The moderating role of socio-semantic networks on online buzz diffusion ☆

Hyejun Lee [a,1], Dong Il Lee [b,*], Taeho Kim [c], Juhyun Lee [d]

[a] Institute of Distribution & Franchise, Sejong University, Seoul, Republic of Korea
[b] Department of Business Administration, Sejong University, Seoul, Republic of Korea
[c] Nexmore Systems, Amkorkorea Annex D, 280-20 Seongsu-dong, Seongdong-gu, Seoul, 133-832, Republic of Korea
[d] Institute of Distribution & Franchise, Sejong University, Seoul, Republic of Korea

ARTICLE INFO

ABSTRACT

Many studies show that online buzz influences consumer's behavior. Relatively few studies empirically explore its diffusion, however. The source and content of online information influences people. This study aims to determine the direct effect of the volume of early online WOM (Word of Mouth) on its subsequent diffusion and the moderating effects of WOM characteristics in both the social and semantic networks in its initial 14-day stage of diffusion. To accomplish the objectives of the study, a specialized agency for online buzz research provided raw data regarding online WOM for 40 cellular phones. This study analyzes three stages of buzz diffusion. In the first stage, we performed a social network analysis of poster–replier relationships to capture the social aspects of online WOM networks. In the next stage, we extracted morphemes from the content corpus and conducted a semantic network analysis of online WOM. The five network characteristic indexes extracted through this analysis were density, degree centrality, betweenness centrality, eigenvector centrality and path length. In the last stage, we employed a 1st level and 2nd level HLM (hierarchical linear model). The results identify the partially direct and moderating factors affecting online WOM diffusion. This study contributes to the understanding of the role of social and semantic network indexes in online WOM diffusion.

1. Introduction

Strictly speaking, WOM is different from buzz. Whereas WOM is purely consumer response, buzz includes marketer activity and consumer response (Shimp, 2006). Marketers observe online WOM to determine appropriate directions for buzz management.

Many studies support the idea that online WOM (Word of Mouth) drives consumer behavior. For example, online reviews correlate with online bookstore sales and weekly box office revenues (Basuroy, Chatterjee, & Ravid, 2003; Chevalier & Mayzlin, 2006; Liu, 2006). These findings strongly suggest that online WOM about a topic will generate consumer interest in that topic and thus lead to more online WOM. This phenomenon can be observed on Twitter, Twitter does not compile similar topics into one category, and the top ten topics listed on Twitter reflect the keywords receiving the most attention from users. When Michael Jackson died, topics such as Michael

Jackson, MJ, and King of Pop appeared as top ten trending topics (Kwak, Lee, Park, & Moon, 2010).

The content that online contributors share and the relationship between contributors also affects online WOM diffusion. Bampo, Ewing, Mather, Stewart, and Wallace (2008) found that the network community members' social structure mediated the spread of information. And Phelps, Lewis, Mobilio, Perry, and Raman (2004) revealed that subjects were more likely to pass along email messages that produced positive emotions or that were important or meaningful. The relationship between the social and semantic characteristics of online WOM and its diffusion is therefore important to investigate.

Studies using online WOM buzz data to explore the nature of such activities and their influence on the volume of online WOM are extremely rare, however. This dearth of research is compounded by the difficulty of developing proper measures for WOM activities. It is therefore essential to develop a methodological framework that can capture the characteristics of online WOM diffusion. This study aims to simultaneously capture the social aspects of online WOM networks using a social network analysis and the semantic aspects using a semantic network analysis. Most of the previous studies conducted one of the two network analyses but few have incorporated both network characteristics simultaneously (Roth & Cointet, 2010). Our study assumes that the socio-semantic characteristics of online WOM in the early stage of its diffusion influence its subsequent volume.

The purpose of this study is to identify how the volume of early online WOM on the online affects its diffusion by analyzing the moderating effects of online WOM's unique characteristics in social and semantic networks.

To accomplish the study objectives, we analyzed 40 online WOM data sets for cellular phone. Each online WOM data set contained material about only one cellular phone from several online communities. Each data set had unique network characteristics and showed how much online WOM was produced per day during the data collecting period. This study therefore regards the daily volume of online WOM as individual level effects and the network characteristics as group level effects. We employed a hierarchical linear model (HLM) ideally suited for cross-level issues.

2. Theoretical background

2.1. Diffusion of online WOM

The volume of online WOM reflects the degree of consumer's interest. Online reviews have become a major information source for consumers. For example, book's sales rate correlates with its average review score on online stores such as amazon.com (Chevalier & Mayzlin, 2006). In response to the influence of online WOM, many studies have focused on aspects of online WOM, such as the source of information (Dichter, 1966; Myers & Robertson, 1972), the information's audience (Granovetter, 1983), the content shared (Phelps et al., 2004) and the process of online WOM diffusion (Godes & Mayzlin, 2004; Liu, 2006).

In Bass (1969), diffusion theory essentially shows that behavior changes depending on the degree to which an individual adopts the information shared. The likelihood of new purchase behavior is a linear function of the individual's cumulative number of previous first purchases. The volume of online WOM can therefore be predicted on the basis of prior online WOM activities.

Generally, there are two major obstacles to studying online WOM. The first is the difficulty of gathering data. Online WOM is a continuous activity, making its dynamic aspect difficult to capture. The recent development of online marketplaces and communities helps us to overcome the first obstacle, however. Anyone who needs the data can access the consumer's conversations stored on web-sites. The second obstacle is the difficulty in determining what elements of the data to measure. Godes and Mayzlin (2004) suggest two measurements to address the second problem; the volume of online WOM measured by the number of conversations mentioning a product and the dispersion of online WOM which is the extent of product-related conversations across the communities. They focus on contributors' social patterns in the context of online WOM. People could also be influenced by the communication content itself when they are engaging in the personal communication process, however. It means that the volume of online WOM diffusion is related to both its social relationship and its semantic dimensions. It is therefore necessary to consider not only the social aspects of personal communication (who people talk with) but also its semantic aspects (what subjects people talk about) when analyzing the diffusion of online WOM.

2.2. The moderating role of social and semantic networks in the diffusion of online WOM

Online communities are characterized by a shared interest (Rheingold, 1993). People who discuss their shared interest publicly with other members who do the same diffuse online WOM. From a network point of view, the interaction between members comprises a social network consisting of links between community members. Similarly, the contents that the members share comprise a semantic network composed of topics clustered by linked keywords.

In the context of the social network, consumers' decision making is affected by reference groups. Contributors with a special role, such as that of opinion leader, play an important role (Dichter, 1966; Myers & Robertson, 1972). Opinion leaders are usually highly knowledgeable, interested, and devoted to the discussion about a topic (Myers & Robertson, 1972). Thus, they tend to connect many people through product-related conversations. The social ties produced through the relationship between community members is also important in the diffusion of online WOM. Strong ties represent close, solid and trusted reciprocated relationships (e.g., family and friends) whereas weak ties are characterized by less intimacy (e.g., co-worker). As observed in dense community, consumers with strong ties are more willing to support and share common norms and values (Granovetter, 1983; Hulst, 2009). People with strong ties therefore make more total contacts with the individuals in their community. Moreover, Bampo et al. (2008) discovered a relationship between social structures and online WOM. To determine the impact of social network structure on viral marketing campaigns, they performed several simulation experiments within different types of social network structures. They established the mediating effect of social structures on the spread of online WOM. In consequence, the diffusion of online WOM is affected by social relationships such as reference groups, the strength of the relationship between community members and the social structure in the social network.

In addition to the social network, the semantic network also affects the diffusion of online WOM. Kwak et al. (2010) compared the topics on Twitter to offline head line news and found that people tend to especially share or spread messages about offline news. People transfer messages about hot topics in the real world. Furthermore, people forward messages that licit the emotions (e.g., positive emotions, such as joy, surprise, and humor and negative emotions, such as sadness, anger, and fear) that they want to share (Dobele, Lindgreen, Beverl, Vanhamme, & van Wijk, 2007; Phelps et al., 2004). The emotional evaluation of content plays a moderating role on the volume of online WOM (Richins, 1983; Stauss, 1997). These previous studies revealed that negative information is more widely diffused and that it exerts greater influence than positive information (DeCarlo, Laczniak, Motley, & Ramaswami, 2007). Shared emotion can increase the diffusion of online WOM through common usage of keywords. All of these studies imply that the topics addressing hot trends or eliciting sympathy spread more widely. More meaningful or emotional semantic structures within the message could therefore plausibly generate more WOM in the online settings.

Both social and semantic network characteristics are formed in the early stage of online WOM diffusion. Consumers exchange information with people with whom they are connected. Similarly, the characteristics of the semantic network are defined early in the buzz process as the contents are being created. Early formation of online WOM could therefore play a moderating role between the volume of early and subsequent online WOM.

2.3. Network analysis approaches

The purpose of network analysis is to investigate the relationship between linked nodes. Thus, the analysis focuses on the morphology of linked nodes and the patterns of linkage and examines different object nodes, including social entities and semantic keywords (Wasserman & Faust, 1998). First, a social network analysis focuses on the patterns and implications of the relationships among social entities (i.e., individual members of the community). An individual is represented as a node and the relation between individuals is represented as link (Knoke & Yang, 2007; Reid & Smith, 2009; Wasserman & Faust, 1998). Second, a semantic network analysis is one branch of a network analysis that explores the relationships between shared meanings in social linguistic settings. Online WOM is the text's setting, and each semantic construct is a network of semantic relations between topics