Timing effects of opinion leader’s electronic word of mouth

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Abstract: Companies are increasingly interested in recruiting opinion leaders to spread electronic word of mouth (eWOM). Prior research has demonstrated the sales effects of such eWOM. An unexplored question for this practice is when the opinion leaders should disseminate their eWOM. An implicit assumption is that companies should use opinion leaders at the beginning of product launch. Using a dataset of Amazon customer review, we demonstrate that opinion leader’s eWOM should be spread out by arriving as early as possible, and continuing to be present. In addition, the impact of variance of timing on sales follows an inverse U shape. The marketing implications of timing effects of opinions leaders’ eWOM in terms of entry, span and intensity are addressed.

Keywords: online user reviews; opinion leader; electronic word-of-mouth.


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1 Introduction

Traditional word of mouth (WOM) is defined as an oral form of inter-personal communication (Lazarsfeld et al., 1948). The internet, a media for regular people compared to traditional media such as newspaper and television for companies, gives rise to electronic word-of-mouth (eWOM): the statement about a product or a company by customers via internet (Cheung and Thadani, 2012). Consumers perceive eWOM more trustworthy than the traditional marketing communications such as TV advertising (Piller, 1999), and prior researches have demonstrate that positive eWOM can increase product sales (Chevalier and Mayzlin, 2006; Duan et al., 2008). By definition, every consumer can produce eWOM, however, it will not be cost-effective for companies to recruit all potential consumers to provide eWOM. Instead, companies have focused on attracting a small number of influential consumers known as opinion leaders (Bao and Chang, 2014a; Godes and Mayzlin, 2009; Hinz et al., 2011). An popular press study made it well-known that 10% of the American population tell the rest what to shop (Keller and Berry, 2003); and a recent academic research estimated that eWOM from 1% of consumers will influence product sales (Bao and Chang, 2014a).

As a nascent form of marketing communication, opinion leader’s WOM campaign can learn from the practices of advertising. Among the aspects of an advertising campaign, advertising scheduling is an important one (Rust and Eechambadi, 1989). From a product adoption perspective, WOM is the key for followers to learn from the innovators during the product diffusion process (Bass, 1969), yet a diffusion process can last for years, and various segments of consumers will make purchases at different times (Golder and Tellis, 2004). When marketers launch an opinion leader’s WOM campaign, they will face the campaign scheduling question – Should the campaign start at the beginning, middle, or end of a diffusion process? Should the campaign be concentrated or spread out? To the best of our knowledge, no studies have been conducted specifically on the timing of WOM in general or opinion leader’s eWOM in particular. Only several studies implied timing in passing: one study implied that general WOM should be consistent throughout the diffusion process while two studies implied that opinion leaders’ WOM should start at the beginning (Easingwood et al., 1983; Godes and Mayzlin, 2009; Hinz et al., 2011).

To fill this research gap on timing, we conduct an exploratory research on timing strategy for using opinion leader’s eWOM to increase sales. Using the methods in Bao and Chang (2014a), we classify three types of opinion leaders: communicative, buzz-generating, and trustworthy, who are the top 1% in the consumer population respectively. We provide three empirical findings. First, the first opinion leader’s eWOM should arrive as early as possible. Second, the average opinion leader’s eWOM arrival time should be as large as possible, which implies that opinion leader’s eWOM should spread out through product life cycle. Third, the variance of opinion leader’s eWOM messages: defined as the spread from the mean and each other follows an inverse U shape, which implies the variance should be neither too big nor too small.

This research provides the first managerial insights on timing strategy for opinion leader’s eWOM. Rather than concentrating all opinion leader’s eWOM at the beginning of product life cycle, companies should have opinion leaders sending eWOM throughout product life cycle. In addition, there is an optimal intensity level of timing effect using eWOM. Companies should leave space between opinion leader’s eWOM messages. The
Spacing should not be too small because eWOM will concentrate at certain time, or too big because opinion leader’s eWOM need reinforcement.

This paper is organised as follows. In Section 2 we present our literature review. We then discuss data and model in Section 3 and present the empirical results and marketing implications in Section 4. Section 5 concludes and addresses limitations and direction for future research.

2 Literature review

This research is related to three research streams that share the foundation of interpersonal communication among consumers, yet each have different focuses – product diffusion, WOM/eWOM, and opinion leader. Product diffusion is the process of how an innovative product is adopted, during which WOM serves as a main communication method, and opinion leaders are individuals whose WOM are influential.

2.1 Diffusion

Marketers are interested in understanding how an innovative product makes the transition from being only recognised by few consumers to being adopted by a substantial number of consumers. Formally, diffusion of innovation is defined as “the process by which that innovation is communicated through certain channels over time among the members of a social system”, and therefore the four key elements are innovation, communication channels, time, and the social system (Mahajan et al., 1990a; Rogers, 1983). A large stream of literature emerged from the pioneering work by Mansfield (1961), Rogers (1983), and Bass (1969). Particularly, the Bass model sets up the basic framework to characterise the diffusion at the aggregate level – a S-shaped pattern – for the ensuring research in marketing. The S-shaped diffusion pattern is adjusted by two parameters referred to as the coefficient of external influence and the coefficient of internal influence respectively that capture influences from mass media and interpersonal communication (Mahajan et al., 1990b). Since the Bass model fits many empirical observations after adjusting the two parameters, subsequent researches proposed many extensions to the Bass model to gain a deeper understanding of various underlying components and mechanisms that give rise to the aggregate observations.

First, the composition of the social system is enriched. In the original Bass model, consumers are either innovators who listen to mass media or adopters who listen to innovators’ WOM (Bass, 1969). More consumer segments are proposed based on the time to adopt an innovation: innovator, early adopters, early majority, late majority, and laggards (Mahajan and Muller, 1998; Rogers, 1983). Providing an underlying psychology, behavioural researches at individual level suggest that, consumers can be segmented according to their innovativeness – the propensity of consumers to adopt new products, a concept for which various measures have been proposed (Hirschman, 1980; Midgley and Dowling, 1978). In a study that differentiates two types of diffusions: adoption diffusion (AD) and use diffusion (UD), consumers are segmented into intense users, specialised users, non-specialised users, and limited users in UD as opposed to innovators and adopters at various stages in AD (Shih and Venkatesh, 2004).

Second, a variety of product types are introduced to the innovation. The original Bass model applies to first purchases with no repeat-purchases and the unit of the purchase is
one, which describes first purchases of durable goods. The basic model is extended to include repeat/replacement purchases such as multiple-generations of durable goods (Danaher et al., 2001; Lilien et al., 1981). Other classification examples include leisure-enhancing vs. time-saving products (Golder and Tellis, 2004; Horsky, 1990).

Third, marketing mix variables are added to the diffusion process. The original Bass model does not have decision variables for marketers. Subsequent studies on diffusion include pricing, product improvement, distribution expansion, and firm entry into a market (e.g., Agarwal and Bayus, 2002; Horsky, 1990). The firm’s diffusion decisions also interact with consumer characteristics. For example, forward-looking consumers may delay their purchases if they anticipate companies to lower prices or improve product qualities (Greenleaf and Lehmann, 1995; Song and Chintagunta, 2003). Advertising, the most common way for companies to communicate with their consumers, is also incorporated (Simon and Sebastian, 1987).

Fourth, recently the economics literature started to differentiate the social process that imitators learn from the innovators, and listed three types: contagion, social influence, and social learning (Young, 2009). In addition, the caution against confusing social influence with other non-social factors in the economics literature is introduced to diffusion literature (Manski, 1993; Susarla et al., 2012).

From the beginning of this literature, the diffusion literature focuses on communication (Mahajan et al., 1995) to the extent that diffusion is “synonymous with its underlying driver (communication)” (Tellis and Johnson, 2007). The combination of interpersonal and mass communications in diffusion theory, and critically, the sequence of mass communication influence followed by interpersonal communication can be traced back to the two-step interpersonal communication model raised in the classic study by Lazarsfeld et al. (1948) that has spawned two literatures: WOM/eWOM and opinion leader.

2.2 WOM/eWOM

WOM is one of the oldest forms of communication (Katz and Lazarsfeld, 1955). Marketers have long been aware of WOM’s effects on product sales. For example, traditional WOM can increase women’s fashion sales (Summers, 1970). However, before the internet was invented, WOM did not receive as much attention as other marketing communications such as advertising because traditional WOM as a face-to-face oral communication is difficult for companies to track and analyse. Internet and social media greatly enhances WOM because eWOM no longer needs to take place in a face-to-face meeting, breaking the time and space limitations on traditional WOM, and eWOM is an analysis-friendly communication for companies because it leaves permanent digital footprints.

The WOM/eWOM literature investigates all components that define a communication process: sender, receiver, channel, and message, and the relationships among the components (Barnlund, 1970). First, sender is the WOM originator, and why senders spend time and efforts in spreading WOM is attributed to multiple reasons: (1) to management one’s impression, (2) to regulate emotions, (3) to seek information, (4) to establish and maintain social relationship, and (5) to persuade others (Berger, 2014; Hennig-Thurau et al., 2004). Conversely, receivers want to read WOM for a variety of reasons: (1) to acquire purchase-related information, (2) to achieve social orientation through information, (3) to have a sense of belonging to a community, (4) to gain
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financial reward, and (5) to learn how to consume products (Hennig-Thurau and Walsh, 2003). These motivations to dispense and to consume WOM explain the supply and demand of WOM. Third, marketers are interested in the impact of WOM. Many researches have demonstrated sales increases across product categories, e.g., books, automobile, and beer, which suggests that senders have impact on receivers’ purchase decisions via WOM (Chevalier and Mayzlin, 2006; Clemons et al., 2006; Feng and Papatla, 2011). Conversely, studies also find that receivers have impact on senders via feedbacks to sender’s WOM (Bao, 2015; Das and Kramer, 2013). Positive feedback from receivers will encourage senders to disseminate more WOM, and therefore reinforce the sales impact. Fourth, the channel of eWOM – internet is different from traditional WOM’s face-to-face channel. The modality difference has impact on eWOM. For example, compared to WOM, eWOM is asynchronised, which allows eWOM senders to construct more refined message (Berger and Iyengar, 2013). On the other hand, senders may experience better emotion regulation and social bonding in a warm face-to-face conversion (Seltzer et al., 2012). Marketers are also interested in how eWOM will fit into integrated marketing communication by working together with other communication channels, both traditional and digital. For example, eWOM, an earned online media, can substitute TV advertising, an paid traditional media, in disseminating product information, and therefore company can reduce advertising expenditure (Feng and Papatla, 2011). On the other hand, eWOM and product best seller list, an earned traditional media, can enhance each other via multiplier effects (Bao and Chang, 2014b). Finally, prior research also investigated the message content of WOM. For example, Amazon pioneered a standardised way to rate a product – five star rating with three metrics: average rating (valence), number of ratings (volume), and variance among ratings (Brinkerhoff, 2005). A large eWOM volume, implying brand awareness and popularity, is associated with large sales (Liu, 2006; Zhu and Zhang, 2010). A high valence implies consumer satisfaction, and therefore increase sales (Chen and Xie, 2008; Sun, 2012). A large eWOM variance suggests that a product is horizontally differentiated, and therefore can better appeal to one segment of consumers while become less attractive to other segments, but overall, horizontal differentiation can increase product sales (Clemons et al., 2006; Sun, 2012). In terms of valence of message, although negative content will worsen consumer perception towards a product (Liu, 2006), negative buzz may also increase product awareness, and therefore, on balance, still increases product sales (Berger et al., 2010). Other than the star-rating, eWOM also shares with tradition WOM in having textual messages, and content analysis to study how texts influence eWOM is underway. For example, in the movie context, words such as comic, music, Oscar, and violence can reveal underlying consumer preferences over movie genre (Moon et al., 2014). More credible eWOM messages conveying benevolent intention allow companies to extract more profits from setting price premium (Pavlou and Dimoka, 2006).

2.3 Opinion leader

Traditional marketing communication seems to lose steam in the digital era: 65% of consumers reported that they were overwhelmed by advertising messages and 60% reported that advertising was irrelevant (Porter and Golan, 2006). Realising the advantage of eWOM, companies have started to investigate how to incorporate eWOM as part of marketing communication mix. WOM by nature is fundamentally different from traditional marketing communications: the former is initiated and implemented by
consumers while the latter by companies (Godes and Mayzlin, 2009). The proposed methods in the literature vary in how much control companies want to insert into eWOM process (Godes et al., 2005). At one end of the range, company can be a silent observer to collect business intelligence from eWOM, and the consumer-generated nature of eWOM is intact in this case. For example, companies discover consumer’s preferences on fashion through their Facebook and Twitter posts. At the opposite end, companies can be anonymous but direct participants in consumer-to-consumer conversations (Mayzlin et al., 2012). However, this approach raises the question on the authenticity of eWOM, and undermines consumers’ trust on eWOM, the reason that they turn to eWOM in the first place (Piller, 1999). Two approaches in between the two ends call for companies to act as moderator and mediator respectively. In the role of moderator, companies can create an online community that foster eWOM. For example, Amazon invented the format of online customer review, and made it available on its website (Brinkerhoff, 2005). As a mediator, a company seeks to take more control on eWOM process. In this role, companies do not directly create and spread eWOM messages as in the role of participants. Instead, companies find indirect ways to influence eWOM. A leading approach is to find opinion leaders to be eWOM senders. In this case, although companies cannot decide every consumer who will eventually spread eWOM, but at least they can decide on a small set of consumers called opinion leaders. The opinion leader strategy can be considered as a hybrid between traditional WOM and traditional marketing communication: it is initiated by companies and implemented by consumers (Godes and Mayzlin, 2009). Conceptually, opinion leaders may overlap but differ from other important group of consumers including innovators in the context of product diffusion (Simon and Sebastian, 1987), and marketing maven in the context of product information diffusion (Feick and Price, 1987). The focus of the opinion leader approach has been on whom companies should recruit. To this end, three methods have been proposed based on sender, receiver, and message (Bao and Chang, 2014a). In the sender-based approach, companies ask WOM senders to self-identify whether they are opinion leaders via a survey (Godes and Mayzlin, 2009; King and Summers, 1970). Sender-based approach is easy to implement, but suffers from reporting bias. In the receiver-based approach, companies identify those senders who hold central positions in the social network with their receivers (Hinz et al., 2011; Iyengar et al., 2011). Receiver-based approach is more accurate than the sender-based approach because it uses actual observation rather than self-reporting, but it only applies to a closed community rather than an open community such as the ones on the internet where eWOM can easily travel beyond one’s social network. In the message based approach, companies identify opinion leaders who produce a large number of eWOM messages, whose messages generate great buzz, and whose messages are trustworthy (Bao and Chang, 2014a). The message based approach is more accurate than the sender-based approach, and more appropriate for the open community on the internet. Another focus of the opinion leader approach is to study which aspects of opinion leader’s eWOM have effects on product sales. To this end, researchers have found that opinion leader’s product experiences: product popularity/awareness, customer satisfaction, and horizontal differentiation have effects. In addition, opinion leader’s knowledge breadth and focus also have effects (Bao and Chang, 2014a).
2.4 Timing-related research

Among the three streams of literatures on diffusion, WOM/eWOM, and opinion leader, timing-related questions mostly appeared in diffusion – how fast a product will be adopted by majority of the population? First, along the time line, product diffusions take a S-shape pattern which is punctuated by a rapid take-off and a slowdown in sales (Hauser et al., 2006). On average, products take 16 years and 19 years to reach peak sales in developed and developing countries respectively (Chandrasekaran and Tellis, 2007), but may take less time in a digital environment (Hauser et al., 2006; Rangaswamy and Gupta, 2000). Second, seasonality, e.g., holiday season for toy sales, also plays a role in product diffusion – adoption is faster in peak season than in off season (Radas and Shugan, 1998). Third, consumers can be segmented, according to when they adopt as innovator, early adopters, early majority, late majority, and laggards (Mahajan and Muller, 1998; Rogers, 1983). Yet, such characterisation is not exact. Those consumers who can adopt products earlier may delay their purchases due to forward-looking behavior including anticipating prices and improvement of product quality (Greenleaf and Lehmann, 1995; Song and Chintagunta, 2003).

Innovator/adopter categories have implications on WOM in two ways. First, there appear to be different levels of demand for information and influence that can be delivered in WOM. Although the categories are defined by the relative time to adopt an innovation, but the underlying behaviour is the personal trait of innovativeness (Hirschman, 1980). Innovators are able to use complex innovation and eager to try innovations without any external pushes, whereas laggards are traditionalists relating themselves to the past instead of future, and are sceptical of innovations, and therefore need the most convincing efforts from others. And early adopters, early majority, and late majority occupy the middle of the continuum on innovativeness. Their characteristics suggest the need of WOM that convey information and influence increase as the diffusion process extends to the later stage. Secondly, along the diffusion process, opinion leadership seems to arrive early rather than later. Innovators tend to have social relationships extend to local circle – the so called weak tie (Granovetter, 1973), and this feature makes them likely to be opinion leaders (Hinz et al., 2011). Early adopters are also reported to possess strong opinion leadership while laggards possess almost none (Rogers, 1983). This observation coupled with the previous one suggests that if companies allow the diffusion process to run its natural course, the opinion leadership is likely to diminish when it is needed the most.

Surprisingly, although three abovementioned stream literatures are centred around marketing communications including both mass media and WOM, the question on the timing of communications has received little attention. The original two-step interpersonal communication study that spawned the three literature streams implies that WOM (through which followers learn from opinion leaders) should follow mass media communication (through which opinion leaders acquire information (Lazarsfeld et al., 1948). Although traditional advertising uses mass media (e.g., TV), advertising was only added to diffusion process later along with other marketing mix variables (Horsky, 1990). The implication is that advertising and WOM will work in tandem, although a recent study finds that WOM and advertising are substitutes to each other (Feng and Papatla, 2011). Two studies offered different views on when advertising should be applied during the diffusion process: one suggests frontloading marketing communications including advertising (Narayanan and Manchanda, 2009), while the other suggests the
opposite because advertising works mostly on imitators (Simon and Sebastian, 1987). Finally, advertising usually runs during a period of time, and research has found adjacent advertisements should have spaces in between (“spacing effect”) because it helps the consumers to have better memory and more accurate retrieval, therefore, it will be more effective to have an alternative on and off pattern (sometimes referred to as “pulsing”) than a continuous pattern (Noel and Vallen, 2009; Strong, 1977). Furthermore, the length of the spaces should be neither too short nor too long, and therefore an optimal length exits (Appleton-Knapp et al., 2005; Bellezza and Young, 1989).

Regarding WOM/eWOM, only few studies discussed timing questions in the extant literature. One study for general WOM suggests that WOM should be consistent throughout the diffusion process (Easingwood et al., 1983). The recent opinion leader studies suggested the beginning of the product launch is the time to deploy opinion leaders identified by sender-based approach (Godes and Mayzlin, 2009) and by receiver-based approach (Hinz et al., 2011; Iyengar et al., 2011).

3 Data, variable and model

3.1 Data

To study the timing strategy of opinion leaders, we use the Amazon user review dataset in Bao and Chang (2014a). Many forms of eWOM are available for consumers or under development such as Tweets, Instagram, and online forum, and online user review is the most dedicated to product sales. When Amazon started selling books in 1995, it initially used traditional marketing communication – having staff members to write expert reviews to promote books. After inventing online user review and realizing its effects on product sales, Amazon stopped the expert review practice, and used customer review as the primary promotion method for books. Amazon has been expanding to other categories in an attempt to become the “Everything Store” (Stone, 2013), the latest example being travel service (Karmin, 2015). Since Amazon uses customer review for all product categories, customer review has become the most important eWOM form in electronic commerce.

The dataset contains user reviews for 350,122 products in four product categories of book, music, video, and DVD. The descriptive statistics for these products are listed in Table 1. On average, each title receives 13.98 user reviews (the number of user reviews is referred to as volume) from all eWOM senders. Each user view contains a numerical rating, a review text, and sometimes a video review. In this study, we focus on the numerical rating. The average numerical rating (referred to as valence) from all eWOM senders for each title is 4.33. The standard deviation among the numerical ratings (referred to as SD) from all eWOM senders for each title is 0.58. Although Amazon does not reveal the actual sales figure for its products, it displays their rankings. The sales rank in our dataset ranges from 1 to 3766000. Amazon also has an internal product category system, and puts each product into multiple product categories. For example, Jane Austen’s “Sense and Sensibility” belongs to the category: /Books/Literature & Fiction/World Literature/British/19th Century. On average, a product belongs to 4.88 categories.
Amazon displays a user name for each user review. We found 2,145,885 unique eWOM senders in the dataset. On average, these eWOM senders wrote 4.37 user reviews, and received 26.43 votes (which can be either helpful or not) and 12.83 helpful votes from eWOM receivers (Table 2). On average, the eWOM senders wrote user reviews for 392.90 product categories. We use the message-based method outlined in Bao and Chang (2014a) to identify three types of opinion leaders. The first type is communicative opinion leader based on how many user reviews they have written. The second type is buzz-generating opinion leader based on how many votes (whether they are helpful or not) they have received. And the third type is trustworthy opinion leader based on how many helpful votes they have received. We identify the top 1% (or 21,457) senders for each type. The total number of the three opinion leaders is 64,371, but there are only 34,340 unique opinion leaders, which suggests overlapping among the three types (Table 3), an observation also made in prior literature (Iyengar et al., 2011).

Table 2  Descriptive statistics on reviewers with unique identities

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Median</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of user reviews written</td>
<td>4.37</td>
<td>14.62</td>
<td>1</td>
<td>1</td>
<td>8659</td>
</tr>
<tr>
<td>Number of votes received</td>
<td>26.43</td>
<td>218.03</td>
<td>6</td>
<td>0</td>
<td>66,540</td>
</tr>
<tr>
<td>Number of helpful votes received</td>
<td>12.83</td>
<td>118.27</td>
<td>3</td>
<td>0</td>
<td>55,800</td>
</tr>
<tr>
<td>Product category knowledge</td>
<td>392.80</td>
<td>1561.29</td>
<td>31</td>
<td>1</td>
<td>35,640</td>
</tr>
</tbody>
</table>

Table 3  Overlapping opinion leaderships

<table>
<thead>
<tr>
<th>Type of Opinion Leader (OL)</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total size of three sets of OL’s</td>
<td>64,371</td>
</tr>
<tr>
<td>Distinct OL’s in the three sets</td>
<td>34,340</td>
</tr>
<tr>
<td>Both communicative and buzz-generating OL’s</td>
<td>12,109</td>
</tr>
<tr>
<td>Both communicative and trustworthy OL’s</td>
<td>11,819</td>
</tr>
<tr>
<td>Both buzz-generating and trustworthy OL’s</td>
<td>16,989</td>
</tr>
<tr>
<td>Communicative and buzz-generating and trustworthy OL’s</td>
<td>10,886</td>
</tr>
</tbody>
</table>
3.2 Variables and empirical model

Our research question is on how timing of opinion leader’s eWOM will impact product sale, therefore the unit of analysis is product (book, music, video, or DVD). The top 1% communicative, buzz-generating, and trustworthy opinion leaders have written user reviews for 199,253, 200,618, and 196,423 products respectively. Among the products, books are the most common, followed by music CD, DVD, and video (Table 4).

Table 4 Summary statistics of group for three types of opinion leaders

<table>
<thead>
<tr>
<th></th>
<th>Communicative</th>
<th>Buzz-generating</th>
<th>Trustworthy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total number of titles</td>
<td>199,253</td>
<td>200,618</td>
<td>196,423</td>
</tr>
<tr>
<td>Number of books</td>
<td>129,615</td>
<td>134,189</td>
<td>131,739</td>
</tr>
<tr>
<td>Number of music CDs</td>
<td>46,913</td>
<td>44,257</td>
<td>42,970</td>
</tr>
<tr>
<td>Number of videos</td>
<td>10,725</td>
<td>10,554</td>
<td>10,330</td>
</tr>
<tr>
<td>Number of DVDs</td>
<td>12,000</td>
<td>11,618</td>
<td>11,384</td>
</tr>
</tbody>
</table>

We describe the variables for communicative opinion leader, and similar variables are also used for buzz-generating and trustworthy opinion leaders. If data is available, the dependent variable should be product sales, but Amazon does not disclose actual product sales. Prior literature has shown that the logarithm transformation of product rank has a linear relationship with product sales (Chevalier and Goolsbee, 2009), so we instead use logarithm transformation of product sales \( \log(\text{sales}) \) as the dependent variable. Among the user reviews, we identify those written by communicative opinion leaders, and construct variables for opinion leader’s eWOM.

To study timing effects of opinion leader’s eWOM, we first define timing measures. Since Amazon does not specify product launch date on its website, we use the date of the first user review as a proxy for the launch date. The arrival time of a subsequent review is the days elapsed from the launch date. We collect arrival time of the first review written by a communicative opinion leader. We also collect the arrival time for each review for the communicative opinion leaders and find their average and standard deviation. The average timing measures whether opinion leaders’ eWOMs collectively arrive early or late. The standard deviation measures intensity of eWOMs. We also include a squared term of the standard deviation. On average, the arrival time of the first review by communicative opinion leader is 454.70 days. The average and standard deviation of arrival times of all communicative opinion leaders are 758.80 days and 239.20 respectively (Table 5).

We also include variables that capture product experience effects in our empirical analysis (Bao and Chang, 2014a). Communicative opinion leaders can influence product sales through three aspects of their product experiences. First, communicative opinion leader’s eWOM can increase product popularity and awareness that lead to higher product sales. We use the number of user reviews (volume) written by communicative opinion leaders to capture product popularity and awareness. The average volume is 6.02 (Table 5). Second, customer satisfaction among communicative opinion leaders can increase product sales. We use the average rating (valence) of user reviews written by communicative to capture the customer satisfaction. The average valence is 4.24 (Table 5). Third, the horizontal differentiation of product perceived by communicative opinion leaders influences product sales. As opposed to vertical differentiation that can
be ranked (e.g., fuel economy of a car), horizontal differentiation generally cannot be ranked (e.g., colour of a car). Horizontal differentiation can be liked and disliked by different consumer segments simultaneously. For example, “The Lord of Rings” trilogy appeals to the fantasy book readers, but not romance book readers. A horizontally differentiated product tends to have a better product sale than non-horizontally differentiated one because the latter does not attract any segment. The level of horizontal differentiation is measured by standard deviation (SD) of communicative opinion leader’s eWOM. On average, the standard deviation is 0.4 (Table 5).

**Table 5** Summary statistics of variables for three types of opinion leaders (OL’s)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Communicative OL</th>
<th>Buzz-generating OL</th>
<th>Trustworthy OL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of reviews ((Volume))</td>
<td>6.02</td>
<td>5.48</td>
<td>5.07</td>
</tr>
<tr>
<td>Average rating ((Valence))</td>
<td>4.24</td>
<td>4.23</td>
<td>4.26</td>
</tr>
<tr>
<td>Std. dev. of rating ((SD))</td>
<td>0.40</td>
<td>0.40</td>
<td>0.52</td>
</tr>
<tr>
<td>Arrival time of first review ((Time_1))</td>
<td>454.70</td>
<td>432.40</td>
<td>551.71</td>
</tr>
<tr>
<td>Average arrival time of reviews ((Time_{ave}))</td>
<td>758.80</td>
<td>699.80</td>
<td>713.40</td>
</tr>
<tr>
<td>Std. dev. of arrival time of reviews ((Time_{SD}))</td>
<td>239.20</td>
<td>214.30</td>
<td>221.30</td>
</tr>
<tr>
<td>Average knowledge of opinion leader ((Know))</td>
<td>3710.00</td>
<td>3615.00</td>
<td>3752.00</td>
</tr>
<tr>
<td>Average distinct knowledge of opinion leader ((Know_d))</td>
<td>2874.00</td>
<td>2850.00</td>
<td>2955.00</td>
</tr>
</tbody>
</table>

Additionally, we include the variables that capture opinion leader’s knowledge effects (Bao and Chang, 2014a). Opinion leaders have different levels of product category knowledge; and those knowledgeable opinion leaders have stronger influences on product sales. For each opinion leader, we measure knowledge level by the number of Amazon product categories he/she has read. Specifically, we collect all products in the dataset that a user (opinion leader or not) has written reviews for, and use the total number of distinct product categories as a proxy for product category knowledge. The median product category knowledge is 31. At the book level, we distinguish two knowledge effects of opinion leaders: breadth and focus of the knowledge by the opinion leaders writing reviews for the book (Table 2). Suppose that K communicative opinion leaders write user reviews for a title. Then average knowledge of communicative opinion leaders for the title is defined as:

\[
\text{average knowledge} = \frac{\text{total number of product category knowledge of the } K \text{ opinion leaders}}{K}
\]

The average knowledge captures the knowledge breadth of the opinion leaders. The larger the average knowledge, the more product category knowledge each individual opinion leader has. The K opinion leaders can have overlapping knowledge. For example, a book has two communicative opinion leaders writing reviews. In the first scenario, one has knowledge in fantasy and science fiction, and the other has knowledge
in cooking and history. In the second scenario, both opinion leaders have knowledge in two categories: fantasy and nature. The average knowledge is the same (2 categories) in both scenarios, but the combined knowledge is more focused in the latter than in the former. To capture such focus, we define average distinct knowledge of communicative opinion leaders as:

\[
\text{average distinct knowledge} = \frac{\text{total number of distinct product category knowledge of the K opinion leaders}}{K}.
\]

In the previous example, the average distinct knowledge is 2 for the first scenario and 1 for the second scenario. Average distinct knowledge captures the knowledge focus that opinion leaders collectively have. The smaller average distinct knowledge is, the more focused collective knowledge is. On average, a title has been reviewed by communicative opinion leaders with an average knowledge of 3,710 product categories and an average distinct knowledge of 2874 product categories (Table 5).

Two control variables are included for each title. The first is category count – how many product categories a product belongs to. The average category count is 5.35 (Table 5). The Amazon’s product category has a tree structure on which lower branches are sub-level categories. At the top level, the products belong to book, music, video, or DVD (Table 4). We include the top level product category as a factor variable (referred to group).

We specify the following model to empirically test our hypotheses.

\[
\text{Sales} = \beta_0 + \beta_{\text{type}} + \beta_{\text{group}} + \beta_{\text{count}} + \beta_{\text{valence}} + \beta_{\text{volume}} + \beta_{SD} + \beta_{\text{know}} + \beta_{\text{time}} + \beta_{SD} + \beta_{\text{time}} + \epsilon.
\]

Sales = logarithm of sales rank of a title

\(j\) = type of opinion leaders, i.e. communicative, buzz-generating, and trustworthy types

Group = top level of category tree, i.e. Book, Music, DVD, and Video to which a title belongs

Count = number of categories to which a title belongs

Valence = average review by type \(j\) opinion leaders

Volume = number of reviews by type \(j\) opinion leaders

SD = standard deviation of reviews by type \(j\) opinion leaders

Time = arrival time of first review by type \(j\) opinion leaders

Time = average arrival time of reviews by type \(j\) opinion leaders

Time_SD = standard deviation of arrival time of reviews by type \(j\) opinion leaders

Know = average product category knowledge by type \(j\) opinion leaders

Time_d = average distinct product category knowledge by type \(j\) opinion leaders
This model extends the one in Bao and Chang (2014a) by including timing aspects in addition to the product experience and knowledge aspects (Figure 1).

Figure 1  Aspects of opinion leaders’ eWOM

Opinion leader’s eWOM

Product Effect
Pa, b, c

Knowledge Effect
Ka, b

Timing Effect
Ta, b, c

Sales

Notes:  Pa: product popularity/awareness, Pb: customer satisfaction, and Pc: horizontal differentiation
        Ka: individual knowledge breadth, Kb: collective knowledge focus
        Ta: first arrival time, Tb: average arrival time, Tc: standard deviation of arrival time

4 Results and discussions

4.1 Model fit

We first use model fit to discuss how our model is compared to two benchmark models: one with product experience aspect only and the other with product experience aspect and knowledge aspects. We examine both in-sample model fit and out-of-sample prediction accuracy. Specifically, we split the dataset, and use 90% of the total sample (training sample) to conduct regression analysis, and record in-sample fit. Then we use the regression coefficients obtained from the training sample to perform a prediction exercise in the remaining 10% of the sample (validation sample). We find that, with respect to the two benchmark models, our model fits the training sample the best, and has the most accurate prediction in the validation sample (Table 6). The rest of the discussion is based on our model.
Table 6  Model validation for three types of opinion leaders

<table>
<thead>
<tr>
<th>Communicative opinion leader</th>
<th>In sample (AIC*)</th>
<th>Holdout sample (RMSE**)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model 1: product effects</td>
<td>582337.8</td>
<td>5.100</td>
</tr>
<tr>
<td>Model 2: product and knowledge effects</td>
<td>580201.6</td>
<td>5.088</td>
</tr>
<tr>
<td>Model 3: product timing, and knowledge effects</td>
<td>570680.9</td>
<td>5.063</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Buzz-generating opinion leader</th>
<th>In sample (AIC)</th>
<th>Hold-out sample (RMSE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model 1: product effects</td>
<td>586390.9</td>
<td>4.910</td>
</tr>
<tr>
<td>Model 2: product and knowledge effects</td>
<td>584266.4</td>
<td>4.901</td>
</tr>
<tr>
<td>Model 3: product, timing, and knowledge effects</td>
<td>574702</td>
<td>4.881</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Trustworthy opinion leader</th>
<th>In sample (AIC)</th>
<th>Hold-out sample (RMSE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model 1: product effects</td>
<td>576147.1</td>
<td>4.954</td>
</tr>
<tr>
<td>Model 2: product and knowledge effects</td>
<td>574343.2</td>
<td>4.945</td>
</tr>
<tr>
<td>Model 3: product, timing, and knowledge effects</td>
<td>564836.3</td>
<td>4.931</td>
</tr>
</tbody>
</table>

Notes: *Akaike’s Information Criterion (AIC) is defined as $\text{AIC} = -2 \times \log (l) + 2 \times p$ where $l$ is likelihood and $p$ is number of parameters.

**RMSE = Root Mean Square Error.

4.2 Timing effects of opinion leaders

Next we report the empirical results for eWOM made by communicative, buzz-generating and trustworthy opinion leaders (Table 7). All estimates are significant at P-value of 0.001. We first report the estimates on the timing effects. First, the estimate on arrival time of the first communicative opinion leader is positive. Since sales log is inverse to actual sales: the more actual sales, the smaller sales rank is, the estimate implies that the earlier the first communicative opinion leader’s eWOM arrives, the higher the sales will be. Second, estimate on the average arrival time of eWOM by communicative opinion leaders is negative, suggesting that overall arrival time of all eWOM by communicative opinion leaders need to be large in order to achieve large product sales. In light of the previous result on the arrival time of the first eWOM, the current result implies that eWOM by communicative opinion leaders should spread out through the product life cycle. Third, the estimate on the standard deviation (or intensity) of eWOM by all communicative opinion leader is negative, and the estimate on its squared term is positive. These two results together imply that the intensity follows an inverse-U shape. In another word, the intensity should be neither too high nor too low, and an optimal value exits. The estimates on the timing effects by buzz-generating and trustworthy opinion leaders are similar to those of communicative opinion leaders, suggesting that our results on timing effects are robust.
Table 7  Estimates of eWOM by three types of opinion leaders

<table>
<thead>
<tr>
<th>Variables</th>
<th>Communicative opinion leader</th>
<th>Buzz-generating opinion leader</th>
<th>Trustworthy opinion leader</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>13.40*</td>
<td>13.32*</td>
<td>13.34*</td>
</tr>
<tr>
<td>(0.017)</td>
<td>(0.016)</td>
<td>(0.017)</td>
<td></td>
</tr>
<tr>
<td>DVD (Group)†</td>
<td>−2.209*</td>
<td>−2.263*</td>
<td>−2.272*</td>
</tr>
<tr>
<td>(0.015)</td>
<td>(0.016)</td>
<td>(0.016)</td>
<td></td>
</tr>
<tr>
<td>Music (Group)†</td>
<td>−1.296*</td>
<td>−1.363*</td>
<td>−1.378*</td>
</tr>
<tr>
<td>(0.007)</td>
<td>(0.007)</td>
<td>(0.007)</td>
<td></td>
</tr>
<tr>
<td>Video (Group)†</td>
<td>−2.486*</td>
<td>−2.530*</td>
<td>−2.539*</td>
</tr>
<tr>
<td>(0.013)</td>
<td>(0.014)</td>
<td>(0.014)</td>
<td></td>
</tr>
<tr>
<td>Category count† (Countcat)</td>
<td>−0.012*</td>
<td>−0.010*</td>
<td>−0.010*</td>
</tr>
<tr>
<td>(0.001)</td>
<td>(0.001)</td>
<td>(0.001)</td>
<td></td>
</tr>
<tr>
<td>Volume of reviews (Volume)</td>
<td>−0.012*</td>
<td>−0.012*</td>
<td>−0.015*</td>
</tr>
<tr>
<td>(0.0002)</td>
<td>(0.0002)</td>
<td>(0.0003)</td>
<td></td>
</tr>
<tr>
<td>Average rating (Valence)</td>
<td>−0.149*</td>
<td>−0.137*</td>
<td>−0.138*</td>
</tr>
<tr>
<td>(0.004)</td>
<td>(0.004)</td>
<td>(0.004)</td>
<td></td>
</tr>
<tr>
<td>Std. dev. of rating (SD)</td>
<td>−0.133*</td>
<td>−0.154*</td>
<td>−0.137*</td>
</tr>
<tr>
<td>(0.008)</td>
<td>(0.008)</td>
<td>(0.008)</td>
<td></td>
</tr>
<tr>
<td>Average knowledge of opinion leader (Know)</td>
<td>−4.843e-05*</td>
<td>−4.153e-05*</td>
<td>−3.807e-05*</td>
</tr>
<tr>
<td>(2.180e-06)</td>
<td>(2.212e-06)</td>
<td>(2.170e-06)</td>
<td></td>
</tr>
<tr>
<td>Average distinct knowledge of opinion leader (Knowd)</td>
<td>5.355e–05*</td>
<td>5.132e-05*</td>
<td>4.616e-05*</td>
</tr>
<tr>
<td>(2.351e-06)</td>
<td>(2.388e-06)</td>
<td>(2.346e-06)</td>
<td></td>
</tr>
<tr>
<td>Arrival time of first review (Time1)</td>
<td>7.387e–04*</td>
<td>7.434e–04*</td>
<td>7.239e–04*</td>
</tr>
<tr>
<td>(2.245e-05)</td>
<td>(2.478e-05)</td>
<td>(2.488e-05)</td>
<td></td>
</tr>
<tr>
<td>Average arrival time of reviews (Timeave)</td>
<td>−1.003e-03*</td>
<td>−1.008e-03*</td>
<td>−0.971e-04*</td>
</tr>
<tr>
<td>(2.159e-05)</td>
<td>(2.395e-05)</td>
<td>(2.403e-05)</td>
<td></td>
</tr>
<tr>
<td>Std. dev. of arrival time of reviews (TimeSD)</td>
<td>−7.669e-04*</td>
<td>−8.492e-04*</td>
<td>−9.198e-04*</td>
</tr>
<tr>
<td>(4.456e-05)</td>
<td>(4.674e-05)</td>
<td>(4.692e-05)</td>
<td></td>
</tr>
<tr>
<td>Squared std. dev. Of arrival time of reviews (TimeSD)2</td>
<td>1.521e-06*</td>
<td>1.586e-06*</td>
<td>1.607e-06*</td>
</tr>
<tr>
<td>(4.979e-08)</td>
<td>(5.300e-08)</td>
<td>(5.254e-08)</td>
<td></td>
</tr>
</tbody>
</table>

Notes: †: control variables. *: significant at P-value less than 0.001. Standard Deviation is in bracket.

Although previous studies have found evidence that opinion leaders and early adopters can overlap, opinion leaders are not necessarily early adopters (Arndt, 1967; Baumgarten, 1975). But studies have suggested that firms should have eWOM marketing at the early stage of product launch (Li and Hitt, 2008; Liu, 2006). Our finding implies that opinion leaders’ eWOM has effects on sales at both early and later stages of product diffusion process. This result is consistent with the finding that eWOM has diminishing effects over time (Cao et al., 2011). Therefore, firms should start eWOM of opinion
leaders as early as possible, but should also spread eWOM from opinion leaders over time. As a consequence, the average time of opinion leaders’ eWOM will increase.

4.3 Product experience effects of opinion leaders

Next we report the estimates on product experience effects. First, the estimate on eWOM volume of communicative opinion leaders is negative, suggesting that product popularity and awareness among communicative opinion leaders increases product sales. Second, the estimate on eWOM valence of communicative opinion leaders is negative, suggesting that customer satisfaction among communicative opinion leaders increases product sales. Third, the estimate on standard deviation in eWOM ratings by communicative opinion leader is negative, suggesting that product horizontal differentiation increases product sales. We find the same results on buzz-generating and trustworthy opinion leaders.

4.4 Knowledge effects of opinion leaders

Next we report the results on the knowledge effects. First, the estimate on the average knowledge of communicative opinion leader is negative, suggesting that broader the product category knowledge at the individual level leads to high product sales. Second, the estimate on the average distinct knowledge of communicative opinion leader is positive, suggesting that the more focused the product category knowledge at the collective level leads to high product sales. The results on buzz-generating and trustworthy opinion leaders are the same.

Finally, we also report the estimates on the control variables. First, the category count is negative, suggesting that a product belonging to more product categories has higher product sales. Second, with respect to the group variable, we find that the estimates on DVD, music, and book are all negative. Note that, group is a factor variable and book is the benchmark. Examining the magnitudes of estimates we infer that, as a group, video has the highest product sales, followed by DVD, music, and book. These results apply to all three types of opinion leaders.

5 Concluding remarks

Companies have learned that WOM/eWOM is an important source of information that affects decisions of consumers living in a highly-connected world through the internet. Finding opinion leaders and using their WOM has become a valuable addition to company’s marketing communication mix. Although time scheduling is part of advertising planning, the timing effect about when to use the opinion leader’s WOM has not been explicitly examined in the literature. This research fills this gap in the academic research and provides managerial implications to industry practices.

5.1 Academic contributions

We make the contributions to the literatures. In the product diffusion literature, timing is a key question because marketers want to understand when a product adoption will take off and slow down (Mahajan et al., 1990a). Several factors that contribute to the timing dynamics are investigated including consumer segmentation based on their
Timing effects of opinion leader’s electronic word of mouth

heterogeneous propensities to adopt early or late, why consumers may delay purchasing, seasonality, but the timing for the key mechanism that drives followers to adopt – WOM remains unknown (Greenleaf and Lehmann, 1995; Radas and Shugan, 1998; Song and Chintagunta, 2003). The only research on WOM that mentioned timing in passing suggested that WOM should be available throughout the diffusion process (Easingwood et al., 1983). This paper addresses the timing question by using the message-based method proposed in Bao and Chang (2014a) to identify communicative, buzz-generating, and trustworthy opinion leaders, and provides the following insights on the timing effects of their eWOM on product sales. First, the first eWOM by opinion leaders should arrive early. Second, the average arrival time should be large. Third, there exists an optimal intensity level of using opinion leaders’ eWOM, which should be neither too high nor too low. This paper contributes to the literature by showing that the effectiveness of opinion leader’s eWOM is determined by not only “who” to select as the opinion leaders but also “when” to use their eWOM. Specifically, we reveal that, even after controlling two other aspects of opinion leader’s eWOM: product experience and knowledge, timing still has significant impact on product sales. Furthermore, our results echo the prior study on advertising planning and imply a parallel between advertising and opinion leader’s eWOM. Both advertising and eWOM should start early (Narayanan and Manchanda, 2009), extend to later stage of product diffusion (Simon and Sebastian, 1987), and have an optimal spacing in between adjacent messages (Appleton-Knapp et al., 2005; Naik et al., 1998).

5.2 Managerial implications

Our results suggest that it is critical for firms to schedule their promotion and communication campaigns with a proper timing strategy to obtain desired effectiveness of opinion leader’s eWOM. The empirical findings of this study have the managerial implications eWOM timing strategy in terms of entry, span and intensity. Traditional marketing communication mix includes only company-initiated communications (Chen and Xie, 2008). Incorporating consumer-generated WOM as a new element in the mix is appealing due to the evidences of WOM’s sales effects. Since it is impossible to recruit every consumer to launch a WOM campaign, a more viable practice for marketers is to find a small percentage of influential consumers. The managerial focus has been on who companies should recruit as opinion leaders (Bao and Chang, 2014b; Godes and Mayzlin, 2009; Hinz et al., 2011). However, product diffusion can be a process that last for years (Chandrasekaran and Tellis, 2007). The current practice seems to have opinion leaders to disseminate eWOM at the beginning of the product launch (Godes and Mayzlin, 2009; Hinz et al., 2011). Our findings have managerial implications on the timing strategy of opinion leaders’ eWOM. First, the aforementioned practice of early entry is, though partially, supported by our findings showing that the first opinion leader’s eWOM needs to arrive early. Second, we also found that the use of opinion leader’s eWOM should extend deep into the product life cycle, revealing a large timing span is advantageous. Third, the variation of opinion leader’s eWOM message timings follows an inverse-U shape which implies the existence of an optimum level. This suggests that the interval between adjacent eWOM messages should be neither too big nor too small, similar to the optimal timing intensity in advertising (Appleton-Knapp et al., 2005). In brief, the timing effects of opinion leaders eWOM in terms of entry, span and intensity are consistent with the observations based on the characteristics (innovativeness, social ties, and opinion
leaderships) of innovator and different adopters along the diffusion process – later adopters such as late majority and laggards will need WOM the most for its information and influence, and yet opinion leadership, when companies let diffusion to run its natural course, tend to arrive early in the groups of innovators and early adopters (Hirschman, 1980; Rogers, 1983).

5.3 Future research

There are several directions for the future research to explore. First, due to the limitation of dataset, we only study message-based opinion leaders. It would be an interesting direction to examine timing aspects for opinion leaders identified by sender- and receiver-based methods (Godes et al., 2005; Hinz et al., 2011). Second, many companies also use other marketing communications to launch an integrated marketing communication campaign (Bao and Chang, 2014b; Schultz, 1992). It would be important to study timing management of both opinion leader’s eWOM and other traditional/online communication mix elements such as TV advertising and search engine marketing. Third, there is no prior research on how to map opinion leaders identified through sender-based, receiver-based-, and message-based approached to the consumer segments along the diffusion process. The characterisation of the latter suggests that the early adopter has the most opinion leadership, but to which degree they overlap and whether opinion leaders also come from other adopter categories are unknown (Rogers, 1983). One implication of this research is that opinion leader’s eWOM should extend through the entire diffusion process. If opinion leaders come from all adopter categories, one strategy to explore is to recruit from all adopter categories. Fourth, the products in our dataset are in the product categories of book, music, VHS video, and DVD. These are one-time purchasing goods described in the original Bass model (Bass, 1969). Diffusion literature has studied repeat/replacement purchases of multiple-generations of goods, for example iPhone 6 and 7 (Norton and Bass, 1987, 1992). A newer-generation product as a substitute to the current product on the market introduces interesting dynamics in the diffusions of both. Particularly, the timing of product introduction and the timing of opinion leader’s WOM will likely be different from single purchase situation in this study. Therefore, a timing study for joint diffusion and substitution is necessary.

References


Timing effects of opinion leader’s electronic word of mouth


Timing effects of opinion leader’s electronic word of mouth


