

BLOGI I BLOGOSFERA Z PERSPEKTYWY SIECI SPOŁECZNYCH BLOGS AND BLOGOSPHERE FROM THE PERSPECTIVE OF SOCIAL NETWORKS

Abstrakt

Blogi stają się coraz ważniejszą formą komunikacji internetowej, wykraczając poza pierwotną funkcję pamiętnika i zdobywając coraz większe znaczenie dla sfer takich jak marketing, public relations, dziennikarstwo czy polityka. Aby poznać ich znaczenie i rolę, jaką mogą pełnić w procesach rozprzestrzeniania się informacji czy wpływu społecznego, warto analizować je w szerszym kontekście całości sieci hipertekstowych odnośników, którymi blogi połączone są ze sobą i z innymi stronami internetowymi. Dopiero analiza struktury pozwala na pełne zrozumienie kształtu blogosfery i procesów tam zachodzących. Umożliwia to analiza sieci społecznych – metoda pełniąca coraz ważniejszą rolę w naukach społecznych, która czerpie wiele z aparatu formalnego fizyki i matematyki.

Słowa kluczowe: *blogi, blogosfera, analiza sieci społecznych, dynamika sieci, sieci linków, dyfuzja informacji*

Abstract

With the rapid growth of blogs popularity over last few years, the blogosphere is nowadays a lively social space and its impact on various areas of life, as marketing, public relations, journalism or politics, cannot be neglected. In order to investigate the importance and role of weblogs in processes of diffusion of information and social influence, they should be analyzed in the context of hyperlinks connecting various weblogs and other web pages. The structural analysis enables understanding the specifics of blogosphere and social processes taking part there. Social networks analysis is a useful method to reach such objectives.

Keywords: *weblogs, blogosphere, social networks analysis, network dynamics, hyperlinks networks, diffusion of information*

Introduction

Blogs are becoming an increasingly important form of Internet communication, going beyond their original function of diaries and gaining significance in spheres such as politics, marketing, public relations and journalism. They are not just a form of authors' self-expression but a specific medium of great variety targeted at narrow circles of recipients. It happens that particular blogs gain enormous popularity and meaning. Also significant and interesting are phenomena resulting from numerous blogs' influence, such as information or gossip overflow and mass group actions. Researching this topic, it is worth to take a wider perspective and to analyse blogs in the context of their hyperlinks. We take the web approach and analyse network relations between blogs and other webpages and their links. This web, known as blogosphere, is a reflection of the system structure of blogs and its shape directly influences the ongoing social processes within the system.

An analysis of social networks is a method of analysis of relationships between social actors (people or organizations). It enables a precise description of structure and influences of various kinds. It is also possible to point out elements playing different roles, central versus peripheral. Presently, this method is undergoing dynamic development and it has been studied

by scholars for some time. The sociometric methods proposed by Jakob Moreno¹ (1934) in order to study interpersonal relations in small groups require a sheet of paper only. New techniques and better calculating methods allow an analysis of networks encompassing thousands or even millions of elements, which is the case with the Internet.

In this article we will show our knowledge of blogs as forms of communication and blogosphere as a specific social structure. We will research such topics as popularity, prestige, mutual relationships and creation of communities in the blogosphere. From that it will be possible to draw conclusions about the mechanisms of creation and development of this phenomenon. Another subject of study can be the processes going on in its structure, influencing the behaviour of authors and readers, such as searching for content, assessing its credibility, social influences, the propagation of information and gossip as well as various recommendations. The ruling mechanisms are becoming increasingly more complex. Without an analysis of structure, it is impossible to have insight into the specificity of communication forms, quickly developing and having all the more influence on mass media and social reality.

Aside from increasing our knowledge of blogs as new forms of communication, this analysis will also give us insight into the changing social structures and processes. It is an example of data about real social relations being automatically registered on the Web. Often it is available on entire population scale so there is no danger that the sample size will be distorted. The analysed relations are related to Internet specificity which means that on their example we can research the changes in social ties and the creation of new forms of social life organization.

This is a topic which is becoming increasingly absorbing to researchers and, as a result, is studied more frequently. Citing the works of other authors, we will prove the usefulness of network analysis in the context of blogs, discuss the results and show its application. We will attempt to show how it broadens our knowledge of blogs and blogosphere. This is not the only possible approach but together with observation and survey methods it will create a more full picture of the phenomena of interest.

The structure which influences the processes

The blog, as a fairly new form of communication, is undergoing dynamic development. According to Schmidt² (2007a), based on the Technorati and Blogpulse services data from June 2007, there were between 50 and 95 million blogs in existence up to date. With numbers, also grows their influence on various spheres of people's lives. Blogs are not just Internet diaries where people write about their experiences and emotions, although, according to research carried out in different countries these are still their most important functions (Herring et al.³, 2005; Lenhart i Fox⁴, 2006; Schmidt⁵, 2007b; Trammell et al.⁶, 2006). Presently, blogs are also used in politics, business and journalism. Blogosphere can verify facts, become a tool of social control and influence the propagation of information. There are more discussions and new trends are implemented which often inspire other media.

¹ J. Moreno *Who shall survive? Foundations of sociometry, group psychotherapy and sociodrama*, Nervous and Mental Disease Publishing Co, Washington D. C. 1934.

² J. Schmidt, *Blogging practices. An analytical framework*, "Journal of Computer-Mediated Communication" 2007a, 12 (4). [online] <http://jcmc.indiana.edu/vol12/issue4/schmidt.html> [07.07.2007].

³ P. C. Herring et al., *Conversations in the blogosphere: An analysis 'from the bottom up'*. in "Proceedings of the 38th Hawaii International Conference on System Sciences 2005", [online] <http://csdl2.computer.org/comp/proceedings/hicss/2005/2268/04/22680107b.pdf> [07.07.2007].

⁴ A. Lenhart and P. Fox, *Bloggers. A portrait of the internet's new storytellers*, Pew Internet & American Life Project Research Centre, Washington 2006 [online] <http://www.pewinternet.org/pdfs/PIP%20Bloggers%20Report%20July%2019%202006.pdf> [07.07.2007].

⁵ J. Schmidt, *Blogging practices in the German-speaking blogosphere: Findings from the "Wie ich blogge?!" – survey*. Research centre "New communication media" working paper 07-02, Bamberg 2007b.

⁶ K. D. Trammell, A. Tarkowski, J. Hofmökler and A. M. Sapp, *Rzeczpospolita blogów [Republic of blog]: Examining Polish bloggers through content analysis*, "Journal of Computer-Mediated Communication" 2006, 11 (3), [online] <http://jcmc.indiana.edu/vol11/issue3/trammell.html> [07.07.2007].

This would not be possible on such a wide scale if not for the existence of the network aspect. The different blogs are connected and influence one another.

What is specific to blogs is their great diversity and fragmentation, the same as is true for the entire Internet. Although the larger broadcasters may be more influential, there are also niche authors who have their followers. Moreover, it is becoming increasingly easier to become a blog author due to the low costs of set up. Thanks to free blog platforms present now on many services, it is possible to be a blog owner having even little competence, less than necessary to have an own website. According to Jenkins⁷ (2006), blogs, just like all other new media, are characterized by partner communication, *peer-to-peer* instead of one to many. We may ponder whether this is really true and if many blog authors interact with their readers and other authors and to what extent⁸. In the majority of cases this is not so. Even the most popular blogs are rather limited in their range in comparison to traditional media (Drezner and Farrell⁹, 2004). Regardless, they have real influence on the public opinion, business and politics. The key is mutual interaction and strengthening of processes present in the network structure.

Interaction between blogs leads to an intensification of information transmission which is widely spreading in blogosphere and spills over to other media, Internet based as well as others, including direct contacts. As Adar and associates¹⁰ (2004; cf. also Efimov and Hendrick¹¹, 2005) point out, blogs are becoming a medium of information diffusion or in memetic language – mem transfer (cf. Dawkins¹², 1996). Bloggers who transmit or comment on key information draw readers in and this way improve the status of the blog. Also, information which is broadcasted through many sources gains importance.

Information and opinion diffusion models on the Web are similar to epidemic models of propagation. In those models there are two most imperative factors – the number of contacts with the disease and its contagiousness. The analogy to blogosphere is simple. Firstly, aside from the content, significant is multiple repetition which results in becoming ‘infected’. If one is exposed to the same information numerous times, it is more likely that he/she will repeat it on their blog. Secondly, information in the form of gossip is more likely to be passed on further, or in other words has a great capability of replication. Instead of classic press conferences, marketing and public relations specialists decide to stimulate bloggers’ interest through unofficial yet controlled leaks of information. A classic example of such was an immediate increase in the popularity and money inflow for Howard Dean during the presidential campaign in the US in 2004. This happened because of the Internet and blogosphere in particular (Jenkins, 2006; Wolf¹³, 2004). In the business world it was Apple which used such tactics in order to promote its new telephone model, the iPhone.

Blogosphere plays an increasingly important role in social control. Bloggers are involved in the verification of information and the results of their cooperation are quite visible. The most well known example comes from the US. During the presidential campaign in 2004 bloggers verified false information about G. W. Bush’s military service and were responsible for the resignation from work of CNN journalists (Jenkins, 2006). In 2002, senator Trent Lott’s racist remarks came to light and due to the criticisms he was dismissed as

⁷ H. Jenkins, *Kultura konwergencji: Zderzenie starych and nowych mediów*, Wydawnictwa Akademickie i Profesjonalne, Warszawa 2006.

⁸ In most cases blog authors are, at the same time, readers of other blogs. (cf. Lenhart and Fox, 2006; Schmidt, 2007b).

⁹ D. W. Drezner and H. Farrell, *The power and politics of blogs*, 2004 [online] <http://www.danieldrezner.com/research/blogpaperfinal.pdf> [07.07.2007].

¹⁰ E. Adar, L. A. Adamic, L. Zhang and R. Lukose. *Implicit structure and the dynamics of blogspace*, HP Information Dynamics Lab 2004. [online] <http://www.hpl.hp.com/research/idl/papers/blogs/blogspace-draft.pdf> [07.07.2007].

¹¹ L. Efimova, P. Hendrick and A. Anjewierden, *Finding “the life between buildings”: an approach for defining a weblog community*, from a conference Internet Research 6.0: Internet Generations, Chicago, Illinois, 2005, October. [online] https://doc.telin.nl/dscgi/dp.py/Get/File-55092/AOIR_blog_communitie.pdf [07.07.2007].

¹² R. Dawkins, *Samolubny gen*, Prószyński and S-ka, Warszawa 1996.

¹³ G. Wolf, *How the Internet invented Howard Dean*. *Wired*, 12.01, 2004 [online] <http://www.wired.com/wired/archive/12.01/dean.html> [07.07.2007].

majority leader of the Senate. Also, in 2003 bloggers discredited New York Times reporter Jayson Blair's reliability (Drezner and Farrell, 2004). Similarly, in Poland in 2007, due to blogs began the trial which exposed journalist Eliza Michalik who plagiarized others' texts. The same mechanisms uncovered false blogs (known as flogs) created by firms such as Sony, Vichy and Wal-Mart in order to promote their products (Grynkiewicz and Bojanowski¹⁴, 2007). Moreover, bloggers themselves often control or correct each other in order to better the credibility of this medium (Johnson and Kaye¹⁵, 2004).

Also the processes of social control in the blogosphere have network character. Presumptions of dishonesty lead to discussion as well as activity in order to verify the information. Individual, amateur broadcasters, due to such interaction, can gain credibility. According to Drezner and Farrell (2004), if the same issue is noted on numerous important blogs, it will make its way to mass media and reach wide audiences. Cases have also been noted where scandals were curbed after they have been properly interpreted in the early phase. In epidemic models, after exceeding the critical point, percolation takes place, or the epidemic breaks out. The same is with the Internet, a stop can only be put to things in the early phase and through activity targeted at key areas by separating them from the rest. If not, the range is later too widespread in order to do anything (Pastor-Satorras and Vespignani¹⁶, 2001; 2002).

The worlds of traditional and Internet (blog) media continue to permeate and mutually use each other (Jenkins, 2006; Johnson and Kaye, 2004). Jenkins (2006) writes about this in the context of general media convergence. Within the blogosphere merges the knowledge of many participants including experts and identified is, due to discussion, key information (Adamic and Glance¹⁷, 2005). As Drezner and Farrell (2004) point out, the power of blogs comes from the fact that they are the first to interpret the current events.

Moreover, within the blogosphere observation and prediction of various trends takes place. Bloggers not only look for information about the past but also attempt to predict the future (Jenkins, 2006). Analysts in charge of predicting public feeling and market trends all the more so turn to blogs.

Blogosphere is a complex social system where interaction of many elements occurs. Due to the processes taking place there, even weaker or dispersed elements can potentially gain greater force. Through other media, the influence of blogs reaches also those people who do not access them. In order to get to know and understand these processes, we need to further look into the structure of this system and we will do so by network analysis.

Analysis of social networks

The analysis of social networks as a method of researching interdependencies between individuals, in this case the authors and readers of blogs, seems to be particularly useful in the study of blogosphere. This method is often used in sociology, social psychology, anthropology and communication studies. It enables us to research and measure the models of resource exchange (information or prestige) between various social actors (ie. people, organizations, countries). They, through specifically defined relations¹⁸, are network junctions. Depending on the definition method, we can analyse networks of friendships, communication, sexual relations or social support.

¹⁴ T. Grynkiewicz and M. Bojanowski, *Firmy oszukują w fałszywych blogach*, "Gazeta Wyborcza", Warszawa, June 11, 2007, p. 35.

¹⁵ T. J. Johnson and B. K. Kaye, *Wag the blog: How reliance on traditional media and the Internet influence credibility perceptions of weblogs among blog users*, "Journalism and Mass Communication Quarterly", 81 (3) 2004, p. 622-642.

¹⁶ R. Pastor-Satorras and A. Vespignani *Epidemic dynamics in finite size scale-free networks*, "Physical Review E" 65, 2002, 035108(R); R. Pastor-Satorras and A. Vespignani, *Epidemic spreading in scale-free networks*, "Physical Review Letters" 2001, 86, 3200-3203.

¹⁷ L. Adamic and N. Glance *The political blogosphere and the 2004 U.P. election: Divided they blog*, 2005, [online] <http://www.blogpulse.com/papers/2005/AdamicGlanceBlogWWW.pdf> [07.07.2007].

¹⁸ There are also multimodal networks with more than type of junctions and relations.

Network analysis allows us to obtain a picture of non-obvious or informal dependence structures explaining, for example, power or hierarchy relations. One of the most well known examples is the Padgett research (1993; from Wassermann and Faust¹⁹, 1994). He used a network of family and trade relations of XV century Florence patricians in order to show the central position and power of the Medicius family. Another interesting and perspective area is research of web structure dynamics and the dynamics of the phenomena which this structure influences (the so-called web dynamic).

This type of structure analysis is meaningful as, according to some sociologists, it shows the changes in social ties and organization of social life. They say that in some types of network societies (Castells²⁰, 1997) or networked societies (Wellman²¹, 2001b) the structure of social relations in modern societies of the West evolves toward loosely spread types of networks. Less important now are the traditional closed-off, cohesive groups which have a greater influence on its members. Instead, the individual is more loosely connected to a greater number of people. The development of technology, especially the Internet, is a great catalyst in these changes. This is largely due to more effective individual management of personal relations and as well as the initiation of new, weak interpersonal relations (cf. Batorski²², 2005).

Blogging is a phenomenon which fits in well with the on-going changes, especially due to the formation of weak relations. On the one hand, discussions about certain blogs lead to the forming of new friendships, or groups of people who know each other solely through the Internet as they have similar interests. On the other, a blog can be a great tool in helping people stay in touch who are otherwise separated by great distances (students going away to schools, emigrants). This way, contacts can be comfortably kept-up among relatives and friends. Due to the development of technology, pictures, films, sound files can now be added to blogs. Also there are company blogs, like *biznes.net*, which are created to aid professional relations between people and help build the company's brand name.

In Poland, such methods have so far not been very popular, although lately we can observe growing interest and more publications on the specificity of Web networks (Batorski²³, 2004; Hupa²⁴, 2007; Juza²⁵, 2006; Zając²⁶, 2007). An introduction of Web analysis in Polish language can be found in Bendyk²⁷ (2004), short texts by Sozański²⁸ (2002) and Jonak²⁹ (2007) as well as in a chapter from a textbook by Turner³⁰ (2004).

Network analysis does not only relate to social studies. Lately, there has been a great deal of exchange of information from various fields in academic circles. Fascinating are various overlaps and similarities of many regularities regardless the field of study. From the network perspective, there are many various networks that are studied such as technological networks (inflow of electric energy or the physical structure of the web), biological (digestive

¹⁹ P. Wasserman and K. Faust, *Social network analysis: Methods and application*, Cambridge University Press, Cambridge, New York 1994.

²⁰ R. Castells, *The Rise of the Network Society*, MA: Blackwell, Malden 1997.

²¹ G. Wellman, *Physical place and cyberspace: The rise of personalized networking*. "International Journal of Urban and Regional Research", 25, 2001b.

²² D. Batorski, *Internet a usieciowienie relacji społecznych*, *Kultura Współczesna* 1(43) 2005, p. 41-62.

²³ D. Batorski, *Sieci społeczne: Charakterystyka, uwarunkowania and konsekwencje struktur relacji społecznych na podstawie komunikacji internetowej*, doctoral thesis, not published, Uniwersytet Warszawski, Warszawa 2004.

²⁴ A. Hupa, *Badania orientacji politycznych w internecie*, "Studia Socjologiczne" 2007, w druku.

²⁵ M. Juza, *Sieć społeczna – nowoczesne plemię: Serwis www.orkut.com jako przykład możliwości internetu w upowszechnianiu sieciowej formy porządku społecznego*, in K. Krzysztofek, M. Podgórski, M. Grabowska, A. Hupa and M. Juza, *Wielka sieć: E-seje z socjologii internetu*, Trio, Warszawa 2006.

²⁶ J. M. Zając, *Sieci w sieci*, in: K. Winkowska-Nowak, A. Nowak, A. Rychwalska, (ed.), *Modelowanie matematyczne and symulacje komputerowe w naukach społecznych*, Wydawnictwo SWPS Academica, Warszawa 2007, p. 128-135.

²⁷ E. Bendyk, *Antymatrix: Człowiek w labiryncie sieci*, W.A.B., Warszawa 2004.

²⁸ T. Sozański, (2002). *Sieć społeczna*. in: *Encyklopedia socjologii*, vol. 4, Oficyna Naukowa, Warszawa 2002, p. 28-36.

²⁹ Ł. Jonak, *Analiza sieci społecznych and dynamika sieciowa*, in A. Nowak, K. Winkowska-Nowak, A. Rychwalska (ed.), *Modelowanie matematyczne i symulacje komputerowe w naukach społecznych*, Wydawnictwo SWPS Academica, Warszawa 2007, p. 113-121.

³⁰ J. H. Turner, *Struktura teorii socjologicznej: Wydanie nowe*, Wydawnictwo Naukowe PWN, Warszawa 2004.

or protein metabolism), information (citing of academic authors) and social networks. At the same time, there are many characteristics common to all of them (Newman³¹, 2003). Practically all the observed webs are significantly different from random webs of similar size, which can be seen based on the mechanisms of their creation. The most important characteristic, important also to blogosphere, is the great differentiation of various junctions. For example, a small number of key junctions includes a great number of relations while a great number of junctions has very few relations. Also, practically all junctions in a web are intertwined and in close distance of each other. We will return to these phenomena further on when we discuss the implications of network structure and dynamics for blogs and blogging.

Networks within blogosphere

Lately, web researchers have been analysing Internet social networks more often. They assumed that networks within the Internet illustrate imperative social relations such as communication or friendships. According to a theory by Wellman³² (2001a), computer networks which unite people have become *computer supported social networks* (or CSSN). Such social networks based on people connecting through WWW sites are a type of CSSN. There has been a lot of research done from the network theory perspective where WWW sites were analysed as an example of an abstract network, without any special emphasis on the social context. The goal was rather to analyse data within such a great web (cf. Scharnhorst³³, 2003).

Blogosphere is where social Internet networks are created. It is one of its most important aspects, as Schmidt (2007a) states in his thesis. Many social relations of bloggers can be found in the links (Adamic and Glance, 2005; Hasan and Adamic³⁴, 2007; Herring et al. 2005; Marlow³⁵, 2004). Blogs are written by people, who write about others, explain their likes or dislikes or simply comment on something. There are three types of such networks, and these will be discussed further on. There are links to other blogs of choice on the blog's main page (*blogroll*), links in the table of entries and comments included in the blog. Blogs are linked, by hypertext, to other blogs but also to other types of websites.

The structure of footnotes illustrates to a large extent the social structure of blogosphere and influences author and reader behaviour. According to the general definition of social networks (Wassermann and Faust, 1994), these are models of information exchange. The actors, or network junctions are, in this case, blog creators and their readers who actively comment on the blogs. Blogs can be written by more than one person, also one person can be the author of more than one blog or write under various pseudonyms. The basic factor determining success is visibility (Schmidt, 2007a). If a site has links to others, there are greater chances that more internauts will find it. The better the blog, the greater the chance that it will be mentioned on a popular site. Blog popularity can bring in material gains, although in Poland they are still rather minimal. Bloggers make money when advertising and other sponsored links are inserted on their sites. Sometimes they may be paid to write about certain content, ie. to build an image of a product, although this can be controversial ethically. Gaining popularity in blogosphere can lead to a greater career, if for example, the media become interested or one gains authority as an expert.

³¹ M. Newman, *The structure and function of complex networks*, "SIAM Review", 45 2003, 167-256.

³² G. Wellman, *Computer Networks As Social Networks*, "Science" 293, 14, 2031-34, 2001a.

³³ Scharnhorst, *Complex networks and the web: Insights from nonlinear physics*. "Journal of Computer Mediated Communication" 2003, 8 (4). [online] <http://jcmc.indiana.edu/vol8/issue4/scharnhorst.html> [07.07.2007].

³⁴ N. A. Hasan and L. Adamic, *Expressing Social Relationships on the Blog through Links and Comments*, 2007 [online] <http://www.icwsm.org/papers/2--Ali-Hasan--Adamic.pdf> [07.07.2007].

³⁵ C. Marlow, *Audience, structure and authority in the weblog community*, from a conference, International Communication Association, New Orleans, May 2004, [online] <http://alumni.media.mit.edu/~cameron/cv/pubs/04-01.pdf> [07.07.2007].

A links network has a deeper social meaning. Recommending other sites increases their prestige and credibility. According to Moreno's (1934) social network theory, there is a relationship between the strategic position within the network and the significance of the social actor. One of the most important and basic measures is the number of recommendations from other people (cf. Wassermann and Faust, 1994). When bloggers create links, they recommend certain sources, therefore bettering their structural position.

The links structure, however, is only somewhat similar to a full social structure. Not all social relations in the blogosphere are illustrated by links (Schmidt, 2007a). What is more, we need to remember that not all links are explicit (ie. Efimova and Hendrick³⁶, 2005; Nilsson³⁷). Typically, most links are positive but there are also those which criticise or ridicule certain content (Park and Thelwall³⁸, 2003). In case of blogs, these are predominantly included in the posts. There are also spam blogs or splogs which only include links to sites they wish to promote (Kolari, Java and Finin³⁹, 2006).

The hypertext blogosphere network not only delineates its structure but also influences the behaviour of users and the on-going processes there. As mentioned earlier, the larger the number of links, the greater the chances that content will reach wider audiences. If they reach bloggers, it is possible that they will comment on what they've read in their own blogs or insert a link on their site. Chances for information to be disseminated increase as well as interest in it, according to mechanisms described earlier. The same is regarding discussion on a subject. There are links to supporting content, arguments and opinions. Such feedback is important for authors as it indicates people's reception of their work. This can also be traced using other technical devices such as the so-called trackbacks or entrance statistics.

Three types of social relations in links

Within links there are three types of social relations: through blogrolls, footnote content and commentary. These three forms have different meaning and the networks created based on them have little in common (Hasan and Adamic, 2007). Therefore, their specificity in defining a network should be discussed separately.

The so-called blogroll is a list of links to other blogs or Internet sites included on the blog's main page. These links can be of various types. They could recommend other blogs, indicate friendship with another author (from the Internet or outside of it), or be a result of an exchange of links with someone in order to better one's position (Schmidt, 2007a; Trammell et al., 2006). These reasons are, of course, not mutually exclusive. A blogroll is important in defining a blogger's identity as it gives information about him and sites significant to him (Schmidt, 2007a).

The blogroll indicates predominantly positive relations – friendships, one's likes and recommendations (ie. Efimova and Hendrick, 2005; Marlow, 2004). There is also easy access to a blog's main page and, therefore, the blogroll. However, relations within the blogosphere cannot be solely limited to this type of linking (Schmidt, 2007a). Research shows that not all blogs have blogrolls (41% - Lenhart and Fox, 2006; 55% - Schmidt, 2007b; 82% - Trammell et al., 2006), however, these differences can be explained by different types of research and survey methods. Moreover, blogrolls continually change over time as authors add new links or delete old ones (less frequently).

³⁶ L. Efimova and P. Hendrick, *In search for a virtual settlement: An exploration of weblog community boundaries*, 2005 [online] https://doc.telin.nl/dscgi/dp.py/Get/File-46041/weblog_community_boundariep.pdf [07.07.2007].

³⁷ P. Nilsson, *The function of language to facilitate and maintain social networks in research weblogp.* [online] <http://www.eng.umu.se/stephanie/web/LanguageBlogp.pdf> [07.07.2007].

³⁸ H. W. Park and M. Thelwall, *Hyperlink analyses of the world wide web: A review*, "Journal of Computer Mediated Communication" 2003, 8 (4), [online] <http://jcmc.indiana.edu/vol8/issue4/park.html> [07.07.2007].

³⁹ P. Kolar, A. Java and T. Finin, *Characterizing the splogosphere*, from a conference "Weblogging Ecosystem: Aggregation, Analysis and Dynamics", Edynburg 2006. [online] <http://www.blogpulse.com/www2006-workshop/papers/splogosphere.pdf> [07.07.2007].

In footnote content we can find citations and sources of information the authors used. This means sources of all types. According to Adar and associates (2004), cited are original sources, as well as places where bloggers first found the information. The amount of footnote content depends on the type of blog. In case of filter blogs, there are many citations and links to other sites, while in personal blogs this will happen less often. In one American research results about 50% of bloggers surveyed declared that they check the information they write about and cite the sources (Lenhart and Fox, 2006), however, in reality this probably happens less often.

It is assumed that mutual blog citations are a type of conversation or debate within the blogosphere. Present research shows that this happens rather rarely so far (Herring et al.⁴⁰, 2004; Herring et al., 2005). According to Trammel and associates (2006), it was estimated that this occurs only in 9% of Polish blogs. These citations do not necessarily signify meaningful social relations. What is more, they do not have to be positive but may be critical or ridiculing in nature. Relations which take place only in such citations are multiple or mutual.

The analysis of networks created as a result of commentaries seems to be most complicated and to a large degree dependent on technical solutions in blog programming. Usually the commentaries will include links to their authors' sites or blogs, according to Schmidt (2007a). Also, many blog platforms require one to log-in before inserting any comments, and the log-in may be the commentators' blog address. Moreover, in some cases the blog author may easily recognize the commentator based on his commentary content or style. Due to the specificity of Internet anonymity, one may know who the commentator is, even though he does not identify himself (cf. Mazurek⁴¹, 2006). While the first and second type of communication identifies the author, the third one does not.

Collection and interpretation of data and networks created as a result of commentaries will be more difficult than in case of the first two types of communication. Commentaries are an integral part of blogs and they truly enable communication and mutual relations between the author and the recipient. It is the blog author's decision whether to allow commentary about his blog but research shows that a large majority allow it (87% in Lenhart and Fox research, 2006, and 97% in Schmidt's, 2007b). Interactions based on commentary allow researchers to obtain a picture of the social networks taking place, which was not the case regarding blogrolls or permalinks (Hasan and Adamic, 2007). We can also speculate that interaction in commentaries influences the creation of networks in blogrolls and footnote links. It is usually through commentary that interactions first take place within the blogosphere. This could later be documented through inserting someone's blog on a blogroll or in a footnote link.

It should also be taken into consideration, when analysing such networks and relations, whether the relations are solely Internet based or not. Contacts in blogosphere may be a result of people knowing each other outside cyberspace, meeting in blogosphere or be only limited to it. So far, the Internet is used mostly as an additional channel of communication between people who already know each other (cf. Batorski⁴², 2006), however, in blogosphere many acquaintances are began for the first time in the virtual world.

⁴⁰ P. C. Herring, L. A. Scheidt, P. Bonus, and E. Wright, *Bridging the gap: A genre analysis of weblogs.*, in *Proceedings of the 37th Hawaii International Conference on System Sciences*, IEEE Computer Society Press, Los Alamitos 2004, [online] <http://www.blogninja.com/DDGDD04.doc> [07.07.2007].

⁴¹ P. Mazurek, *Anatomia internetowej anonimowości*, w D. Batorski, M. Marody and A. Nowak (ed.), *Spoleczna przestrzeń internetu*, Wydawnictwo SWPS Academica, Warszawa 2006, p. 79-90.

⁴² D. Batorski, *Przemiany and konsekwencje korzystania z internetu*, in: Ł. Jonak et al. (ed.) *Re: internet – społeczne aspekty medium. Polskie konteksty i interpretacje*, Wydawnictwa Akademickie I Profesjonalne, Warszawa 2006, p. 119-151.

Specificity of Internet network research

Data on blogosphere structure from links can be analysed through the network analysis method. The data about contacts through telecommunication technologies is automatically registered, through registers of telephone conversations, e-mails and through networking services, such as grono.net. These are great opportunities for researchers as the data are complete and exact (Zajac, 2007). Because of this, various research problems can automatically be eliminated, such a subjectivity, lack of reliability or too little data (Newman, 2003). Presently structures including millions of junctions and relations can be analysed. This is due to the development of statistical models and special software which increase computing power. At the same time, we need to take more into consideration issues such as ethics in the collection, management and interpretation of data (Garton, Haythornthwaite and Wellman⁴³, 1999).

Network analyses are most frequently used to analyse Internet networks. Since it is a communication web comprised of a web of sites, it only seems natural. What is more, the data is registered there automatically which allows for an analysis of a great network without the trouble of collecting data more manually. Data on hypertext networks can be gathered three ways: through observation (including people), through the use of special programmes or a combination of the two. In case of large network analysis, it is better to use automated data and the programmes used for such are called *crawlers* or *spiders* (Bruns⁴⁴, 2007; Park and Thelwall, 2003).

However, this type of analysis method also has its limitations. In many cases, a description of structure does not give us insight into social relations. It should be combined with more in-depth data gathered through surveys or observation. Moreover, these types of networks are loose and extensive in character and it may not be easy to establish their border lines. It may be difficult to ascertain which blogs belong to the research area. Specific limitations may also arise from the method of data collection, ie. it may be difficult to reach junctions which have low or inexistent number of incoming relations or do not have any links. One solution to this may be using data from a service provider, such as a blog platform. This way, however, we would only be researching part of the WWW. Finally, we need to take ethical issue into consideration, or the use of anonymous people's data or personal content which, at the same time, is made public.

Different types of blogs

In this part of the article discussed will be the conclusions of network research to understand the phenomenon of blogs and the social processes taking place within the blogosphere.

Blogosphere structure is characterized by a small number of popular and standing out blogs and a large number of insignificant blogs. The most important measure in this is the number of links that a specific blog has to others, the number of incoming communication and the number of other blogs that mention the one in question. The research shows that a majority of blogs have no, one or two links at most, while a small number of them have as many as several hundred. In many blogroll and link analyses, no matter whether they were analysed together or separately, observed was power disintegration of number of incoming

⁴³ L. Garton, C. Haythornthwaite and B. Wellman, *Studying on-line social networks*, in: P. Jones (ed.), *Doing Internet research: Critical issues and methods for examining the Net*, CA: Sage, Thousand Oaks 1999, p. 75-105.

⁴⁴ A. Bruns, *Methodologies for mapping the political blogosphere: An exploration using the IssueCrawler research tool*, "First Monday", 12 (5) 2007. [online] http://firstmonday.org/issues/issue12_5/bruns/index.html [07.07.2007].

relations (Adamic and Glance, 2005; Bachnik et al.⁴⁵, 2005; Herring et al. 2005, Marlow, 2004). A very slanted disintegration was also observed by Drezner and Farrell (2004).

These types of junction disintegrations are quite common to networks of this type. This is in accordance with the *preferential attachment* (Barabasi⁴⁶, 2002) rule. The network develops, new junctions are added and they connect to already existing ones. Resulting is the *rich get richer* phenomenon, where the longer existing blogs have the most links. Authors of new blogs obviously create links to most popular blogs instead of ones that are unknown. According to the *preferential attachment* mechanism, much depends on the age of the junction, older ones have had more time to accumulate relations and they have greater chances to make new relations in the future. This happens with blogs that have build up a name for themselves. They can be popular for a long time, provided that their authors continue to write. Also, there are new blogs which quickly gain popularity within the blogosphere. This is also in accordance with the above mentioned mechanism, which states that different junctions have various capabilities for attracting new relations (the *fitness* parameter). Some blogs will be more interesting or better promoted and will gain a good position within a short time.

When one is surfing the Web within blogosphere, going from link to link, it is easiest to find blogs with a large number of relations/links. This is also due to the way search engines are designed, such blogs have greater chances to get a high position on the search result lists. It is such junctions or websites that play a key role in the dissemination of information on the Web. The greater the number of links to a certain blog, the greater the chances of coming across it, reading, commenting and adding new links to it. According to Shirky⁴⁷ (2003), there is something like blog inequality but due to certain growth mechanisms it is also possible for new blogs to advance and gain good positions.

Differentiation in structural positions and ease of blog accessibility influence people's opinions of blogs. According to Herring and associates (2004), there is still no complete picture of blogosphere as an integrated, interactive unit geared toward external events network. Generally blogs with those characteristics are more popular in comparison to those which are more individual in expression. According to Trammell and associates (2006), on the other hand, among Polish blogs from the blog.pl service, the majority are a form self-expression. Also other researchers state that, although many popular blogs comment on politics or are journalistic in character, most bloggers write about their lives and personal experiences (Lenhart and Fox, 2006; Schmidt 2007b). As we can see, there is a difference between a popular image of blogosphere and reality. What is more, we cannot consider the popular image untrue, however, it is fragmentary and focuses on elements most visible, therefore most important, within the network.

Aside from the well visible junctions, interesting are also those blogs outside the hypertext network. We can assume that a large majority of blogs do not possess any links. The Bachnik and associates research shows that 90% of blogs are in this category. We can also suppose that a vast majority of those are old, no longer active blogs. Internet policy in this area is that even blogs abandoned long ago are not deleted from the Web. Of course, there are also active blogs which do not have any links or hypertext relations. Since they are not part of blogosphere, they should rather be compared to personal websites or to traditional diaries.

⁴⁵ W. Bachnik et al. *Quantitative and sociological analysis of blog networks*, "Acta Physica Polonica B", 36 (10), 2005, 2435-2446.

⁴⁶ A.-L. Barabasi, *Linked: The new science of networks*, Cambridge University Press, Cambridge 2002.

⁴⁷ C. Shirky, *Power laws, weblogs, and inequality*, 2003 [online] http://www.shirky.com/writings/powerlaw_weblog.html [07.07.2007].

Other application areas of network methods in blog and blogosphere research

Research of blog networks does not solely regard structural analysis but also other aspects such as various types of blogs, their influence on network development, creation of new clusters and societies as well as the relationship of structure and dynamics of information dissemination and social influence. Most of these issues have, so far, not been studied empirically but this can be expected to change in the near future.

An interesting research area is the relation between the structural characteristic and the blog function and character. Generally, there is great blog diversity, from personal diaries, sometimes interactive discussions with commentators, to journalistic reports, knowledge management, image building and customer communication. There are also filter blogs which select information and direct people to specific sources. The heterogeneity is illustrated in the structure of hypertext networks where links play an imperative role in finding sources of information and determining relations between authors and readers. Such were the conclusions reached by Herring and associates (2004; 2005).

Another important aspect is the influence of various factors on the creation of relations. The processes of creation of social networks are not random ones. There are mechanisms such a reciprocity, creation of relations between neighbours, in practice it means people getting to know each other due to common friends, or homophilia – a tendency to create relations between people who have something in common. Other determinants are factors such as age and sex. Thanks to the development of statistical models, it is possible to evaluate the creation or extinction of various relations (Monge and Contractor⁴⁸, 2003; Wassermann and Faust, 1994). It would be worth examining factors which contribute to the development of blog networks, however, due to their complexity it is not easy. The research that has been done to date suggests that factors influencing networks are types of links created, blog characteristics and the character of comments (Tremayne et al., 2006). Interesting is also, typical to social networks, and present in blogosphere, the mechanism of reciprocity of relations (cf. Kumar et al.⁴⁹, 2004). It seems that aside from *preferential attachment* it is possibly the second most important element in blogosphere development.

Network analysis is an excellent tool of identification of specific substructures within the Web. Their existence and range often determine the size of particular communities. Research shows that within blogosphere there are communities centered around specific topics, such as the war in Iraq (Tremayne et al., 2006), knowledge management (Efimova, Hendrick and Anjewierden, 2005), or various interests (Kumar et al., 2004). In America, for example, there is a clear division of bloggers in terms of their political sympathies, right and left wing (Adamic and Glance, 2005). This is not surprising and is rather typical to social networks. Nevertheless, the number, size and make-up of web communities are among the most important structure characteristics.

Within blogosphere there is enormous potential for debate and exchange of opinions. Many authors say that there is a great deal of fragmented but also unified discussion on almost any imaginable subject (Marlow, 2004). However, research to date does not support this thesis. It seems that fragmentation is more characteristic as well as the existence of cliques. In most cases, blogs are read by those who agree with the author's opinions (Jenkins, 2006). Obviously, sometimes more open debates take place, especially among smaller communities but generally blogosphere is a place where divisions are created and strengthened.

⁴⁸ P. R. Monge and N. P. Contractor, *Theories of communication networks*, Oxford University Press, Oxford 2003.

⁴⁹ R. Kumar, J. Novak, P. Raghavan, A. Tomkins, *Structure and evolution of blogspace*, "Communications of the ACM", 47 (12) 2004, p. 35-39.

There is also research that examines the influence of network structure on the processes of information dissemination. Thanks to large, spread-out networks with many links, possible is the diffusion of many blogs. Often news or gossip travel outside blogosphere into other channels of communication. Similarly to epidemiologic models, 'contagious' information of common interest and easily repeatable can travel at enormous speeds. Adar and associates (2004) point out that such content often starts out on relatively unknown blogs. Then a more popular blog, one with a great number of links and important within the structure, picks up the issue. This type of mechanism, of information travelling from marginal to central sources and then to peripheral ones again, is described in diffusion theories (Valente⁵⁰, 1995). Another interesting aspect of various research is 'peak' activity of certain topics which are disseminated almost instantaneously and commented on by many blogs (Adar et al., 2004; Gruhl et al.⁵¹, 2004; Kumar et al., 2004). Although researchers devote a lot of attention to the dissemination of information and gossip, or easy content, we know a lot less about the processes of social influence on the networks and this seems to be a intriguing topic for future research.

Conclusion

This article attempted to illustrate how an analysis of social networks can help us better understand the phenomena of blogs and blogosphere, a specific type of social sphere and a place of important social processes. Due to great blogosphere fragmentation, many processes taking place there, such as fast diffusion of information, verification of facts or social control, are based on the interaction of many users who separately do not mean much but grow in strength as a group. Blogs are connected by relations through hypertext links which can be researched through the developing methods of social network analysis. The structure of these networks is a result of the social mechanisms and process dynamics that take place there. One of the most imperative aspects is the great diversity of blogs, in terms of their structure, visibility, popularity and prestige.

Understanding the blogosphere networks helps us get to know this new way of communication better, one that is constantly gaining popularity, is evolving to new uses and gaining position in the media system. The world in which it was created is based on a great deal of interaction between many broadcasters and it is a very complex world. In order to analyse the relations that take place there, we needed to use a network paradigm.

The public opinion turned its attention to blogs only several years ago and just lately they have started influencing other media and social reality. Obviously, research of the subject is very new as well and much still needs to be done in this area. Presently, there is growing interest in blog and blogosphere research, therefore, we should expect more literature on the subject in the near future. It is definitely worth to analyse the dynamics of the processes taking place there, the structure of blogosphere and the fast evolution of blogs. Due to the large popularity of this type of communication in our country, useful will be further empirical research of Polish blogosphere.

⁵⁰ T. W. Valente, *Network models of the diffusion of innovations*, Hampton, Creskill, NJ, 1995.

⁵¹ D. Gruhl, R. Guha, D. Liben-Nowell and A. Tomkins, *Information diffusion through blogspace*, w *Proceedings of the 13th international conference on World Wide Web*, ACM Press, New York 2004, p. 491-501.