

Article

Connectivity Practices and Activity of Greek Political Blogs

Kostas Zafiropoulos

Department of International and European Studies, University of Macedonia, Egnatia 156, Thessaloniki 54006, Greece; E-Mail: kz@uom.gr; Tel.: +30-2310-891-487; Fax: +30-2310-891-285

Received: 1 May 2012; in revised form: 19 July 2012 / Accepted: 30 July 2012 /

Published: 14 August 2012

Abstract: This paper uses Social Network Analysis indexes to study Greek political blogs. The indexes describe bloggers' community recommendations, centrality and bloggers' attempt to form spheres of influence. Five Social Network Analysis indexes are used: incoming links, normalized betweenness, outgoing links, number of 1-cliques a blog belongs to, and size of blog's ego-network. By recording 127 Greek political blogs, the paper finds that there are two distinct blog performance properties regarding connectivity: Only a few blogs serve as authority blogs having many incoming links and centrality, while a few others try to expand their influence territory by having many outgoing links and forming larger 1-cliques and ego-networks. Next, the paper associates the proposed indexes with blogs' and users' community activity. Authority blogs present high blog activity and users' community activity, as well. These are recorded by large numbers of posts and comments to the blog posts, respectively. It is shown that blogs, which strive to expand their network by using many outgoing links are more likely to link to the authority blogs. Content analysis reveals that authority blogs provide news and information and promote discussion to a much higher degree compared to the overall Greek political blogosphere.

Keywords: Greek political blogs; centrality; activity; Social Network Analysis; hyperlinks; influence; content analysis

1. Introduction

The blogosphere or universe of blogs is conversational [1,2] consisting of millions of individual blogs that form social networks. Users interact through the unique technological capabilities and enhanced blogging tools for between-blog features interactivity [3], forming communities, sub-communities, links and cliques [4]. The term weblog was first used by Barger in 1997 [5], and it is

defined as “a web page where a blogger “logs” all the other web pages he finds interesting”. *Opendiary*, *Live Journal* and *Diaryland* were the first programs allowing people unfamiliar with web-design to create blogs [6]. LiveJournal is probably the most recognizable of the early sites, while *Blogger* is largely responsible for bringing blogging to the mainstream [7]. In 1999 there were 23 blogs on the internet, by the middle of 2006, there were 50 millions [7]. Technorati.com, the most popular real-time search engine dedicated to the blogosphere tracks 1,301,732 blogs on 23 May 2012.

Political blogs “cover and discuss political issues and also promote certain political parties and views” [8]. Political blogging is a more recent phenomenon [9]. *BlogforAmerica* was created by the Dean campaign in 2000 as an effort to mobilize voters [10]. Political blogs were multiplied exponentially after the events of September 11, 2001 when people used blogs in order to express their political awareness and their feelings about the terrorist attacks and also to locate information not available in the mainstream media [9,11], although blogs with political content predate this terrorist act, for example platforms such as LiveJournal and Blogger.com were created in the late 1990s. Moreover a number of note blogs dedicated to political commentary were established in 2001, expressing a variety of political viewpoints [12]. Tom Watson was the first member of Parliament who used a blog, in 2003 [13]. Ever since then, the number of people engaging in explicitly political blogging has increased, following the overall explosion of blogs [14]. Political blogs form political discourse, call to political action, and request for feedback [10,11,14] and in many situations have exercised important influence over how politics is practiced and policy is developed [15–17]. Moreover, a growing number of political leaders and political parties are using their own blogs to diffuse information to internal audiences, build up a volunteer base, shape their political agenda, mobilize support from their constituency and generate resources [18–20].

Political conversation arises through blogrolls, hypertext links, posts and opinionated commentary. A blogroll is a list of blogs that the blogger frequently reads or especially admires. Blogrolls are indicative of the communication networks of the blogger [21–23]. Posts consist of links to other blogs, to mass media accounts of daily political events with political commentary by their authors, diaries, reflections, and audiovisual material. Comment tools allow blog visitors to contribute their opinions by leaving a reply to a post [12,22,23]. Lu and Hsiao ([24], p. 346) claimed that “posting volume would be a key determinant of content value”.

Social influence describes the phenomenon “by which the behavior of an individual can directly or indirectly affect the thoughts, feelings, and actions of others in a population” ([2], p. 971) and according to Anagnostopoulos *et al.* [25] “the actions of a user can induce his/her friends to behave in a similar way”. In the great number of blogs in existence there is a small group of bloggers that has the largest influence on the public’s perception because of their high profile [26]. The purpose of the paper is to find connectivity patterns of Greek political blogs by using Social Network Analysis, locate influential blogs and associate networking influence with blogs’ activity regarding both bloggers’ and users’ activity. Further, the paper associates social networking properties and activity indexes of the blogs to their content and performance in order to frame the analysis within the political context and understand the impact of Greek political bloggers.

2. Blogs and Social Network Analysis

Social networks are individuals or groups that share social status, similar or shared functions, geographic or cultural connections [27]. These social networks associate their existence with specific needs and interests of their members [27]. They are a fundamental medium for the spread of information and ideas among its members and influence peoples' lives, many times without them being aware of the implications they raise [28,29]. Words, actions or presence of a user may have effects on others' thoughts, feelings, attitudes and actions [30].

Nowadays, people are incorporating technology increasingly into their social relationships [31]. The evolution of the Internet and social media technologies has changed the architectures of social interaction dramatically, thus the formation of social networks [32]. Moreover, the number of social media users grows rapidly and is no longer limited to teenagers and members of Generation X [33]. Time and space become less important in communication. However, it is easier to communicate with large groups of community members and to bring unconnected community members into direct contact [34]. In this vein, new online social networks have emerged from blogs, knowledge-sharing sites, collaborative filtering systems, online gaming, social-networking sites, newsgroups and chat rooms linking people and organizations [30]. Online social networks typically have tens of thousands to millions of members [30]. Chin and Chignell [35] described blogs as a form of social hypertext, which serves as a one-to-one mapping between a network of web pages and a network of people, and they can be represented as a social network from which communities can be formed.

Social network analysis (SNA) is a theory and a methodology of social science that tries to interpret human interaction ([22], p. 2). The goal of SNA is to identify key actors and the positions and actions that they are likely to take ([36], p. 161). SNA is rooted in the concepts of nodes and connections [37]. Nodes are the social actors and can be persons, groups, organizations, nations, communities, offices, blogs and so on and "connections" refer to channels of communication [37,38]. Recently, social network analysis techniques have been widely used to analyze the content and structure of websites and to study groups in blogs [39–41].

A Social Network can be represented in three ways: The first one is by giving a simple list of all the elements taken from the set of social actors, and the list of the pairs of elements that are linked by a social relationship of some kind. The second has a form of matrix. If two social actors I and J have a relation then 1 is placed at the cell (i,j), otherwise 0 is placed in this cell. Finally, a description of a Social Network may have a form of a graph where social actors can be represented by nodes, and the connections with each other can be represented by edges between these nodes. If the graph is directed, each interaction describes a one-way association between two social actors. In this case, the in-degree of a node is the number of incoming links and the out-degree is number of outgoing links. The Graph Theory approach is crucial as it denotes the structural properties of a network and provides a tool to quantify and measure some properties of the network [22,38]. Uses of SNA regarding a Korean blogosphere can be found in [19,23,42,43].

This paper uses the original adjacency matrix of the social network of the Greek political blogs and computes networking indexes based on this matrix.

3. Influence in the Blogosphere

The easy access and availability of blog sites and generally of Web 2.0 applications has tremendously changed the way people search, find, read, gather, share, develop and consume information [44,45]. Users are encouraged to become information providers rather than just information consumers. Thus, as information providers they exert a certain level of influence on the readers affecting their purchase decisions, attitudes and approaches to life and political viewpoints [46]. Tan *et al.* [46] argued that “the ability to detect influence in the blogosphere could be used to identify influential bloggers and the chain of information flow”.

Previous studies have taken different approaches in order to identify influential bloggers. The first approach takes into consideration incoming links [1,4,22,47–50]. Counting incoming links assumes that there is a positive relation between quantity of links and influence, reputation or quality [51]. These papers suggest that the overall distribution of incoming links between blogs is highly unequal. However, prestigious blogs, “A-list” or “short-head” the most well-known and read blogs, have a higher number of links from other blogs and perform much better than the rest regarding information aggregation [22]. [47,48,52] “Popular blogs are propelled to celebrity status through proven credibility and reputation, which leads to even more traffic” claimed Meraz ([52], p. 685).

Tan *et al.* [46] claimed that a large number of incoming links to the posts indicates high readership. However, influence is not always a product of high readership. Authority blogs may be linked with any blog, which might not be influenced by the linked posts. Thus, aiming at investigating influence in the blogosphere they took into consideration quantitative blog feature analysis, content analysis, and community identification.

Karpf [53] used the Blogosphere Authority Index (BAI) for tracking online influence. The index combines four measures of authority, the Network Centrality Score, the Hyperlink Authority Score, the Site Traffic Score and the Community Activity Score to produce comparative rankings of the elite blogs. Based on this approach Zafiroopoulos *et al.* [54] measured and compared the influence of clusters of Greek political blogs. They found out that clusters of blogs formed according to their incoming links are of all kinds, influential and non-influential, while only one cluster—the one containing the most linked blogs—is also the most influential. This cluster mainly consists of media and information providing blogs [54]. Although the Greek political blogosphere is quite different from the ones in other western countries such as the US—for example the degree of polarization is much smaller and there exist enough connections among blogs of different affiliations—the Greek political blogosphere presents several common properties with the US blogosphere. For example there is evidence that A-list blogs exist among Greek political blogs, they serve as focal points of discussion and take the form of clusters of active and heavily linked blogs [49,50,54]. It is this resemblance or the common properties with blogospheres of other western countries that make the study of Greek political blogs and blogosphere to be of essence, in the sense that it may produce interesting findings, which could apply to other contexts and blogospheres. Further, there are not many in-depth quantitative or qualitative studies on the Greek political blogosphere, and this paper, by studying linkage properties of the political blogs, strives to offer some broader and deeper understanding of it, and an understanding of how political blogs contribute to the general political discourse.

4. The Greek Political Blogosphere

According to the Greek Statistical Authority, Greece has a population of 10,787,690 and according to the Hellenic Observatory for the Information Society 2010, one in four Greeks has access to the Internet, while more than 40% of them choose to read blogs. Even though traditional mass media and especially television are in the center of the public in Greece [55], their dominance began to be challenged in 2006 with the emergence of blogs, which featured continuous news updates, investigative journalism, commentary and criticism [56], have played critical role and have exercised important influence in many situations.

Political blogs emerged in Greece after the events of 2007. People used blogs in order to express their political awareness and their feelings about major events that happened that year. In 2007, Greek blogs posted about foreigners who had been beaten in the police department of Omonia square in the center of Athens [54]. A major event of cyber-activism in Greece was the protest organized by bloggers who raised concern about the environment after the deforestation caused by fires in the Peloponnese and organized a big demonstration in the Syntagma Square in Athens [54]. An unexpectedly impressive number of people gathered outside the Greek parliament and the surrounding streets to participate in the protest event on 8 July 2007 [57].

In 2008, blogs began to exercise influence on Greek politics. On 6 December 2008 Alexis Grigoropoulos, a 15-year-old student, was killed by the police in Athens. Tens of thousands of people joined protests and demonstrations in major cities for weeks. Mowbray [58] comments that “The most sustained dedicated coverage of the situation came in the form of blogs, which brought together information, links, and media from around the web and off of the streets and served a narrativizing function”. Konstantina Kouneva, a cleaner and active radical syndicalist was attacked with acid on December 23, 2008, “Several posts and texts make links to her case as exemplary of women’s, immigrants’, radicals’ and precarious workers’ struggles against the forms of domination that they endure” [58]. Blogs have also played a critical role in sharing information during protests in the summer of 2011. Protests gathered outside Parliament to express their disapproval of the austerity measures that cut salaries and imposed higher taxes [59]. The movement “Aganaktismenoi” (Indignants) which consisted of forming meetings in squares of big cities of Greece in order to peacefully demonstrate against the economic measures and political system organizes its moves through a website (www.aganaktismenoi.com) and many blogs are commenting on what is happening in the squares [60]. Nervadakis [61] wrote that the Greek blogosphere dynamically spread news and information and they reported on things the mainstream media are reluctant to report upon.

5. Methodology

The paper attempts to describe the connectivity patterns of the Greek political blogosphere. It records Greek political blogs, which tag the five Greek parliamentary parties. Blogs were recorded during November 2010 using Technorati.com and Google blog search, and using the names of the parties as key words. Blogs were visited and the content analyzed to see if they actually discussed politics regarding the political parties. The five parliamentary Greek parties are: New Democracy (ND)—a Christian Democratic party, Pan-Hellenic Socialist Movement (PASOK), the

Communist Party of Greece (KKE), Coalition of the Left and Progress (SYRIZA) and the right wing party People's and the Orthodox's Rally (LAOS).

In total, 127 blogs were recorded. These blogs were selected from a pool of several blogs discussing politics, because they discussed mainstream politics and made references to parliamentary parties. Also, previous studies have shown that generally they enjoy high readership and traffic [54]. Previous research has demonstrated the suitability of choosing the specific category of blogs in order to study Greek political blogosphere linkage and networking patterns, and for associating blogs with their political affiliations or studying the properties of centrality and formation of A-list blogs [49,50,62].

Incoming links between blogs through their blogrolls were also recorded. The paper uses the social network of the blogs and analyzes the associated adjacency matrix. An adjacency matrix is a square non-symmetric binary data matrix where unity is placed in cell ij if blog i links blog j through the blogroll, otherwise zero is placed in the cell. Social Network Analysis (SNA) can be used to study connectivity and popularity of blogs in regard to inter-linkage of the blog communities.

At the beginning, only data from the blogs' network are used and no data for the users' community, so the study, at start, is limited to studying the bloggers' popularity within the context of the blogger community. When many blogs link to a particular blog, this blog has a high in-degree, that is a high degree of incoming links. It can be argued that highly linked blogs are appreciated or are recommended by the bloggers' community. Thus, heavily linked blogs may be regarded to be influential in the sense that their content is read and recommended by others.

From this origin, this paper expands the analysis in the following way: It studies the blogs' community characteristics and the level of the blogs' connectivity. That is, the paper studies how blogs are organized into small communities along with other blogs, expanding in this way their territory of influence. This property is not necessarily directly linked to the property of centrality as measured by the incoming links. Rather it is about the individual blogger's effort to establish a network of blogs or bloggers close to them, those who probably share common characteristics or interests.

The paper uses five Social Network Analysis indexes to measure the abovementioned properties:

1. Number of incoming links of a blog. It represents the number of blogs that link to a specific blog and it can be considered to be a kind of index of recommendation.
2. Number of outgoing links. It represents the number of blogs that a specific blog links to. It can be considered to be a blog connectivity index regarded as a means to reach the blogs' community.
3. Normalized betweenness. The centrality of a node in a network is a measure of the structural importance of the node. A person's centrality in a social network affects the opportunities and constraints that they face. Betweenness centrality is defined as the number of geodesic paths that pass through a node. It is the number of "times" that any node needs to go through a given node to reach any other node by the shortest path. The node with high betweenness can serve as a liaison between disparate regions of the network. Betweenness is therefore a measure of the number of times a vertex occurs on a geodesic [62]. The normalized betweenness centrality is the betweenness divided by the maximum possible betweenness expressed as a percentage.
4. Number of 1-cliques that a blog belongs to. A 1-clique is a maximal subgraph, which contains blogs which are linked directly to each other. That is, for a given blog, the 1-clique contains all the blogs that this particular blog is connected to, and also the blogs of the 1-clique are

connected with each other, regardless of whether the linkages refer to incoming or outgoing links. So, a 1-clique contains the closest blogs to a particular blog, which also are linked to each other. The number of 1-cliques that a particular blog belongs to is a measure of a blog's network connectivity and its belonging to certain families of blogs. It should be noted that the 1-cliques used in the analysis contain at least three blogs, that is they do not contain pairs of connected blogs.

5. Ego-network size. For a specific blog, an ego-network contains all the blogs that are directly linked to this blog. The size of an ego-network is the number of blogs in the ego-network. Again as in the case of 1-cliques, this number is a measure of a blog's and community connectivity.

In the analysis that follows, all the above indexes are calculated. Normalized Betweenness, ego-network size, and number of 1-cliques are calculated using UCINET for Windows, while number of incoming links and number of outgoing links are calculated as the sum of the elements of columns and rows, respectively, from the blog network adjacency matrix. In order to calculate ego-network sizes and 1-cliques, the adjacency matrix is symmetrized, that is 1 is placed in cell i,j either if i links to j blog, or j links to i blog.

Next, the paper combines and summarizes the five proposed indexes to form overall scores of blog connectivity. The method followed is the Principal Components Analysis (PCA) with Varimax rotation. PCA creates new "summary" variables, which do not either under- or overrepresent specific characteristics or properties represented by the original variables. Scores of the Principal Components can be sorted in order to distinguish which are the blogs that have the largest overall network connectivity.

Next, the paper introduces a blog activity index and a users' community activity index. These indexes are calculated for each blog in the analysis using content analysis. Following the approach of Karpf [53], they measure the number of posts and the number of comments to the posts of the blogs during one-week frame, 24 January to 30 January 2011, for the present study. Blog activity index measures how active a blog is by means of the frequency with which it posts and addresses to the public. The community activity index measures how many users engage in commenting the posts of a blog. It is an indication of how many people not only read the blogs, but actually participate in commenting. Besides presenting descriptive statistics for the two activity indexes, the paper explores whether there is a correlation between the factor scores previously calculated from the network indexes and the activity indexes. It explores, therefore, whether the bloggers' connectivity and networking attitudes are associated with the bloggers' and users' engagement and participation.

Finally, content analysis is used to explore the blogs' content and characteristics and associate them with their networking properties. For this reason, the political affiliation of the blogs and the frequency of blogs making references to certain eParticipation areas of discussion are presented. Blogs with specific properties are compared to the overall Greek political blogosphere so that we can describe their profile and place them within the context of the Greek political blogosphere, in order to distinguish how they contribute to political discussion and influence.

6. Findings

6.1. Analysis of the Social Networking and Activity Indexes of the Greek Political Blogs

Table 1 presents the descriptive statistics of the five indexes. Incoming links range from zero to 25. That is, there exists at least one blog that gathers at the most 25 out of 127 links (20% of the links). The mean equals 4.5. Outgoing links have a wider range, from zero to 30. The mean is equal to the mean of incoming links, but the standard deviation is greater. Outgoing links have a greater variance than incoming links do, so it seems that they are used by some blogs to a greater degree as a tool of networking. Normalized betweenness ranges from zero to 7.28 with a mean equal to 1.06 and a standard deviation equal to 1.75. There is a diversity of betweenness among the blogs.

Table 1. Descriptive statistics of the five social network indexes.

	Minimum	Maximum	Mean	Std. deviation
Incoming links	0	25	4.45	4.4
Outgoing links	0	30	4.45	5.48
Normalized betweenness	0	7.28	1.06	1.75
Number of 1-cliques a blog belongs to	0	80	6.06	9.81
Size of Ego network	0	38	8.64	6.72

The number of 1-cliques a blog belongs to ranges from zero to 80. That is, there are some blogs belonging to no 1-cliques, but some others are much more connected. Having in mind that the maximum value of 1-cliques a blog belongs to is 80, and since the mean equals 6.06, it becomes clear that most of the blogs belong to small groups of 1-cliques and only a minority of the blogs belongs to larger groups of 1-cliques. This property is associated with skewness. Skewness is a common property of many Web 2.0 applications and it represents the situation that most of the studied entities have small values of a specific characteristic while only a few have the highest values. Regarding the size of ego network, the conclusions are similar but not the same. The range is smaller than that for the 1-cliques and the mean is greater than the one for 1-cliques. Yet, it seems that skewness still holds even for this case.

A first attempt to explore whether the five indexes describe different aspects of the same property, that is, connectivity of the blogs, it is usual to calculate the correlation coefficients among the indexes [23]. High correlations provide evidence that all of the indexes indeed measure aspects of the same thing. This property of indexes' inter-correlations is of the essence for the graph-theoretic study of a network and in fact it provides evidence of the reliability of the proposed indexes. Conclusions are further supported in such a case of strong index inter-correlations, and there is also strong evidence that all the indexes measure network centrality and blog connectivity. Table 2 presents the correlation coefficients among the indexes. All of them are positive and all, except one, are statistically significant. The non-significant one is the correlation between incoming links and number of 1-cliques a blog belongs to.

Table 2. Correlation coefficients among the five social network indexes.

	Incoming links	Outgoing links	Normalized betweenness	Number of 1-cliques a blog belongs to
Outgoing links	0.301 **			
Normalized betweenness	0.531 **	0.750 **		
Number of 1-cliques a blog belongs to	0.163	0.737 **	0.413 **	
Size of Ego network	0.192 *	0.773 **	0.497 **	0.795 **

*: $p < 0.05$; **: $p < 0.01$.

Since there is evidence that correlations exist among the proposed indexes, a usual approach is to perform Principal Components Analysis (PCA) with Varimax rotation. The method produces new variables that “summarize”, through a statistical procedure, the original variables. Although the new variables called Principal Components (PC) or Factors do not represent some actual measurement, their values or factor scores can be used to consequently describe values of the original variables, those which constructed the factors. For example, if factor loadings are positive, large values of the factors are associated with large values of the original variables.

By performing PCA two PCs are constructed, the first one explaining 53% of the total variance and the second one explaining 32% of the total variable (total variance explained = 85%). With reference to the factor loadings (Table 3), PC1 refers to a blogs’ property that could be described as blogs’ attempt to construct ego networks, to belong to many 1-cliques, and to have many outgoing links. Loadings for size of ego network, number of 1-cliques a blog belongs to and outgoing links are over 0.8. This could be interpreted as the property of blogs to try to expand their territory by belonging to many groups and linking to many other blogs.

Table 3. Factor loadings of the Principal Components constructed from the five social network indexes (Varimax rotation).

	PC1 (Total variance explained = 53%)	PC2 (Total variance explained = 32%)
Size of Ego network	0.917	0.135
Number of 1-cliques a blog belongs to	0.914	0.062
Outgoing links	0.855	0.387
Incoming links	0.013	0.924
Normalized betweenness	0.494	0.745

PC2 refers to the property of blogs having many incoming links and normalized betweenness. Loadings for incoming links and normalized betweenness are 0.924 and 0.745, respectively. They are central blogs, regarding betweenness, mainly linked by others and not linking to others. Having in mind that by construction these two PCs are uncorrelated, it is reasonable to argue that they represent two distinct connectivity properties of the blogs. Some blogs serve as authority blogs having many incoming links and centrality, while others strive to expand their influence territory by having many outgoing links, and being members of many cliques or forming large ego-networks.

The findings are organized hereafter to respond to three related questions:

1. How are these properties associated with the blogs’ activity?
2. Which are the blogs that perform best regarding the two factor scores?
3. What is the connection, if any, between blogs that have the first property, *i.e.*, they try to expand their territory, with the blogs that have the second property, *i.e.*, they are central and are recommended?

Activity regarding blogging is conceptualized in this paper, with reference to the bloggers’ activity and to the users’ community activity. They are measured by counting number of posts to represent blog activity and number of comments to represent community activity. Because both posts and comments may be so many, this paper follows the approach of Karpf [53] and records them for a week interval. Measuring activity, although interesting, is not an end in itself. Rather, what is of interest in the analysis is to study the correlations between activity and networking practices. Table 4 presents the correlation coefficients between number of posts and number of comments with the two factor scores. Only correlations between the second factor scores and the two activity indexes are both positive and statistically significant. There is, therefore, strong evidence that only blogs, which are central and recommended by others (with regard to incoming links), are also more active and attract more users’ activity and reaction.

Table 4. Correlation coefficients between Principal Components (PC) scores and activity indexes.

	Number of posts	Number of comments
PC1	-0.019	0.136
PC2	0.429 *	0.408 *

*: $p < 0.01$.

The construction of overall influence scores is practical and meaningful. By construction, factor scores have a mean equal to zero and a standard deviation equal to 1. It is a common procedure to separate cases (*i.e.*, the blogs) using their factor scores. Blogs with factor scores greater than 1 are usually considered to be the ones that have the highest values of the factor scores and therefore of the proposed indexes, while those blogs with factor scores smaller than -1 are considered to have the lowest values of the factor scores. This finding also holds for the original variables, which served to form the factor. High factor scores provided that factor loadings are positive, and are associated with high values of the original indexes.

For the two PCs constructed by PCA, we can distinguish those blogs having factor scores greater than one for both PCs. Table 5 presents the descriptive statistics for blogs having factor scores over 1 in PC1 and PC2. For convenience these blogs may be considered as best performing according to either PC1 or PC2. Twelve blogs, that is 9.5% of the 127 blogs, belong to the group of blogs having the property of striving to link to many other blogs. Twenty blogs, that is 15.7% of the 127 blogs, receive many incoming links, are more central and present the highest activity, regarding both blog activity and community activity. The 20 blogs having PC2 scores over unity are considered to be authority or central blogs, because they are heavily linked and they present high frequencies of posts and comments (Table 5).

Table 5. Descriptive statistics of the social network and activity indexes for best performing blogs according to PC1 and PC2.

	Incoming links	Normalized betweenness	Outgoing links	Number of 1-cliques a blog belongs to	Size of ego network	Number of posts	Number of comments
PC1 scores > 1; N = 12							
Mean	7.25	3.95	16.16	28.91	23	558.38	83.4
Std. Deviation	3.72	2.72	7.77	18.25	6.48	619.98	208.79
PC2 scores > 1; N = 20							
Mean	11.65	4.04	10.25	11.1	13.15	1104.94	523.3
Std. Deviation	4.92	2.22	7.77	10.93	8.14	2150.1	1253.85

To answer to the third question, that is, what is the connection between best performing blogs regarding PC1 and best performing blogs regarding PC2, a useful and easy to comprehend approach is to turn to the blogs social network and corresponding adjacency matrix. First blogs in the rows of the matrix are labeled using two labels, blogs with PC1 scores over 1 and blogs with PC1 scores under 1, and similarly, blogs in the columns of the matrix are labeled as blogs with PC2 scores over 1 or blogs with PC2 scores under 1. Therefore, four groups of blogs are created and they can be presented in a kind of contingency-linkage table:

- blogs with PC1 scores > 1 that link to blogs with PC2 scores > 1;
- blogs with PC1 scores > 1 that link to blogs with PC2 scores < 1;
- blogs with PC1 scores < 1 that link to blogs with PC2 scores > 1;
- blogs with PC1 scores < 1 that link to blogs with PC2 scores < 1.

Then, we can count the number of actual links between blog groups, and calculate a percentage by dividing this number by the total number of links that could exist between blog groups, if all the blogs of group 1 linked to all the blogs of group 2. These percentages serve as measurements of intergroup linkages. Large percentages imply that many of the possible links between groups actually exist. Percentages are presented in Table 6. It becomes clear that 31.67% of the possible links from blogs having PC1 scores over one are actually used to connect with blogs having PC2 scores over one. Similarly, 9.19% of all the possible links from blogs with PC1 scores over one are indeed used to connect with blogs having PC2 scores under one, *etc.* It is quite clear that the biggest percentage of links exist between blogs best performing regarding PC1 and best performing regarding PC2. Blogs that strive to expand their network territory heavily link central and active blogs.

Table 6. Percentages of hyperlinks between blog performance groups.

	PC2 scores > 1	PC2 scores < 1
PC1 scores > 1	31.67%	9.19%
PC1 scores < 1	6.83%	1.75%

6.2. An Exploration of the 20 Central-Authority Blogs

This section introduces an exploration of the 20 central (authority) blogs, located through the analysis of the previous section (blogs with PC2 scores over 1). Content analysis is followed to link the quantitative findings of this paper with the political framework and the context of the Greek political

scene. Content analysis investigates content, political affiliation and topics discussed in the 20 blogs, using the NVIVO 8. For each blog, the following features were recorded in the content body:

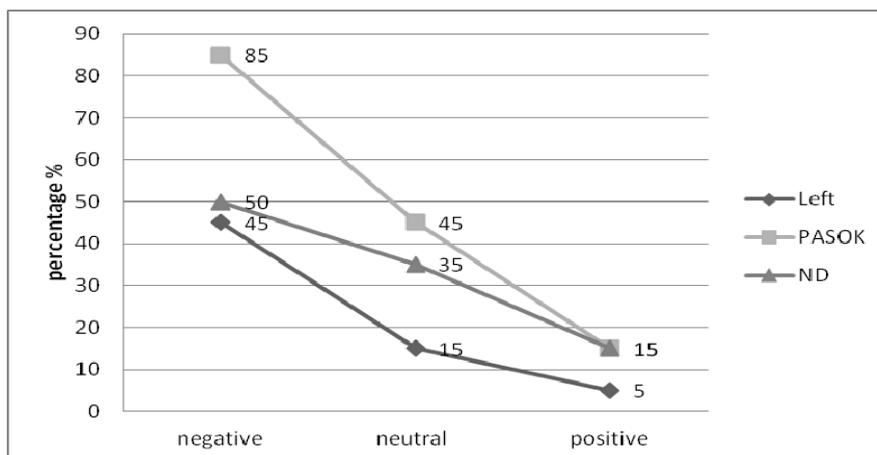
1. The main title of the blog along with a summarized description.
2. The “about” part of each blog (when applicable), where the scope of the blog is given, the motivation of the blogger to create it, *etc.* Usually there is also information concerning the blogger, such as his/her interests, her/his aims, her/his academic background and her/his political beliefs.
3. The main part of this analysis, the posts of the political blogs, including the title of each post, its main body followed by its’ comments (those for November 2010).

The units of the media content were decided to be words or phrases. Synonyms or small phrases were grouped together. Table 7 presents the political affiliation of the 20 central blogs. Most of them have no specific affiliation or have a Left affiliation. Also, Figure 1 presents the percentages of negative, neutral or positive references that the central blogs make for the main Greek parties. From Figure 1, it is obvious that for the period under study, half of the blogs make negative references for the Left or ND, but the majority of them make negative references for PASOK, which was the party in Governance for the period of the study. Neutral comments and references are more frequent for PASOK and ND than they are for parties of the Left, and positive references have equal frequencies for ND and PASOK (15%) and there are just a few for the Left. As a general conclusion we can say that the central blogs are generally critical to all main political parties. Of course they act within the general political context of the period (criticism for the government in relation to the economic crisis of Greece), but still they make either neutral or positive references to the parties.

Table 7. Political affiliation of the 20 central blogs.

Not specified	8
Left	6
PASOK	3
ND	2
LAOS	1
Total	20

Figure 1. Percentages of the 20 central blogs with negative, neutral or positive references to the Greek political parties.



Next, this analysis looked for specific areas of interest over which discussions occurred among the 20 central blogs through their posts/comments.

The analysis identified 11 main eParticipation areas that the central political blogs may discuss. These areas are:

1. Campaigning: Protest, lobbying, petitioning and other forms of collective action (except for election campaigns, see electioneering as topic),
2. Community building/collaborative environments: To promote individuals to come together to form communities, to progress shared agendas and to shape and empower such communities.
3. Deliberation/criticism: To support virtual, small and large-group discussions, to express thoughts or ideas, to comment on or criticize, allowing reflection and consideration of issues.
4. Discourse: To support analysis and representation of discourse.
5. Electioneering: To support politicians, political parties and lobbyists in the context of election campaigns.
6. Information provision: To structure, represent and manage information in participation contexts.
7. Polling: To measure public opinion and sentiment.
8. Concern creation: To make an impression about a fact/set of ideas and cause further uncertainty or suspicion.
9. Media and book reference: References to websites, magazines, newspapers *etc.* as well as books.
10. Environmental issues: References to environmental topics.
11. News.

Table 8 presents the percentages of blogs within the 20 central blogs and within the total 127 blogs, which make reference to the eParticipation areas. In general we can observe that in almost all eParticipation areas, the central blogs are more active than the overall Greek political blogosphere. To verify which are the main topics for which central blogs are most active compared to the blogosphere, chi-square tests are used. Statistically significant differences are found for the eParticipation areas to which central blogs also make references with the highest frequencies: information provision, media references, criticism, news, discourse and concern creation. Also there is a difference for environmental issues. These eParticipation areas may be used to describe a general profile of the central blogs. Thus, the central blogs can be characterized as being critical, informative, promoting discourse and concern. They are not only heavily linked but they also are active and very much involved in the political discourse.

Table 8. Percentages of central blogs, which make references to the eParticipation areas.

	20 Central blogs	127 blogs (Total)	Chi-square significance
Information Provision	95	54	*
Media references, publications	85	52	*
Deliberation, criticism	85	57	*
News	80	50	*
Discourse	60	32	*
Concern creation	55	33	*
Campaigning	40	32	
Environmental issues, concern	25	10	*

Table 8. Cont.

	20 Central blogs	127 Blogs (total)	Chi-square significance
Polling	20	12	
Community building/ Collaborative Environments	10	13	
Electioneering	10	6	

*: $p < 0.05$.

7. Conclusions

This paper tried to summarize basic properties regarding the Greek political blogosphere. It used a combination of hyperlink analysis and activity indexes. Greek political blogs are characterized by two distinct properties. There exist two minority groups, the first one striving to expand its network and connections and the second receiving many incoming links, being central and appreciated-recommended by the blogger community, and further, being the most active in posting and gaining users' activity regarding comments to the posts. Thus, the users' community engagement and interaction is positively associated with the bloggers' community characteristics.

Furthermore, these two distinct blog groups are heavily connected in the fashion that blogs of the first group link to the blogs of the second. It can be argued therefore that linking to central and active blogs could be part of their strategy to expand their network.

These findings are in accordance with previous studies about Greek political blogosphere, where few blogs serve as focal points where all the informative discussion is taking place [49,50,62]. They are also in accordance with studies for the case of the USA, where indeed few focal point blogs serve as "elite" blogs and can operate as both an information aggregator and as a "summary statistic" for the blogosphere [47,48].

The analysis could be further developed and refined by using different or more social network analysis indexes, content analysis of the posts and comments and applications to different cases from Greece and other countries.

When associating the content of the central political blogs with eParticipation areas and the blogs' political affiliation, the central blogs can be described as providing news and references to media, promote criticism and discussion and concern creation. Compared to the overall political blogosphere, as it is defined in this paper, the central blogs are most linked and highly active in posting and promoting political discussion.

References

1. Herring, S.C.; Kouper, I.; Paolillo, J.; Scheidt, L.-A.; Tyworth, M.; Welsch, P.; Wright, E.; Yu, N. Conversations in the Blogosphere: An Analysis "From the Bottom Up". In *Proceedings of the Thirty-Eighth Hawai'i International Conference on System Sciences (HICSS-38)*, Los Alamitos, CA, USA, 3–6 January 2005.
2. Song, X.; Chi, Y.; Hino, K.; Tseng, B. Identifying Opinion Leaders in the Blogosphere. In *Proceedings of the Sixteenth ACM Conference on Conference on Information and Knowledge Management*; ACM: New York, NY, USA, 2007; pp. 971–974.

3. Woodly, D. New competencies in democratic communication? Blogs, agenda setting and political participation. *Publ. Choice* **2008**, *134*, 109–123.
4. McGlohon, M.; Leskovec, J.; Faloutsos, C.; Hurst, M.; Glance, N. *Finding Patterns in Blog Shapes and Blog Evolution*; Carnegie Mellon University: Pittsburgh, PA, USA, 2007.
5. Barger, J. FAQ: Weblog Resources. Available online: <http://www.robotwisdom.com/weblogs/> (assessed on 4 April 2008).
6. Grieve, J.; Biber, D.; Friginal, E.; Nekrasova, T. Variation Among Blogs: A Multi-Dimensional Analysis. In *Genres on the Web: Corpus Studies and Computational Models*; Santini, M., Mehler, A., Sharoff, S., Eds.; Springer-Verlag: New York, NY, USA, 2010; pp. 3–30.
7. Chapman, C. A Brief History of Blogging. 2012. Available online: <http://www.webdesignerdepot.com/2011/03/a-brief-history-of-blogging/> (assessed on 23 May 2012).
8. Avenstar Blog Definition 15 Different Definitions for Blogs ...that's right - 15! Available online: <http://www.avenstar.net/blogdefinition.htm> (assessed on 10 August 2012).
9. Wallsten, K. Political Blogs and the Bloggers Who Blog Them: Is the Political Blogosphere and Echo Chamber? Presented at the American Political Science Association Annual Meeting, Washington, DC, USA, 1–4 September 2005.
10. McKenna, L.; Pole, A. What do bloggers do: An average day on an average political blog. *Publ. Choice* **2008**, *134*, 97–108.
11. McKenna, L.; Pole, A. Do Blogs Matter? Weblogs in American Politics. In *Proceedings of the Annual Meeting of the American Political Science Association*, Chicago, IL, USA, 2–5 September 2004.
12. Lawrence, C.; Dion, M. Blogging in the political science classroom. *PS: Polit. Sci. Polit.* **2010**, *43*, 151–156.
13. Ferguson, R.; Griffiths, B. Thin democracy? Parliamentarians, citizens and the influence of blogging on political engagement. *Parliam. Aff.* **2006**, *59*, 366–374.
14. Wallsten, K. Political blogs: Transmission belts, soapboxes, mobilizers, or conversation starters? *J. Inform. Technol. Politics* **2008**, *4*, 19–40.
15. Jackson, N. Dipping their big toe into the blogosphere. The use of weblogs by the political parties in the 2005 general election. *Aslib Proc. New Inf. Perspect.* **2006**, *58*, 292–303.
16. Lankshear, C.; Knobel, M. Do-It-Yourself Broadcasting: Writing Weblogs in a Knowledge Society. In *Proceedings of the Paper Presented to the American Education Research Association Annual Meeting*, Chicago, IL, USA, 21 April 2003.
17. Sroca, N. *Understanding the Political Influence of Blogs*; Institute for Politics, Democracy, & the Internet: Washington, DC, USA, 2007.
18. Bloom, J.; Kerbel, M. The Blogosphere and the 2004 Elections. Presented at the American Political Science Association Annual Conference, Washington, DC, USA, 27 August–3 September 2005.
19. Park, H.W.; Thelwall, M. Developing network indicators for ideological landscapes from the political blogosphere in South Korea. *J. Comput.-Mediat. Commun.* **2008**, *13*, 856–879.
20. Trammell, K.; Williams, A.; Postelnicu, M.; Landreville, K. Evolution of online campaigning: Increasing interactivity in candidate web sites and blogs through text and technical features. *Mass Commun. Soc.* **2006**, *9*, 21–44.

21. Ali-Hasan, N.; Adamic, L. Expressing Social Relationships on the Blog through Links and Comments. In *Proceedings of the International Conference Weblogs and Social Media*, Boulder, CO, USA, 27–28 March 2007.
22. Marlow, C. Audience, Structure and Authority in the Weblog Community. In *Proceedings of the 54th Annual Conference of the International Communication Association*, New Orleans, LA, USA, 27–31 May 2004.
23. Park, H.-W.; Jankowski, N. A hyperlink network analysis of citizen blogs in South Korean Politics. *Javn. Publ.* **2008**, *15*, 57–74.
24. Lu, H.-P.; Hsiao, K.-L. Understanding intention to continuously share information on weblogs. *Internet Res.* **2007**, *17*, 345–361.
25. Anagnostopoulos, A.; Kumar, R.; Mahdian, M. Influence and Correlation in Social Networks. In *Proceedings of the 14th ACM SIGKDD International Conference on Knowledge Discovery and Data Mining*, Las Vegas, NV, USA, 24–27 August 2008; pp. 7–15.
26. Trammell, K.; Keshelashvili, A. Examining the new influencers: A self-presentation study of A-List Blogs. *J. Mass Commun.* **2005**, *82*, 968–982.
27. Barker, R.-L. *The Social Work Dictionary*, 4th ed.; NASW Press: Washington, DC, USA, 1999.
28. Kempe, D.; Kleinberg, J.; Tardos, E. Maximizing the Spread of Influence through a Social Network. In *Proceedings of the Ninth ACM SIGKDD International Conference on Knowledge Discovery and Data Mining*, Washington, DC, USA, 24–27 August 2003; pp. 137–146.
29. Staab, S.; Domingos, P.; Mike, P.; Golbeck, J.; Li, D.; Finin, T.; Joshi, A.; Nowak, A.; Vallacher, R.R. Social networks applied. *IEEE Intell. Syst.* **2005**, *20*, 80–93.
30. Domingos, P.; Mike, P.; Golbeck, J.; Li, D.; Finin, T.; Joshi, A.; Nowak, A.; Vallacher, R.R. Social networks applied. *IEEE Intell. Syst.* **2005**, *20*, 90–91.
31. Farnham, S.; Kelly, S.U.; Portnoy, W.; Schwartz, J. Wallop: Designing Social Software for Co-Located Social Networks. In *Proceedings of the 37th Annual Hawaii International Conference on System Sciences (HICSS'04)*, Big Island, HI, USA, 5–8 January 2004.
32. Boyd, D. Social Network Sites: Public, Private, or What? Available online: http://kt.flexiblelearning.net.au/tkt2007/?page_id=28 (accessed on 10 August 2012).
33. Kaplan, A.; Haenlein, M. Users of the world, unite! The challenges and opportunities of Social Media. *Bus Horiz.* **2010**, *53*, 59–68.
34. Wellman, B. Computer networks as social networks. *Sci. Mag.* **2001**, *293*, 2031–2034.
35. Chin, A.; Chignell, M. Identifying communities in blogs: Roles for social network analysis and survey instruments. *Int. J. Web Based Commun.* **2007**, *3*, 345–363.
36. Krackhardt, D. Social Networks and the Liability of Newness for Managers. In *Trends in Organizational Behavior*; Cooper, C.L., Rousseau, D.M., Eds.; John Wiley & Sons: Weinheim, Germany, 1996; pp. 159–173.
37. Balancieri, R.; Cuel, R.; Carlos, R.; Pacheco, S. Social Network Analysis for Innovation and Coordination. In *Proceedings of 12th International Conference on Knowledge Management and Knowledge Technologies*, Messe Congress Graz, Austria, 5–7 September 2007. Available online: http://i-know.tugraz.at/wp-content/uploads/2008/11/19_social-network-analysis-for-innovation-and-coordination.pdf (accessed on 10 August 2012).

38. Martino, F.; Spoto, A. Social network analysis: A brief theoretical review and further perspectives in the study of Information Technology. *Psychol. J.* **2006**, *4*, 53–86.
39. Chau, M.; Xu, J. Mining communities and their relationships in blogs: A study of hate groups?. *Int. J. Hum.-Comput. Stud.* **2007**, *65*, 57–70.
40. Chau, M.; Xu, J. Using web mining and social network analysis to study the emergence of cyber communities in blogs. *Terr. Inform.* **2008**, *18*, 473–494.
41. McGrath, M. Employing 'social Network Analysis' to Influence Tourism Events Decision-Making: A Pilot Study. In *Information and Communication Technologies in Tourism*; O'Connor, P., Höpken, W., Gretzel, U., Eds.; Springer: Berlin, Germany, 2008; pp. 556–567.
42. Park, H.-W.; Lee, Y.-O. The Korean presidential election of 2007: Five years on from the 'internet election'. *J. Contemp. East. Asia* **2008**, *7*, 1–4.
43. Park, H.-W.; Kluver, R. Trends in online networking among South Korean politicians. *Gov. Inf. Q.* **2009**, *26*, 505–515.
44. Sigala, M. Developing and implementing an eCRM 2.0 strategy: Usage and readiness of Greek tourism firms. *Inf. Commun. Technol. Tour.* **2008**, *14*, 463–474.
45. Sigala, M. WEB 2.0, Social Marketing Strategies and Distribution Channels for City Destinations: Enhancing the Participatory Role of Travelers and Exploiting Their Collective Intelligence. In *Information Communication Technologies and City Marketing: Digital Opportunities for Cities around the World*; Gascó-Hernández, M., Torres-Coronas, T., Eds.; IDEA Publishing: New York, NY, USA, 2009; pp. 220–240.
46. Tan, L.K.-W.; Na, J.-C.; Theng, J.-L. Influence detection between blog posts through blog features, content analysis, and community identity. *Online Inf. Rev.* **2011**, *35*, 425–442.
47. Drezner, D.; Farrell, H. The Power and Politics of Blogs. In *Proceedings of the 2004 Annual Meeting of the American Political Science Association*, Washington, DC, USA, 28–31 August 2004. Available online: <http://www.utsc.utoronto.ca/~farrell/blogpaperfinal.pdf> (accessed on 10 August 2012).
48. Drezner, D.; Farrell, H. The power and politics of blogs. *Publ. Choice* **2008**, *134*, 15–30.
49. Zafiroopoulos, K.; Vrana, V. The impact of political events on blog conversational patterns: Two cases from Greece. *Quad. Del CAC* **2009**, *33*, 77–85.
50. Zafiroopoulos, K.; Vrana, V. Representation and Study of Political Blogs Conversational Patterns. In *Proceedings of the 4th Mediterranean Conference on Information Systems*, Athens, Greece, 25–27 September 2009.
51. Gill, K. How Can We Measure the Influence of the Blogosphere? In *Proceedings of the World Wide Web Conference (www2004)*, New York, NY, USA, 17–22 May 2004.
52. Meraz, S. Is there an elite hold? Traditional media to social media agenda setting influence in blog networks. *J. Comput.-Mediat. Commun.* **2009**, *14*, 682–707.
53. Karpf, D. Who is Winning and How Can We Tell? George Washington University's Institute for Politics, Democracy and the Internet. Available online: <http://www.the4dgroup.com/BAI/articles/PoliTechArticle.pdf> (accessed on 10 August 2012).
54. Zafiroopoulos, K.; Vrana, V.; Vagianos, D. Bloggers' community characteristics and influence within greek political blogosphere. *Future Internet* **2012**, *4*, 396–412.

55. Pleios, G.; Poulakidakos, S.; Kalpaki, K.; Kappas, G.; Manatou, M.-E. Publicity and private life within the Greek blogosphere. *Int. J. Electr. Gov.* **2010**, *3*, 48–71.
56. Nervadakis, M. The Greek News Blog Phenomenon: Troktiko and the Rise and Fall of the Fifth Estate. In *Proceeding of the International Association for Media and Communication Research (IAMCR)*, Istanbul, Turkey, 13–17 July 2011.
57. Karamichas, J. The impact of the summer 2007 forest fires in Greece: Recent environmental mobilizations, cyber-activism and electoral performance. *S. Eur. Soc. Politics* **2007**, *12*, 521–533.
58. Mowbray, M. Blogging the Greek riots: Between aftermath and ongoing engagement. *Resist. Stud. Mag.* **2010**, *1*, 4–15.
59. Gerlich, W.-J. Violence rises as Greece's debt swells. Available online: <http://www.dailytexanonline.com/news/2011/07/04/violence-rises-greeces-debt-swells> (accessed on 10 August 2012).
60. Nikiforidou, E. Outline and Discuss Some of the Ways in Which New Media are Influencing Contemporary Political Life. Available online: http://www.essex.ac.uk/sociology/student_journals/UG_Journal/UGJournal_Vol6/2011SC224_EleanaNikiforidou.pdf (assessed on 3 June 2012).
61. Nervadakis, M. Reinventing Greece Media Project, 2011. Available online: <http://www.hellenext.org/reinventing-greece/> (assessed on 12 June 2012).
62. Zafiroopoulos, K.; Vrana, V. *Hyperlink Analysis of Political Blogs Communication Patterns*; NOVA Publishers: Carbondale, IL, USA, 2011.

© 2012 by the authors; licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution license (<http://creativecommons.org/licenses/by/3.0/>).