/BNxv	News
19	13	@kogibbq	Lakernation Kogi Bryant!	Humorous
20	12	@zappos	http://twitpic.com/1rjnv —My cousin's invention: 2 waffles, maple syrup, 2 eggs, 2 slices Taylor Ham, string cheese, 2 sausages, 3 bacon ...	Humorous
21	12	@NAKEDpizza	fyi: @nakedpizza sets record. 68% of sales May 29 from twitter. set store record for all sales. 41% all tickets twtr	News
22	11	@zappos	Obama landed in Las Vegas today. I wanted to board Air Force One, but apparently I didn't have enough frequent flyer miles.	Humorous
23	11	@Starbucks	We taste 250,000 cups of coffee a year to ensure quality: @jphayw some of that is done in the 'cupping room'. I'll grab a photo next time.	Anecdotal
24	10	@WholeFoods	Empower 25,000 people to lift themselves out of poverty. Donate to the Whole Planet Foundation Prosperity Campaign. http://is.gd/l7cJ	Philanthropic

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