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Mediated relations: new methods to study online social capital

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The Web has expanded the research agenda for communication scholars to study social capital. In this field of Internet studies, new indicators of social behavior and social relations have surfaced to describe and understand how social capital develops online and what the consequences are for social capital in general. Specifically, Web 2.0 as characterized by User Generated Content on weblogs and the enormously popular social network sites significantly increased the importance of studying online social capital. To study online social capital, traditional and new means of data collection and analysis can be used. This study focuses on the origins of the concept of social capital, how it is used in communication studies, and the means to measure social capital. Furthermore, two examples of studying online behavior and online social relations are provided to represent webometric tools for data collection and analysis: (1) the analysis of hyperlinks between political actors' websites in South Korea, and (2) semantic network analysis of writings produced by professional journalists online and bloggers in South Korea. These examples use advanced analytical methods (hyperlink network analysis and semantic network analysis) to understand the online practices.

Keywords: computer-mediated communication; strategic communication; South Korea; journalism; online community

Introduction

Nowadays people worldwide use social network sites to connect and socialize with close and distant friends. Popular examples in the Asian-Pacific region are Mixi in Japan, Cyworld in South Korea, and Renren in China. People share abundant information with each other on sharing sites such as Flickr for photos, YouTube for videos, Digg for news, and (micro-) blogging (e.g., Blogger and Twitter). As such, these services allow for the creation of many online communities based on shared interests as opposed to geographical communities. This has led to a large number of studies focusing on the concept of social capital in relation to online presence and online activities. This present study provides an overview of what social capital is, and presents two examples of how social capital can be studied with so-called webometrics. The aim of this study is twofold. First, it debates social capital in the offline and the online realms and theoretical and methodological difficulties

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surrounding its study. Second, it aims to provide an overview of methods and techniques still scarcely used in social science to study online traces of social capital.

Social capital

In social theory, many different approaches to social capital exist. These approaches lead to different but related conceptualizations of social capital. Bourdieu (1986) distinguishes three types of capital: economic, cultural, and social. Social capital then refers to how people can utilize social relations to influence social mobility across social strata, specifically upward mobility and vertical mobility. His definition of social capital is '(. . .) the aggregate of the actual or potential resources which are linked to possession of a durable network of more or less institutionalized relationships of mutual acquaintance and recognition' (Bourdieu, 1986, p. 248). For instance, Bourdieu uses the concept of social capital to explain the reproduction of societal inequality (see also Sum, Mathews, Pourghasem, & Hughes, 2008; Swain, 2003). As such, Bourdieu is mainly interested in the vertical social relations between social classes (i.e., social stratification).

Although Bourdieu paid less attention to social capital than cultural and economic capital, it instigated a research tradition that produced a large body of knowledge (see Figure 1). Where the sociological approach is predominantly focused on vertical mobility, studies originated from psychology and communication studies focus chiefly on horizontal mobility: formal relations in organizations and neighborly and friendship relations. Putnam's approach (1995, 2000), although it shares similarities with Bourdieu's approach (see Lin, 1999), also looks at the horizontal and transitive conceptualization of social capital, at the community level as well as the individual level. His approach focuses on formal social capital (e.g.,

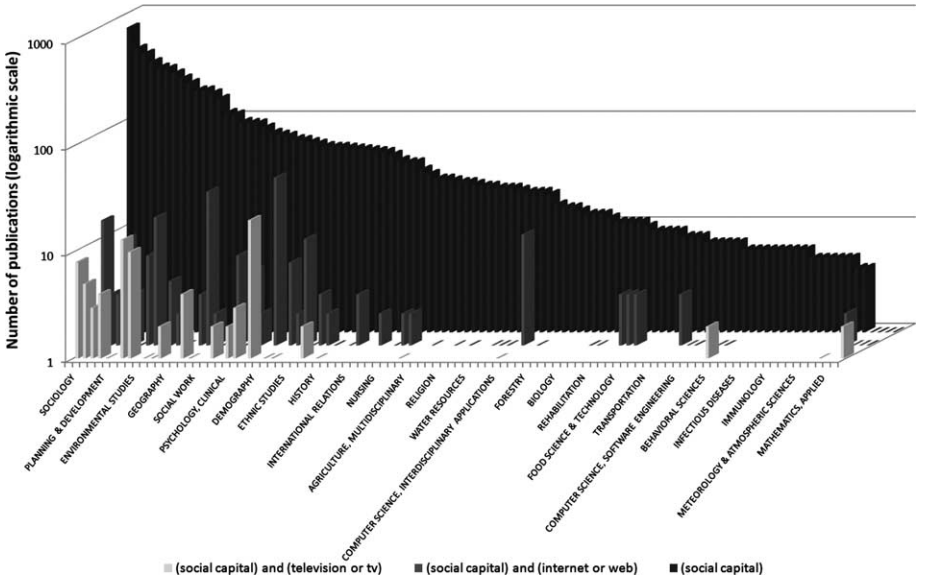

Figure 1. Social capital studies: number of scientific articles by keyword combination by subject area.

membership and participation in organizations) and informal social capital (e.g., socializing with friends and neighbors at home or elsewhere), which have decreased in recent decades, according to Putnam (2000). Wellman, Quan-Haase, Witte, and Hampton (2001), following up on Putnam's claims, distinguish two forms of social capital: network capital and participatory capital. Another domain consists of attitudinal concepts such as interpersonal trust and sense of community (Quan-Haase, Wellman, Witte, & Hampton, 2002; Shah, McLeod, & Yoon, 2001).

Even though there are many approaches to social capital and different conceptualizations thereof (Lin, 1999), they share similarities: all focus on people's relations with each other and utilizing these relations for obtaining some kind of capital. Lin (2001) defines social capital succinctly as 'the investment in social relations with expected returns in the market place' (p. 19). Some concepts refer to the formation and maintenance of actual relations (i.e., socializing), others to potential relations (i.e., network members). Again other concepts (e.g., interpersonal trust) are expected to facilitate or lubricate these social relations.

Sub-domains of social capital

There are many ways of classifying different areas or strands in the research domain of social capital. Scheufele and Shah (2000) distinguish between intrapersonal, interpersonal, and behavioral aspects. Wellman et al. (2001) distinguish between network capital, participatory capital, and community commitment, whereas in sociology the distinction in formal and informal network capital is commonly used (Lin, 2001; Putnam, 2000). Another approach looks at attitudes, networks, and participation. For instance, Putnam (2000) focuses on social trust, the networks people have, and membership in organizations. His definition of social capital refers to 'social organization, such as trust, norms, and networks that can improve the efficiency of society by facilitating coordinated actions' (Putnam, Leonardi, & Nanetti, 1993, p. 167).

As seen in Figure 1, research on social capital is a popular field of research, in which sociology is the most productive. However, because other social science disciplines share common interests with sociology, those disciplines also focus on social capital or related areas of interest. A search using the keyword 'social capital' resulted in 748 published studies in the subject area of sociology and 65 in the subject area of communication. The keyword 'social capital' combined with those terms referring to media produces far fewer hits (front row in Figure 1).

From sociology, research on social capital also bifurcated into psychology and communication science. Psychological studies often deal with what can be called the by-product of social capital: the well-being of people in terms of loneliness, psychological and physical health, and social support (Beaudoin, 2007; Beaudoin & Tao, 2007; Coulson, 2005; Eastin & LaRose, 2005; Finn & Gorr, 1988; Fogel, Albert, Schnabel, Ditkoff, & Neugut, 2002; Helliwell & Putnam, 2004; Hlebec, Manfreda, & Vehovar, 2006; Kraut, Kiesler, Boneva, Cummings, Helgeson, & Crawford, 2002; Kraut, Patterson, Lundmark, Kiesler, Mukopadhyay, & Scherlis, 1998; Morahan-Martin & Schumacher, 2003; Valkenburg & Peter, 2007a, b; Vergeer & Pelzer, 2009; Wright, 2000). These psychological studies mostly have an individualistic approach to how people function in society at large. In this perspective social groups are largely ignored. The psychological approach also

involves research designs and measurements commonly used in psychology, such as experimental designs, small samples, and attitude measurements.

Because media studies and communication science are multidisciplinary research fields, they use insights from sociology and psychology and relate these to the role media play in society. The dominant view was and is that media in general and 'new' media[1] in particular, are often seen as detrimental in their consequences (Kraut et al., 1998; Putnam, 1995). The increased discussion on social capital coincided with the rise of the Internet as a new medium. This coincidence led to a strong focus on the relation between the two, mostly starting off with the assumption that the Internet is detrimental to social capital. Putnam's studies especially (1995, 2000)[2], but also that of Kraut et al. (1998), generated a great deal of attention and led to a vast amount of research activity into the relationship between (new) media use and social capital. Although Putnam′s initial study (1995) focuses on the use of television as an explanation of the disappearance of social capital, he also mentions new technology, in particular the Internet, as a factor that reduces social capital.

Putnam was quickly criticized on both methodological and theoretical grounds (e.g., Fischer, 2005; Norris, 1996, Portes, 1998). Norris (1996) showed that Putnam's conclusion were incorrect, or at least that his claims needed more thorough analyses. Initially, the debate about the effects of the Internet on social capital was strongly polarized between the cyber optimists (utopians) and the cyber pessimists (dystopians) (Katz, Rice, & Aspden, 2001; Wellman, 2004; Wellman et al., 2001). Subsequently, many following studies focused on the actual empirical relations between the Internet and social capital.

Many Internet studies have shown that the distinction between the offline and online worlds in general, and more specifically in regard to social capital, is becoming less relevant. First of all, these studies often show that online participation does not destroy offline participation or network capital. Several studies have also shown that these different realms of offline and online are increasingly indistinguishable (Skoric, Ying, & Ng, 2009; Valenzuela, Park, & Kee, 2009; Vergeer & Pelzer, 2009), especially for younger people as early adopters of the Internet.

It is unclear whether these networks created on social network sites are viable ones. Are friends on a social network site friends in the traditional meaning of the word, or are they acquaintances or merely strangers (e.g., Baym, Zhang, Kunkel, Ledbetter, & Lin, 2007; Lewis & West, 2009)? In the first place, these networks most likely replicate initially a large part of an existing offline social network: people tend to befriend people online that they already have met offline. Subsequently, they befriend people they have not met offline but would like to, followed by befriending people with whom they merely want to be connected, even though it is unreciprocated, maybe in order to stay informed on certain issues. This means that, in part, the primary social network (i.e., family and close friends) is online, but a large portion of the online network is most likely for information and entertainment purposes. The former relations can be labeled as bonding whereas the latter ones can be labeled as bridging (Putnam, 2000; Skoric et al., 2009). Discussion has arisen whether the meaning of 'friend' is being depreciated due to the extensive use of friends on social network sites. Critics assume that friends on social network sites are not friends in the traditional sense of the word: a person that you know well, in whom you can confide, and who helps and supports you when necessary. A friend on a social network site then is considered inferior because he or she cannot truly offer

support. However, even though these online 'friends' might not be friends in the traditional meaning of the word, they can provide easier access to information or assistance. Particularly, online social networks are probably larger than the online networks. As such, the online networks allow for the quick spread of information and as such perform as bridging capital (Granovetter, 1973; Putnam, 2000, Steinfield, Ellison, & Lampe, 2008). Some studies (e.g. Ellison, Steinfield, & Lampe, 2007) have established links (weaker) between the use of social network service such as Facebook and bonding capital.

Measuring social capital in the offline realm

Measurement of social capital in the offline realm is predominantly done by using questionnaires, focusing on the individual person as the unit of analysis. For instance, to chart a network one uses a so-called name, position, or resource generator (Lin, 1999). Other social capital concepts (i.e. attitudes and opinions), such as social trust, loneliness, and perceived social support, are also measured by using questionnaires: multiple items for distinct concepts are used to measure attitudes. In other studies (e.g., Kenyon, 2008; Nie & Hilligus, 2002), the focus is predominantly on the time displacement of activities, using time diaries to register activities.

Participation is another important social capital concept, often measured by asking whether people are members of different associations. Subsequently, an index is created to indicate the degree of participation. Participation in general, such as in voluntary organizations (Kim, 2007; Wellman et al., 2001) and political participation specifically (De Zuniga, Puig-I-Abril, & Rojas, 2009), can also be measured by asking people whether they actually attend meetings or campaign rallies or voted in the last elections. Other similar measurements focus on volunteering, voting, and attending council meetings. Most of these measurements can be augmented by measuring how much time people spend these activities on a weekly basis.

What is social capital in the online world?

In this section, two examples are shown of how social capital or indications of social capital could be measured, beyond the use of traditional measurement instruments mentioned earlier: hyperlink network analysis and semantic network analysis.

People's social capital on the Net

In the early phases of increased popularity of the Internet, research focused primarily on what people did online: what applications they used (e.g., Web browser, IRC, email), how much time they spent online. Subsequently, questions arose concerning the extent to which online participation would affect offline participation? Would increased Internet use decrease offline face-to-face contacts? In these early stages, this is a legitimate concern and question. The consequence was that measuring social capital focused greatly on its online presence. By comparing measures focusing on online and offline social capital, conclusions could be made about online capital weakening offline capital. Two studies that focused on this approach are Vergeer and Pelzer (2009) and Williams (2006). Vergeer and Pelzer (2009) used separate participation and network measures for the size of online networks and offline

networks, as well as the time spent socializing with people in these networks. Williams (2006), following up on work by Norris (2002) and Putnam (2000), developed Internet Social Capital Scales (ISCS) to measure bridging and bonding in the online and offline realms separately. The goal was not only to focus on offline bonding, but also on online bonding, as well as online and offline bridging.

Bridging and bonding are not essentially different to those in the pre-Internet era. However, the means by which or the channels through which bridging and bonding occur have changed due to the Internet. To cater for this, Williams (2006) opted to develop separate scales for online and offline bridging and bonding, enabling comparisons over time. The problem with this approach is twofold. First, the questionnaire tends to grow in size because many measurements have to be made twice, once for the offline realm and once for the online realm. Second, because the offline and the online realms become increasingly intertwined, it is difficult to make explicit distinctions between them. This increases the likelihood of overlap between the two measurements and thus the likelihood of a logical positive correlation. Alternatively, one can choose to measure these concepts ignoring the online and offline distinction. This reduces the length of the questionnaire considerably. Measuring change is still possible by correlating these measures with indicators of offline and online activities. Apart from these considerations, Ji, Hwangbo, Yi, Rau, Fang, and Ling (2010) show that bridging and bonding capital are significantly related to the use of SNSs in South Korea, China, and the US. More specifically, people in China and South Korea utilize SNSs for expert search which affects their bridging capital, whereas people's use of SNSs in the US for communication purposes affects their bonding capital. Skoric et al. (2009), who focus on explaining online political participation and offline political participation separately, use Williams' ISCS (2006) to measure bridging and bonding as well. Their analyses of the Singaporean case show that bridging capital is positively related to online political participation but not to offline participation, whereas bonding capital is positively related to offline capital but not to online participation. These findings suggest bonding is related to the offline realm, whereas bridging is related to the online realm.

Apart from aforementioned research on social capital that uses established research tools (such as sampling from a population of people and measuring by way of questionnaires), the advent of the Internet brought new types of huge amounts of data and new methods for data collection and analysis. These new approaches are categorized under the label webometrics (Thelwall, 2009). Webometrics and its data collection methods, such as scraping or crawling the Web, have major advantages over the use of questionnaires. For instance, measurements of behavior and opinions are performed unobtrusively: people are not aware their behaviors or expressions are being observed. As such, these measurements are not influenced by social desirability, and thus provide more accurate data (Caverlee & Webb, 2008). Similarly, measuring general opinion using semantic network analysis avoids social desirability by analyzing Web content using a network approach. This is especially the case when Web services allow access to their databases by providing an application programming interface (API). In particular, Twitter (a hybrid of a micro-blogging service and a social network site) allows extensive access to its user database. In the next sections, two examples of webometrics that focus on South Korean data are presented: hyperlink network analysis and semantic network analysis.

Hyperlink network analysis and social capital

Hyperlink network analysis (HNA) can be broadly defined as the study of web-based links with primarily social network analytical methods for humanities and social science research goals. HNA originates from social network analysis as seen in Table 1 (Park, 2003). In HNA the nodes are the websites that represent their official producers, such as people, subgroups, organizations, nation-states, or collectives (aggregates) like Korean provinces. Hyperlinks between websites represent online networks among people, organization, or nation-states. Thus, we can identify the social and communication structure among those social actors based on the hyperlink structure.

One could question the definition of hyperlink networks as social ties because hyperlinks are technical devices. As Park and Jankowski (2008) argue, 'a hyperlink is

Table 1. Comparison between hyperlink network and other networks

		Operational measure	
Type of network	Conceptual definition	Nodes	Content of relation/ link
Social network	Is a set of people (or organizations or other social entities) connected by a set of relationships	Individual, Group, Organization, Nation-State	Any kind of social relation
Communication network	Is a network composed of interconnected individuals who are linked by patterned flows of information	Same as above, but generally focuses on individual	Communication & information
Computer-mediated network	Is a specific type of communication network in which individuals are interconnected by computer systems	Same as above, but also includes computer systems	Same as above, but restricted to computer as channel of information flow
Internet network	Is a communication network connected by the Internet among computer systems	Same as above, but focuses on Internet users	Same as above, but restricted to Internet as channel of information flow
Hyperlink network	Is the extension of traditional communication network in that it focuses on the structure of a social system based on the shared hyperlinks among websites Same as above, but restricted to hyperlink as channel of information flow	Same as above, but focuses on websites which represent Individual, Group, Organization, Nation-State	

Source: Park (2003, p. 51)

not a monolithic construct and can entail several activities, with important implications for social communication' (p. 58). According to Park and Thelwall (2008a), hyperlink networks in cyberspace generally tend to be weaker ties by nature. However, the classification of hyperlink relationships into strong or weak ties can be limited by a number of contextual factors. People with strong social ties tend to have mutual obligations, and give support and affection when others are in need. People with strong ties are prone to employ more kinds of communication media to meet their informational and emotional needs, particularly when they are temporarily unavailable and geographically distant (Kim, Kim, Park, & Rice, 2007). In this case, Web technologies such as social networking sites are often used as the functional equivalent of other communication channels, because of the asynchronous, cheap nature. In this case, friends often establish hyperlinks between their homepages. Thus, the strength of hyperlink ties can vary according to the specific context under investigation. Furthermore, the characteristics of offline ties can be reflected in hyperlinking behavior.

Types and functions of hyperlinking across Web technologies

In this section we distinguish between different types of hyperlinks (e.g., blogroll hyperlinks, links embedded in texts) and what different meanings and functions they could serve. The Web has recently been classified into Web 1.0 and Web 2.0 (O'Reilly, 2005). A homepage made in simple HTML represents Web 1.0 technology. In the Web 1.0 era, hyperlinks permit homepage authors to select and reference anything on the Web. Ackland, Gibson, Lusoli, and Ward (2010) have identified the major functions of hyperlinks in Web 1.0 being 'information provision' and 'audience sharing', in that hyperlinks serve as an entry point to news, reports, and photos located elsewhere on the Web. For instance, members of the South Korean National Assembly hyperlinked most frequently to party websites from their official homepages (Park & Thelwall, 2008b). Local government and National Assembly sites were the second most frequent target type. Other popular hyperlink destinations included promotional materials (e.g., campaign-related products), political advertisements, and donation requests.

It has been said that we have entered the Web 2.0 era and, indeed, we have been witnessing the rapid growth of Web 2.0 applications including blogs. In a review of blog studies, Schmidt (2007) argues that bloggers have a networking practice that guides them to express a social tie to another person through different types of hyperlinks. For instance, blogroll links can convey important aspects of social relations among bloggers, such as being a marker of personal acquaintance, or friendship, or professional affiliation. What hyperlinks cannot reveal is support or dissent with the linked site. For that, additional information (provided by content analysis) is needed to produce a valued network. On the other hand, hyperlinks within a posting are more likely to serve as a navigational pointer for being an online source of information. For instance, the most common targets of links embedded in the postings of George W. Bush's and John Kerry's blogs during the 2004 US campaign were blog authors' official websites and mass media sites to provide supplementary information. As such, blogroll links can be interpreted as structural, (semi-)permanent links, whereas links in blog posts are incidental links.

A short review of HNA in terms of'social capital' research approach

As seen in Table 2, HNA research is classified into four categories according to their theoretical and methodological approaches. Some HNA research in natural and engineering sciences, including statistical physics and computer science, seeks to establish general laws about hyperlinking behaviors, formulate mathematical models of Web structure, and measure Web growth (e.g., Barabási, 2002). The relationship between hyperlinks and the content of websites is of more interest to social sciences. Particularly in sociology and political science, the social context of hyperlink creation, the interpretation of hyperlink meanings, and the central/peripheral position of website producers are the main research topics (e.g., Park & Thelwall, 2008b).

In social sciences, being the recipient of numerous hyperlinks from external actors is often interpreted as a form of power or authority which we call 'hyperlinked social capital' (Turow & Tsui, 2008). Finding out about the 'power structure' of online networks of actors is a key issue in social capital-related hyperlink studies. Note that 'actor' in this sense refers to an individual human or group of human agents.

Park and colleagues (Park & Kluver, 2009; Park & Thelwall, 2008a) have looked at politicians with many incoming hyperlinks from peer politicians' homepages or blogs as central or successful in cyberspace. Related to this logic, Park and Thelwall (2008b) found that hyperlinks reflected underlying offline connections (e.g., friendship networks) among politicians. However, the correlation is too weak to be definitive. Park and colleagues argue that such evidence suggests that the observed structure of hyperlink network partly indicates the degree of 'bridging' social capital (Putnam, 2000) maintained by politicians.

Even though South Korea is more similar to the West regarding fundamental values people subscribe to than other Asian countries (Welzel, 2011), collectivism remains fundamentally important in South Korea (Yoon, 2010). For instance, a cross-national comparative study suggests that South Korean youngsters subscribe strongly to supportive and empathic relations and show greater trust in others (Igarashi, Kashima, Kashima, Farsides, Kim, Strack, et al., 2008). In the cultural analysis of personal blogging in South Korea, Park and Kluver (2008) state that a 'bonding' social capital inscribed on hyperlink networks also exists. Hyperlink

Table 2. Research traditions and approaches of Hyperlink Network Analysis

Discipline	Applications	Object of study	Interpretation needed?
Natural and engineering sciences (e.g., Statistical physics, Computer science)	Web structure models, Web growth models, Information retrieval, Web mining	Abstract networks of hyperlinks and websites, Algorithms involving hyperlinks	No
Social science (e.g. Political Science, Sociology, Information science, Communication studies)	Networks of actors, Networks of information	Actors creating and targeted by hyperlinks, Information sourcing and targeted by hyperlinks	Yes

Source: Based on Thelwall (2006), modified by the authors.

configuration demonstrates the continuity of social networks among congress members. Korean politicians tend to design and produce their personal blogs to reinforce and signal party affiliation, gender, and regional ties, just as they do in the 'offline' world.

Online social capital can be better captured at the group-level. In a study on the hyperlinks on international NGOs, Shumate and Dewitt (2008) disclosed the North-South divide. Given that hyperlinks serve as a flagship for representational communication, they claimed that various attributes such as the level of reputation, resources, experience, and leadership position within the NGO community would influence hyperlink formation. In a similar vein, using campus movement homepages from US universities, Biddix and Park (2008) found that hyperlinks were a good indicator of social connections. The pattern of hyperlinkage connectivity among student organizations indicated their frequent offline communication.

These results provide some practical implications for social capital researchers. Hyperlink network identification and its interpretation are required in measuring the online position if human actors or a group of human agents try to build their electronic social capital through their own websites or blogs to communicate with others without necessarily relying on traditional media. These perspectives are taken in more recent studies: e-social capital of US non-profit organizations (Nah, 2009), identifying online environmental networks in nanotechnology (Ackland et al., 2010), and ethnographic link analysis of Singaporean political blogs (Soon & Cho, 2010).

As Kluver (2005) has argued, online behavior including hyperlinking is a reflection of socio-political communicational culture, and the way in which people use Web media illustrates cultural values. Therefore, whether hyperlink networks create bridging or bonding social capital is most likely dependent on the culture itself. However, we are not entirely certain if offline cultural values and patterns in Asia reproduce themselves when hyperlink networks are decomposed. Investigating how culture influences people's online behavior requires further cross-cultural comparative research.

Future direction of hyperlink network analysis: theoretical and methodological issues

There is a growing interest among social scientists for the study of online social structure based on the use of new digital tools available for collecting hyperlink data. However, there are several issues that need to be addressed to further understanding the underlying social process and hidden mechanism of online social capital as measured by hyperlinks. One such issue is hyperlink network evolution. Like other social networks, hyperlink networks are a dynamic system of communication among actors. However, researchers have not yet fully explored by which (socio-political) process hyperlink network evolution is governed. Further research is warranted to conduct statistical and longitudinal modeling (e.g., Snijders, van de Bunt, & Steglich, 2010) to investigate the hyperlink network development in various Web technologies (e.g., homepages, blogs, social networking sites, and micro-blogging ties). A second issue concerns the relevance of HNA to offline capital. Several studies reviewed earlier suggest that individuals and organizations, centrally based on the number of inlinks received from others, and the associational structure among their websites reflect their reputation and relations in the physical world. However, the extent to which hyperlink networks mirror realities in the offline world is still in debate. One

approach to resolve this issue is to investigate what offline network characteristics are more evident in hyperlink networks. A third issue is the lack of theory-driven analysis. The majority of HNA takes an information-centered approach. In other words, by extracting information in some issue-specific hyperlink network HNA tends to be descriptive and topological. To further understanding of hyperlinking processes HNA researchers need to conduct theory-driven social network research that relates a node′s positional difference (e.g., centrality) to its performance (e.g., economic success) or behavior patterns (e.g., communication homogeneity). The fourth issue concerns difficulties that arise due to Web 2.0. The use of search engines is necessary in collecting a large amount of hyperlink data. However, current engines including proprietary crawlers do not properly index multimedia content on Web 2.0 platforms. This problem is even greater if access to some Web 2.0 services (e.g., SNS) is not permitted by the site-hosting company via API (Application-Programming Interface). The final issue concerns the main focus of social capital research on positive aspects of social capital, ignoring negative aspects of social capital in communities. Whether this is also the case for online social capital is as yet unclear. However, a number studies have been conducted on the hyperlinking practices by right-wing extremist groups in societies (Caiani & Wagemann, 2009; Tateo, 2005). How these networks of fringe parties are connected to the political networks at large and even affect these larger online political networks is worth studying in the future.

Semantic network analysis and online social capital

Generally, the measure of social capital focuses on social relations between actors in a social system as well as their message content that people communicate to each other. According to Burt (1997), the social capital value in a social system is defined as a function of network form and its content. Although structural analysis can identify social connections, individual positions, distances between actors, and information flows, social capital cannot be defined by structural network properties alone. In terms of the nature of social capital, such as trust and reciprocity, content analysis is necessary.

Online communication messages usually remain on the Web. Online communication platforms preserve users' messages as a set of data. The APIs provided by Web search engines allow for automatic retrieval of Web content. The permanency of online content and its improved accessibility are an advantage for online social capital research. The distinct characteristics of online content enable researchers to trace communication messages created by Internet users easily and to gather the data efficiently.

Today online data is extensive and expanding, providing researchers with access to large amounts of data. Traditional content analysis, using manual coding, poses problems due to limitations in terms of time and cost. Some sort of sampling could be considered a solution. However, when the analysis should reflect the entire network, random sampling produces biased results (Wasserman & Faust, 1997). At this point, a systematic and (semi-)automatic content analysis for large amounts of data can be considered as an alternative.

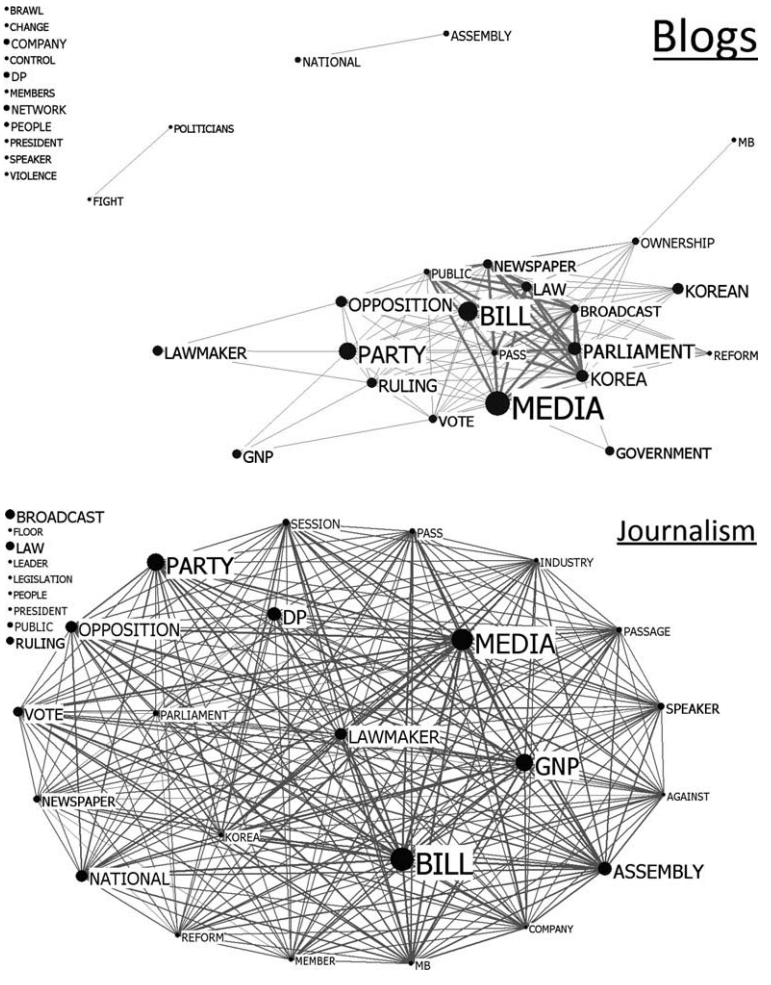

Figure 2. Semantic networks of professional journalism and blogs (source: Lim, 2011, p. 57).

Definition of semantic network analysis

Semantic network analysis[3] can be defined as a systematic technique of content analysis to identify the meaning structure of symbols or concepts in a set of documents, including communication message content by using network analysis (Monge & Contractor, 2003; Monge & Eisenberg, 1987). Although semantic network analysis is based on network analysis, unlike traditional network analysis, it explores implicitly shared meanings of symbols or concepts in texts rather than explicitly perceived communication structure among actors (Doerfel & Barnett, 1999; Doerfel & Marsh, 2003). Metaphorically speaking, the semantic network represents the associations of neurons responding to symbols or concepts that are socially constructed in human brains. That is, it is a relationship of shared understanding of cultural products among members in a social system (Monge & Contractor, 2003).

Application for online social capital

Semantic network analysis can be applied in online social capital research by identifying the structural properties of online content. Through cluster analysis and multidimensional scaling (MDS) technique, the semantic network analysis uncovers what people talk about.

Also, the semantic network analysis can compare the meaning structures between groups. As an example, Figure 2 shows the semantic networks of a social issue, the Korean media reform bill of 2009, between writings by professional journalists and bloggers in South Korea (Lim, 2011). Although the two networks are based on a single social issue, their structures appear to be quite different. Regarding formal journalism from newspaper agencies, the semantic network presents a dense network and a large cluster focused on the main event. Conversely, the semantic network of blogs is relatively sparse and includes diverse issues, such as politicians' fights and violence. As such, the semantic network structure can indicate the homogeneity or the heterogeneity of information within each group.

These two features of the semantic network analysis provide a hint to measure the quality of social relations, such as social trust, reciprocity, or conflict, as well as the type of information, such as cohesiveness or diversity of information. Keyword identification and mapping of linked words or concepts can indicate the shared meaning between group members. In a semantic network of a social group, from the presence of negative words or concepts that are connected to an issue related to a person or an organization, we can infer the group's lack of trust. Conversely, if there are positive words, the group shows trust. Likewise, the shared meaning structure can represent the norm of social trust in a group.

The semantic network structure also indicates the type of information. As seen in Figure 2, the semantic network analysis can identify the cohesiveness or the diversity of information structure in a social group. Traditionally, socially diverse networks that have many weak ties and structural holes are more useful for job promotion, innovation, productivity, and performance because of diverse information distribution without redundancy (Burt, 1992, 2004; Reagans & Zuckerman, 2001). That is, the structure of the social network determines the information flows and quality. However, this theoretical reasoning seems to be vague because the relationships between social network structure and information have been investigated indirectly, focusing on the association between the social network and its outcomes (e.g., Reagans & Zuckerman, 2001; Tsai, 2001). For this reason, as a direct measure of information structure, the semantic network analysis can be considered for better understanding of the structural relationship.

Semantic network analysis: limitations and future directions

As discussed above, the semantic network analysis is a useful tool to measure the quality of online social capital. However, several challenges can arise. The first challenge involves the data collection of various types of online content. Because of the development of Internet technology, people can communicate using multimedia formats, such as movie clips, pictures, and music on the Web. Usually, semantic network analysis tools have focused solely on text format, thus excluding many other types of online content. By limiting semantic network analysis to textual data, the

analysis can be augmented by analyzing discussions to uncover communication patterns produced by the actors. Because information of the communication thread is often embedded in the messages (i.e., email addresses or @tweets on Twitter) and the development of the discussion (see Vergeer & Hermans, 2008). Therefore the change in the meaning structure within groups can be monitored. This combined approach would overcome limitations regarding the static nature of semantic network analysis.

A final challenge is the limitation of multi-lingual analysis. Currently, most of the semantic network tools have focused on English-based language. Although recently a multi-lingual tool, ZIPF (Elbirt, 2009), was developed, it has the limitations caused by different grammatical structures of different languages and cultural factors (Kwon, Barnett, & Chen, 2009). Alternatively, a (semi-)automatic translation prior to semantic network analysis might be an option in the short term. These challenges provide a future direction of the semantic network analysis.

General discussion and conclusion

In this study, we presented an overview of social capital in Internet studies and presented examples of analysis for studying online social capital. Because social capital refers to the capital of people, groups, and organizations, these examples show a slightly different methodological perspective to the study of social capital. It focuses on the online traces that individuals, groups, and institutions leave behind on the Internet.

The analysis of online content and activities has some advantages over traditional measurements of activities using questionnaires. Questionnaires need to rely on self-reported behavior, opinions and attitudes of respondents may contain biases due to socially desirable answering as well as the reliance on people's memory and their perceptions. The measurement of actors' online activities and their produced online content does not contain these biases. The same holds for sampling issues: today's surveys suffer from considerable non-response, leading to reduced external validity of non-response is non-random. In the online realm, other sampling issues arise, for instance how to define the population under investigation and delineating this empirically. If actors belong to a more or less formal group, this can be easy, as is the subsequent data collection that often is (semi-)automatic.

These new and automated methods also have a drawback in that they are only able to collect online data. Especially, because the online and the offline worlds are increasingly intertwined, traditional research has the benefit to collect data distinguishing between these worlds. An additional advantage of questionnaires is that it allows for the measurement of attitudes and opinions, even though the measurements are obtrusive.

Because no research approach is perfect and therefore not able to completely capture the complexity of social phenomena, the alternative is to use different research approaches combined. Using established and new research methods along side of each other, whether this is called methodology triangulation (Murray, 1999) or mixed methods (Creswell & Plano Clark, 2007), increases the validity of the research outcomes. For instance, there is often a discrepancy between what people say and how they actually behave. By comparing what people say on how they use, for instance, Facebook or Twitter, and also observe what they actually do on these platforms allows us to establish behavior in far greater detail and with more validity

than using just one of the two. Furthermore, multiple methods supplement each other: webometrics is particularly suited for measuring online activities, whereas questionnaires are particularly suited to measure attitudes.

Analysis of online traces of people's activities, whether these are hyperlinks between sites that allow for finding dispersed information on the Web or indicate some kind of affiliation or meaning on the Web through semantic network analysis, or traces of communication activities, can help in understanding how actors act on the Web. It also provides information on how groups and individuals are connected and how this connectedness can influence the flow of information between these actors. Moreover, well connected websites allow visitors to navigate to multiple sources and be better informed than when websites are sparsely connected.

Semantic network analysis shows promise in measuring general opinion and sentiments on the Web. One such sentiment, the level of trust, is essential for social capital. Trust is considered essential for cooperation between people and organizations to reach common goals (Putnam, 2000). Semantic network analysis allows for the analysis of these sentiments at a group level and determines whether these groups display trust in each other. If these research strategies can evolve to a more explanatory approach, for instance by relating the activity of users and groups to changes in sentiments and changes in hyperlinking, the research on social capital on the Web will take great strides forward.

To answer the research questions on online social capital using webometrics more thoroughly, the use of theory, or at least some kind of reasoning, is strongly recommended. Lo and Wei (2010) showed that a mere one in two published articles focusing on new media and political communication uses theory explicitly. To enlarge scientific knowledge, research needs to build up on existing knowledge, using advanced methods because now we are entering the era in which the Internet is no longer necessarily new and novel (Peters, 2009).

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Notes

1. What constitutes as a new medium dependents on when the claim is made. At one point in time all media were new media. Also, all new media eventually will be labeled traditional media.
2. Cited 396 times (source: Web of Science)
3. There are several semantic network tools: CATPAC (Woelfel, 1993, 1998), WORDLINK (Danowski, 1993), VBPRO (Miller, 1997), AUTOMAP (Diesner & Carley, 2004), LEXIMANCER (Smith & Humphreys, 2006), and ZIPF (Elbirt, 2009). Although these programs have different data processes, they are all based on a similar algorithm, word co-occurrence.

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