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Maximizing micro-blog influence in online promotion

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ABSTRACT

The opportunities for dynamic and timely interaction afforded by micro-blogs, accompanied by the increasingly widespread use of mobile devices, have drawn disparate groups of people together to form communities online. For businesses, marketers should not underestimate the importance of understanding and communicating effectively with customers, but it is difficult to use micro-blogs to estimate bloggers' marketing influence due to their lack of structure. In this study, a framework is proposed for identifying opinion leaders and maximizing the dissemination of messages by analyzing existing micro-blogs. More specifically, the framework enables companies to ascertain the subjects of marketing, select keywords, retrieve micro-blog content and blogger information, form ontologies, estimate and analyze the indices of bloggers' influence, identify opinion leaders, and maximize message dissemination. We use Weibo, the most popular micro-blog platform in China to demonstrate the framework.

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1. Introduction

People like to share their experiences and opinions, and positive or negative comments they make about a product might affect the purchasing decisions of their friends. Word-of-mouth marketing then becomes an effective channel for traders to promote their products. This has led to the emergence of many online social communities in micro-blogs. Messages disseminate much more rapidly and with lower costs through online networks, compared with offline networks. The potential growth and effect of online word-of-mouth marketing in micro-blogs have thus attracted the attention of the research community. From a research perspective, online communities are different from those offline in many ways. For example, strong ties determine the "friends" in a conventional offline community, while those in an online community are in fact "followers" whose ties are weak (Ma, Krishnan, & Montgomery, 2015; Aral & Walker, 2014; Granovetter, 1973).

The development and increase in number of mobile devices have vastly increased the popularity of micro-blogs. The opportunity for dynamic real-time communication between members of communities in micro-blog systems has been extremely attractive. For marketers, micro-blog systems have become a crucial channel for customer interaction. It is important but difficult to effectively disseminate messages and attract the attention of customers. Companies want to understand their customers, and encourage customers to know them.

Compared with weblogs, micro-blogs are more rapidly distributed, and their users' opinions have a higher rate of penetration. Companies therefore fiercely compete to promote their products on micro-blogs, through by word of mouth (WOM) marketing. For example, a report by Sina.com, the holding company of the popular micro-blog www.weibo.com, reveals that 58.78% of their users post information on merchandise they have purchased; 20.31% explain the use of the merchandise to others; 35.83% evaluate merchandise and service quality; 82.2% of users are influenced by this information; and 81.77% consult online reviews before purchasing a product. Meanwhile, for promotional purposes, companies use Weibo to observe the behavior and relationships of both online and offline consumers. The numbers of message retweets and comments are monitored carefully. There is considerable evidence that opinion leaders play a crucial role in effectively disseminating messages in new-media contexts, such as micro-blog systems.

The contents of micro-blogs and user relationships both provide useful information, but micro-blogs are difficult to analyze as they lack structure. In this study, we propose a framework that can help companies analyze micro-blog contents, identify opinion leaders, and maximize the influence of messages. Our research focuses on identifying the sources of word-of-mouth marketing (opinion leaders) and quantifies their effectiveness and coverage. The framework can be specifically used by companies to identify keywords relating to marketing subjects, retrieve micro-blog contents and blogger information, form ontologies based on the information re-

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trieved, analyze the influence of bloggers, identify opinion leaders on given subjects, and maximize the influence of marketing messages. We use Weibo, the most popular micro-blog in China hosted by Sina.com, for illustration.

2. Related work

This study focuses on message distribution and diffusion in online social networks. Identifying and measuring the influence of opinion leaders in micro-blog systems is also relevant to the related research areas of social media and influence maximization.

2.1. Social media studies

Social media studies commonly focus on either user-generated content (UGC) or online social networking. UGC focuses on contributors and the contribution, consumers and consumption, and the effect of the collected data, but does not consider the relationships within networks, while both the content and the relationships between network users are examined in online social networking. This research adopts the social network approach, considering both content and relationships.

(1) The research into UGC is mainly empirical, and studies the intention, behavior, and influence of network users. For example, Shriver, Nair, and Hofstetter (2013) and Toubia and Stephen (2013) noted that users who receive greater attention, i.e., have more followers/fans/friends, publish micro-blogs more frequently. Blanco-Fernández et al. (2011) used audiovisual UGC in handheld devices to exchange and share users' contents. Lovett, Peres, and Shachar (2013) reported that the incentives to disseminate messages in WOM marketing are social, emotional, and functional. They also compared new vs. premium brands, and online vs. offline channels in WOM. Moe and Schweidel (2012) and Godes and Silva (2012) examined UGC content from an after-sales perspective. Moe and Schweidel (2012) reported that customers who purchased bathing, fragrance, or home products and found they considerably exceeded or fell below their expectations are more likely to express strong opinions about the products on social media. Users who buy the same products also tend to agree with the opinions of the initial poster, showing a strong bandwagon effect. It has also been found that customers who more frequently express opinions on purchases are more likely to be negative. Godes and Silva (2012) noted that when users' opinions on a product vary widely, negative feedback is more likely if the product falls below customer expectations, and users who receive less attention publish fewer blogs. Social attention therefore provides closed-loop and positive feedback (the more micro-blogs published the more attention received, and vice versa). Shelton and Skalski (2014) identified gender differences in users' activities from UGC on Facebook. Salehan and Negahban (2013) and Park, Lee, and Kim (2012) analyzed race as a behavioral factor in online social networks.

Empirical research and simulation methodologies are commonly used to measure the influence of UGC. For example, Gopinath, Chintagunta, and Venkataraman (2013) analyzed the relationship between movie box-office sales and users' comments and found that the heterogeneity of the data generated by consumers and firms significantly contributed to the effect of the box-office performance. Ghose, Ipeirotis, and Li (2012) suggested hotel-product recommendations based on an analysis of comments made by experienced users; Hu et al. (2012) investigated book sales and reviews on Amazon.com and found that 10% of the site's online reviews are manipulated; these may increase sales, but they cannot create a bestseller. Flanagin and Metzger (2013) argued that users tend to follow the crowd when there are a large number of comments, but follow experts if only a few comments are made. Oum and Han (2011) found social trust and perceived playfulness are the key to individual's intention to participate in UCC services. Westerman, Spence, and Heide (2012) noted that messages posted on Twitter have less credibility if the users have too many or too few followers. Even if users have a large number of followers they are not necessarily experts. Zhao et al. (2013) found that customers consult reviews before purchasing books, music, and movies, but their final decisions are based on their personal experiences. Customers are less influenced by reviews if there are a high number of them. Albuquerque et al. (2012) used Hewlett-Packard as a case study, and found UGC to be more useful than product promotion. Yildirim, Gal-Or, and Geylani (2013) analyzed the effects of financial results using UGC for new product development. Tirunillai and Tellis (2012) compared the effects of positive and negative UGC on stock prices.

Other studies analyze how users select a social network. Davenport et al. (2014) used age as a factor to analyze how adults and college students choose between a weblog (Facebook) and a micro-blog (Twitter). Li (2014) and Choi, Jung, and Lee (2013) compared cultural backgrounds in the choice between a local and a global social network system (Facebook). Zaglia (2013) analyzed users' intention and purpose when joining the brand communities of social networks. Armentano, Godoy, and Amandi (2013) used text analysis to propose an followee recommendation system in micro-blog.

Previous studies indicate that social media can influence the decisions of users (such as in purchasing products), considering factors such as users, products, and information. However, the relationships between users are rarely taken into consideration.

(2) Researchers use complex-network and social-network analyses to quantify users' relationships. Most previous research focuses on developing network models based on analyses of their structure and properties, or on users' behavior, based on their network position. Yang and Yu (2014), for example, calculated the indices of degree, average shortest path, and betweenness of a micro-blog system. Yan, Wu, and Zheng (2013) analyzed the "small-world" property of the micro-blogs of social networks and Fu, Liu, and Wang (2008) examined weblogs to verify this property, and found the feature "scale-free." Armentano, Godoy, and Amandi (2012) used the topology of network to identify relevant users for good information resources in micro-blogs. Duong, et al. (2015) used consensus-based social network analysis in collaborative video annotation. Lu, Jerath, and Singh (2013) proposed a stochastic network growth model, arguing that an opinion leader is unlikely to connect with another of a similar status. Hellmann and Staudigl (2014) divided network model development into stochastic and game-theory models, analyzing evolutionary and co-evolutionary processes. Other research has analyzed users' behavior based on network position; Du, Gao, & Hu (2014) and Kiss and Bichler (2008) measured the influence of nodes and used their properties to identify opinion leaders. Lu et al. (2013) found that those with high-opinion leadership status are not willing to link to other opinion leaders, while those with low-opinion leadership status link to opinion leaders, becoming hub nodes. Lee (2014) investigated the different methods of acquiring information used by experts and novices with either central or peripheral network positions. Traud, Mucha, and Porter (2012) analyzed the effects of gender, class year, major, high school, and residence of college students on the community structure.

In conclusion, two social media studies perspectives, analyzing network properties and the relationship of nodes, are the foundation of this study.

2.2. Influence maximization

Research into influence examines how to maximize the dissemination of positive information and control negative messages or

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