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Social activity and structural centrality in online social networks

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ABSTRACT

It has become well known that the knowledge about key network members is essential for doing business successfully through online social networking sites. As of now, most studies targeted at identifying key members have used network structural centrality measures. Little emphasis has been placed on member activities to identify key members in a network; even though gathering and utilizing such data is relatively easier than estimation of structural centrality positions. Using a structural equation model on an Internet social networking site data, this study finds that the personal activity status of key members is highly correlated with their structural centrality measures. Managerial implications, limitations, and further research issues are also addressed.

1. Introduction

Social networking has become very popular with consumers as well as businesses with the arrival of online social network sites (Yang, 2012). It appears to be a realization of their long held latent need of anytime interaction from anywhere and any place. For consumers, such sites enable them to communicate with friends, make new friends, and engage in expressing their innovativeness, and self-, and social-identities (Pagani et al., 2011). For businesses, these sites provide them with access to large ensembles of consumers to promote their messages and products by using key members of networks as their secondary sources of communication and consumer evangelists. Kozinets et al. (2010) call it a 'seeding campaign' in which firms are getting directly involved in word of mouth marketing with virtual community members. The underlying assumption is that network communication follows a two-step process of mass communication. Therefore, the practical implications for a firm are to find the key individuals, also referred as 'influentials' or 'centralities' in a network, seed them, and let them take care of the rest of communication. As a result, the past three decades have seen structural centrality identification as an active focus of theoretical and empirical research fueled by Freeman's seminal work (Freeman, 1979).

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Over time, there have been modifications and extensions of Freeman's three key indices of centrality, 'degree centrality, closeness centrality, and betweenness centrality' based upon the specific type of network flows. For a comprehensive list of centrality indices, see Borgatti (2006). Regardless of the modifications, Freeman's key indices have remained robust for most of the applications and are still being used extensively. Concomitantly, some scholars were also exploring the development of alternatives to the structural centrality measures. One such area that became promising is the 'network activity' of members. Two recent studies that of Trusov et al. (2010) and Pagani et al. (2011) have attempted to connect the network activity of members with structural centrality measures. The first uses the 'number of site logins over time of others based upon the site login of a user' as an indicator of influential activities of members and connects them with structural centrality. The second classifies activities on a social network site such as viewing and posting of opinions, questions, answers, photos, videos, personal information, and knowledge about an issue, and relates these activities to personality traits such as innovativeness and self- and social-identity expressiveness.

Building upon these two works, this study develops a structural equation model and tests hypotheses about the relation between the activities and structure measurements at the individual level in a social networking site of approximately 26,000 members in the area of event planning and organization. The results show that the personal activity status of key members is highly correlated with the key structural measures of their importance. Managerial implications, limitations, and further research questions of this approach are also addressed. We think that this study significantly advances the social network marketing literature in many ways. First, it directly connects the network member activities with the identification of key members in a network. Second, it provides an alternative way of finding key members of the network based upon their activity levels that is more practical. Finally, the study opens up avenues for further research in network member activities.

2. Online social networks

Online social networks are essentially online social communities where people socialize or exchange information and opinions through pictures, postings, blogging, and other tools to communicate with one another (e.g., Vista, 2015). Social network sites enable individuals to build their public or semi-public profile within a bounded system, articulate a list of other users with whom they share a connection, and view and navigate their list of connections and those made by others within the system (Boyd and Ellison, 2008). These networks are primarily Web 2.0 based and their functioning is mainly dependent upon the ability of extant users to add contents and other users as friends; for example, a current user can invite others to join him/her, who may accept or reject the invitation. However, once the individuals accept to be friends, new relationship ties are built. This process carried out over time by multitude of extant users, therefore, underlies the potential size of the network, and hence its survival (Pagani et al., 2011). These networking sites have become popular over time; they are attracting millions of users worldwide and are growing exponentially (Katona et al., 2011). Many social networks are valued at billions of dollars because of their business potential (Hoffman and Novak, 2012). In particular, Facebook, Twitter, Google+ and MySpace, are considered as market leaders. Within these networks, not only playfulness, critical mass, and trust play a crucial role (Sledgianowski and Kulviwat, 2009), but user-generated content is indispensable for maintaining old and establishing new ties (Pagani et al., 2011; Heinrichs et al., 2011). Other studies have similarly highlighted sociability and usability as two key factors underlying the success of online social communities. While usability mainly pertains to the technology used, sociability relates to how members of an online community interact with each other (Lin and Lee, 2006). According to Panzarasa et al. (2009), the ties between the users are established and maintained by their communication, i.e., the greater the communication between users and their friends in a social network, the greater the strength of ties between them.

In social networks, some users are likely to be more valuable than others to marketers regarding diffusion of information for their products or for other business opportunities (DiMaggio and Garip, 2012; Karnik et al., 2013). They can impact their virtual friends more effectively (Goldenberg et al., 2009) by acting as word-of-mouth channels (Brown et al., 2007; Kozinets et al., 2010; Meuter et al., 2013) as well as role models to inspire others connected to them to imitate their behavior. And, they have also been referred as "key members", "influentials", or "central figures." The received literature recognizes that the desired communication (e.g., launching a new product) in social networks takes place in two steps; first, the communication is directed at key members, who subsequently, spread the communication to their followers (Haenlein, 2013; Kozinets et al., 2010). That is why the identification of key network members has assumed such a high importance that it has become a stream of active research for the past few decades. In the next section we discuss the concept of critical structural positions in a network to lay the foundation for our work.

3. Identifying critical structural positions in a network

Centrality is an important structural attribute of a social network because it is highly related to other group properties and processes such as enhancement of desired network communication or controlling the disruptive cells. According to Freeman (1979) a person located at the center of a network has maximum possible degrees (number of contacts with others), falls in the geodesics (shortest possible paths) between the largest possible numbers of members, and is closest to all other members than any other member. These three characteristics have come to be recognized as the three key measures of centrality in a social network. While, the first one is viewed as an index of potential communication activity of the member occupying this position, i.e., it enables a member to engage in maximum communication with others in a network, the