

# The Role of Message Content and Source User Identity in Information Diffusion on Online Social Networks

Insoo Son<sup>a</sup>, Young-kyu Kim<sup>b</sup>, Dongwon Lee<sup>c\*</sup>

<sup>a</sup> Post-Doctoral, Korea University Business School and Kogod School of Business, American University, USA

<sup>b</sup> Assistant Professor, Korea University Business School, Korea

<sup>c</sup> Associate Professor, Korea University Business School, Korea

---

## ABSTRACT

This study aims to investigate the effect of message content and source user identity on information diffusion in Twitter networks. For the empirical study, we collected 11,346 tweets pertaining to the three major mobile telecom carriers in Korea for three months, from September to December 2011. These tweets generated 59,111 retweets (RTs) and were retweeted at least once. Our analysis indicates that information diffusion in Twitter in terms of RT volume is affected primarily by the type of message content, such as the inclusion of corporate social responsibility activities. However, the effect of message content on information diffusion is heterogeneous to the identity of the information source. We argue that user identity affects recipients' perception of the credibility of focal information. Our study offers insights into the information diffusion mechanism in online social networks and provides managerial implications on the strategic utilization of online social networks for marketing communications with customers.

*Keywords:* Information Diffusion, Retweet, Social Networks, Twitter, Word-of-Mouth

---

## I . Introduction

Since the emergence of social network service (SNS) in the market, both researchers and practitioners have explored its distinctive features and the value for business and our society. In contrast to previous modes of online communications, SNS enables users to communicate with each other through virtual and

global human networks by leveraging the ubiquitous Internet environment (Boyd and Ellison, 2007). The recent fast growth in the user population and worldwide popularity of SNS reinforce the value of networks as communication channels for extensive information exchange that may affect public opinions and social practices (Jansen et al., 2009; Park and Son, 2012). This paradigm shift motivates organizations to ac-

---

\*Corresponding Author. E-mail: [mislee@korea.ac.kr](mailto:mislee@korea.ac.kr). Tel: 82232902822

tively participate in SNS to achieve an efficient and effective communication with the external business environment. Considering the growing importance of SNS as a new channel for online communication, organizations should understand what are the antecedents of information diffusion and how these factors disseminate various information among SNS users.

Early studies on SNS explored the network structure between users to identify the network hubs in SNSs (e.g., Java et al., 2007) or analyzed the activities of SNS users to conceptualize the behavioral types of the users (e.g., Krishnamurthy et al., 2008; Lee et al., 2012; Pentina et al., 2013). In a broad sense, recent SNS studies have concerned with the following major subjects: (1) the role and use of SNS in transmitting information during special events, such as earthquakes and epidemic outbreaks (e.g., Hughes and Palen, 2009); (2) the motivation and communication behaviors of SNS users with one another (e.g., Ehrlich and Shami, 2010; Krishnamurthy et al., 2008; Lee et al., 2013); and (3) the features or traits of information shared through SNS (e.g., Jansen et al., 2009; Petrovic et al., 2011).

The previous studies on SNS provide theoretical underpinnings that allow us to understand the importance of SNS as communication channels, user motivation and behaviors, and unique features of user networks. However, scarce studies have explored how message characteristics (content of SNS messages) and user identity (as a message creator) interactively affect the level of information diffusion on SNS. To fill this research gap, our study aims to investigate how information characteristics affect the users' message transition behavior toward SNS in the business context. Furthermore, our study seeks to investigate how SNS users, as communicators, evaluate the credibility of an information source when they are trying to disseminate certain messages

through SNS.

For empirical analysis, we collected 11,346 messages posted on Twitter regarding the three major mobile telecom service providers in Korea. Data analysis suggests that the information diffusion on Twitter is affected by message content, such as marketing campaigns, corporate social responsibility (CSR), and social issues. The effects of message characteristics on information diffusion also vary depending on the type of Twitter user (i.e., firm, news media, and individual). In addition, the informational features embedded in tweets, such as URL, hashtag, and message length, have significant effects on information diffusion rate. Our results suggest that SNS, particularly the Twitter network, is a valid online channel for business communications. The results also imply that message content should be carefully selected, and that the source of the messages should be considered to achieve a relatively high level of diffusion rate.

The study contributes to our knowledge on communication mechanism in online social networks by identifying the role of message characteristics and user identity in determining information diffusion rate. Our study also provides managerial implications on the strategic utilization of online social networks for marketing communications with customers.

The rest of the paper is organized as follows. Section 2 describes the context of our research (i.e., Twitter and the Korean mobile telecom service industry). Section 3 explains the theoretical background and research model by presenting hypotheses. Section 4 describes the research method, including data and empirical estimation. Section 5 summarizes the analysis results. Section 6 discusses several implications of the empirical results. Section 7 concludes our study.

## II. Research Context

### 2.1. Twitter as a Communication Channel

Twitter is one of the most popular SNSs available in the market. The critical features of Twitter distinguish it from other services, such as Facebook, MySpace, Cyworld, and Google+. For instance, the length of all messages posted on Twitter is restricted to 140 characters only. This limitation compels users to write messages (i.e., tweets) concisely and directly, thereby facilitating the easy comprehension of ideas and sentiments (Jansen et al., 2009). In addition, Twitter has a unique social network structure consisting of followers (i.e., people who follow me) and followees (i.e., people whom I follow). This structure differs from other online social networks (e.g., Facebook and Google+) in which one is required to obtain permission from other users to establish relationships. Twitter users can freely view the messages posted by other users and develop social relationships with one another as either followers or followees without the need to request permission. This open architecture of social networking results in an interesting information-sharing behavior on Twitter called retweeting, which is the practice of reposting another Twitter user's tweet. Such feature allows users to easily share a tweet that they find interesting.

The presence of ubiquitous and rapid message sharing on Twitter creates a research opportunity to explore a new mode of information propagation as an emerging socio-technological phenomenon in the digital community (Kim et al., 2012). This research perspective considers retweeting as a central form of information diffusion because the original messages are disseminated to different audiences (Suh et al., 2010). This public disclosure may be closely

associated with a certain value of the original tweets and the various traits of Twitter users who have generated and reposted the messages. Considering these unique features of Twitter, we assessed the information diffusion mechanism on Twitter by investigating the effects of message content and information source on retweet (RT) volume.

### 2.2. Use of Twitter in the Korean Mobile Telecom Market

To investigate the information diffusion mechanism on Twitter in the business context, our study focused on the mobile telecom service in South Korea. We selected this specific industry because the mobile telecom service is one of the most popular industries that is closely related to our daily lives; such relation suggests that messages with diverse content are expected to be circulated on Twitter. The Korean mobile telecom industry has dramatically grown since the launch of the first mobile telecom service in 1984. By the end of 2012, the industry had reached approximately 53.5 million subscribers (which is the result of the 1% market growth from the previous year), presenting a subscription rate of 105% with respect to the total population of the country (50.9 million, IDC Korea, 2012). This mature market is dominated by three major mobile carriers, namely (in order of market share), SKT, KT, and LGU+. Service providers within such a highly saturated and concentrated market typically engage in fierce competition by offering new telecom services (e.g., 4G and LTE) and aggressive marketing promotions (e.g., rewards, discounted fees, and subsidies) to attract customers. To increase the efficiency of communication with customers, major mobile carriers in South Korea focus on Twitter usage because of the SNS-inherited benefits, such as inexpensive communication,

rapid and broad audience reach, and voluntary message transmission by members (Dobele et al., 2005; Helm, 2000).

Service providers maximize these benefits by incorporating Twitter into their real business practices not only to promote products/services, but also to encourage customers to share their opinions, which can then be applied in the business strategy. Thus, Twitter usage is expected to increase in the Korean mobile telecom industry because Twitter is being regarded as a new online vehicle that encourages strategic marketing communications. Considering the increased importance of Twitter in real business, we explored how firms utilize the network to achieve excellent productivity in online communications (e.g., the performance of message diffusion).

### **III. Theoretical Background and Research Model**

#### **3.1. Communication Theories on Message and Information Source**

Our research focuses on two significant factors of information propagation: message content and source user identity. The literature characterizes information diffusion as a process in which news and knowledge are disseminated through various channels over time across human society (Basil and Brown, 1994). Based on this theoretical definition, researchers in this field have attempted to identify the influencing factors that affect news diffusion.

Previous studies on rumor theory (e.g., Allport and Postman, 1965; Shibutani, 1966) argue that a news is not diffused unless the topic is important for the audience that hears and circulates the story. Rosnow (1988) proposed that the message subject

and its topical importance are major factors that predict news generation and transmission. Rumor theory also emphasizes the role of the information source in determining the diffusion rate. For instance, Shibutani (1966) argued that the scope of news spread is affected by the identity of the source of the delivered news. Studies in the media communications (e.g., Katz and Lazarsfeld, 1955) proposed the two-step theory of communication, which maintains that information or knowledge flow from traditional news media can be accelerated when the participants in the communication have public influence on the other audiences.

A number of studies (e.g., Fisher, 1978; Krone et al., 1987) also presented theories that conceptualize the role of message and information source in communication. To articulate the essence and structure of human communication, the mechanistic perspective of communication regards communication as a message transmission process through a channel from one point to another (Krone et al., 1978). This mechanistic perspective argues that within the communication process, the source affects or provides something to the receiver by transmitting a message through the channel (Fisher, 1978). Thus, the message is viewed as the fundamental material (or unit of communication) that contains a specific content or information that can possibly change an individual's behavior and attitude (Frazier and Summers, 1984; Mohr and Nevin, 1990). The mechanistic framework also suggests that a message has tangible dimensions, such as message frequency and transition time, which can be used to measure communication outcomes (Krone et al., 1987).

Therefore, previous communications studies have provided a theoretical background for identifying the influencing factors, which are essential to predicting the information diffusion in online communica-

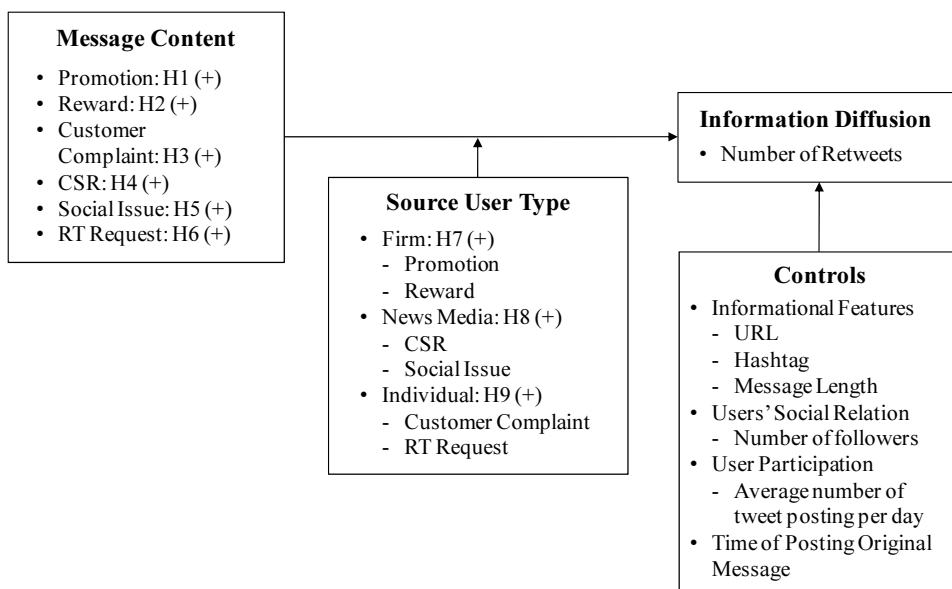
tion networks. Researchers have recently focused on assessing information propagation through online communication channels powered by the Internet. In these studies, researchers investigate how information diffusion can be affected by a group of participants in the information-sharing process (Brownstein et al., 2009; Greenberg et al., 2002; Nguyen, 2008). In Internet-mediated communication channels, the role of influential participants as information sources is emphasized because they are usually at the center of online communications and the social network, and they may significantly increase the dissemination of a message or piece of information (Gladwell, 2000).

The literature emphasizes the role of the message subject and the influence of news source in disseminating various information through communication media. Thus, our study examines the effects of message content and user type on information diffusion in online social networks. We adopted the fundamental components of communication proposed by

the mechanistic perspective to structuralize our research model and specified the causal relationships among the proposed communication factors. In the subsequent sections, we discuss the research hypotheses that explain the causal relationship between message content, user type, and information diffusion rate in terms of the diffusion volume. <Figure 1> shows the research model in this study.

### 3.2. Message Content and Information Diffusion

In human communications, a message refers to an exchanged content or information that indicates what a sender (i.e., source) intends to convey (Mohr and Nevin, 1990). A user in SNS communication transmits a set of messages that represent various social contexts. Messages can have business-related characteristics, particularly when a user wants to use SNS as a business tool. To explore the characteristics of such communication, marketing researchers have



<Figure 1> Research Model

proposed the content analysis of communication interaction by employing predetermined categories (e.g., Anglemar and Stern, 1978) or by applying the perception of the communicating parties toward the content of the exchanged messages (e.g., Frazier and Summers, 1984). These methods have allowed the identification of the groups of messages in terms of content as independent variables in our research model to explain the effects of message characteristics on communication outcomes (i.e., information diffusion rate) in SNS.

Marketing literature defines communication as the practice by which organizations directly or indirectly inform, persuade, and remind consumers about the brand that they sell in the market (Keller, 2001). Marketing communications with customers regarding a firm's business is broadly related to two different types of communication content, namely, brand-related and non-brand-related (Keller, 2001). Brand-related content may contain the tangible (e.g., physical attributes) and/or intangible (e.g., usage benefits) aspects of products and services. One of the primary reasons why business entities participate in marketing communications is to introduce certain products and to launch marketing campaigns (Vollmer and Precourt, 2008). Thus, the current study uses tweet messages concerning new products or services and reward-based marketing campaigns as explanatory variables. These variables measure the effect of business-related messages on the information diffusion performance in SNS.

Meanwhile, non-brand-related content delivers favorable information regarding the company behind the brand (Keller, 2001). In addition to marketing promotions for specific products, organizations utilize communication channels to improve their images toward the public (Chaudhri and Wang, 2007). A means of fulfilling this objective is informing the

public about any CSR-related activity, such as sponsorship without marketing intent and other social activities for public welfare (Maignan and Ferrell, 2001). The current study incorporates CSR-related content into the research model as an explanatory variable to empirically test its impact on information diffusion in SNS.

The mechanistic perspective of communication postulates the bidirectional mechanism of the communication process (Krone et al., 1987) such that receivers typically respond to messages from senders. Conversations among SNS users can yield diverse personal opinions and criticisms regarding a firm's business (Balmer and Greyser, 2006; Chen and Xie, 2008) because of the open-to-public feature of SNS. In response to brand advocacies of firms in terms of the features and potential benefits of various products, SNS members can generate their personal opinions as consumers by personally evaluating the products (Chen and Xie, 2008). With regard to the reputation-building initiative of a firm (e.g., CSR reports), SNS members tend to assess the socio-business activities of a firm and criticize the business practices or policies that may diminish the social expectations or responsibilities of a firm (Balmer and Greyser, 2006). These user-created comments, which are circulated through SNSs, regarding a specific business entity could influence the consumption behaviors of other users toward certain products and their impression of the firm (Jansen et al., 2009). Thus, messages that contain customer opinions on products and services (e.g., customer complaint) and customer criticism of the business practices of a firm (e.g., social issue) are implemented in the model as indicators that measure the effect on information diffusion.

Another aspect of SNS that is reflected in the model is the voluntary participation of users in com-

munications (Dobele et al., 2005). SNS involves a collection of users who demonstrate homophily in terms of interest and value, and this consensus is the result of active user involvement inspired by common goods (Boyd and Ellison, 2007). Twitter has a unique peer-to-peer message transmission called retweeting. In principle, Twitter users can increase the extent of message transmission by requesting other users to RT the message they posted. The RT request estimates the message transmission attitude of a user, that is, whether a message sender is actively involved in disseminating their messages (Dobele et al., 2005). Thus, messages with RT requests are also examined in the present study to measure their effects on information diffusion. The following section discusses our hypotheses, which are based on the selection of these six content-related variables.

### 3.2.1. Twitter as a Medium of Customer Relations

*New Product/Service Promotion.* SNSs, such as Twitter, play a significant role in business organizations as a communication platform on which a firm can advertise new products and services (Jansen et al., 2009). Marketing literature regards communication as a decisive factor that affects the success of new products and services (Crawford and Di Benedetto, 2003). A firm that is proficient in communicating the positioning of its products and services may increase the chances of achieving profitable acceptance in the market (Guiltinan, 1999). Previous studies support the positive relationship between effective communication and new product success (e.g., Cooper and Kleinschmit, 1987). The launch of a new product and service delivers messages with a set of marketing mix elements to influence customer attention and behavior. Thus, message content in-

cludes product attribute expressions or strong persuasion attempts (Crawford and Di Benedetto, 2003). In terms of subject, message content consists of two dimensions, namely, informational and transformational (Aaker and Norris, 1984). Informational messages describe the factual and meaningful aspects of a product to satisfy customers with verifiable information. Transformational messages explain the effects of owning or using the relevant products and services to emphasize the psychological benefits. Messages during most product and service launches are conveyed in either informational or transformational form, or a combination of both (Cohen and Areni, 1991).

Previous studies on high-tech marketing argue that customers who use IT-related products and services, such as mobile telecom services, have rational buying motives and high levels of involvement (Guiltinan, 1999). Their purchasing decisions require information on when and how the product and service features are upgraded. Related to the argument, Chen et al. (2007) empirically showed that messages regarding the launch of high-tech products have positive effect on performance. The results imply that product-launch related messages offer informational incentives that encourage customers to more actively search and share product related information with other people (Mohr, 2000). However, Chen et al. (2007) and Mohr (2000)'s works did not test the effect of product-launch messages in Twitter networks. These studies also did not examine the moderating role of user identity between message content and information diffusion. One of the objectives of our study is to empirically examine whether the previous arguments about the positive effect of new product launch messages on information diffusion is still valid in online social networks like Twitter. Thus, based on the prior studies, we propose

the following hypothesis:

*H1: All things being equal, tweets that contain a message about the launch of new products or services are more diffused than other tweets.*

**Monetary Rewards.** In addition to marketing messages with informational incentives, business communication with customers is sometimes delivered in the form of marketing campaigns driven by monetary incentive. Rewards program has been studied in relation to customer referral management for products and services (Biyalogorsky et al., 2001). Organizations offer certain monetary values in communication processes to promote their marketing initiatives through extensive and rapid word-of-mouth (WOM) among customers and the public (Buttle, 1988). Referral management with rewards is recognized in business as an efficient tool for motivating customers to engage in positive WOM because the program assumes a “pay for performance” incentive (i.e., actual referrals or WOMs are selectively rewarded) (Biyalogorsky et al., 2001). In the context of Twitter, such referral management is similarly applied in Twitter to promote WOM for certain products and services. Organizations post messages about their marketing campaigns with conditional rewards with the purpose of convincing users to RT their messages to other users.

From the customer (or user) perspective, the mobile telecom service, which is the focus of our study, is generally provided for personal use. The cost of using the service is likely to be assumed by end users (Hong and Tam, 2006). Thus, several mobile telecom users tend to be sensitive to direct or indirect monetary values (e.g., discounting subscription fees, free trials for new services, or gift tickets) offered by service providers. Previous studies have examined

the effect of reward-based referral on WOM in diverse research contexts, such as the effect of social ties (Brown and Reingen, 1987), reference group influence on WOM (Bearden and Etzel, 1982), and customer susceptibility to WOM influence (Bearden et al., 1989). The positive effect of reward referral in the existing literature can be explained as customer satisfaction, which is attributed to marketing rewards that trigger behavioral outcomes (i.e., positive WOM in information diffusion) (Biyalogorsky et al., 2001). Basing on these arguments, we suggest the following hypothesis:

*H2: All things being equal, tweets that contain messages with monetary rewards are more diffused than other tweets.*

**Customer Complaints.** Twitter is a communication platform that allows users to freely express their interest, opinions, and information (Java et al., 2007). Customers of mobile telecom services utilize this platform to share their experiences or opinions regarding the quality of their current mobile subscriptions.

Customer comments assume either a positive or a negative tone. Messages with negative sentiments are diffused more extensively and more rapidly than those with positive sentiments. Negativity bias in consumer behavior has been studied, and people reportedly tend to weigh negative information more heavily than positive information (Kanouse and Hanson, 1972). Existing literature in social psychology also states that negative information influences evaluation more strongly than positive information (Ito et al., 1998). In the field of communications, Rosnow (1988) argued that negative information in the form of improvised news is circulated among people more extensively and rapidly before the information is verified by credible sources. But, the



context of Rosnow (1988)'s work was not online social networks. Our study intends to empirically test whether negative bias of communications discussed in prior studies still exists in Twitter context. Thus, we expect that comments on mobile telecom services, including customer complaints, are more likely to be disseminated extensively on Twitter networks. Therefore, we posit the following hypothesis:

*H3: All things being equal, tweets that contain customer complaints are more diffused than other tweets.*

### 3.2.2. Twitter as a Medium of Social Relations

**CSR.** Organizations engage in CSR to generate a favorable support (e.g., purchase and investment) from stakeholders and to build a positive corporate image in the long run (Maignan and Ferrell, 2001). However, the lack of awareness and unfavorable attitude of customers toward CSR activities prevent the firms from achieving the expected benefits from their social participation (Du et al., 2010). Thus, organizations have recently communicated their efforts to fulfill social responsibilities with customers in online communication channels (Chaudhri and Wang, 2007).

Firms maximize Twitter by regularly reporting activities related to social welfare and persuading their customers to participate in donations or social services. Thus, firms recognize Twitter not only as a channel for marketing communications, but also as a network for building social trust with customers. Offering CSR-related messages conveys a "doing good" impression to the audience and can possibly acquire the attention of information receivers, thereby obtaining more chances of being extensively and rapidly publicized to users (Bhattacharya and Sen,

2004). Previous CSR studies collectively provide a theoretical background for examining the effect of CSR-embedded messages in Twitter on information diffusion. Thus, we present the following hypothesis:

*H4: All things being equal, tweets that contain CSR activities are more diffused than other tweets.*

**Social Issues.** Twitter is a social network by nature because it is composed of users with shared interests and values. From a marketing perspective, these virtually bonded people are beneficial factors for businesses as sources of electronic WOM (eWOM) (Jansen et al., 2009). Meanwhile, individuals on Twitter can become major sources of social criticism or judgment regarding the moral hazard of firms or any organizational behavior against public expectation. In this study, social issues refer to any societal problem that is discussed on an SNS as a result of a business's faults. In rumor theory, any piece of news concerning social issues is known to be diffused widely and rapidly (Rosnow, 1988). The majority of social issues remain dubious before a credible authority or institution confirms the entire story. Therefore, a large number of people recognize these improvised news as second-best information sources and show a relatively high level of interest or curiosity prior to confirmation. We examined the relative performance of information diffusion related to messages regarding the social issues resulting from the firms' business practices. This factor leads to the following hypothesis:

*H5: All things being equal, tweets that contain social criticism about a firm's business practices are more diffused than other tweets.*

**RT Request.** Retweeting is the basic mechanism

for propagating information on Twitter. In the information-sharing context, retweeting can be interpreted as an altruistic behavior that generates mutual benefits for the information sender and receiver. An RT request is an efficient method for information senders, which can either be organizations or individuals, to increase the chance of disseminating a tweet (particularly those containing valuable information). On the one hand, an RT request conveys a “doing good” impression to the audience, enabling the information sender to construct a favorable identity as a beneficial information source. The request also enhances the social status and reputation of the sender because of the voluntary altruism (Roberts, 1998; Van Vugt et al., 2007). On the other hand, RT requests can be perceived as clues for the information receiver to determine messages with interesting and useful information (Suh et al., 2010). Therefore, the benefit of feeling good resulting from the altruistic behavior can provide a certain tweet with an RT request with more chances of attracting attention from Twitter users, possibly increasing the diffusion rate. Therefore, we propose the following hypothesis:

*H6: All things being equal, tweets that contain an RT request are more diffused than other tweets.*

In summary, the hypotheses discussed represent a set of different business-related content and communication tones embedded in SNS messages. New product/service promotion (H1) and monetary rewards (H2) are related to direct brand marketing content with a positive tone for advertising a product or service. Customer complaint (H3) is related to the comments of users on a product or service. CSR (H4) is related to indirect brand marketing content with a positive tone for facilitating the favorable image

or reputation of a firm. Social issues (H5) are related to the comments of users on corporate reputation with a negative communication tone. An RT request (H6) is related to information-sharing activity from both firm and audience with a neutral communication tone. In general, the six derived hypotheses in this section reflect our conceptualization of the SNS communications between business entities and the audience in terms of the content of transmitted messages.

### 3.2.3. Twitter as a Medium of Social Relations

The users involved in SNS have different roles as information sources in online communication, and such roles depend on their identities (Boyd and Ellison, 2007). For example, organizations such as firms typically create business-related information for commercial purposes, whereas individuals are more likely to exchange information to socialize with friends and acquaintances. Thus, the identities of the communicators define the primary activities and message subjects that SNS users frequently conduct and generate in communications (Weimann, 1994).

Previous studies on the elaboration likelihood model (ELM) suggest that the credibility of information sources is positively associated with message persuasiveness, which is an indicator of information diffusion outcomes (Brown et al., 2007; Sussman and Siegel, 2003). The positive relationship between source credibility and persuasion can be explained by the source expertise and trustworthiness in the perceived competence of the source (Petty et al., 1981). The psychological incentive (e.g., belief or trust) reflected in the information from the source results in the favorable attitude of information recipients (Eagly and Chaiken, 1993; Petty et al., 1981). Based on these findings, we posit that the identity

of source users on Twitter is likely to increase the persuasiveness (or credibility) of certain messages, resulting in a high level of agreement among information recipients.

We particularly focused on the role of source user identity in determining the relative performance of message content for information diffusion rate under online business communication settings. Business communication through an SNS environment is an emerging practice in which a group of stakeholders accomplishes their interests by generating and exchanging domain-specific information (Jansen et al., 2009). In this study, we identified three specific user types as major components of business-related communications enabled by SNS: firm, news media, and individual. We selected the firm and individual types because both types are basic elements that represent a dynamic business relationship between sellers and buyers (Lavie, 2006). In our study, news media refer to SNS users whose accounts are owned by news media organizations (e.g., newspapers and broadcasting firms). We implemented this user type because news media function as a mutual entity that connects firms and individuals by promoting the interests of each side (Katz and Lazarsfeld, 1955). With the conceptualization of the user types in the model, we expect to find that the diffusion of messages on social networks is not only affected by message content, but also by user type because the persuasiveness and credibility of messages depend on information sources (Brown et al., 2007).

*Firm User Type.* Firms participating in marketing communications, such as manufacturers or service providers, have multiple responsibilities, such as offering information regarding products and services, reporting marketing campaigns, and responding to customer requests (Keller, 2001). The communication options that reflect these diverse marketing ini-

tiatives proceed in different ways depending on the selected media platform (Brown et al., 2007). In contrast to traditional mass media (e.g., TV, radio, newspapers, and magazines), online communications such as SNS allow firms to directly communicate with customers by assuming both content creation and content delivery roles (Dobele et al., 2005; Woerndl et al., 2008). The direct communication through SNS reinforces the identity of firms as primary sources of messages that contain marketing-related content. In traditional advertising, third-party offline media typically play a key role in delivering marketing content; such practice emphasizes the credibility of news media in message persuasiveness. The capability of SNS to increase the scope of direct access to the audience enables information recipients to recognize firms as reliable information sources for marketing initiatives. Therefore, we expect that the SNS messages posted by firm users would have excellent information diffusion performance for marketing-related content, such as new product and service promotions and reward-based marketing campaigns. This condition leads to the following hypothesis:

*H7: Tweets about new product or service promotions and monetary rewards posted by firm users are more diffused than tweets posted by other users.*

*News Media User Type.* Online communication through the Internet changes the feature of traditional journalism by offering digital news media (Pavlik, 1998). The new form of news media, which is equipped with information technology that enables unlimited access to news content with enhanced interactivity and multimodality (Bardoel and Deuze, 2001), seeks to appeal its own gratification opportunity to the audience (Dimmick et al., 2004). The participation of new media entities in SNS with regard

to information provision and sharing demonstrates the use of the digital communication environment as an alternative news delivery platform. In the SNS context, news media, as a news delivery platform, report several aspects of business other than marketing advertisements. For example, such media provide news links to the market performance of a firm, the community service conducted by the company, and comments on business practices.

SNS enables direct marketing communication between businesses and the audience. This direct communication may weaken the role of news media as content providers. However, media substitution hypothesis states that audiences are active consumers of news and employ different news sources depending on the capability of each source to satisfy their needs or goals (Katz et al., 1974). With regard to source credibility, audiences seeking information regarding certain products and services may perceive firm users on social networks to be more reliable information sources because of firms' relatively high expertise concerning the products and services. Meanwhile, audiences who receive news regarding the social service of a company or other business rumors possibly recognize news media users as more trustworthy sources of information than the firms. We examined the effects of news media users on information diffusion for messages containing a firm's CSR activities and social issues related to a firm's business practices. Thus, we propose the following hypothesis:

*H8: Tweets about CSR and social issues posted by news media users are more diffused than tweets posted by other users.*

*Individual User Type.* Boyd and Ellison (2007) stated that SNS allows individuals to construct interpersonal relationships using publicly disclosed

profiles. The disclosure of personal profiles forms homophily among the members of a social network. Homophily refers to the similarity of group composition in terms of member characteristics, such as age, gender, education, and lifestyle (Brown et al., 2007). The similarity of user profiles typically strengthens the relational bonds among participants in SNS communications because individuals tend to affiliate with others who share similar interests or are in a similar situations (Schacter, 1959).

In online marketing communication, individuals as consumers are the primary information sources that generate eWOM regarding certain products and services (Brown et al., 2007). By maximizing the homophily among members, individuals participating in SNS can communicate with one another to search and share information regarding products or services that they are interested in because anyone who has already experienced the same (or similar) products can be regarded as a reliable information source. People who are known as "gurus" on the use of certain products have a high level of source credibility, which resulted from a high level of perceived source expertise.

The homophilous characteristic of SNS also motivates members to share information on what they have seen and heard about various social phenomena. This motivation stems from the self-efficacy inspired by competitive altruism (Van Vugt et al., 2007) that strengthens the psychological perception of an SNS member's social status. By engaging actively in information sharing (e.g., through an RT request on Twitter), individuals can be recognized as altruistic because of their actions of "doing good" or "contributing" to the online community. This enhanced social position in SNS increases the credibility of the messages or information provided by the person, thereby increasing the possibility of the message or

information to be disseminated among other members in the SNS. Thus, we examined whether Twitter messages posted by individual users with content consisting of customer opinions (i.e., complaint) and RT requests have better information diffusion performance. Thus, we propose the following hypothesis:

*H9: Tweets containing customer complaints and RT requests posted by individual users are more diffused than tweets posted by other users.*

### 3.4. Control Variables

In addition to highlighting the hypothesized effects of message content and source user type on information diffusion, we identified several control variables to attenuate their effects on the results. First, our dataset contains a number of information on the Twitter user's number of followers and the number of tweets that the user has posted. In this case, user refers to both the source user (the original author of a message) and the retweeter (the user who RTs the message). In a previous study, these variables were hypothesized to affect information diffusion performance (i.e., a greater number of followers or tweets posted corresponds to more RTs for a message) (Suh et al., 2010). Therefore, we controlled the effect of users' social relationships and Twitter participation on information diffusion performance. In addition, each message in our dataset contains an information that allows us to identify the inclusion of extra features, such as URLs, hashtags, and message length (i.e., number of characters). These variables were tested in previous studies as determinants of information diffusion rate (Jansen et al., 2009; Suh et al., 2010). Thus, we controlled the message effects attributed to the informational features in Twitter messages. Finally, we considered the time-fixed effect

of message posting by adding dummy codes that represent a specific time band (by hour) when a specific tweet was posted by the original author.

## IV. Research Method

### 4.1. Data

For the empirical analysis, we gathered messages transmitted through Twitter that were related to the business context. Messages about a specific industry (i.e., mobile telecom service) typically have business-related characteristics, which may contain information or comments on certain products/services or overall brand image (Keller, 2001). The data source used in this study is *SocialMetrics*, which is a social trend exploration service offered by Daumsoft (www.daumsoft.com). We collected the samples using the following criteria. First, the primary keywords used in selecting tweet messages include the names of the major mobile service carriers in South Korea (i.e., SKT, KT, and LGU+) as we investigate the tweet messages related to Korean mobile telecom industry. The three keywords represent the comprehensive sets of major mobile service players in the South Korea. Second, we only selected the tweets that were retweeted at least once among the large number of tweet messages related to the major mobile service carriers during the sample period. One reason for only selecting retweeted messages is that our study is involved in the process of an extensive text search of sample messages; such process consumes a great deal of human effort to define the appropriate content type discussed in hypotheses development. Thus, reducing the sample scale by focusing on retweeted messages increases work productivity. Narrowing down the samples allowed the investigation of the

relative performance of tweet messages (i.e., RT volume) influenced by Twitter-specific usage context to understand the information diffusion mechanism on Twitter.

The sample collection procedure driven by the aforementioned criteria finally yielded 11,346 tweets, which were initially posted over a period of three months between September and December 2011. A total of 59,111 RTs were observed for these original tweets, suggesting an average of 5.21 RTs for each original tweet. Over 70% of the original tweets were retweeted at most twice, as indicated in <Table 1>, which shows the frequency distribution of retweeting

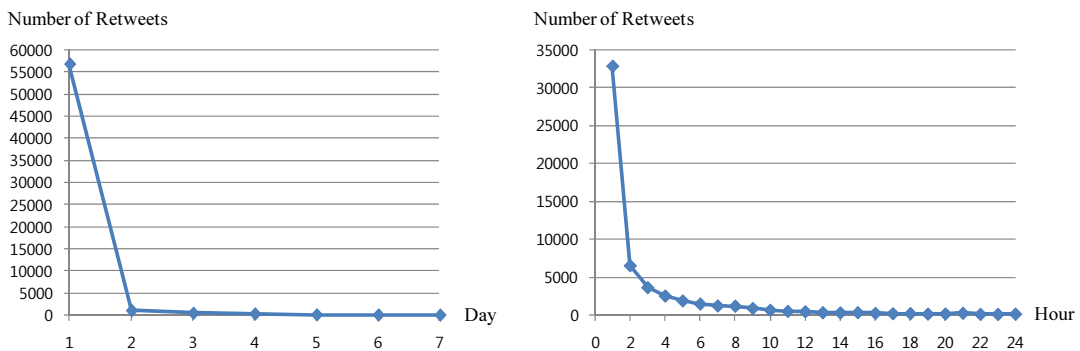
cases in response to the original tweets.

Our data presented several interesting features. For example, 56,847 (96.2%) of the 59,111 RTs were generated within a day after the original tweets were posted (see <Figure 2>). Moreover, 32,884 RTs (58%) were generated within an hour after the original posting, as in <Figure 2>. These findings can be attributed to Twitter's Internet communication feature, which allows users to browse through and respond to received messages rapidly.

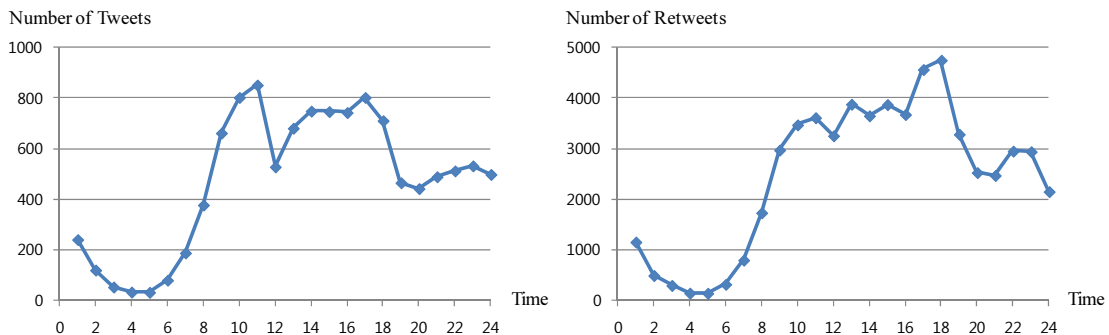
Analysis of our sample distribution in terms of posting time in a day revealed a large variance in original tweet posting time. As shown in <Figure 3>,

<Table 1> Retweeting Frequency in Our Data

# of Retweeting	Frequency	Percent (%)
1	6,187	54.5
2	1,821	16.1
3	891	7.8
4	500	4.4
5	330	2.9
6	264	2.3
7	157	1.4
8	128	1.1
9	104	0.9
10	99	0.9
> 10	883	7.7
Total	11,346	100.0



<Figure 2> Distribution of Number of Retweets (by Day and Hour)



<Figure 3> Distribution of Number of Tweets and Retweets (by Posting Time in a Day)

early morning hours (particularly between 2:00 a.m. and 6:00 a.m.) presented a relatively small number of tweet postings, whereas afternoon hours (between 2:00 p.m. and 6:00 p.m.) generally showed active tweet postings. Retweeting distribution had a similar trend to that of tweets during early morning hours (between 2:00 a.m. and 6:00 a.m.). The peak retweeting time was between 6:00 p.m. and 8:00 p.m., which is approximately four hours later than the beginning of active tweet postings. The data characteristics of our sample play a significant role in determining the relevant analysis method.

#### 4.2. Empirical Estimation

Based on the research hypotheses discussed in the previous section, we conducted an empirical analysis to examine the influence of message characteristics and user types on the different specifications of information diffusion on Twitter. In this study, the nature of information diffusion on Twitter was measured by the number of RTs for each original tweet in our dataset. The measurement indicated the extent to which a tweet was disseminated by other Twitter users. Prior to implementing this variable in the empirical model, a factor that we had to consider was

that most of the retweeting cases in our dataset occurred within a day (see <Figure 2>). In addition, we could hardly confirm which day was the last retweeting day for each original tweet as we collected the data in a specific time period (i.e., between September and December 2011). Restricting our sample only to messages that contain retweeting cases generated within a day enabled us to carefully measure the volume of information diffusion in Twitter with the equal conditions in our dataset.

We used message- and user-specific information in our dataset as independent variables to capture the effect of contextual factors on Twitter information diffusion. For the message content, we developed content-related variables obtained from the subjects of the posted tweets (e.g., the introduction of new products/services, marketing promotions and campaigns, CSR, customer opinions for mobile services, and social issues). Our study employed an extensive text search of Twitter messages to determine the code representing the types of message content based on the consensus of the co-authors. All three co-authors examined the content of all of the messages in our sample. We then coded each Twitter message according to the predefined content type only if all of the co-authors agreed on the content type selection.

For the user type, we added variables that represented the identities of the Twitter users who posted the original messages. Based on the user name presented in our dataset, we developed the categorical variables of the firm (i.e., mobile carrier), news media, and individual users. As discussed in Section 3, we implemented the informational features of the messages (i.e., URLs, hashtags, and number of characters), other user characteristics (i.e., number of followers and number of tweets), and the posting time of the original message as the controls. The model specifications proposed in this study are described in the following equations.

$$\begin{aligned} \ln\_E(\text{Num\_RTs}_i|*) = & \beta_0 + \beta_1 \text{Promotion}_i + \beta_2 \text{Reward}_i \\ & + \beta_3 \text{Customer}_i + \beta_4 \text{CSR}_i + \beta_5 \text{Social}_i + \beta_6 \text{RT\_Request}_i \\ & + \beta_7 \ln\_Orig\_Follower_i + \beta_8 \ln\_Orig\_Tweet_i + \beta_9 \ln\_RT\_Follower_i + \beta_{10} \ln\_RT\_Tweet_i \\ & + \beta_{11} \text{URL}_i + \beta_{12} \text{Hashtag}_i + \beta_{13} \text{Num\_Char}_i + \beta_{14} \Sigma \text{Orig\_Hour}_i + \varepsilon_i \end{aligned} \quad (1)$$

In Equation (1), the dependent variable  $\text{Num\_RTs}_i$  represents the event of retweeting by users and has the features of a countable variable (i.e., integer-based and non-negative). Moreover, the distribution of the number of RTs in our sample is right skewed with inflation (see <Table 1>). We employed negative binomial regression (NBR) to adjust the analysis for the aforementioned features of  $\text{Num\_RTs}_i$ . NBR assumes that the dependent variable follows the negative binomial distribution (Cameron and Trivedi, 1998). Applying NBR requires a log-transformation of the conditional expectation of the dependent variable. The estimated coefficient requires an exponential transformation to interpret the level of effect. <Table 2> presents the definitions of all of the variables used in the empirical model.

## V. Empirical Results

### 5.1. Results of Retweet Volume

The results of the empirical analysis are summarized in <Table 3>. The coefficients of  $\text{Orig\_Hour}$  (for measuring time-fixed effects) and standard errors are omitted from the table for brevity. Regression analysis was performed four times. To test the message-related hypotheses (i.e., H1 to H6), we conducted regression analysis using the full sample data. To examine the message sender-related hypotheses (i.e., H7 to H9), we ran the regression for each sub-sample representing the three types of source users. The second column in <Table 3> presents the regression results using the full data sample. Columns 3, 4, and 5 in <Table 3> indicate the results based on user type.

As shown in <Table 3>, the full data model demonstrates that the variables related to message content (e.g., *Promotion*, *Reward*, *CSR*, *Customer*, and *Social*) have positive and significant effects on RT volume. Thus, the content-related hypotheses (H1 to H6) are supported. The results indicate that any tweet containing a marketing message and encouraging customer engagement in mobile services has the potential to be disseminated extensively. Tweet messages regarding the CSR of a firm are also expected to gain significant attention among Twitter users. However, the results of content-related variables by source user type presented mixed results (see <Table 3>). For example, the effects of marketing-related tweets, such as *Promotion* and *Reward*, are positive and significant in the firm user group, supporting H7. In the news media user group, only *Social* has a positive and significant effect between the tested variables (i.e., *CSR* and *Social*). This result partially supports H8, which expects that tweets about CSR



&lt;Table 2&gt; Description of Variables

Variable	Description	Measurement
<i>Num_RT<i>s</i></i>	The number of retweets recorded for a certain tweet message	<i>Num_RT<i>s</i><sub>i</sub></i>
<i>Promotion</i>	A dummy variable indicating that a certain message contains any content for a new product or service promotion	1 = if containing promotion; 0 = otherwise
<i>Reward</i>	A dummy variable indicating that a certain message contains any content for monetary rewards from the mobile carriers	1 = if containing reward; 0 = otherwise
<i>Customer</i>	A dummy variable indicating that a certain message contains any content for customer opinion about the service	1 = if containing customer opinion; 0 = otherwise
<i>CSR</i>	A dummy variable indicating that a certain message contains any content for CSR activities	1 = if containing CSR; 0 = otherwise
<i>Social</i>	A dummy variable indicating that a certain message contains any content for social issues(e.g., politics, telecom policies and other social problems)	1 = if containing social issue; 0 = otherwise
<i>RT_Request</i>	A dummy variable indicating that a certain message includes any content for an RT request	1 = if containing RT request; 0 = otherwise
<i>User's Social Relationship</i>	The natural log-transformed number of followers related to Twitter users for both original authors and retweeting users	<i>ln_Orig_Follower<sub>i</sub></i> <i>ln_RT_Follower<sub>i</sub></i>
<i>User's Twitter Participation</i>	The natural log-transformed average number of tweets posted by the original author and retweeting users per day	<i>ln_Orig_Tweet<sub>i</sub></i> <i>ln_RT_Tweet<sub>i</sub></i>
<i>URL</i>	A dummy variable indicating that a certain message includes a URL	1 = if containing a URL; 0 = otherwise
<i>Hashtag</i>	A dummy variable indicating that a certain message includes a hashtag (#)	1 = if containing a hashtag; 0 = otherwise
<i>Num_Char</i>	The number of characters within the main body of a tweet message	<i>Num_Char<sub>i</sub></i>
<i>Orig_Hour</i>	A dummy variable indicating a specific time band (24 time bands by one hour) when a certain tweet was posted by its original author	1 = if corresponding posting time; 0 = otherwise

and social issues posted by news media users would be more diffused than tweets posted by other users. In the individual user group, only the RT request variable had a positive and significant effect on RT volume between the two tested variables, namely, customer complaint and RT request. This result partially supports H9. <Table 4> summarizes the empirical results related to hypothesis testing.

With regard to the informational feature variables, the effects of *URL* and *Hashtag* were negatively significant on RT volume; however, these variables had a positive and significant effect on the firm users group, as shown in <Table 3>. *Num\_Char* had a

positive and significant effect on RT volume across all models, as shown in <Table 3>.

User characteristics, such as social relationships and Twitter participation, demonstrated mixed results for RT volume. *ln\_RT\_Follower* and *ln\_RT\_Tweet* consistently had positive and significant effects on RT volume, except for the news media group. The effect of *ln\_Orig\_Follower* was also positive and significant across all models.

## 5.2. Results of Additional Analysis

Our dataset has the record of the specific time-

&lt;Table 3&gt; Results of Negative Binominal Regression (Retweet Volume)

Variable	Full Data (H1~H6)	Firm (H7)	News Media (H8)	Individual (H9)
<i>Promotion</i>	0.3489***	0.4503***	-0.0428***	0.1942***
<i>Reward</i>	0.4335***	1.1446***	-0.0649***	-0.1473***
<i>Customer</i>	0.3817***	0.5476*	-0.0937***	0.3771***
<i>CSR</i>	1.3521***	1.2862***	0.0425***	1.2356***
<i>Social</i>	0.3898***	-0.6364**	0.7869***	0.4779***
<i>RT_Request</i>	0.7807***	0.0634	N/A	0.8873***
<i>ln_Orig_Follower</i>	0.2057***	0.2084***	0.4221***	0.1431***
<i>ln_Orig_Tweet</i>	-0.0266***	0.2159***	-0.1189***	-0.0461***
<i>ln_RT_Follower</i>	0.0625***	0.1501***	0.0295***	0.0694***
<i>ln_RT_Tweet</i>	0.1210***	0.0500***	0.2078***	0.1251***
<i>URL</i>	-0.1311***	0.3217***	-0.3598***	-0.2399***
<i>Hashtag</i>	-0.3010***	-0.6650***	-0.3777***	-0.2274***
<i>Num_Char</i>	0.0062***	0.0026**	0.0039***	0.0063***
Constant	-1.8001***	-2.5593***	-3.8855***	-1.3613***
Log-Likelihood	-27233.907	-4678.046	-1808.204	-20233.108
Observations	10,968	1,681	694	8,593

Note: Dependent Variable: Num\_RTsi. Standard errors and coefficients for Orig\_Hour are omitted for brevity. Analysis includes only the number of retweets within one-day. \*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.1$

&lt;Table 4&gt; Summaries of Empirical Results

Hypothesis	Construct	Hypothesis Testing	Key Findings
H1	New Product/Service Promotion	Supported	The inclusion of product and service promotion content makes tweets more diffused among users on Twitter networks.
H2	Monetary Reward	Supported	Monetary reward engaged in marketing communication receives users' positive attention in terms of information diffusion.
H3	Customer Complaint	Supported	Within our sample, tweets conveying customer complaints tend to be more diffused among users due to negative bias.
H4	Corporate Social Responsibility (CSR)	Supported	CSR content presented in Twitter messages is associated with broader attention from users, suggesting that a firm's taking social responsibility may lead to customers' positive evaluation of a brand.
H5	Social Issue	Supported	The positive and significant result indicates that the report of social criticism against a firm's business practice stimulates users' attention and triggers social discussion on Twitter networks.
H6	RT Request	Supported	The significant result of RT request shows that message senders' altruistic behavior of information sharing facilitates broader information propagation among users.
H7	Firm User Type	Supported	The positive and significant results indicate that for marketing communication, the IT-driven online channel (i.e., Twitter) reinforces the position of a firm as a primary information source of products and services.
H8	News Media User Type	Partially Supported (social issue)	The partially supported results illustrate limited role of news media as information intermediate because online communication channel like Twitter supports direct communication between firms and customers in business context.
H9	Individual User Type	Supported	The significant result of RT request by individual users indicates that information sharing behavior involved with individuals gains more attention among users.

stamps as to when the original tweets were posted by the users and retweeted by their followers. To measure retweeting response time, we calculated the difference between the original posting time and the first retweeting time and utilized the value as a substitute for information diffusion speed (i.e., how quickly a certain message begins to be retweeted). The model specification proposed for examining the information diffusion performance in terms of RT speed is described in the following equations.

$$\begin{aligned} \ln\_First\_RT_i = & \beta_0 + \beta_1 Promotion_i + \beta_2 Reward_i + \beta_3 Customer_i \\ & + \beta_4 CSR_i + \beta_5 Social_i + \beta_6 RT\_Request_i \\ & + \beta_7 \ln\_Orig\_Follower_i + \beta_8 \ln\_Orig\_Tweet_i + \beta_9 \ln\_RT\_Follower_i \\ & + \beta_{10} \ln\_RT\_Tweet_i + \beta_{11} URL_i + \beta_{12} Hashtag_i \\ & + \beta_{13} Num\_Char_i + \beta_{14} \Delta Orig\_Hour_i + \varepsilon_i \end{aligned} \quad (2)$$

We implemented the same set of independent and control variables as those implemented for Equation (1). However, we used the natural log-transformed time difference (in seconds) between the original posting time and the first RT time as a dependent variable (i.e., *ln\_First\_RT<sub>i</sub>*). We applied the ordinary least squares model with robust standard errors to Equation (2) because the dependent variable represents a continuous time unit. The results of the additional analysis are summarized in <Table 5>.

With regard to RT speed, the full data model in <Table 5> indicates that a number of content-related variables, such as *CSR* and *Social*, have negative and significant effects. The results indicate that any tweet message containing CSR or social issues is more likely to be retweeted rapidly by other users after being posted. Analysis of our sample in terms of user type

<Table 5> Results of OLS Regression (Retweet Speed)

Variable	Full Data	Firm	News Media	Individual
<i>Promotion</i>	-0.0562***	-0.6249***	0.1325***	0.1474***
<i>Reward</i>	-0.0778***	-0.1991***	-0.3201***	0.0343***
<i>Customer</i>	-0.0765***	-1.4915***	-0.5125***	-0.0469***
<i>CSR</i>	-0.4726***	-1.6186***	0.4913***	-0.3183***
<i>Social</i>	-0.2559***	0.4339***	0.0383***	-0.2904***
<i>RT_Request</i>	-0.3249***	-0.2435***	N/A	-0.3678***
<i>ln_Orig_Follower</i>	-0.1312***	-0.0397***	-0.5358***	-0.1092***
<i>ln_Orig_Tweet</i>	-0.1866***	-0.2353***	0.1487***	-0.2173***
<i>ln_RT_Follower</i>	0.0267***	0.0469***	-0.0471***	0.0091***
<i>ln_RT_Tweet</i>	-0.4936***	-0.7015***	-0.5611***	-0.4050***
<i>URL</i>	0.2569***	-0.3983***	0.2703***	0.3053***
<i>Hashtag</i>	0.1967***	0.4087***	0.2555***	0.1675***
<i>Num_Char</i>	0.0019***	-0.0039***	-0.0086***	0.0038***
Constant	8.0915***	8.7259***	13.1112***	7.6642***
# of Obs.	11,221	1,736	705	8,780
R <sup>2</sup>	0.209	0.326	0.333	0.198

Note: Dependent Variable: *ln\_First\_RT<sub>i</sub>*. Robust standard errors and coefficients for *Orig\_Hour* are omitted for brevity.

\*\*\**p* < 0.01, \*\**p* < 0.05, \**p* < 0.1

yielded different sets of results. For example, *Promotion*, *CSR*, and *Social* generated negative and significant effects on RT speed in the firm user group. In the news media user group, no content-related variable had a significant effect. In the individual user group, *CSR* and *Social* contributed negatively and significantly to RT speed.

Informational feature variables had a significant relationship with RT speed. *URL*, *Hashtag*, and *Num\_Char* had positive and significant effects. These results indicate that any tweet message with a high informational feature level, being negatively associated with RT speed, requires more time for readers to read and respond. However, the magnitude of these variables differed by user type, as shown in <Table 5>. *ln\_RT\_Tweet* had a negative and significant effect on RT speed.

## VI. Discussion

Our study makes several research contributions. First, we expanded the literature on information diffusion by developing and empirically testing hypotheses that explain the effect of message content on information diffusion rate. We empirically examined the contingent effect of user identity on the diffusion rate of message content. Combining these two dimensions enabled us to derive more diverse empirical results and related implications that have been rarely reported in previous studies. Second, the current study links message content and user identity to the dynamic measure of information diffusion, namely, RT volume and speed. By doing so, we elucidated how Twitter usage context affects the multi-dimensional aspects of information diffusion in online social networks. Third, our study provided insight into the value of Twitter as an IT-enabled platform for market-

ing communications. The significant results of source user type imply the changed role of participants in business communication on Twitter networks. As an explorative research, our study provides a theoretical basis that can be applied in subsequent research to further investigate Twitter-mediated business practices. Finally, the findings of our study broadened the existing literature. In particular, the results of *CSR* and competitive altruism through RT requests provide research opportunities for investigating the nascent concepts in IS field. The ongoing research on the issue has the potential to enrich the theoretical foundations of social network studies in IS literature.

Our study also has several practical implications. First, for retweet volume, our findings presented the significant effects of all content-related variables in the analysis of the entire dataset (Model 1 in <Table 3>). The significant results of *Promotion*, *Reward*, and *CSR* suggest that Twitter is an efficient tool for promoting marketing practices targeted to a wide range of customers. However, other significant customer and social issue effects imply that the business practices of a company become more vulnerable to public evaluation and criticism. Customer opinions posted on Twitter generally contain negative content. For example, most of the messages related to customer opinion in our dataset indicated customer complaints regarding the products and services provided by the Korean mobile carriers. Only two out of 122 messages in this category had a positive or neutral tone. These findings suggest that information diffusion on Twitter depends on the personal opinions that reflect customer attitudes toward products and services. Our findings imply that managers must use Twitter as a monitoring channel to detect customer evaluation of their businesses. The results of RT request imply that firms can benefit from engaging in altruistic behavior with regard to information

sharing. The mixed results of the effect of content-related variables by user type (Models 2, 3, and 4 in <Table 3>) demonstrate the conditional effect of user identity on information diffusion. The significant results of *Promotion*, *Reward*, and *CSR* in the firm user group suggest that in customer interactions, information receivers on Twitter tend to trust firm users as primary sources of information regarding business operations. The significant results of *Promotion*, *CSR*, and *Social Issues* in the individual user group emphasize the multiple roles of individuals either as transmitters of marketing information or as watchdogs of illegitimate corporate behavior.

Second, for retweet speed, the regression results using the entire dataset presented mixed results for message content (Model 1 in <Table 5>). The significant results of *RT\_request*, *CSR*, and *Social* suggest that Twitter audiences respond more rapidly to messages that communicate altruistic behavior and social issues. The results of content-related variables in terms of user type indicated mixed results, demonstrating the conditional effect of user identity on information diffusion speed (Models 2, 3, and 4 in <Table 5>). The significant results of *Promotion* in the firm user group suggest that information receivers on Twitter typically respond more rapidly to messages that mention new products and services. Thus, managers should consider maximizing SNS to attract public attention to products or services, particularly during the early stages of market presence. The significant results of *CSR* and *Social* in the individual user group suggest that as consumers, Twitter users respond more rapidly to messages about the social participation of a company and messages that criticize the faults of a business entity. Social criticism against a firm is disseminated rapidly among people and may thus amplify the negative image of a firm in an online community. Thus, managers must address

the online dispersion of criticism by proactively participating in SNS communications. The significant result of *Social* in the firm user group supports our argument (Model 2 in <Table 5>).

Third, the significant effect of *URLs*, *Hashtags*, and message length suggest that informational features embedded in tweets can serve as auxiliary indicators that predict the degree of information propagation of Twitter messages. URL is particularly useful in enabling tweet messages to be transmitted extensively to other users by compensating for the message length limitation (Model 2, firm user group in <Table 3>). These findings suggest that managers must consider the efficient use of URLs to increase the quality of their information when posting marketing-related messages. However, the use of a URL was found to decrease the likelihood of fast marketing message retweeting in terms of RT speed. Thus, managers should also prepare a customized strategy for tweet message design depending on the marketing communication purpose.

Finally, our findings suggest that a user's social relationship is another salient factor that affects the proliferation of information sharing on Twitter. In particular, the significant results of an original author's social relationship, which is represented by the number of followers, suggest that social network theory, which mentions social ties among members, may be applicable to the Twitter context. The results of Twitter participation for both the original author and retweeter also reinforce the potential of social network-related variables as stable indicators to investigate the information diffusion from the network perspective. Maximizing these findings would enable managers to develop a marketing practice that evaluates the social influence of Twitter users on social network members, selects the leading users, and uses them as social hubs for marketing communications.

## VII. Conclusion

Twitter has shown a fast growth in user population and application in recent years. This emerging circumstance motivates researchers to investigate the usage context of the network based on diverse theoretical perspectives. As a part of the academic studies on social networks, our research seeks to understand the use of Twitter as a communication channel in the business context. Specifically, we examined the role of message content and information source in information propagation (i.e., RT volume) in Twitter networks.

Analysis of our sample messages, which concerned the Korean mobile telecom industry, yielded empirical results that supported the idea that business related content (e.g., marketing campaigns, CSR, and social issues) is significantly associated with information diffusion. Our results also indicated that the diffusion performance of these messages depends on the type of information source, suggesting the significant moderating role of firm, news media, and individual users.

In summary, from an academic perspective, our study broadens the theoretical knowledge on the information diffusion mechanism in online social media. From a practical perspective, our study provides managers with useful guidelines on how to

strategically use online social media in marketing communications with customers.

Although our findings are generally applicable to business-related content, our study also has certain limitations that should be addressed in future research. The research context and data analysis of our study is currently limited to tweet messages related to the three major service providers in the Korean mobile telecom market. Such research settings possibly lead to eventual bias in data sample and can hardly guarantee universality of the empirical results. To mitigate such limitation, future study needs to collect and analyze tweet messages regarding mobile telecom services in other countries and compare empirical results with our results. The relatively small number of tweet messages in our data set also causes difficulty in generalizing our findings. Thus, to enhance the applicability of our study, future research should analyze the information diffusion status of messages related to diverse subjects that represent various social aspects. Our study also applied relatively simple methods of empirical analysis. To derive substantial theoretical and managerial implications, future studies should employ sophisticated methodologies, such as text mining for content analysis, experimental analysis, and econometric modeling analysis.

## <References>

- [1] Aaker, D., and Norris, D. (1982). Characteristics of TV Commercials Perceived as Informative. *Journal of Advertising Research*, 22(2), 161-70.
- [2] Allport, G., and Postman, L. J. (1965). *The Psychology of Rumor*. New York, NY: Russell and Russell.
- [3] Balmer, J. M. T., and Greyser, S. A. (2006). Corporate Marketing: Integrating Corporate Identity, Corporate Branding, Corporate Communications, Corporate Image, and Corporate Reputation. *European Journal of Marketing*, 40(7/8), 730-741.
- [4] Basil, M. D., and Brown, W. J. (1994). Interpersonal Communication in News Diffusion: A Study of "Magic" Johnson's Announcement. *Journalism and Mass Communication Quarterly*, 71(2), 305-320.

- [5] Bardoel, J., and Deuze, M. (2001). Network Journalism: Converging Competences of Media Professionals and Professionalism. *Australian Journalism Review*, 23(2), 91-103.
- [6] Bearden, W., and Etzel, M. J. (1982). Reference Group Influence on Product and Brand Purchase Decisions. *Journal of Consumer Research*, 9(2), 473-481.
- [7] Bearden, W., Netemeyer, R. G., and Teel, J. E. (1989). Measurement of Consumer Susceptibility to Interpersonal Influence. *Journal of Consumer Research*, 15(4), 473-481.
- [8] Bhattacharya, C. B., and Sen, S. (2004). Doing Better at Doing Good: When, Why, and How Consumers Respond to Corporate Social Initiatives. *California Management Review*, 47(1), 9-24.
- [9] Boyd, D. M., and Ellison, N. B. (2007). Social Network Sites: Definition, History, and Scholarship. *Journal of Computer-Mediated Communication*, 13(1), 210-230.
- [10] Brown, J., Broderick, A.J., and Lee, N. (2007). Word of Mouth Communication within Online Communities: Conceptualizing the Online Social Network. *Journal of Interactive Marketing*, 21(3), 2-20.
- [11] Brown, J. J., and Reingen, J. P. (1987). Social Ties and Word of Mouth Referral Behavior. *Journal of Consumer Research*, 14(3), 350-362.
- [12] Brownstein, J. S., Freifeld, C. C., and Madoff L. C. (2009). Influenza A (H1N1) Virus: 2009 Online Monitoring. *New England Journal of Medicine*, 360, 2156.
- [13] Cameron, A. C., and Trivedi, P. K. (1998). *Regression Analysis of Count Data*. Cambridge, UK: Cambridge University Press.
- [14] Chaudhri, V., and Wang, J. (2007). Communicating Corporate Social Responsibility in the Internet: A Case Study of the Top 100 Information Technology Companies in India. *Management Communication Quarterly*, 21(2), 232-247.
- [15] Chen, C. W., Shen, C. C., and Chiu, W. Y. (2007). Marketing Communication Strategies in Support of Product Launch: An Empirical Study of Taiwanese High-Tech Firms. *International Marketing Management*, 36(8), 1046-1056.
- [16] Chen, Y., and Xie, J. (2008). Online Consumer Review: Word-of-Mouth as a New Element of Marketing Communication Mix. *Management Science*, 54(3), 477-491.
- [17] Cohen, J. B., and Areni, C. S. (1991). Affect and Consumer Behavior, in: Robertson, T.S. and Kassarian, H.H. (Eds.), *Handbook of Consumer Behavior*, Upper Saddle River: Prentice-Hall, 188-240.
- [18] Cooper, R. G., and Kleinschmidt, E. J. (1987). What Makes a New Product a Winner: Success Factors at the Project Level. *R&D Management*, 17(3), 175-189.
- [19] Crawford, C. M., and Di Benedetto, C. A. (2009). *New Products Management*, Boston, MA: McGraw-Hill.
- [20] Dimmick, J., Chen, Y., and Li, Z. (2004). Competition between the Internet and Traditional News Media: The Gratification-Opportunities Niche Dimension. *Journal of Media Economics*, 17(1), 19-33.
- [21] Dobeles, A., Toleman, D., and Beverland, M. (2005). Controlled Infection! Spreading the Brand Message through Viral Marketing. *Business Horizons*, 48(2), 143-149.
- [22] Du, S., Bhattacharya, C.B., and Sen, S. (2010). Maximizing Business Returns to Corporate Social Responsibility (CSR): The Role of CSR Communication. *International Journal of Management Review*, 12(1), 8-19.
- [23] Eagly, A. H., and Chaiken, S. (1993). *The Psychology of Attitudes*. Fort Worth, TX: Harcourt Brace Jovanovich College Publishers.
- [24] Ehrlich, K., and Shami, N. S. (2010). Microblogging Inside and Outside the Workplace. In *Proceedings of the 4th International AAAI Conference on Weblogs and Social Media (ICWSM)*, Washington, DC, 42-49.
- [25] Fisher, B. A. (1978). *Perspectives on Human Communication*. New York, NY: Macmillan.
- [26] Frazier, G., and Summers, J. (1984). Interfirm Influence Strategies and Their Application within Distribution Channels. *Journal of Marketing*, 48(3), 43-55.
- [27] Gladwell, M. (2000). *The Tipping Point: How Little Things Can Make a Big Difference*. New York, NY: Little Brown.
- [28] Greenberg, B. S., Hofschire, L., and Lachlan L. (2002).

- Diffusion, Media Use and Interpersonal Communication Behaviors, in: Greenberg, B.S. (Eds.), *Communication and Terrorism*. Cresskill, NJ: Hampton Press, 3-16.
- [29] Guiltinan, J. P. (1999). Launch Strategy, Launch Tactics, and Demand Outcomes. *Journal of Product Innovation Management*, 16(6), 509-529.
- [30] Helm, S. (2002). Viral Marketing — Establishing Customer Relationships by Word-of-Mouth. *Electronic Markets*, 10(3), 158-161.
- [31] Hong, S., and Tam, K. Y. (2006). Understanding the Adoption of Multipurpose Information Appliances: The Case of Mobile Data Services. *Information Systems Research*, 17(2), 162-179.
- [32] Hughes, A. L., and Palen L. (2009). Twitter Adoption and Use in Mass Convergence and Emergency Events. *International Journal of Emergency Management*, 6(3/4), 248-260.
- [33] IDC Korea. (2010). *Korea Communications Service and Equipment Market: 2012-2016 Forecast and Analysis*. Framingham, MA: IDC.
- [34] Ito, T. A., Larson, J. F., Smith, N. K., and Cacioppo, J. T. (1998). Negative Information Weighs more Heavily on the Brain: The Negativity Bias in Evaluative Categorizations. *Journal of Personality and Social Psychology*, 75(4), 887-900.
- [35] Jansen, B. J., Zhang, M., Sobel K., and Chowdury, A. (2009). Twitter Power: Tweets as Electronic Word of Mouth. *Journal of the American Society for Information Science and Technology*, 60(11), 2169-2188.
- [36] Java, A., Song, X., Finin, T., and Tseng, B. (2007). Why We Twitter: Understanding Micro-Blogging Usage and Communities. In *Proceedings of the 9th WEBKDD and 1st SNA-KDD Workshop on Web Mining and Social Analysis*. San Jose, CA, 1-10.
- [37] Kanouse, D. E., and Hanson Jr, L. R. (1972). Negativity in Evaluations, in: Edward, E.J., Kanouse, D.E., Kelley, H.H., Nisbett, R.E., Valins, S., and Weiner, B. (Eds.), *Attribution: Perceiving the Causes of Behavior*, Morristown, NJ: General Learning Press.
- [38] Katz, E., Blumler, J. G., and Gurevitch, M. (1972). Utilization of Mass Communication by the Individual, in: Blumler, J.G. and Katz, E. (Eds.), *The Uses of Mass Communication: Current Perspectives on Gratifications Research*. Beverly Hills, CA: Sage, 19-32.
- [39] Katz, E., and Lazarsfeld, P. E. (1975). *Personal Influence: The Part Played by People in the Flow of Mass Communications*, Glencoe, IL: The Free Press.
- [40] Keller, K. L. (2001). Mastering the Marketing Communications Mix: Micro and Macro Perspectives on Integrated Marketing Communication Programs. *Journal of Marketing Management*, 17(7/8), 819-847.
- [41] Kim, H., Son, J.-Y., and Suh, K.-S. (2012). Following Firms on Twitter: Determinants of Continuance and Word-of-Mouth Intentions. *Asia Pacific Journal of Information Systems*, 22(3), 1-27.
- [42] Krone, K., Jablin, F., and Putnam, L. (1987). Communication Theory and Organizational Communication: Multiple Perspectives, in: Jablin, F. (Eds.), *Handbook of Organizational Communication: An Interdisciplinary Perspective*. Newbury Park, CA: Sage Publications, 11-17.
- [43] Krishnamurthy, B., Gill, P., and Arlitt, M. (2008). A Few Chirps about Twitter. In *Proceedings of the 1st Workshop on Online Social Networks (WOSN)*, Seattle, WA, 19-24.
- [44] Lavie, D. (2006). The Competitive Advantage of Interconnected Firms: An Extension of the Resource-based View. *Academy of Management Review*, 31(3), 638-658.
- [45] Lee, J., Lee, J.-N., and Tan, B. C. Y. (2013). The Contrasting Attitudes of Reviewer and Seller in Electronic Word-of-Mouth: A Communicative Action Theory Perspective. *Asia Pacific Journal of Information Systems*, 23(3), 105-129.
- [46] Lee, J. H., Park, J.S., Kim, H. M., and Park, J. H. (2013). Investigating the Influence of Perceived Usefulness and Self-Efficacy on Online WOM Adoption Based on Cognitive Dissonance Theory: Stick to Your Own Preference VS. Follow What Others Said. *Asia Pacific Journal of Information Systems*, 23(3), 131-154.
- [47] Mohr, J. (2000). The Marketing of High-Technology Products and Services: Implications for Curriculum Content and Design. *Journal of Marketing Education*, 22(3), 246-259.



- 
- [48] Maignan, I., and Ferrell, O. C. (2001). Corporate Citizenship as a Marketing Instrument: Concepts, Evidence, and Research Directions. *European Journal of Marketing*, 35(3/4), 457-484.
  - [49] Mohr, J., and Nevin, J. R. (1990). Communication Strategies in Marketing Channels: A Theoretical Perspective. *Journal of Marketing*, 54(4), 36-51.
  - [50] Nguyen, A. (2008). The Contribution of Online News Attributes to Its Diffusion: An Empirical Exploration based on a Proposed Theoretical Model for the Micro-Process of Online News Adoption/Use. *First Monday*, 13(4), 12-25.
  - [51] Park, J., and Son, J.-Y. (2012). Understanding Customer Participation Behavior via B2C Microblogging. *Asia Pacific Journal of Information Systems*, 22(4), 51-73.
  - [52] Pavlik, J. V. (1998). *New Media Technology: Cultural and Commercial Perspectives* (2nd ed.), Boston, MA: Allyn and Bacon.
  - [53] Pentina, I., Gammoh, B. S., Zhang, L., and Mallin, M. (2013). Drivers and Outcomes of Brand Relationship Quality in the Context of Online Social Networks. *International Journal of Electronic Commerce*, 17(3), 63-86.
  - [54] Petrovic, S., Osborne, M., and Lavrenko, V. (2011). RT to Win! Predicting Message Propagation in Twitter. In *Proceedings of the International Conference on Weblogs and Social Media (ICWSM 2011)*, Barcelona, Spain, 586-589.
  - [55] Petty, R. E., Cacioppo, J. T., and Goldman, R. (1981). Personal Involvement as a Determinant of Argument-based Persuasion. *Journal of Personality and Social Psychology*, 41(5), 847-855.
  - [56] Roberts, G. (1998). Competitive Altruism: From Reciprocity to the Handicap Principle. In *Proceedings of the Royal Society of London*, 265, 427-431.
  - [57] Rosnow, R. L. (1988). Rumor as Communication: A Contextual Approach. *Journal of Communication*, 38(1), 1-17.
  - [58] Schacter, S. (1959). *The Psychology of Affiliation: Experimental Studies of the Source of Gregariousness*. Stanford, CA: Stanford University Press.
  - [59] Shibutani, T. (1966). *Improvised News: A Sociological Study of Rumor*. Indianapolis, IN: Bobbs-Merrill.
  - [60] Suh, B., Hong, L., Pirolli, P., and Chi, E. H. (2010). Want to be Retweeted? Large Scale Analytics on Factors Impacting Retweet in Twitter Network. In *Proceedings of the IEEE 2nd International Conference on Social Computing*, Minneapolis, MN, 177-184.
  - [61] Sussman, S. W., and Siegel, W. S. (2003). Informational Influence in Organizations: An Integrated Approach to Knowledge Adoption. *Information Systems Research*, 14(1), 47-65.
  - [62] Van Vugt, M., Roberts, G., and Hardy, C. (2007). Competitive Altruism: Development of Reputation-based Cooperation in Groups, in: Dunbar, R., Barrett, L. (Eds.), *Handbook of Evolutionary Psychology*. Oxford, UK: Oxford University Press, 531-540.
  - [63] Vollmer, C. (2008). Precourt, G., *Always On: Advertising, Marketing, and Media in An Era of Consumer Control*. New York, NY: McGraw-Hill.
  - [64] Weimann, G. (1994). *The Influentials: People Who Influence People*. Albany, NY: State University of New York Press.
  - [65] Woerndl, M., Papagiannidis, S., Bourlakis, M., and Li, F. (2008). Internet-induced Marketing Techniques: Critical Factors in Viral Marketing Campaigns. *International Journal of Business Science and Applied Management*, 3(1), 33-45.
-

## ◆ About the Authors ◆

---



**Insoo Son**

Insoo Son is a research associate of Institute for Business Research and Education at Korea University Business School in Seoul, Korea, and he is a visiting research fellow at Kogod School of Business, American University. He earned Ph.D. degree in MIS from Korea University Business School. He also received MBA degree from University of Wisconsin-Madison and MISM degree from Carnegie Mellon University. His research interests are IT-based service innovation and technology adoption, e-Business, service-oriented computing, business value of IT, and consumer behaviors under social network environment. His research papers have appeared in *Information and Management*, *Pacific Asia Journal of the AIS*, and conferences such as HICSS, ICEC, and PACIS.

---



**Young-Kyu Kim**

Young-Kyu Kim is an assistant professor of management at Korea University Business School and he is an affiliated faculty member in Harvard Law School Center on the Legal Profession, where he worked as a postdoctoral research fellow from 2008 to 2010. He received his bachelor/master in business administration at Seoul National University, Master of Information Systems Management at Carnegie Mellon University, and his MBA/PhD from the University of Chicago Booth School of Business in 2008. His research interests include social networks, organizational status and identity, and social mobility of individuals and firms. Currently, he looks into the legal education reform in Korea, based on his past experience on various legislative reform projects in Korean public sectors, and plans a career study of Korean law school graduates

---



**Dongwon Lee**

Dongwon Lee is an Associate Professor of MIS at Korea University Business School. He earned his Ph.D. degree in MIS from University of Minnesota. He also received his BBA and MBA degrees from Seoul National University and his MS degree in MIS from the University of Arizona. His research interests include (1) pricing strategies in e-commerce (price rigidity, price points, e-tailing pricing, etc.), (2) economic analysis of emerging technologies (e.g., cloud computing and social media), and (3) social network and big data analytics. His research papers have appeared in *Review of Economics & Statistics*, *Journal of the Association for Information Systems*, *Journal of Management Information Systems*, *International Journal of Electronic Commerce*, *Communications of the Association for Information Systems*, *Information Systems Frontiers*, *Electronic Markets*, *Journal of Global Information Technology Management*, and *ACM Crossroads*.

---

Submitted: January 10, 2015; Accepted: March 26, 2015