A HYPERLINK NETWORK ANALYSIS OF CITIZEN BLOGS IN SOUTH KOREAN POLITICS

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Abstract

Citizen participation may become more deeply integrated into political environments as digital communication technologies such as the Internet and mobile phone are increasingly embedded in everyday life during the coming decade. In the Asian context, there is already an important role for digital media in the political arena as participatory communication channels in high-tech countries, such as South Korea, as well as in technologically less developed countries like the Philippines. In particular, the political use of blogs has been increasing due to the possibility to publish material online quickly and to distribute content with other bloggers. Because of these characteristics, blogs are perceived as both personal and collaborative media. The relational aspects of blogs, however, have not been sufficiently explored. That is the objective of this article and, based on data collected in July and August 2005, two analyses are presented. First, we examine citizen blogs that politicians frequently visit. Second, we analyse the co-inlinks to citizen blogs and attempt to ascertain the relation between these co-inlinks and the inter-linkage patterns among citizens. The findings indicate that the preferred target of politicians' blogs is more likely to be those blogs maintained by citizens who explicitly express a political stance. In addition, the co-inlinks from a politician's list of neighbours to citizen blogs is associated with the inter-linkage network structure.

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Introduction

In a recent review about how communication and technology researchers study the Internet, Walther, Gay and Hancock (2005) remark that previous studies have focused on either the interlinking function of information through hypertext or the divergent effect of different hyperlink structures on a user's cognitive processing of political information. Much Internet research has concentrated on specific aspects of hyperlinks, like interactivity (McMillan, 2002). This has been studied, for example, in the context of political websites (Sundar, Kalyanaraman & Brown 2003) and online newspapers (Trentayne 2004). In contrast, the investigation presented in this article is substantially different from this traditional line of communication research where links on websites are analysed as a part of the technical interfaces comprising a larger human-computer interaction system. Just as the Internet can be conceived as a combination of different media (e.g., text, audio, video, data), a hyperlink is not a monolithic construct and can entail several activities with important implications for communication. The position taken here is that defining a hyperlink only in technical terms hinders understanding of the social roles such links may perform through facilitating networking among people and organisations.

One of the less studied areas in Internet research is how link features embedded in the Web are used to establish forms of political affiliation between social actors, in particular the relational aspects of online political communication. The objective of this article is to investigate the hyperlink structures and the accompanying features of citizen blogs that are popular in South Korean politics. To do this, we examine a set of blogs maintained by citizens listed on the blogs of National Assembly members in South Korea. Next, we analyse co-inlinks to citizen blogs and attempt to determine whether there is a relationship between the inter-linkages of citizen blogs.

There are three underlying motivations for this study. First, during the past decade citizen participation has gradually become more deeply integrated in political environments as digital communication technologies such as the Internet and mobile phone have become embedded in everyday life. In the Asian context, we have witnessed a strong role of digital media serving as participatory communication channels in both high-tech countries such as South Korea and in technologically less developed countries like the Philippines (Rafael 2005). However, it has rarely been examined how the daily practices of political communication among people is represented in their use of the Internet outside of Western countries (Kluver & Banerjee 2005). Second, one of the least understood phenomena in the new ecology of political communication is the use of hyperlinks to build public recognition, to demarcate ideological spaces, and to reflect on political alliances (Park, Thelwall & Kluver 2005). The purpose of this article is to examine the interaction forms of political hyperlinks established by citizens with some visibility in Korean politics. Since little attention has been paid to the relational patterns of Internet-based communication networks between political websites, this study contributes to the literature on how the Internet is affecting the political practices of networked society. Third, there has been substantial growth of blog communities across many countries. In late 2004, Perseus.com (2005) estimated that about 10.3M blogs were hosted by major blogging service providers such as Blogger (http:/www.blogger.

com) and LiveJournal (http://www.livejournal.com). In particular, the networked communication use of a blog has recently been increasing due to the ability not only to publish quickly but also to distribute uploaded content with other people (Blood, 2000; Mortensen & Walker 2002). Blogs are, in this manner, perceived as both personal media and collaborative channels for communication. The relational aspects of blogs in politics, however, have not been sufficiently investigated.

Internet and Politics in South Korea

The Internet is a rich and efficient resource for those interested in receiving or providing political information and contributing to political engagement. The impact of the Internet on political communication, however, is not limited to just the advanced techniques of dealing with information relative to analogue media. Studies suggest that the Internet has been one of the key information technologies involved in transforming the political system, and especially the communication process (Davis 1999; Lusoli 2005; Sunstein 2001). For instance, aspects of the Zapatista movement in Mexico has been widely adopted and deployed in a variety of political, spatial, and situational contexts due to the successful use of the Internet (Garrido & Halavais 2003). It is also becoming an increasingly significant part of the political structure in Asian nations (Kluver & Banerjee 2005). The network attribute of the Internet is altering the political landscape and relations, from a mechanism of hierarchy and power to a range of network forms across Asia. As the cyber-optimist camp argues (Negroponte 1995; Rheingold 2003; Toffler 1980), various types of information technologies, including the Internet, seem to have permeated society and have become a driving force modifying and changing the traditional information network. Analyses conducted on a range of Asian nations – the Philippines (Rafael 2005), Singapore (Soon & Kluver 2007), Hong Kong (Chan 2005), Japan (Tkach-Kawasaki 2003), and South Korea (Kim & Park 2007; Park, Thelwall, & Kluver 2005) – have contributed towards a broader understanding of the socio-informational networking impacts of the Internet on communication practice in politics. The Internet has become a valuable resource for citizens and political organisations to get their messages out to others and to form ah-hoc social networks, known as "flash-mobbing" (Rheingold 2003).

South Korea can in many ways be regarded as an appropriate place for understanding issues in social science research on Internet and politics. Over the past several years, there has been a remarkable growth in the use of the Internet among South Koreans (Park & Biddix 2008). South Korea had the 11th highest Internet penetration rate as of December 2004, according to the most recent data available at Internet World Stats (http://www.internetworldstats.com). Almost two-thirds (63%, 31.6 M of 49.9M) of the population accessed the Internet as of December 2004. In the case of broadband subscribers, 11.9M Koreans (24%) used high-speed Internet networks as of June 2004. This is the fourth largest number of broadband netizens in the world. Korean is one of the top ten languages used on the Web. In addition, there has been a fast diffusion in the adoption of blogs in South Korea. According to a recent government report (National Internet Development Agency of Korea, 2005), 41 percent of South Korean netizens have accessed a blog at least once, and Korea's blog population is estimated to be 9.48 million. In other words, about a third of the Internet users in South Korea have their own blogs. These

developments, taken together, contribute to Korean blogs as an interesting venue for social science investigation.

South Korea, in many ways, has been seen as an ideal test case for understanding the political use of the Internet (Park, Thelwall, & Kluver 2005). Not only has Internet penetration been high, but many political actors including citizens have employed the Internet as a powerful channel to wrest politics away from traditionally elite groups (Kluver & Banerjee 2005). For instance, during the 2000 Korean National Assembly election, civic groups made public on the Internet a "black list" of 86 "unfit" candidates. Although causality cannot be determined between this use of the Internet and election results, 58 of those 86 candidates lost the election. It is popularly known that the public activities in cyberspace have also had an important influence on boosting people's voting rate as well as grassroots participation in the election of President Roh Moo-Hyun in December 2002. For example, an Internet-based supporter club had urged young people (under 40) to take part in the presidential polls, a group usually reluctant to vote, and also provided them with up-to-date information related to Roh via the Internet. In the latest 2004 national elections, civic and advocacy groups formed a representative body named "Red Card 2004" and carried out an online campaign for rejecting certain candidates prior to and during the election campaigns. It must be noted that the suggested relationships between civic electoral campaigns and election results or voting behaviours have not been statistically tested. The Internet use during the recent 2007 presidential election has not yet examined in detail (Park & Lee 2008).

In summary, public campaigns in cyberspace against or for particular candidates have been popular in Korea. The strategy of civic groups in this regard seems twofold: information dissemination and facilitation of political engagement. The first part of the strategy involves provision of detailed information about the candidates on the Internet, including information on their financial status, military service and social contributions. In negative campaigns, groups have disclosed details of candidates regarding criminal records, tax payments, and ideological preferences. The second part of the strategy involves groups building collaborative arrangements with non-profit organisations, political practitioners and citizens, and encouraging citizen participation in electoral campaigns.

Blogs and Hyperlinks

Political communication on the Internet transpires at many levels and through multiple media, and this article illustrates how link channels of blogs are used in the process of networking. We highlight the current and emerging ways in which bloggers link to and interact with other people in the blog sphere. Blogs, a phrase combining the words "Web" and "Log", are often defined as online personal websites and are structurally different from the traditional personal homepages in terms of form, style, and the way in which content is posted and links are addressed (Blood 2000). The components of a blog include: posts (consisting of links, diaries, reflections, and audiovisual material), a space for comments by visitors, updates arranged chronologically, sidebars for personal items such as a blogger's navigational index, links, and a calendar.[1]

Blogs have two distinctive features. The first is diversity of content. Every imaginable topic of interest among netizens is posted on blogs. The accompanying

characteristic is unlimited freedom of communication in terms of reading and citing other blogs, and linking to them. The term "SlashDot Effect" has been coined to express the network impact of blogs on the diffusion of information. Once an issue gets a significant amount of attention from SlashDot.com bloggers, it is rapidly circulated in cyberspace. Strangers can also set up links to the blogs of others. According to Lenhart, Horrigan and Fallows (2004), 46% of blog readers have visited these online diaries of strangers. Mutual reading and referencing among strangers may be becoming a casual communication device.

The next and the most important feature of blogs is the structure of continuous ties. In other words, the blog sphere is massively distributed and highly decentralised, but at the same time it is a collective territory composed of interconnected social networks as discussed in the "Small World" literature (see Milgram 1967). However, the "connectedness" aspect of blogs can be (heavily) subject to the category types of blogs. Herring and colleagues studied the structural properties within conversation-oriented blogs (Herring et al. 2005) and question the popular assertion that a blog sphere is a densely interconnected social space. Their investigation suggests that prestigious blogs, which have a higher number of links from other blogs, play a significant role in shortening the distance between ordinary blogs, but the links tend to be weak ties that are usually one-directional. Further, a majority of blogs in their sample link to very few other blogs, implying that the blog sphere is only partially interconnected.

A common feature among blogs and traditional homepages is hypertext linking. Linking is a technological capability that enables a specific website to connect seamlessly to other sites. However, linking may be considered not only a technological tool, but also a communication channel that enables individuals to stay connected with family members, friends, and colleagues. In the field of science communication, hyperlinks among scholarly web documents or institutions are often comparable to academic citations (Park & Thelwall 2005). Moreover, the configuration of link networks themselves can be a source conveying useful overall information about the (hidden) online relationship of communication networks in interpersonal, inter-organisational, and international settings. This is particularly the case when indexed in "blogrolls," lists of links in the sidebar of a blog. The term "permanent link" refers to the links set up and maintained by bloggers for regular navigation and frequent visits to linked blogs. The links can be regarded as indicative of the communication networks of the bloggers, that is, (in)formal association with the other blogs linked.

Several studies describe and speculate on the relationship developed via hyperlinks (e.g., Park & Thelwall 2003, 2008ab; Thelwall, Vaughan & Björneborn 2005). Typologies of link analyses are growing at a rapid pace, making direct comparison between previous studies. Thelwall (2005) suggests that there are four major disciplinary approaches to studying hyperlinks: Physics, Computer Science, Library and Information Science, and other social sciences including Communication Science. The link analyses in the natural sciences and engineering suggest that the Web is a small world that can be reflected in a mathematical model (Barabáasi 2002; Pastor-Satorras & Vespignani 2004) and others have produced an algorithm best suited to retrieving Web information with search engines (Brin & Page 1998). Related social-scientific investigations have been conducted about various information and

communication aspects of the Web, mostly using the applied techniques of bibliometrics (Thelwall 2004) and/or social network methods (Park, Kim, & Barnett 2004). The discovery of information networks among websites or among site producers through the analysis of link counts and patterns, and exploration into motivations or contexts for linking, has been a key issue in this social science literature.

Several blog link analyses have been conducted since blogs began to rival traditional websites. However, the research tradition discussed above still seems to prevail in blog-specific link analysis. An illustration of this is a statistical model developed for blog-ranking systems (Adar et al. 2004), community formation of blog space (Kumar et al. 2003; Adamic & Glance 2005), and the detection of a power structure present in a blog space (Shirky 2003). There have been, however, few in-depth quantitative link analysis studies of blogs in the political arenas. Forms of social link analysis based upon identifying or interpreting links between blogs have been performed in the investigation of connections between cities (Lin, Halavais & Zhang 2007), and between political (Hargittai, Gallo & Kane 2005; Williams et al. 2005) as well as conversational (Herring et al. 2005) blogs.

Lin, Halavais and Zhang (2007) analysed links among blogs in a study of interpersonal social networks and social cohesion in U.S. cities. They found that links among blogs can be regarded as empirical indicators of relationships between cities. In particular, links embedded in political blogs can be taken as a technical indicator of the ideological landscape of a blog sphere being studied. Expanding Sunstein's (2001) point about the cyber balkanization of the Internet, Adamic and Glance (2005) crawled large-scale link data and demonstrated that a sort of political divide is taking place in a blog sphere. Their analysis reveals two clearly distinct communities with different political orientations, with liberal and conservative values and with little overlap between the two groups in terms of information sources and references linked. On the other hand, Hargittai's group (2005) produced counter-evidence to the balkanization claim. They examined cross-ideological linking patterns among political blogs and, more specifically, both the target point of permanent links and source links of information that bloggers use in making postings. The findings from Hargittai and colleagues point to the same political divide observed by Adamic and Glance (2005), but this time within the U.S. context. At the same time, bloggers do not always address just liberal bloggers, as Sunstein (2001) has remarked. The same situation is also likely the case with conservatively oriented blogs.

There are three implications from prior link studies important for further investigations. First, early examples of social-scientific blog link investigations include the identification of social (communication and information) networks among blogs and/or their producers as well as factors associated with link formation and development. Second, similar to linking practices in traditional websites, the link patterns of blogs are more likely to be case-sensitive or sector-specific phenomenon. Arguments on the blogs vary according to the specific data and context under investigation. Finally, evidence of political communities can be revealed through hyperlinks of blogs and the underlying dimensions of networked communities may be made clear.

Analysis of Citizen Blogs Frequently Linked by Politicians

This article explores the link practices of citizen blogs in South Korea by conducting two interdependent analyses. First, the link features of the citizen blogs frequently selected by politicians are examined. Second, the inter-connectivity among citizens is considered.

Sampling Procedure

The sampling procedure involved, first of all, visiting the official websites of South Korea's National Assembly members who were elected in April 2004 and collecting the blog URLs. Second, when information about the blogs of Assembly members did not exist at their websites, we searched further using commercial search engines such as http://www.naver.com, http://www.empas.co.kr, http://www.google.co.kr, http://kr.yahoo.com, and http://www.daum.net. Third, we used an iterative collection process starting from the list of Assembly members' blogs, based on the above procedures. We followed permanent outlinks contained on the side bars of already listed politician blogs in order to collect blogs that might have been missed.

Some 124 politicians out of 299 National Assembly members maintained personal blogs. The majority of blogs, for 115 Assembly members, used the Naver blog service, which is considered the most popular Web-based blog service in South Korea. These blogs were included in the sample. However, we excluded a few (8 in total) inactive blogs from the sample that had no more than an initial posting, and a small number of politicians using other blog services such as Empas (2) and Morning (7). Some politicians had more than one blog at two different hosts; in such cases, the blogs at Naver were included in the sample. In sum, 107 blogs were selected for this study.

Linked Citizen Blogs

The research question addressed in this section of the article is: What type of citizen blog occupies the most prominent position relative to other blogs in the blog sphere produced by South Korea's politicians? Here, we analyse the characteristics of citizen blogs frequently linked by politicians. We try to determine the nature of the relationship conveyed through links and what elements influence the affiliation between politician and citizen blogs.

The so-called "neighbour" section of blogs maintained by the Assembly members contains both those of peer politicians and lay citizens. We found that the 107 blogs of National Assembly members of South Korea contained 1,418 citizen blogs on their neighbour sections. An asymmetric matrix, S, 107 politician by 1418 of their citizen neighbours, was constructed. When there was a permanent link between two individual blogs, a 1 was placed in the proximity (also called "adjacency" and "co-occurrence" in the terminology of social network analysis) matrix; if there was no connection, a 0 was recorded. In other words, each cell, s_{ij}, indicates the absence or presence of the links among nodes (i.e., blogs), $_i$ and $_j$. This forms a binary connectivity matrix of the links. S is asymmetrical ($s_{ij} \neq s_{ji}$) since there exists directionality between the links. The source and receiver of the links are differentiated. The data on the existence of inter-domain permanent links embedded in the index sections of blogs was collected through navigation of blogs. In a blog sphere at Naver,

permanent links are set up within the title bar named "neighbours" which implies that linked blogs are more likely to be the friends of the blog owner rather than his/her opponents. Both the selection of politician blogs and the data collection of out-linkage connectivity from those blogs were performed during July 2005.

The 107 blogs of South Korean politicians contain 1,418 citizen blogs on their neighbour sections. The degree of linking to citizen blogs varies greatly between Assembly members, which was contrary to our expectation. While 3 members (2.7%) had designated more than 147 citizens as their neighbours, 46 members (43.0%) were isolated, linking to none of the citizen blogs (42.1% linked to less than 30 citizen blogs, and 12.2% to 31-120 blogs; Mean: 16.2, SD: 38.3).

This is an interesting finding since the more citizen neighbours to whom a politician has linked, the more likely that politician is to be competitive relative to others in terms of navigability. For example, a politician's website with a number of outgoing links can encourage people to visit the site often since it acts as a gateway to other sites. If there is an increasing frequency of neighbour links directly flowing through the blog of a politician, it may indicate the politician's role as the online community leader as well as the information hub for the community.

One Assembly member, Gi-Nam Shin, had set up links to 224 citizen blogs. However, his colleague in the same party, Han-Gil Kim, did not link to any citizens, excepting his wife. This implies that there are different uses of blogs among politicians. As the society moves into the information age, some politicians might position their websites as political portals for the general public. Similarly, link connectedness on their blogs may be a good indicator of navigational usefulness. On the other hand, some other politicians (e.g., Han-Gil Kim) may include a family photo as the main image on the blogs. In contrast to an official campaign website, a blog may be considered a form of personal expression or publication. Thus, linking may not be random activity, but specific to individuals.

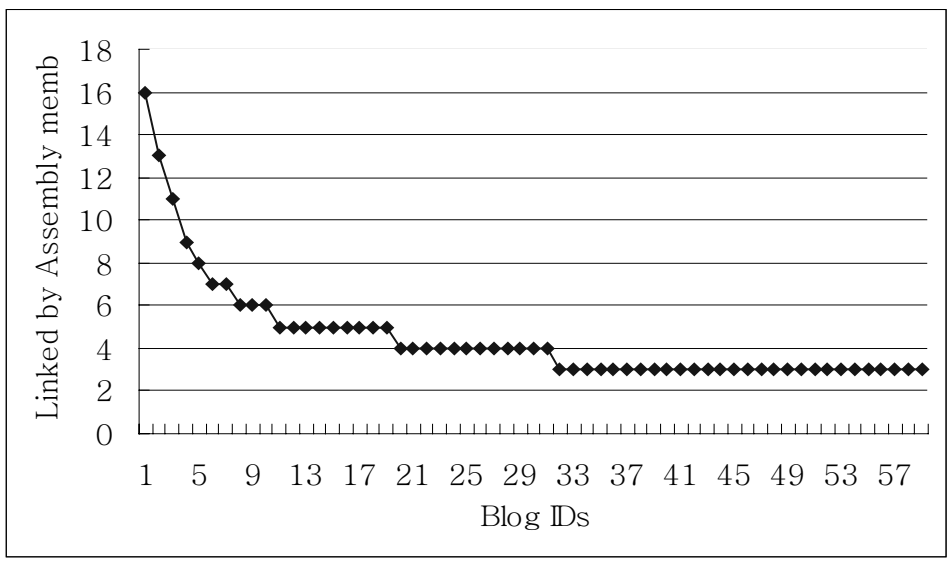
The total number of times all of the 1,418 blogs is linked in the 107 politician blogs is 1,736. Of the 1,418 blogs, only 170 blogs (12%) maintained by citizens are linked by members of the Assembly two or more times. The mean number of citizen blogs linked is 1.22 with a standard deviation of 0.89, which suggests that the majority of the sample of Assembly members has different citizens as their neighbour blogs. Distribution of 1,418 citizen blogs in terms of the number of politician blogs linking to them is summarized in Table 1. However, the linked numbers in Figure 1 reveal that a few citizen blogs were frequently selected by Assembly members. For example, one blog (successc7) was linked by 16 Assembly members. The names of individual bloggers were identified, but are not indicated in this table. Blog names are noted in the description of the findings when such identities contribute to the clarity of the argument.

A follow-up qualitative analysis of the titles of the blogs complements the above findings. First, the preferred target of politicians' blogs is more likely to be those persons who explicitly express a political stance. The titles of the citizens' blogs are self-expressive and strongly imply ideological affiliations in Korean politics. Illustrations of this include: "the truth and falseness of private-school law" (josjosjos, linked by the 7 Assembly members), "A whispering report at pick-up news" (zenokin, 7 inlinks), "Patriotism for my country and ethnic, Jong-Phil Kim" (Jong-Phil Kim is one of the most conservative politicians) (jskim8878, 5 inlinks), "A political

Table 1: Distribution of 1,418 Citizen Blogs Among 107 Blogs of Assembly Members

Frequency of being linked	Number of citizen blogs	Percent
1	1248	88.0
2	111	7.8
3	28	2.0
4	12	0.8
5	9	0.6
6	3	0.2
7	2	0.1
8	1	0.1
9	1	0.1
11	1	0.1
13	1	0.1
16	1	0.1

Figure 1: Inlink Frequencies for 59 Top Citizen Blogs



documentary program" (paragon20kr, 5 inlinks), "Somebody's thought, wiping out pro-Japanism" (tank1801, 4 inlinks), "My love Han-na-ra party" (Han-na-ra, meaning Grand National Party, is a major opposition party) (mahomet12345, 5 inlinks), "Four bad laws to divide Koreans" (anti4bad, 8 inlinks). These titles suggest that citizen blogs function as a vanguard for creating perceived community boundaries rather than being a neutral online source of political information. The majority of postings in some of the blogs contains severe criticism about current politicians and is sometimes specifically directed at incumbent President Roh (see, e.g., zenokin). One blogger (jj123219), with four inlinks from Assembly members,

displays his/her debate with another blogger (chumiaelove1) whose favourite politician is described (post is located at http://blog.naver.com/jj123219/80015250265). This differs from a finding by Park and colleagues (2005) that political websites tend to achieve credibility through appearing like a credible portal and by providing links for information-oriented content. However, citizen blogs having a high visibility in South Korean politics tend to place more emphasis on attracting new supporters and mobilizing existing supporters, and employing an aggressive strategy to state their own opinions rather than simply collecting or linking to political information. This is similar to the campaign strategy that was used by the U.S. Presidential candidate Howard Dean in 2004 (Williams et al. 2005).

Next, we explored the extent to which links reveal sympathetic or hostile intent based on metaphors or other verbal forms provided through links. Blog producers tend to sort their neighbours with labels, which might reveal an editorial footnote or author's comment to the user about how to approach or receive information from the linked blog. It seems that popular citizen blogs demonstrate an active, issue-campaigning approach rather than a cautious, more reserved approach. The metaphors citizens use are straightforward. For example, civic bloggers name some of their neighbour Assembly members as follows: "Here are people who give me energy" (zenokin), "Genuine conservatives" (jskim8878), "Our king President Roh and his people" (asraee), "Politicians I am keen on/Sites I don't like" (pargagon20kr), "People of right" (tank1801), "Alumni and friends" (artlife), and "Sir; National Assembly members" (greme21). This is generally consistent with Sunstein's (2001) argument that links are more likely to target issue-specific affiliated sites. The findings suggest that there is no reason to expect that collaboration should always result in a link or that the motivation for link creation need be attributable to the authority, reputation, or quality of linked websites.

Analysis of Links Between Citizen Blogs

The second group of questions we address is whether citizen blogs popular in South Korean politics are close to each other: How close are they; who is central and peripheral; are there any sub-groupings? Further, like in co-citation analysis, we examine the extent to which the structure of co-inlink matrix to citizen blogs is similar to that of the inter-linkage data. Further, we attempt to determine the structures of co-inlink and inter-linkage connectivity.

Co-linkage and Inter-linkage Connectivity

Of the 1,418 blogs, 1,359 citizen blogs with one or two inlinks from Assembly members were excluded from the analysis since they did not play a significant role in the blog sphere under study. Also, over 1,000 citizen blogs would be too extensive to achieve meaningful results due to the large size of the resulting link matrix. We visited each of the 59 citizen blogs during August 2005 and collected the inter-linkages among those blogs. Using the information about the neighbour blogs of the 59 citizens, we prepared an inter-linkage asymmetric matrix. The number between row $_i$ and column $_j$ is a 0 or 1 depending on the absence or presence of permanent links between citizen blogs. This is asymmetrical ($s_{ij} \neq s_{ji}$) with directionality of the links such that it was later symmetrised to compare with co-inlink matrix among the 59 citizens' blogs. An asymmetric matrix was changed into a symmetric matrix

applying the following the routine: If there is at least one permanent link between citizen blogs, $_i$ and $_j$, a 1 is coded between row $_i$ and column $_j$. In other words, if there is blog $_i \rightarrow$ blog $_j$, it is treated as blog $_j \rightarrow$b log $_i$ and vice versa.

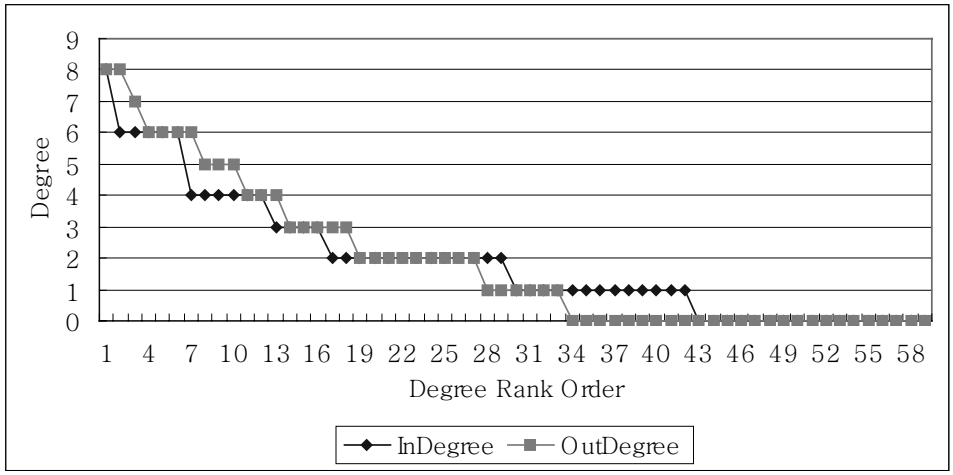
In the second research question, we are more interested in the co-inlink pattern among the 59 citizens' blogs rather than communication flow from Assembly members to citizen neighbours. Note that there are two kinds of colinks (Björneborn & Ingwersen 2004; Thelwall 2004): co-inlinks (termed "colinked" and equivalent to "co-citation" in scientometrics) are links to two different websites, in this case, blogs from a third site, while co-outlinks (called "colinking" and analogous to "bibliographic coupling" in Scientometrics) are links from two different websites to a third site. In order to make a co-inlink matrix among the 59 citizen blogs, a two-mode asymmetric (called "affiliation" in social network analysis) binary matrix, 107 politicians by 59 citizens, was constructed. This matrix, 107 politicians by 59 citizens, was converted into a one-mode symmetric matrix, 59 by 59 citizen blogs. This conversion process was conducted based on a cross-product algorithm using UCINET for Windows (Borgatti, Everett & Freeman 2002), a popular network software program for this kind of analysis. Each cell, s_{ij}, indicates the number of the Assembly members' blogs with permanent links that jointly point to nodes (i.e., citizen blogs), $_i$ and $_j$. The values between cells in the co-inlink matrix were later dichotomised. The criterion for binarisation was that the value was greater than or equal to the mean number of all values in the matrix, which is a frequently-used procedure in social network analysis.

Inter-linkage Between Citizen Blogs

Degree Centralities. Freeman's Degree centralities were calculated in order to examine the concrete picture of the link network (Freeman 1979). Degree centrality measures the number of direct connections between actors in a network (Freeman 1979). The centralities for the 59 citizens are presented in Figure 2. Because of space limitation and analytical considerations, individual centralities are not shown in the figure. Still, some of these are worth noting. The inlink centralities of link network show that the "christen78" (8 links) is the most central node in the network among citizens. Next, "kwcl" (6 links), "tank1801" (6 links), "dkfmal1769" (6 links), "asraee" (6 links), and "dm7208" (6 links) are the most central nodes. Seventeen citizens were found to be isolates with no inlink from other people. The direction of links was examined. Outlink centralities indicate that citizen blogs by "tank1801" and "asraee" occupied the most central positions in the link network; both had 8 outlinks. The second largest linking blog is "dm7208" (7 outlinks) and "zenokin" (6 outlinks) followed. The number of outlink isolates was much more than that for inlinks. Twenty-six citizens did not construct any neighbours with other people within a group. The Pearson correlation between the inward and outward links is .424 ($p = .000$, 1-tailed), indicating that there is a fair degree of similarity in link flows among citizens (Mean: 1.92, SD for inlink and outlink, respectively: 2.31 and 1.95). However, it should be noted that the most central blog "christen78" in the inlink network was, surprisingly, the most peripheral in the outlink network.

One of the most interesting findings is the position of "ppan1" which is very popular in terms of the number of postings. At the time of the research, the contents of "ppan1" have been cited 883 times by other Naver blogs and 159 Naver bloggers

Figure 2: Distributions of Degree Centralities of 59 Citizen Blogs



chose the blog as their neighbour, setting up permanent links to the blogger. The blog was also linked three times by members of the National Assembly. However, none of the 59 citizens had either inlinks to or outlinks from the blog. This may be partially explained by the fact that "ppan1" is trying to collect a wide variety of informational news on cyberspace from various perspectives. As a result, arguably, other actively-working citizen bloggers do not take the blog as either their ally or enemy, in spite of its superiority with regard to informational features. Another interesting finding is that the most favourite neighbour blogs among the Assembly members (successc7, plekhanov, koins69, ecms2) are, relatively speaking, less visible and get few or no links from other citizens. However, high centrality scores for "tank1801" and "asraee" among the 59 citizens are quite intriguing. Those blogs were ranked in the 20th and 23rd positions, respectively, in terms of inlinks from Assembly blogs. The high (inlink and outlink) centrality scores (a total of 14 links) of "asraee," compared to its position in the outlink network of Assembly members, could be partly explained by the fact that it contains large amounts of ideologically-oriented content.

For determining the structure of the hyperlink network, density was measured. Density is the actual number of links divided by the number of possible links, [n(n-1)] (for directional data). It is considered a good measure of group cohesiveness or knittedness (Wasserman & Faust 1994). Among the 59 blogs the system density is 0.033 (SD = 0.18). There are 113 links, with a possible number of 3,422. This network is very limited. Less than 4 percent of the potential links among the blogs are present. Along with an indicator of density, network centralisation is also useful for examining the overall characteristics of the network. Centralisation (or global centrality) indicates the extent to which a network is organised around its most central point (Freeman 1979). Centralisation (or global centrality) shows the extent to which a network is organised around its focal point (Freeman 1979). Interestingly, the centralisations of inlink and outlink matrices are the same (10.7%). A centralised network (the higher percentage, the more centralised) may reflect an uneven distribution of resources (in this case, hyperlinks) such that resources

are concentrated in the central points of the network. Thus, the same value of the centralisations for indegree and outdegree is quite rare, particularly when the correlations between two network centralities are not very high. This sameness does not render a clear interpretation of the data.

Betweenness Centralities. For a more comprehensive analysis, Freeman's betweenness centrality was calculated (Freeman 1979). The values are not presented here, but are available from the first author. Betweenness centrality refers to the frequency with which a blog falls between pairs of other blogs in the group and represents the potential for control of communication, as a broker or a gatekeeper (Freeman 1979). Betweenness centrality measures information control. The between centralities comprised of symmetrical and asymmetrical data showed that the progressive blog "tank1801" is by far the most central node in two measures. While the symmetrical betweenness centrality indicated that "plekhanov" followed by "josjosjos" is the next most central blog, "dm7208" occupies this position in the asymmetrical network. Major blogs in degree centralities, "zenokin" and "asraee", also occupied fairly central positions in the betweenness network. The findings reveal that twenty-two blogs received no link from another blog in the symmetric network. On the other hand, there were thirty-three isolates with none of the links in the other network. Compared to symmetrical network's centralisation (12.3%), its counter-partner value is somewhat smaller (9.6). This may be caused by the larger number of isolates in an asymmetrical network. Overall, as summarised in Table 2, the correlation value between two link matrices is significant at the 0.01 level (Pearson's r = .69, 1-tailed). And, the betweenness centralities are quite similar to those of the degree results. The centrality scores from the degree and the betweenness measures significantly correlate. The highest correlation was between outdegree and asymmetrical betweenness (r = .82). The correlation tests indicate that degree centrality scores – based on the strength of a blog link in terms of the frequency exchanged, betweenness values, and influenced by the pattern of the linkage between the nodes – ranked the positions of individual blogs similarly.

Table 2: Pearson's Correlations among Four Centralities (N=59)

Item	Indegree	Betweenness for Symmetrical	Betweenness for Asymmetrical
Outdegree	.424**	.649**	.824**
Indegree		.607**	.529**
Betweeness for Symmertical			.694**

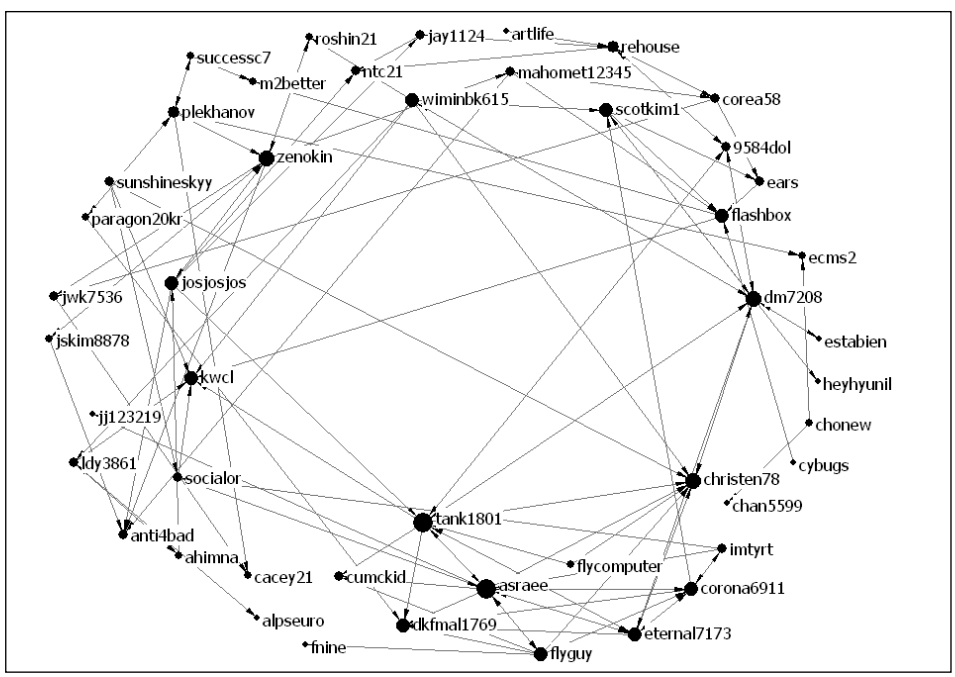
** Correlation significant at the 0.01 level (1-tailed).

Network Diagram. Figure 3 provides a graphic representation of the structure of the link network among 59 citizens. Circle nodes are citizens' blogs and the sizes of nodes are proportional to the number of links a blog sends to and receives from others. An arrow represents a link and its head is the direction of the link. Network figures represent the data at a larger level of aggregation.

Clear ideological trends are visible, with the central blog "asraee" connecting mainly to other progressive blogs (jj123219, christen78, flyguy, tank1801, eter-

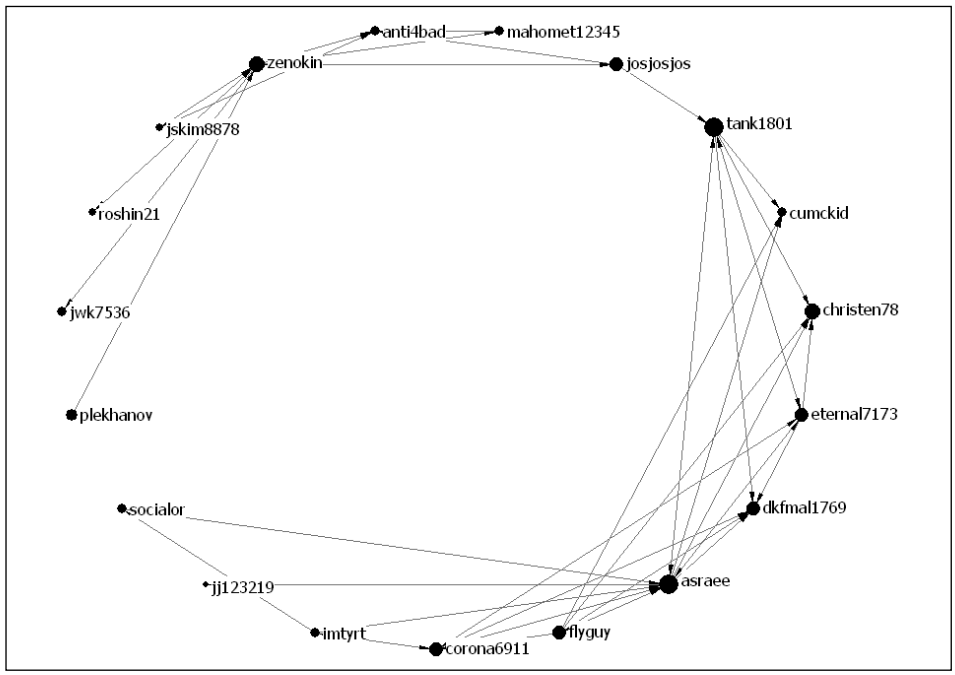
nal7173, corona6911, cumckid, dkfmal1769) within the group. It should be noted that the classifications of progressive and conservative blogs have been made by the researcher's qualitative assessment and are based on a close reading of uploaded postings and evaluations from other bloggers. The majority of the linked blogs (6 out of 8 blogs) provide links back to "asraee", creating a solid ideology-based cluster. The blog "zenokin" with 7 inlinks from Assemblymen occupies a central role in the conservative network, as does "asraee" in the other network. A number of messages contained on the "zenokin" blog deal with the negative aspects of President Roh's regime. There are six neighbours linked with "zenokin": "anti4bad", "josjosjos", "mahomet12345", "jskim8878", "roshin21", and "jwk7536". We can clearly discern the political stance of "zenokin" from one of its neighbour "jskim8878" who calls the blog producer a "genuine conservative." We have also examined cross-linking between two groups. Neither "asraee" nor "zenokin" sends a direct link to blogs linked from the other blog. However, the progressive camp is better organised than the other group in terms of the number of linked blogs, separated by a single step to two central blogs. More interestingly, "successc7", having the most inlinks from Assembly members (16 links), is present as a relatively isolated cluster exchanging a link with "plekhanov" on the top. The blog has only one inlink and 2 outlinks in the citizen's group.

Figure 3: Graphic Representation of Structure of Link Network among 59 Citizens



As shown in Figure 4, an ego-network diagram was used to find which blog has the connection path (in)directly from and to the two major blogs, "asraee" and "zenokin", in the group. In fact, all the blogs of both progressive and conservative groups form single connected groups. The blog "josjosjos" functions as a broker or a gatekeeper.

Figure 4: Ego-Network Diagram



Additional Testing. In analysing "normalised degree centralities" data from both inter-linkage and co-inlink matrices, the Pearson's correlation coefficient between these matrices is .35 and significant at the 0.05 level (p = .004, 1-tailed). Finally, two matrices were compared using the QAP (Quadratic Assignment Procedure) method available in UCINET. In contrast to the above structural tests such as Centralities, QAP shows the extent to which the internal structure of one network is similar to that of another (Wasserman & Faust 1994). In hyperlink network analysis, QAP has been employed to identify patterns of interconnectivity between the websites and to compare the link structure with other attributes of website producers (Park & Thelwall 2003). A statistically significant relationship was found between two network structures although the correlation is weak (Pearson's r = 0.18, p = .000). This means that one might suspect that the more the shared politician neighbours per pair of citizens, the higher possibility of inter-linkage. These two variables are positively correlated. This finding indicates that a co-inlink pattern seems to reflect underlying mutual social connections online.

Interestingly, the results of this research are generally consistent with previous studies. Using student homepages from two U.S. universities, for example, Adamic and Adar (2003) crawled their co-inlinks from another student's "list of friends" and compared the co-inlink network structure with a friendship network based on email list membership or shared topics of interest. They found that co-inlink was a good indicator of possible social connections. This suggests that an internal friendship pattern within a community based on shared neighbours online among the members may match the social nature of the communities studied.

Discussion and Conclusion

In this article we have examined online political communications of South Korea along various dimensions of hyperlink relations on the Web, in this case, the blog sphere. The investigation employed social network indicators for politicians' blogs and the frequency of links to citizen blogs during 2005. We observed that the Internet seems to play a role not only in providing information about politics, but also in fostering community and citizen participation in the South Korean political system. Overall, the data suggest that the Internet has emerged as an important political channel for the diffusion of information as well as for social networking activities in Korea. The main conclusion drawn from the study was that the preferred hyperlink target on politician blogs is more likely to be those maintained by citizens who explicitly express a political stance. The citizens of a politician's list of neighbours are more likely to have an inter-linkage network with each other. These findings were made particularly evident in the visualisations of the relationships. In other words, blog link features may facilitate investigation of politics on the Web in South Korea and may serve as an indicator for such development elsewhere.

Reflecting on the contemporary situation in the social sciences, Borgman (2007, 207) suggests that "the social sciences are facing their own data deluge, as they capture observations of human interaction online, and mine large collections of demographic, economic, and other data sources." As demonstrated in this study in South Korean, substantial amounts of data are available on blogs maintained by both lay persons and formal political actors, including politicians. This article represents an initial effort to apply the knowledge and methods of traditional (social) network analysis and content analysis to uncover previously hidden relations and describe the ideological landscape of sections of the emerging political blogosphere. This approach, network-oriented content analysis of digitalised political communication, is particularly promising because of the visualisation of relationships among data. A small number of research groups are working in this area, such as the Statistical Cybermetrics research group in the UK; see http://cybermetrics.wlv.ac.uk/icr.html. We suggest that the data deluge to which Borgman alludes can be made manageable through the methodological approach presented in this study.

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Note:

1. For a general description and history of blogs, see the Wikipedia entry at http://en.wikipedia.org/wiki/Blog.

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