Identifying Structural Heterogeneities Between Online Social Networks For Effective Word-of-Mouth Marketing

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Abstract— Social networks are extremely important for word-of-mouth (WOM) marketing. However, marketers often ignore network structures when developing WOM marketing strategies. Specifically, there is clearly a lack of research on looking into overall structures and structural heterogeneities of social networks. This research investigates structural heterogeneities between online social networks in different product categories. We collected data from four online networks in different product categories from the most popular social networking site in Taiwan. Social network analysis was performed to understand the network structures. The findings demonstrate the structural heterogeneities between these networks and we also provide managerial implications for practitioners.

Keywords-Social Network; Network Structure; Structural Heterogeneity; Word-of-Mouth (WOM) Marketing; Social Network Analysis (SNA)

I. INTRODUCTION

Due to today’s highly fragmented mass media, it has become increasingly difficult to reach consumers using traditional marketing strategies [27]. Instead, word-of-mouth (WOM) marketing has received more attention and been spurred by the development of the Internet and virtual communities [41, p. B3A].

According to a recent report by eMarketers (2007), 37% of the adults and 70% of teenagers in the U.S. uses social networking sites. Those numbers are projected to increase to 50% of adults and 84% of teenagers. [11][12] Due to increasing popularity, these social networking sites have become resources and new platforms for marketing. World-of-mouth (WOM) marketing in the virtual communities is much more influential in terms of speed and scope than ever as information is transmitted instantly around the globe for virtually free [18].

Marketers appreciate the importance of social networks, particularly in promoting new products [2][24][30]. They expect that word-of-mouth (WOM) marketing (also known as viral marketing) activities will succeed on consumer social networks [3][16][31]. Evidence indicates that marketers often ignore network structures when developing marketing strategies [36].

Prior research has noted the heterogeneities of social network structures in the field of sociology [38] and recently in the field of marketing [5][7]. Although researchers have identified the importance and impact of the network structure on innovation adoption [5] and online WOM communication [7], additional research effort is needed in order to understand how the structural heterogeneity could possibly influence WOM marketing. This research aims to investigate structural heterogeneities between online social networks and provide managerial implications for WOM marketing.

The structure of this paper is organized as below: In section 1, the background and introduction will be introduced. Some related literatures of social network and WOM marketing will be reviewed in section 2. Some basic concept about social networks analysis will be discussed in section 3. In section 4, we will introduce the methodology that used in the paper and the analysis results are shown in section 5. In section 6, this paper will be concluded with the suggestions for future research.

II. SOCIAL NETWORK, NETWORK STRUCTURE, AND WORD-OF-MOUTH (WOM) MARKETING IN VIRTUAL COMMUNITIES

A. Social Networks and WOM Marketing

Social networks refer to composites of a large number of individuals (actors) in groups and the interactions and relationships that exist among the groups and individuals [21].
Three important elements exist within a social network: actors, ties, and relationships [33]. The actors are the essential elements in the social network as they are the people, organization, events or objects being studied. Ties are used to construct the relationships, either directly or indirectly, between the actors by using a mean of path to establish the relationship directly or indirectly. Ties can also be divided into strong and weak tie according to the strength of the relationships and are also useful for discovering subgroups of the social network. Relationships are used to illustrate the interactions and relationships between two actors. Different relationships may cause the network to reflect different characteristics [3][19][25].

Marketers rely on social networks to spread marketing messages in both business-to-business (B2B) [4][26] and business-to-consumer (B2C) [7][29] markets. Individuals in social networks act as WOM channels [32] and disseminate and exchange information [7]. Social networks influence consumer behavior in various aspects, such as information search strategies, decision-making processes as well as purchase and consumption decisions [14]. Therefore, social networks are extremely important for WOM marketing. During the past decade, advanced computing technologies (e.g., Web 2.0) have brought people to virtual communities, which can be defined as groups of computer users who provide friendship, social resources, information and belongingness to each other.

A social networking site (e.g., Facebook or Twitter) is an example of a virtual community. Information exchanges between consumers in these virtual communities have become increasingly easier and quicker. As such, an increasingly influential role in regard to networks on WOM marketing in virtual communities can be expected. Currently, many companies believe that virtual community is a valuable knowledge management system, and therefore make their effort in managing or collaborating with social networking sites [20].

According to recent research, firms spent more than $1.54 billion on WOM marketing activities in 2008, and it is estimated that these expense will increase to $3 billion by 2013. Research further indicates that spending in WOM online communities increased 26.6% in 2008 to $119 million [10]. Given such a substantial allocation for WOM marketing, it is essential for firms to ensure that they execute WOM marketing campaigns effectively in order to gain the best return on their investment.

As Van den Bulte and Wuyts [36] stated, “Like financiers, scientists, and entrepreneurs, marketers have long recognized the importance of social networks, but to a more limited extent.” They further indicated that marketers have focused on the role of opinion leadership and contagion processes in new product diffusion and adoption.

However, the structures of social networks are often overlooked when executing marketing strategies [37]. There is clearly a lack of research on looking into overall structures and structural heterogeneities of social networks and their possible impact on WOM marketing effectiveness.

B. Network Structures and WOM Communication

Researchers have investigated the effect of the network structure between online and offline social networks on WOM communication [7]. Specifically, the finding has demonstrated the information flow difference between online and offline social networks due to different network structures. Recent research examines structural heterogeneity by comparing four different types of network structures: random, cellular automata, small-world, and power-law networks [5].

As each type of the network structures is different from each other in terms of how interpersonal communications occur within the network, such a difference subsequently leads to different innovation diffusion patterns. In the same vein, some researchers also propose that the types of WOM information flow depend on product categories [1].

For instance, a product can be classified as search, experience, or credence product by its perceived risk and uncertainty. Scant research has examines the structural heterogeneities between social networks in different product categories. Thus, following this stream of research, the goal of this research is to identify the structural heterogeneities between online social networks in different product categories and understand their impact on WOM marketing.

This research employs SNA to identify structural differences between online social networks and provides managerial implications to marketers as to achieve the goal of effective WOM marketing.

III. Social Network Analysis (SNA)

SNA was originally utilized in sociological research. However, it has been often used, in recent years, in regard to issues related to information science and social networking due to the development of information techniques and the requirements of data processing [8][10][17].

Marketing researchers also apply SNAs in order to understand consumer behaviors, such as brand switching behavior [22] and WOM referral behavior [7][9][13][23][35][39][38] The research methodology of SNA was developed to understand the relationship between “actors,” which can be used to describe a person, an organization, an event or an object [6].

In a social network, each actor is presented as a node and each pair of nodes can be connected using lines to show relationships. The social network structure graph is a graph formed by these lines and nodes and a SNA is, therefore, a methodology that is used to understand the graph and the relationships between the actors in the social network [6][15][38].

IV. Methodology

A. Sample

The most popular type of social networking site now is a Weblog, or a blog [34][40]. Most of weblogs are personal websites on which users post articles or share stories about
their day. Other users, usually, with similar interests, then post replies on these blogs. Those individuals may then connect with each other via other online resources as well and, as such blogs have become good resources by which to understand the virtual communities and interest groups.

Blogs have become a finest platform for advertising, promotion and WOM marketing. Our target sample came from the most popular social networking site in Taiwan, Wretch (http://www.wretch.cc/). This social networking site has the highest browsing rate and most members in Taiwan. We collected the blogs in four topics: electronic products, cosmetics, travel, and movies/music.

The data collection duration was from May 2010 to July 2010. Data from 139 bloggers in the electronic products, 300 in the cosmetics, 262 in the travel, and 183 in the movies/music social networks were used for this study.

B. SNA

Three measurements (responses, citations and recommendations) were used to measure the relationship of the four social networks. Before performing SNA, a relationship matrix has to be established according to the three measurements. Each member of the community is presented as a node in the network, and the link between any two nodes means the relationship.

The relationship value was denoted as 1, if the value of the measurement was larger than 3 else was denoted as 0. Following this rule, we created a 139 x 139 (electronic products), a 300 x 300 (cosmetics), a 262 x 262 (travel), and a 183 x 183 (movies/music) relationship matrix generated from the network data and each matrix was then entered into a social network program UCINET (Borgatti, Everett, and Freeman, 2007) to calculate density, distance, and centrality scores for each network.

C. Measures

1) Density, Distance and Cohesion: The density, ranging from 0 to 1, measures the connectivity degree of the nodes and links in a social network. A higher level of density represents a higher level of connectivity in the network. The network distance represents the communication distance between the members in the network. The shortest distance, direct communication between members, is 1. The cohesion, ranging from 0 to 1, refers to the degree to which a members are connected directly to each other by cohesive bonds.

2) Centrality: Centrality measures include degree, closeness, and betweenness. The degree centrality, ranging from 0 to 1, measures the level of interaction that a member has with the other members and also revealed the member’s relative influence in the network. The closeness centrality analyzed the centrality structure of the network based on the geodesic distances among the nodes (members) in the social network [10]. A higher closeness centrality means that the member is closer to the center of the network and, therefore, closer to the other members and, thus, able to transmit information faster. In addition, betweenness measures the capacity of a member to be a mediator and mediate information exchanges between the other members in the network.

V. RESULTS

The SNA results of the four networks are presented in table 1 and the graphs of the networks are shown in figures 1, 2, 3, and 4.
A. Density, Distance, and Cohesion

As shown in Table 1, the results show that the cosmetics network has the highest density (0.502), followed by travel (0.130), movies/music (0.113), and electronic product (0.104) networks. That is, the cosmetics network has the highest level of connectivity in the network, as opposed to the other three networks. The cosmetics network (1.505) has the shortest distance, followed by electronic product (1.724), travel (2.020), and movies/music (2.430) networks.

The communication distance between members in the network is shortest in the cosmetics network and longest in the movies/music network. The cosmetics network’s cohesion is highest (0.750), followed by the travel (0.472), movies/music (0.383), and electronic product (0.159) networks. The finding indicates that members in the cosmetics network have the highest level of connecting to each other by cohesive bonds whereas the electronic product network has the lowest level of cohesion.

B. Centrality

The cosmetics network has the highest degree, closeness, and betweenness centrality on average, followed by the travel, movies/music, and electronic product networks (degree: \( M_{\text{cosmetics}} = 0.502, M_{\text{travel}} = 0.130, M_{\text{movies/music}} = 0.113, M_{\text{electronic product}} = 0.098); \) closeness: \( M_{\text{cosmetics}} = 0.679, M_{\text{travel}} = 0.045, M_{\text{movies/music}} = 0.039, M_{\text{electronic product}} = 0.010; \) That is, the level of interaction that a member has with other members is highest in the cosmetics network and lowest in the electronic product network.

The members in the cosmetics network are closer to the center of the network and to other members, as opposed to the members in the other three networks. Similarly, the cosmetics network has the highest betweenness and the electronic product network has the lowest while the movies/music network is slightly higher than the travel network on betweenness centrality (betweenness: \( M_{\text{cosmetics}} = 0.017, M_{\text{travel}} = 0.003, M_{\text{movies/music}} = 0.006, M_{\text{electronic product}} = 0.001).\)

VI. DISCUSSION

The findings from this research show structural heterogeneities between online social networks in different product categories. Specifically, the cosmetics network has the highest level of connectivity between members and of connecting to each other by cohesive bonds and the communication distance between members is the shortest. The electronic product network has the lowest level of connectivity between members and of connecting to each other by cohesive bonds, and the communication distance between members is the longest.

The centrality measures indicate that the cosmetics network still possesses the highest degree, closeness, and betweenness. That is, the interaction level between members in the cosmetics network is higher than the other networks. The members in this network are closer to the center of the network and they are able to transmit information faster than the other networks.

In addition, the members in this network also have higher capacity to mediate information exchanges between the other members in the network, as opposed to the other networks. These findings not only demonstrate the structural heterogeneities between four online social networks, but also offer implications for WOM marketing.

REFERENCES


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