Identifying Opinion Leaders for Marketing by Analyzing Online Social Networks

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Identifying Opinion Leaders for Marketing by Analyzing Online Social Networks

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ABSTRACT

The impact of social networks in customer buying decisions is rapidly increasing, because they are effective in shaping public opinion. This paper helps marketers analyze a social network's members based on different characteristics as well as choose the best method for identifying influential people among them. Marketers can then use these influential people as seeds for market products/services. Considering the importance of opinion leadership in social networks, the authors provide a comprehensive overview of existing literature. Studies show that different titles (such as opinion leaders, influential people, market mavens, and key players) are used to refer to the influential group in social networks. In this paper, all the properties presented for opinion leaders in the form of different titles are classified into three general categories, including structural, relational, and personal characteristics. Furthermore, based on studying opinion leader identification methods, appropriate parameters are extracted in a comprehensive chart to evaluate and compare these methods accurately.

Keywords: *Marketing, Opinion Leader, Social Network, Social Network Analysis, Word-of-Mouth*

INTRODUCTION

Marketing based on social networks refers to a collection of marketing activities that take advantage of social relationships between consumers to increase sales. There are different kinds of marketing using social networks like *word-of-mouth marketing*, *diffusion of innovation*, *buzz marketing* and *viral marketing* (Hill *et al.*, 2006). Between these instances of network-based marketing, word-of-mouth marketing has more creditability (Li & Du, 2011), because there is no direct link between the sender and the merchant. As a result, information is considered independent and subjective. In recent years, many researches in word-of-mouth marketing investigate discovering influential nodes in a social network. These influential people are called opinion leaders in the literature. Organizations interested in e-commerce need to identify opinion leaders among their customers, also the place (web site) which they are going online. This is the place they can market their products.

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Social Network Analysis

Regarding the importance of interpersonal relationship, studies are looking for formal methods to measures *who talks to whom* in a community. These methods are known as social network analysis (Scott, 1991; Wasserman & Faust, 1994; Rogers & Kincaid, 1981; Valente & Davis, 1999). Social network analysis includes the study of the interpersonal relationships. It usually is more focused on the network itself, rather than on the attributes of the members (Li & Du, 2011). Valente and Rogers (1995) have described social network analysis from the point of view of interpersonal communication by "formal methods of measuring who talks to whom within a community". Social network analysis enables researchers to identify people who are more central in the network and so more influential. By using these central people or opinion leaders as seeds diffusion of a new product or service can be accelerated (Katz & Lazarsfeld, 1955; Valente & Davis, 1999).

Importance of Social Networks for Marketing

The importance of social networks as a marketing tool is increasing, and it includes diverse areas (Even-Dar & Shapirab, 2011). Analysis of interdependencies between customers can improve targeted marketing as well as help organization in acquisition of new customers who are not detectable by traditional techniques. By recent technological developments social networks are not limited in face-to-face and physical relationships. Furthermore, online social networks have become a new medium for word-of-mouth marketing. Although the face-to-face word-of-mouth has a greater impact on consumer purchasing decisions over printed information because of its vividness and credibility, in recent years with the growth of the Internet and virtual communities the written word-of-mouth (word-of-mouse) has been created in the online channels (Mak, 2008). Consider a company that wants to launch a new product. This company can benefit from popular social networks like Facebook and Myspace rather than using classical advertising channels. Then, convincing several key persons in each network to adopt the new product, can help a company to exploit an effective diffusion in the network through word-of-mouth.

According to Nielsen's survey of more than 26,000 internet uses, 78% of respondents exhibited recommendations from others are the most trusted source when considering a product or service (Nielsen, 2007). Based on another study conducted by Deloitte's Consumer Products group, almost 62% of consumers who read consumer-written product reviews online declare their purchase decisions have been directly influenced by the user reviews (Delottie, 2007). Empirical studies have demonstrated that new ideas and practices spread through interpersonal communication (Valente & Rogers, 1995; Valente & Davis, 1999; Valente, 1995). Hawkins *et al.* (1995) suggest that companies can use four possible courses of action, including marketing research, product sampling, retailing/personal selling and advertising to use their knowledge of opinion leaders to their advantage.

The authors of this paper in a similar study have done a review of related literature using social networks for improving marketing response. They discuss the benefits and challenges of utilizing interpersonal relationships in a network as well as opinion leader identification; also, a three step process to show how firms can apply social networks for their marketing activities has been proposed (Jafari Momtaz *et al.,* 2011). While applications of opinion leadership in business and marketing have been widely studied, it generally deals with the development of measurement scale (Burt, 1999), its importance in the social sciences (Flynn *et al.*, 1994), and its application to various areas related to the marketing, such as the health care industry, political science (Burt, 1999) and public communications (Howard *et al.*, 2000; Locock *et al.*, 2001).

In this paper, a comprehensive review of studies in the field of opinion leadership and employing social networks to improve the marketing response is done. In the next sec-

tion, the concept of opinion leadership as well as different titles (opinion leaders, influential people, market mavens and key players) that has been introduced by different studies for referring to the influential group in social networks is discussed. Then, regarding the similarity of these titles on concept and common identification factors, by considering all definition and characteristics proposed for opinion leaders, influential people, market mavens and key players, three comprehensive classifications including structural, relational and personal characteristics are proposed. Methods of opinion leader identification and selection are reviewed and appropriate parameters for analyzing these methods are extracted and shown in a comprehensive diagram.

OPINION LEADERS

Because of more availability of products via the internet, consumers usually face a wide range of alternatives in their decision making process. Simon (1982) in the theory of bounded rationality declares that people do not have the enough ability to process and evaluate all that information. Instead of spending lots of time and money to analyze every option, people usually make their decision based on trust to others who are close to them and have common interests with.

In studies related to marketing and diffusion of information, there is a central idea that these trustworthy people play a vital role on the formation of public opinion (Watts & Dodds, 2007). These people are introduced with different names in the literature. They are called *opinion leaders* in the majority of the studies as well as *influential people*, *market mavens* or *key players* in other studies. However, the definition and usage of them are the same. Table 1 shows these titles in the opinion leadership theory presented in different studies.

The study of Lazarsfield and his colleagues is the starting point for opinion leadership theory in the 1940s and 1950s (Katz & Lazarsfeld, 1955; Lazarsfield *et al.*, 1948); they discovered that voting decisions were heavily influenced by relatives, friends and co-workers rather than media. Also, they suggested a *two-step flow* framework that shows the flow of information, which is formed under the influence of the mass media from an opinion leader to her followers or opinion seekers (Burt, 1999). Actually, a small portion of people that have a lot of influence on the others can act as filters or intermediaries and accelerate or stop the diffusion of information (Katz & Lazarsfeld, 1955; Watts & Dodds, 2007). In the decades after the introduction of two-step flow, the idea of opinion leaders or influential people and different ways of identifying these individuals has been widely studied in the diffusion of innovation (Coleman *et al.*, 1966; Rogers, 1995; Valente, 1995), social science (Burt, 1999) and marketing (Chan & Misra, 1990; Coulter *et al.*, 2002; Myers & Robertson, 1972; Van den Bulte & Joshi, 2007; Vernette, 2004). Rogers and Cartano (1962) define opinion leadership as "degree to which an individual is able informally to influence other individuals' attitudes or overt behaviors in a desired way with relative frequency". Opinion leaders are described by Katz and Lazarsfield (1955) as "individuals who lead in influencing others' options". Flynn et al. (1994) provide marketing perspective as follows: "as consumers frequently rely upon other people as sources of information, in addition to advertisements and media, opinion leaders exert a disproportionate amount of influence on the decisions of other consumers".

Other studies are used *influential people* for describing this group of key people in the network (Burson-Marsteller, 2001; Coleman *et al.*, 1957; Ding & Liu, 2009; Merton, 1968). Burson-Marsteller defines influential people, as "they shape public opinion and share the uncanny ability to seamlessly spread information by word-of-mouth" (Burson-Marsteller, 2001). The Rober Strach Worldwide study (2000) declares that 8% of American online users are e-influential people (group who change the surfing habits of others).

Literature related to the diffusion of innovation and social networks also include another

Table 1. Different titles in the opinion leadership theory

Influential People	Opinion Leader
Burson-Marsteller, 2001 Coleman et al.,1957 Ding & Liu, 2009 Merton, 1968 Strach, 2000 Keller & Berry, 2003	Katz & Lazarsfeld 1955 Lazarsfeld *et al.,* 1948 Rogers & Cartano, 1962 Rogers, 1995-2003 King & Summers, 1970 Bandura, 1986 Engel *et al.*, 1987 Kelly *et al.*, 1991 Flynn *et al.*, 1994 Weimann, 1994 Hawkins *et al.,* 1995 Valente, 1996 Chau & Hui, 1998 Gilly *et al.*, 1998 Burt, 1999 Bansal & Voyer, 2000 Blackwell *et al.,* 2001 Kempe *et al.*, 2005 Lyons & Henderson, 2005 Feder & Savastano, 2006 Tsai *et al.*, 2006 Watts & Dodds, 2007 Yu, 2008 Ding & Liu, 2009 Van der Merwe & Van Heerden, 2009 Li & Du, 2011
Market Maven	
Feick & Price, 1987 Van der Merwe & Van Heerden, 2009 Williams & Slama, 1995 Walsh & Mitchell, 2001	
Key Player	
Bonacich, 1972 Freeman, 1979 Borgatti et al., 1998 Borgatti, 2006	

term in the form of so-called *market mavens*. Feick and Price (1987) define Market mavens as "individuals who have information about many kinds of products, places to shop, and other facets of markets, and initiate discussions with consumers and respond to requests from consumers for market information". In fact, they are opinion leaders on a wide range of subjects (Van der Merwe & Van Heerden, 2009). Many studies declare that market mavens can influence the decision-making behavior of the majority of buyers (Feick & Price, 1987; Williams & Slama, 1995; Walsh & Mitchell, 2001).

Some studies are concerned with identifying the set of *key players* in a social network (Bonacich, 1972; Freeman, 1979). Key players have the most number of direct links with community members or are along the shortest path between many pairs of nodes. They are placed in a structural optimal position and can accelerate the diffusion of every information, trend, behavior or product. The optimal selection of these people is dependent on for what they are needed. Borgatti (2006) has done a comprehensive study on key players' identification. Accordingly, he illustrates two main purposes for key player identification:

1) Optimally diffusing something through the network by using the key players as seeds.
2) Disrupting or fragmenting the network by removing the key nodes.

SPECIFICATIONS OF OPINION LEADERS: STRUCTURAL, RELATIONAL AND PERSONAL CHARACTERISTICS

Since word-of-mouth has a wide impact on the opinions and purchase decisions of consumers, firm and marketers try to be more focused on the influential customers (Kiss & Bichler, 2008; Duan *et al.*, 2008), and identify people

who are at the center of interactions (Keller & Berry, 2003). Properties expressed in different studies for opinion leaders are largely depending on the type of available data for the study and there is no comprehensive classification for the specification of opinion leaders. Kats and Lazarsfield (1955) specify three comprehensive criteria to identify opinion leaders: 1) personality and special characteristics, 2) capability and knowledge, and 3) strategic position in the network. This is the most complete classification in the opinion leadership studies because of considering both collective and personal factors. However, it does not consider the type of relationship between people and social position in the network. In addition, regarding introducing similar concepts like opinion leader, influential people, market maven and key player as well as numerous studies that have been done after that of Katz and Lazarsfield (1955), there is no comprehensive classification for considering all of these concepts.

Since in the majority of studies the concepts of opinion leaders and influential people are considered equal (Van der Merwe & Van Heerden, 2009; Watts & Dodds, 2007), we propose three comprehensive categories including structural, behavioral and personal factors for identifying opinion leaders. This classification is based on all the specification proposed for opinion leaders, influential people, market mavens and key players discussed in the literature. Besides, considering the similarity between some of the specification described in various articles, a unique name has been put on the common features. Table 2 shows the features discussed in different studies related the three categories listed above.

Structural Characteristics

Structural characteristics refer to the network topology and the position of a person in relation with other people. In addition, the personal comments of network members about products are considered structural characteristics. Countless studies reveal that opinion leaders are more exposed to the external source of information such as media or change agents (Rogers, 1995, p. 92; Valente, 1996; Weimann, 1994, p. 217). Influential people are positioned at the center of interaction; they are well-connected and have relation with the majority of network members (Van der Merwe & Van Heerden, 2009; Katz, 1957; Rogers, 2003; Keller & Berry, 2003; Zhang *et al.*, 2010; Valente & Davis, 1999; Valente, 1995). Another important point is that the impact of messages sent by opinion leaders is directly correlated with the number of users through which the information passes (Kempe *et al.*, 2005; Zhang *et al.*, 2010).

Relational Characteristics

Relational characteristics such as trust are related to interaction of people with each other. The relationship between an opinion leader and his follower is a perceptible indicator of the effectiveness of word-of-mouth marketing (Li & Du, 2011). Numerous studies indicate that diffusion is most efficiently when it occurs between individuals and their "near peers" whom they have chosen as their models (Valente & Davis, 1999; Weiman, 1994; Feder & Savastano, 2006; Zhang *et al.*, 2010). Other studies address the problem of information exchange from the higher social class groups to a lower social class group (Röling *et al.*, 1976; Van de Fliert, 1993). The effectiveness of word-of-mouth recommendations is also based on the tie strength (Granovetter, 1973; Brown & Reinegen, 1987). Stronger ties have more impact on customer behavior than weaker ties, as the opinion leader will be more persuasive. The strength level of relationships can be indicated by trust between people without performing a detailed investigation of intention (Simmel & Frisby, 2004). Relational factors also include the type of personal relations that people have developed with each other during their interaction (Nohria *et al.*, 1992). Nahapiet and Ghoshal (1994) describe this as "two actors may occupy equivalent positions in similar network configurations, but if their personal and emotional attachments to other network members differ, their actions also are likely to

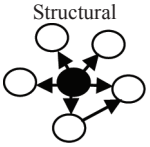
differ in important respects". In some studies type of relationship between people has been used to opinion leader's identification process (Krackhardt & Stern, 1988). For example, Li and Du (2011) define four types of relationship: strangers, friends, good friends, and buddies to measure tie strength.

Personal Characteristics

Personal characteristics refer to individual profile features, and factors related to the personality. Rogers (2003) correlate Innovativeness, Cosmopoliteness, social participation and socioeconomic status with opinion leadership. Opinion leaders are more innovative (Lyons & Henderson, 2005; Rogers, 2003) and educated (Saunders *et al.*, 1974; Summers, 1970; Feder & Savastano, 2006; Xinyi, 2008), have higher income (Marshall & Gitosudarmo, 1995), and more attention to higher-quality information resources, such as newspapers and magazines (Levy, 1978; Polegato & Wall, 1980).

Burson-Marsteller's study conducted in 2001 to identify influential people in electronic platform reveals that gender plays an important role on opinion leadership; In general, men follow opinions and provide advice on technology, computers, whereas more women seek

Table 2. Opinion leader identification factors

Factors	Specifications	References
Structural 	Exposure of media or change agent	Rogers, 2003 Rogers, 1995 Valente, 1996 Weimann, 1994
	Prominence and central position	Van der Merwe & Van Heerden, 2009 Katz, 1957 Rogers, 2003 Keller & Berry, 2003 Valente & Davis, 1999 Valente, 1995 Zhang *et al.*, 2010
	Shorter distance with the most network members	Kempe *et al.*, 2005 Zhang *et al.*, 2010
Relational 	Similarity between opinion leader and his follower	Li & Du, 2011 Weiman, 1994 Valente & Davis, 1999 Feder & Savastano, 2006 Zhang *et al.*, 2010
	Strength of relationships	Simmel & Frisby, 2004 Granovetter, 1973 Brown & Reinegen, 1987 Li & Du, 2011
	Trust	Simmel & Frisby, 2004 Munns, 1995 Li *et al.*, 2010 Morgan & Hunt, 1994 Jurvetson, 2008
	Type of relationship	Li & Du, 2011 Krackhardt & Stern, 1988 Nahapiet & Ghoshal, 1994 Nohria *et al.*, 1992

continued on following page

Table 2. continued

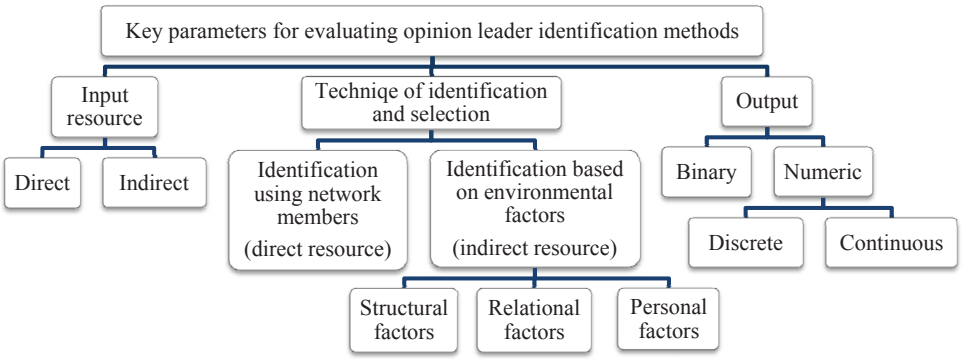
Personal	Innovation	Rogers, 2003 Lyons & Henderson, 2005 Li & Du, 2011
	High social involvement and more activity	De Valck *et al.*, 2009 Rogers, 2003 Arndt, 1967
	Prestige	Li & Du, 2011 Freeman, 1979
	Socioeconomic	Rogers, 2003 Bandura, 1986
	Informative and knowledgeable	Li & Du, 2011
	1. Age and gender 2. Education 3. Income 4. More attention to higher-quality information resources, such as newspapers and magazines	1. Burson-Marsteller, 2001 Yu, 2008 2. Saunders *et al.*, 1974 Summers, 1970 Feder & Savastano, 2006 Xinyi, 2008 3. Marshall & Gitosudarmo, 1995 Yu, 2008 4. Levy, 1978 Polegato & Wall, 1980
	Regular visit	De Valck *et al.*, 2009 Li *et al.*, 2010
	Time of last visit	Li *et al.*, 2010
	Motivation and tendency	Ho & Dempsey, 2010 Tong *et al.*, 2007
	Reputation	Gilly *et al.*, 1998 Bansal & Voyer, 2000

information about food, restaurants, health and fitness. Yu (2008) shows that opinion leaders are usually men at the medium or low income. According to other studies, opinion leaders are more educated, wealthy as well as have more income and cosmopolitan tendency (Rogers, 1995, p. 92; Valente, 1996; Weimann, 1994, p. 217). Li and Du (2011) introduced influential people as influential, knowledgeable, communicable, respective, and innovative. Some studies have shown that sociable people are more likely to participate in word-of-mouth because they enjoy being in relation with other people (Arndt, 1967; De Valck *et al.*, 2009). In addition to sociability, individual's base level of influenceability, i.e., how a person accepts the opinions and experiences of others can have impact on his buying decision (McGuire, 1985). De Valck *et al.* (2009) declare that the frequency of visits and the amount of time spent during each visit are likely to affect the extent of community influence. Another important personal factor is reputation of a person that can make him an opinion leader (Gilly *et al.*, 1998; Bansal & Voyer, 2000). Also, motivation is a prominence factor for effectiveness of word-of-mouth marketing (Ho & Dempsey, 2010; Tong *et al.*, 2007).

EVALUATION PARAMETERS FOR OPINION LEADER IDENTIFICATION METHODS

As already discussed, many studies are concerned with identifying influential people in

Figure 1. Appropriate parameters for evaluation and classification of opinion leader identification methods



a social network. However, few studies have focused on opinion leader identification on an online platform (Ding & Liu, 2009; Tsai *et al.*, 2006). It is because of this that identification in the online environment needs to consider the semantic level of the message, the relationships among, the profiles of the platform participants, and the reliability of the message (Endo & Noto, 2003). Despite the various methods presented for identifying opinion leaders, no study takes into account the specification of appropriate parameters to evaluate these methods. Understanding the evaluation parameters related to each method have a significant impact on the marketing decision marketing process, as it helps marketers choose the best method for identifying opinion leaders among their customers according to the available resources and output needed. By studying methods of identifying opinion leaders, we realize that these methods can be analyzed and compared base on factors like the type of input and output as well as the main technique of identification and selection. These parameters are shown in Figure 1.

Opinion leader identification methods vary based on the type of sources used. Sources used as input in the different methods could be divided into direct and indirect resources. Indirect sources mean the set of available information in an environment, such as structural and relational characteristics of network, as well as profile of customers. These sources contain information about the behavior and activities of customers in the network. On the contrary, direct sources indicate use of network members to collect information about leadership capabilities of other members through surveys. These sources need to access to the all or majority of members for conducting direct interviews and surveys to gain information about opinion leadership, different groups, communication channels and network topology (Feder & Savastano, 2006).

Output of opinion leader identification methods, independent of input resources can be either binary or a numerical value. Usually, output includes identifying some people as opinion leader among other members of network. Hence, each node has a value of 0 or 1 that 1 indicates an opinion leader, and 0 indicates a non-leader member. In other cases, output includes a numerical value which indicates the degree of influence for a person. In this case, a discrete set of values or a numerical range could be used to refer to eligible values of influence for opinion leaders. Due to the importance of resources as an evaluation parameter, methods of opinion leader identification and selection are shown base on input resources in Table 3.

In some studies, the degree distribution is used to select the most influential people. Degree distribution as an indicator of networks shows the distribution of communication within the network. Many studies have consid-

Table 3. Techniques of identification and selection based on resources used

Type of Resource	Technique of Identification and Selection	References
Direct Resource	Individuals in the top q% of the influence distribution p (n)	Keller & Berry, 2003 Watts & Dodds, 2007 Coulter *et al.*, 2002
	Self-reporting or self-designating method	King & Summers, 1970 Childers, 1986 Flynn *et al.*, 1994
	Sociometric method	Engel *et al.*, 1987 Rogers & Cartano, 1962
	Key-informant method	Engel *et al.*, 1987 Rogers & Cartano, 1962
Indirect Resource	Influence maximization problem and greedy algorithm	Domingos & Richardson, 2001 Kempe *et al.*, 2005 Kempe *et al.*, 2003 Mossel & Roch, 2007 Estevez *et al.*, 2007 Surma snd Furmanek, 2010 Zhang *et al.*, 2010 Even-Dar & Shapira, 2011
	Selection based on structural, relational and personal factors	Feder & Savastano, 2006 Li *et al.*, 2010 Li & Du, 2011 Van der Merwe & Van Heerden, 2009 Ding & Liu, 2009 Hill *et al.*, 2006 Zhang *et al.*, 2010 Surma & Furmanek, 2010

ered top 10% of the degree distribution as the most influential people (Watts & Dodds, 2007; Keller & Berry, 2003; Ding & Liu, 2009). Some studies have classified opinion leader identification methods into three general categories: 'self-reporting' (which is called also self-designating), 'sociometric' and 'key informant' methods (Engel *et al.*, 1987; Rogers & Cartano, 1962). In self-reporting method respondents are asked to evaluate their own capability to be an opinion leader. At first, King and Summers (1970) developed a seven-item, self-reporting scale for opinion leadership, and then other researchers like Childers (1986) and Flynn *et al.* (1994) adjusted a six-item scale from the original scale. In sociometric methods respondents are asked from whom they get advice and to whom they turn to seek advice on a particular topic (Engel *et al.*, 1987; Rogers & Cartano, 1962). In key informant methods, informed individuals, and not all members of the community can be asked to identify the people they think are opinion leaders (Engel *et al.*, 1987; Rogers & Cartano, 1962).

All of these methods identify a ranking-based indicator of opinion leadership. However all of them need to access to the all community members as the main source of information to gather information about how many times a person is nominated as an opinion leader by the other members. In contrast, methods which use indirect resources utilize the information about the social network between people including structural and relational factors as well as members' personal specifications to evaluate the opinion leadership. We have classified other methods in the form of indirect methods into two general categories. The first class is

Table 4. Evaluation parameters of important studies for identifying opinion leaders

Paper Focus	Data Set	Input Resources	Method/Factor(s)	Output	References
Challenging the assumption that using influential people will improve marketing efforts.	Simulated date	Indirect	Select the top 10% of the influence distribution /degree distribution	**Binary**	Keller & Berry, 2003; Watts & Dodds, 2007; Ding & Liu, 2009
Accelerating the diffusion of innovation via opinion leaders.	Simulated date	Direct	Sociometric method	**Binary**	Valente & Davis, 1999
Using social network theory in conjunction with opinion leadership concept to identify opinion leaders	Students of a college	Both direct and indirect	Using Sociometric and Self-reporting methods as well as relational data for construct the social network, then use the Power measure to identify opinion leaders / structural - relational	**Numeric - discrete**	Van der Merwe & Van Heerden, 2009
Proposing a framework for identifying opinion leaders	Users of a Bulletin board system	Direct	Self-reporting, six-item	**Binary**	Xinyi, 2008
Using a combination of RFM model and Text mining techniques to identify influential reviewer	Epinions.com	Indirect	Personal-structural	**Numeric-continuous**	Li *et al.*, 2010
Examining influence maximization problem	We sites' hyperlinks	Indirect	Greedy algorithm	**Binary**	Estevez *et al.*, 2007
Investigating the hypothesis of similarity between opinion leader and his follower	Data of some farmers in the Indonesia	Indirect	Selection based on knowledge and education / personal	**Binary**	Feder & Savastano, 2006
Identification of opinion leaders in online social blogs	Some weblogs	Indirect	Proposing a framework named BARR for opinion leader identification/ structural, relational and personal	**Numeric-continuous**	Li & Du, 2011
Illustrating that analysis of interdependencies between consumers and customers' network will improve targeted marketing	Demographic and interpersonal data	Indirect	structural and personal	**Binary**	Hill *et al.*, 2006
Employing data mining in social network to improve marketing response	Biznes.com	Indirect	Structural	**Binary**	Surma & Furmanek, 2010
Proving that centrality can be as good as complex algorithms for opinion leader identification	Epinions.com	Indirect	Investigating hill climbing and general greedy algorithm against the centrality measure/ structural-relational	**Binary**	Zhang *et al.*, 2010

the *influence maximization problem* which was defined by Domingos and Richardson (2001), and some studies have investigated this problem with greedy algorithms. This problem can be formulated as finding the set *K* of influential individuals by introducing them with a new technology/product the spread/adoption of the technology/product will be maximized in a given social network. The study of Kempe *et al.* (2005) proves that in practice finding the optimal subset of size *K* is a NP-hard problem. The second class of studies employs the structural and relational of the network as well as profile characteristics of customer to identify opinion leaders. Table 4 summaries some important studies related to opinion leadership according to evaluating parameters.

As already mentioned, in a number of studies degree distribution are used to select influential people. Classical studies have suggested that influential people are those who have directly affected more than 3 or 4 of their neighbors (Coleman *et al.*, 1957; Merton, 1968). The number of affected neighbors is considered at least 14 in another study (Burson-Marsteller, 2001). Many studies have considered top 10% of degree distribution as the most influential people (Watts & Dodds, 2007; Keller & Berry, 2003; Ding & Liu, 2009).

Valente and Davis (1999) proposed a three step model to identify opinion leaders and use them as seeds for the marketing activities. In the first step, opinion leaders are selected using sociometric method or centrality (Borgatti *et al.*, 1998; Freeman 1979). Second step includes generating optimal pairs by matching these leaders with their closest neighbors who have nominated them as an opinion leader. Then, the leaders can be given educational materials to educate or train those with whom they have been matched. This diffusion network support principles of learning theory (Bandura, 1986) and diffusion (Rogers, 1995; Valente & Rogers, 1995). The result of this study declares that learning occurs most efficiently when individuals are trained by their "near peers" whom they have chosen as their models.

The study of Van der Merwe and Van Heerden (2009) shows that opinion leadership is non domain-specific and marketers do not to spend lots of time and money to identify opinion leaders in different domains. Accordingly, a framework for opinion leader identification is proposed in this study.

Xinyi (2008) investigates opinion leadership among the participants in the bulletin board systems. In this study self-reporting method is used to identify opinion leaders. Results of study dictate that bulletin board system participation history, frequently participation and time spent on bulletin board system every day has a significant positive relationship with opinion leadership.

Li *et al.* (2010) proposed a framework for finding potentially influential reviewers. In this framework, text-mining techniques as a modified PMI (Pointwise Mutual Information) measure are used to analyze and quantify the comments written by each reviewer. Meanwhile, the reviewing recency and frequency of the authors are quantified to measure the RFM scores of the reviewers. Then, the PMI- and RFM-based scores are combined using an ANN (artificial neural network) technique to determine whether a reviewer is valuable in word-of-mouth marketing. The output of the well-trained is a list of ranked influential reviewers.

As previously mentioned, some studies probe influence maximization problem in social networks. For example, in (Estevez *et al.*, 2007) a set covering greedy algorithm is presented for solving this problem and is verified by a data set of some websites' hyperlinks.

Feder and Savastano (2006) examine whether similarity between opinion leaders and their follower can cause a more effective word-of-mouth. They employ personal factor on a data set of Indonesian farmers to identify opinion leaders.

Li and Du (2011) propose a framework called BARR to identify opinion leaders in online social blogs. This framework first analyzes blogs based on blog content and comments of readers. Then, select opinion leaders based on

specification of writers and readers and their relationship. This study shows that hot blog selection is a multi-attribute decision problem so TOPSIS which summarizes the Euclidean distance between measurements and the ideal solution is used to determine the popularity of a blog.

Hill *et al.* (2006) illustrate that analyzing the social network between customers can directly affect product/service adoption. The advantage of their study is using a real data set with regard to inadequate data in prior studies which cause fewer abilities to provide direct and statistical support for the hypothesis that network analysis will improve marketing activities. They show that consumers who have a link with prior customers adopt the service at a rate 3–5 times greater than baseline groups selected by the best practices of the firm's marketing team. In addition, firms and marketers can acquire new customers who would not have been identified based on traditional attributes.

The study of Surma and Furmanek (2010) dictate that even a rudimentary application of data mining techniques can improve marketing response. In this study, C&RT (classification and regression tree) approach is used to build a classification tree that enables firms to formulate some specific rules to select proper target group for marketing.

Zhang *et al.* (2010) compare a set of algorithms, including general greedy, hill-climbing and centrality-based algorithms to investigate which of them can better identify key users with great influence. This study shows that out-degree can not reflect the influence of a node in the network, because a person can trust to whoever he likes. Indeed, in-degree would be a better measure to identify influence of members. Results of comparison between in-degree centrality, general greedy and hill-climbing algorithms show that a simple measure like centrality is as good as more complex algorithms.

CONCLUSION

The phenomenon of word-of-mouth in different social network of people has a wide impact on the opinion and decision of them. Hence, firms and marketers should try to focus on influential customers and identify people who are at the center of communications and interactions to market their product and services. These influential people are called opinion leaders in the majority of studies and can shape the public opinion. Studies show different titles are used to refer to this influential group of people in the social networks, as well as different methods are presented to identify and select these individuals. Identifying characteristics of opinion leaders and effective factors in each method can have a significant impact on marketer's decisions; they can select the best method for identifying opinion leaders with regard to their available resources and needed output. However, the characteristics of opinion leaders expressed in different studies, largely depend on their dataset and there is no comprehensive classification to identify opinion leaders. Also, appropriate parameter to analyze and compare opinion leader's identification methods is not specified.

Since in some papers, the definition and application of different titles for opinion leaders are considered equal, in this paper all the properties presented for the opinion leader, influential people, market maven and key players are classified into three comprehensive categories, including structural, relational and personal characteristics. Furthermore, effective parameters for analyzing opinion leader identification methods are extracted and displayed in a comprehensive chart. The main contribution of this article is a comprehensive study on opinion leadership theory as well as the type of analysis and classification that have been done on them. By identifying opinion leaders in social networks and use them for different purposes (such as introducing new products, diffusion of innovation, advertising), marketers are able to

form a powerful word-of-mouth in the network, increase the product and brand awareness, and identify the needs of their customers properly.

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