

Network Centrality of Obama and his Cabinet Members as Predictors of  
Job Approval Over Time

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### Abstract

To test hypotheses concerning presidential cabinet network centrality and its relationship to presidential job approval, this research mined the social network structure of President Barack Obama's cabinet members through automatic network analysis of all *New York Times* and *Washington Post* stories including any of 24 individual cabinet members and the president. The WORDij semantic-network software identified their co-occurrences in these news stories. The software also segmented the aggregate text into two-week intervals based on the average time between Gallup presidential approval polls. Time-series analysis linked network centrality with presidential job approval after removing serial autocorrelation. The research tested the hypothesis that when the centrality of the president is higher than the centrality of the cabinet members, presidential job approval ratings are lower. Conversely, when the centrality of the president is lower relative to average cabinet member centrality, job approval ratings are higher. This is based on the reasoning that press coverage is commonly negative, and the president absorbs more negative press sentiment when he stands higher in centrality than the other cabinet members, acting as a metaphoric "lightening rod." When the president's centrality is lower relative to the cabinet average, this lightening rod effect dissipates as other cabinet members would absorb more of the negative press content as publics process information about the administration. The hypothesis was supported for the Obama administration and his cabinet with a significant negative correlation between relative presidential centrality and job approval at a time lag of  $l=3$ , a period of 6 weeks.

## **Introduction**

Political leaning and bias are increasingly prevalent terms in an age of the twenty-four hour news cycle. Accusatory rhetoric portraying a “liberal” or “right-wing” media is ripe for discussion. Media’s influence on public opinion is well documented among political scientists (Kurtz, 1990; MacKuen, 1983; MacKuen et al. 1992). It has been argued that the media themselves are agents of control, essential to the process of opinion formation of publics (Swanson, 1949). Of relevance to the current research, negative news coverage as an indicator of Presidential popularity has been observed (Graber, 1993). In the same vein, Blood and Phillips (1995) examined Presidential popularity in a time series analysis of recession news headlines.

Political networks have become a term of consequence evidenced by symposiums in Political Science Journals and annual conferences held at elite institutions. The network approach has long been utilized in observing political processes (Katz & Lazarsfeld, 1955). An extensive explanation of political networks from individual, system and international levels of analysis positioned network concepts as an integral determinant of political behavior and processes (Knoke, 1994). Network methods have been utilized more recently to study influence and communication among terrorists (Brams, Mutlu, & Ramirez, 2006; Krebs, 2002; Danowski, 2011). A recent overview provided varying explanations outlining empirical determinants of causality in Political Networks (Fowler, Heaney, Nickerson, Padgett, & Sinclair, 2011). Of relevance to this research, mapping political actors to observe voting patterns in the US house and senate outlined network effects on legislation (Fowler, 2006). The multitude of political processes and behaviors the network approach is employed to observe signifies network characteristics’ predictive qualities. We aim to apply the network approach to a measure of public opinion, job approval ratings of the president.

The current study bridges the network approach with the measure of media influence on public opinion. We have introduced a method of automatic detection of social networks of presidential cabinet actors by mining large volumes of news corpora (Cepela & Danowski, 2009). We automatically detect and measure networks among political actors in news text, demonstrating media network representation of presidential cabinet actors as a predictor of presidential approval. While content of news stories has been observed in relation to presidential approval (Blood & Phillips, 1993; Graber, 1993), analyzing the presidents' and cabinet members' network structure within the news stories themselves and measuring its association with presidential approval has yet to occur. As major news media are available electronically with time-stamps, employing time series analysis to display network evolution over time, and measure its association to presidential approval is viable.

When considering crests and troughs of presidential approval, one is drawn to varying events within an administration. G.H.W. Bush had the Gulf War, Clinton was stymied with the Lewinski scandal and G.W. Bush experienced steep declines following his ephemeral high after 9/11. When observing the data the sensible assumption that a positive or negative event precedes an increase or decrease in presidential approval is not always the case. This is evidenced with Clinton's increase in approval following the Lewinski scandal (Stimson, 2004). In analyses of the general volatility in presidential approval, there has been an "equilibration" hypothesis that as presidential approval (absent of crises) moves either above or below a threshold, it flows back toward this equilibrium (Stimson, 2004). Absent from scrutiny in consideration of these fluctuations is the association between news media representation of presidential administrations and job approval. Additionally, lacking reflection in the case of Clinton's post Lewinski approval ratings is the notion that media representation has a salient relationship with time. We reason

that news stories contribute to public perception, particularly depiction of social networks of presidential cabinet actors within the press itself through time.

Because only a small percentage of the population actively follows political news, approximately 25% (Erikson & Tedin, 2011) it takes some time for viral distribution of changing opinions. The plurality of the population gets political news through local television news (Erikson & Tedin, 2011) which infrequently gives in-depth coverage of national political news. A large subset of the population expresses no interest in politics. As the political news focused to create proliferating online sources that are attended to by these elite, there may be an internet-era multi-step flow of influence, more active, complex and vibrant than proposed in the original two-step flow hypothesis (Lazersfeld, Berelson, & Gaudet, 1948; Katz & Lazarsfeld, 1955; Katz, 1957). Within the media, there also appears to be increasing multi-step flow, with news organizations' attention to the political blogs and micro-blogging on Twitter, and no longer looking only to the *New York Times* for setting the news agenda. Through microblogging and blogging, the politically-focused 25% may themselves be producing more news or leads.

In determined categories, political science and communication scholars have observed news content and its relation to presidential approval (Blood & Phillips, 1995; Graber, 1993; Gronke & Newman, 2000). Set aside is the utilization of network characteristics within the content itself. We employed a method of detecting and analyzing the social networks of political actors as portrayed in news stories within predetermined time intervals and measured their association with presidential job approval.

To demonstrate the connection between network structure as represented in news stories and presidential approval, we mapped the social network of President Barack Obama's cabinet members. We detected the social network among cabinet members through measurement of their

co-occurrence in news stories. Further, we analyzed the network centrality of each actor and of the entire network to examine its relation to presidential job approval through time.

We have analyzed network centrality and presidential approval through time within the administration cabinets of Presidents Reagan, G.H.W Bush, Clinton and G.W. Bush (Danowski & Cepela, 2009). We have used for time slice intervals the average length between Gallup job approval ratings for each administration. As polling conditions have evolved, the length between polls for President Obama's cabinet is shorter than previously analyzed administrations as there are currently daily 3-day moving average polls Gallup conducts on job approval. Gallup makes a more summarized report every two weeks. Accordingly, we measured the association of centrality characteristics to Gallup job approval ratings at two-week intervals, slicing the approximately 3 years of news content for President Obama's cabinet into two week intervals so that the time intervals for the job approval ratings and the cabinet network centrality could be measured most validly.

Using a "lightning rod" as a metaphor, we posit that when the president is a more central figure within news stories compared to his administration he stands above his cabinet members, effectively exposing him to negative press coverage (Danowski, 2010). As positive events are not as likely to obtain news coverage as negative events (Entman, 2007), when the president is portrayed as a central actor in the cabinet network, his approval will be negatively impacted as he absorbs more blame for the negative media messages. Conversely, when the president is less central compared to the average centrality of his cabinet as a whole, the negative media messages disperse among the additional cabinet actors; making the approval rating of the president higher, or at least not declining. When cabinet centrality compared to the president is higher it effectively lowers the prominence of the president, diminishing the "lightening rod" effect as the

network structure conveyed in the media messages is not focused on the president as a central figure. Our resulting hypothesis is as follows:

*H: The greater the difference of the centrality of the president and his cabinet members, the lower the job approval ratings for the president.*

## **Methods**

We have analyzed the social networks of the cabinets of each presidential administration since Nixon (Danowski & Cepela, 2009; Cepela & Danowski, 2009). For President Obama's 24 cabinet members, all Lexis-Nexis news stories in the *New York Times* and *Washington Post* were captured for a period of 148 weeks, which is the length of his term at the time of this study. A separate search was conducted for each cabinet member for the duration of his or her respective post. Obtaining each news story written for every cabinet member effectively ensures any press coverage for the cabinet in this elite media was acquired. All separate, full text cabinet media content files were then aggregated into a single file for the administration. The file size was 386 megabytes.

An analysis of the aggregate administration file was then conducted using WORDij 3.0 (Danowski, 2009a; 2009b). We created an alias string conversion file to recode name variations into a single unigram, and an include file of these names that enabled measuring the link strengths among pairs of individuals. The co-occurrence between presidential cabinet actors within a 3-word window (effectively 7 words wide) of each other, excluding all other content links between actors were determined by their co-occurrence in the news stories, with a higher frequency of co-occurrences signifying greater link strength. Using proximity to determine co-occurrence limits link coding to actors within a short distance of each other as opposed to

treating any co-occurrence in a given story as a link. Indicative of social structure, proximity criterion more clearly defines the relationship between social actors (Danowski, 1982)

WORDij additionally has a time segmentation feature, TimeSlice. As each news story pulled contains a time stamp, we were able to segment the aggregate administration file into two-week intervals and measure co-occurrences at each time slice. This enabled comparison to our response variable, Gallup polls of presidential job approval, also observed in two-week intervals.

Each output file was then put into UCINET (Borgatti, Everett, & Freeman, 2002) to measure average network centralization, and individual centrality scores for each cabinet member and to NetDraw (Borgatti, 2002) to create the static network visualizations. The result is a set of centrality scores for every cabinet member at each time slice observed. We are effectively able to measure presidential centrality relative to cabinet centrality and its correlation to presidential approval through time.

Betweenness Centrality (Freeman, 1977) is the most commonly employed centrality measure in social network analysis (Hanneman & Riddle, 2005). With this measure, a single shortest path is assumed for message flow between nodes. Additionally, the strength of each link based on frequency is not considered as links are treated as either present or absent. Also lacking from observation with the betweenness centrality model are actors receiving messages from multiple actors within the network or an actor's capability to convey the same message to more than one actor within the network. This model does not align with our conception of presidential cabinet actor networks, which we assume are structured with consideration of communication among the actors with link strength functionally acting as a major determination of network structure. The apt centrality measure that takes these assumptions into account is "flow betweenness centrality" (Freeman, Borgatti, & White, 1991; Borgatti, 2005). It considers all

possible paths among network actors, and weights the strength of each link. Flow betweenness centrality was used in the current study. The measure was computed for every cabinet member in the network of co-occurrences in each two-week time slice. Given our hypothesis, we removed Obama from the computation of the average of other cabinet members' centrality, then to measure his centrality prominence we subtracted from his centrality score in a time period the average value for centrality of the appearing cabinet members.

To examine the sentiment of the news stories, we used LIWC (Pennebaker, Booth, & Francis, 2007). It is a dictionary-type content analysis program based on the General Inquirer (Stone, Bales, Namenwirth, & Ogilvie, 1962; see <http://www.wjh.harvard.edu/~inquirer/> for a PC and Mac version) that looks for occurrences of words in its stored positive and negative word dictionaries. Since it does not measure context, such as taking word pairs into account would, it is not a very powerful sentiment analysis system. Nevertheless, it was the only program we located to perform this analysis. With the aggregate administration news stories being segmented into intervals, we were able to analyze sentiment through time. We measured the correlations of positive and negative emotion in the news stories with presidential approval and presidential centrality relative to cabinet centrality.

To test our hypothesis, we measured the association between presidential centrality, average cabinet centrality and job approval derived from the Gallup polls. To remove autocorrelation of adjacent time points, we used differencing ( $d=1$ ) for each variable: 1) Obama's relative centrality, 2) job approval, and 3) positive and negative sentiment in the news stories. Then we tested lagging approval behind Obama centrality starting at a lag of 1 time period through 7 time periods and observed the significant correlations. We then tested the relationship between the Obama centrality difference variable and his job approval.

**Results**

To display the cabinet network structure as represented in the obtained news stories for president Obama’s administration, Figure 1 shows the aggregate cabinet social network drawn from a time segment during the debt crisis when president Obama was highly central. Figure 2 displays the aggregate cabinet social network during the Libyan intervention in which president Obama was closer to the average relative centrality of the cabinet. We created a difference variable that represents the extent to which president Obama stands apart from his administration in centrality. The difference between the centrality of the president and the average centrality was computed to create this score. Figure 3 shows the centrality difference, in which Obama was always to some degree higher than the cabinet average, in comparison to the average cabinet centrality across all time periods.

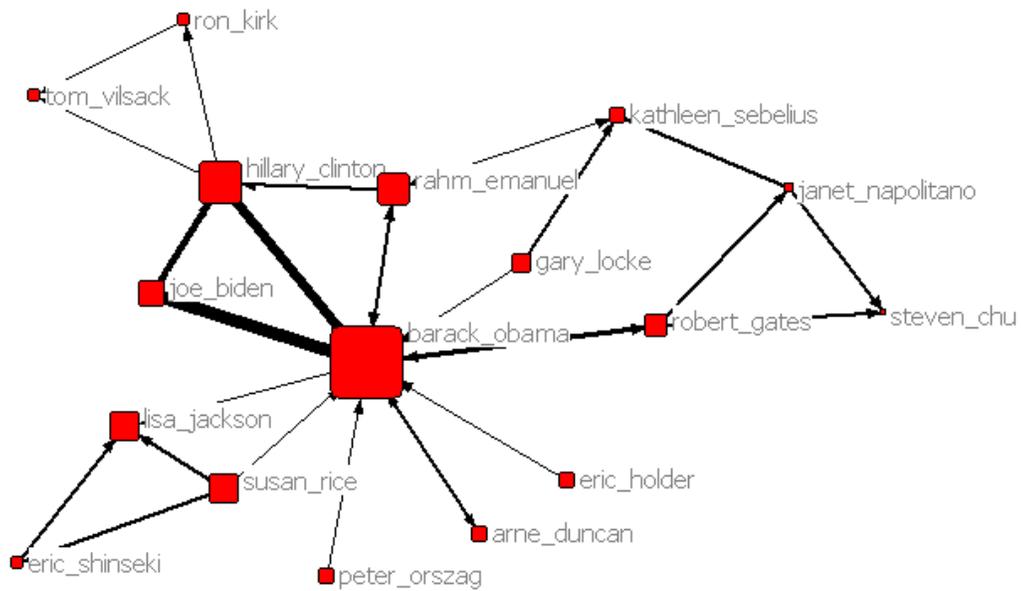


Figure 1. Aggregate cabinet network during debt crisis: Higher Obama relative centrality

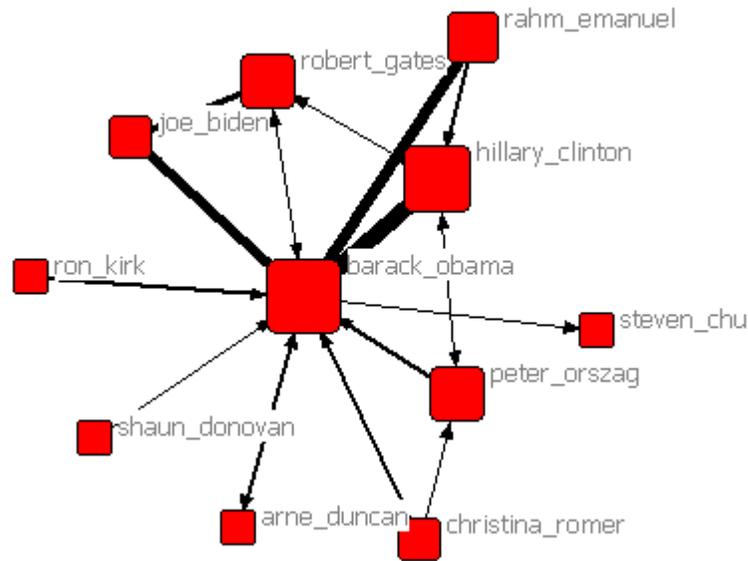


Figure 2. Aggregate cabinet network during Libyan civil war: Lower Obama relative centrality

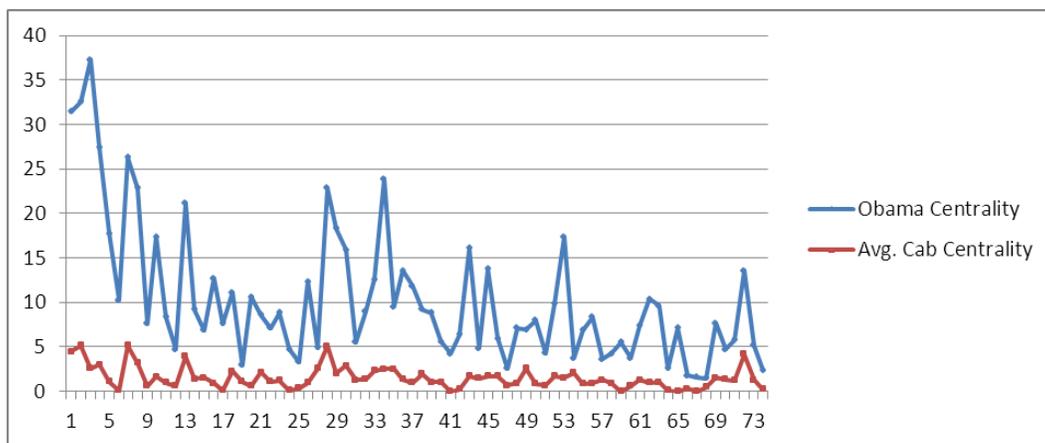


Figure 3. Obama’s centrality compared to average cabinet centrality

The correlation with differencing to remove serial autocorrelation between president Obama’s centrality relative to cabinet centrality and presidential job approval produced a coefficient at  $-0.26$  ( $p < .01$ ) at a lag of  $1=3$ . This was the only significant lagged relationship.

These results support our hypothesis that as the president stands apart from his administration, higher in centrality; his approval rating becomes more negative. Figure 4 displays negative and positive press sentiment of the aggregate administration file through the time segments. We additionally measured the correlation between negative and positive emotion with presidential approval. Both positive and negative press sentiment had negative correlations with presidential job approval.

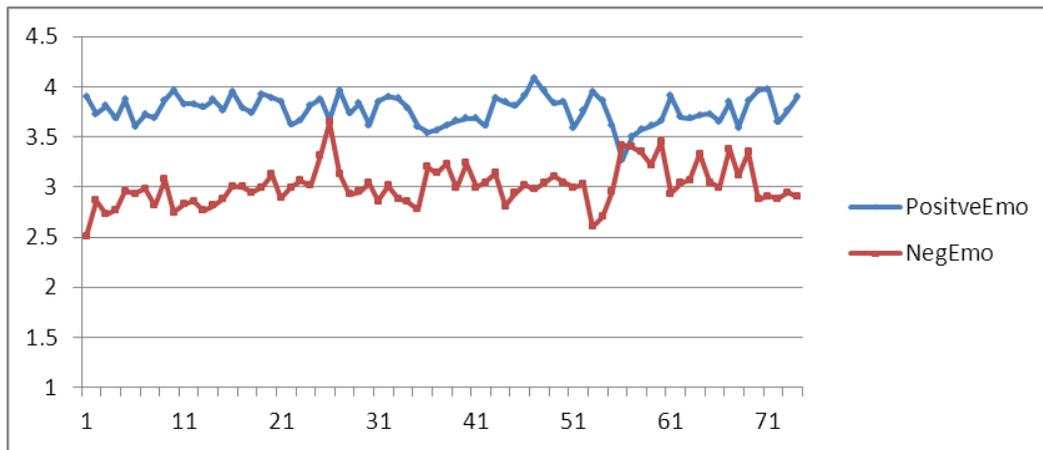


Figure 4. Positive and negative emotion across time segments

We ran regressions using approval as the dependent variable and included president Obama’s centrality relative to cabinet centrality and emotion as independent variables. The results showed that centrality difference and positive emotion were independent of each other and predicted job approval nearly equally. A step-wise regression was performed with job approval and positive and negative emotion values. Centrality difference entered first into the equation, followed by a positive emotion value at lag 6, but was opposite to expectations in being negatively correlated with approval. Centrality difference retained its significance and still had a larger effect than the positive emotion variables. No negative emotion lag variables were significant enough to enter the stepwise regression. , Using Akaike's Information Criteria

goodness of fit test based on sums of squares (Bozdogan, 1987), model 1 utilizing only relative presidential centrality's association with presidential job approval was favored by 100% to 0% for model 2 which had both centrality difference and the positive emotion lag in the equation.

## **Discussion**

The findings support the hypothesis that as the president's centrality stands apart from the average centrality of the cabinet there is a negative association with job approval. For president Obama's cabinet, as his centrality relative to the average centrality of the cabinet is higher, job approval decreases at a lag of 3 time periods or 6 weeks.

We posited that as the president stands above the rest of his cabinet in network centrality, the president is more likely to be associated with negative press information affecting presidential job approval. The president would functionally serve as a lightning rod and absorb this negative press sentiment. There was more positive than negative press sentiment in the aggregate administration file across time segments. Additionally, both positive and negative press sentiment were negatively correlated to job approval. This suggests presidential centrality relative to average cabinet centrality as portrayed in the press is independent of the sentiment within the news stories as a predictor of presidential job approval. The co-occurrence network itself is the noteworthy predictor of approval.

These findings are aligned with Hofstede's (1980) research on cultural differences, in particular with one of his dimensions--power distance, which measures the extent to which societies accept power differences between people in society. The United States scored very low in its acceptance of power differences. As the president is portrayed structurally in the press as a central figure compared to his cabinet network, he is shown with a greater power distance than is

considered acceptable in American society. This may explain the decrease in presidential job approval. People may be influenced by Obama violating their preferences for low power distance.

As positive and negative sentiment in the news stories were both negatively correlated with job approval, the network representation of the cabinet actors and the president are the driving determinant of public reaction. These results provide evidence that there is an apparent lagged media effect on presidential job approval but it is not the content of the news stories in terms of sentiment that appear to make a difference. Perhaps other content of the news also shows no effects, but what we find is that a structural network variable constructed from large numbers of stories within each time period but only from the patterns of co-appearance of the president and the cabinet members' names is a significant predictor of presidential job approval.

We demonstrate in the current study a method for automatically mining for social network data in the press. While mining for these structures is analytically salient, we have compared the network characteristics through time to a response variable of Gallup polls on presidential approval, displaying cross-system predictive validity. We illustrated media representation of the social networks of presidential cabinet actors serves as a predictor of presidential job approval through time.

Future work on media representation of social networks of political actors focuses on inclusion of news story content in addition to sentiment in conjunction with network structure and presidential job approval.

### References

- Blood, D. J., & Phillips, P. C. B. (1995). Recession headline news, consumer sentiment, the state of the economy and presidential popularity: A time series analysis 1989-1993. *International Journal of Public Opinion Research*, 7(1), 2-22.
- Borgatti, S. P., Everett, M. G. and Freeman, L. C. (2002). UCINET for Windows: Software for social network analysis. Harvard, MA: Analytic Technologies.
- Borgatti, S.P. 2002. NetDraw: Graph visualization software. Harvard: Analytic Technologies
- Borgatti, S. P. (2005). Centrality and network flow. *Social Networks*, 27(1) 55-71.  
doi:10.1016/j.socnet.2004.11.008
- Bozdogan, H. (1987) Model selection and Akaike's Information Criterion (AIC): The general theory and its analytical extensions. *Psychometrika*, 52(3), 345-370. doi: 10.1007/BF02294361
- Brams, S., Mutlu, H., & Ramirez, S. L. (2006). Influence in terrorist networks: From undirected to directed graphs. *Studies in Conflict & Terrorism*, 29(7), 679-694.
- Cepela, N., & Danowski, J.A. (2009). Automatic mapping of political networks of actors from large collections of news stories. *Proceedings of the 1<sup>st</sup> ASONAM conference*. Athens, Greece, July 20-22.
- Danowski, J. A. (1982). A network-based content analysis methodology for computer-mediated communication: An illustration with a computer bulletin board, in M. Burgoon (Ed.), *Communication Yearbook 5* (pp. 904-925). New Brunswick, NJ: Transaction Books.
- Danowski, J.A. (2009a). WORDij 3.0 [computer program]. Chicago: University of Illinois at Chicago. <http://WORDij.net>.

- Danowski, J.A. (2009b). Inferences from word networks in messages. In Krippendorff, K. & Bock, M.A (eds.) (2009). *The content analysis reader* (pp.421-429). Sage Publications.
- Danowski, J. A. (2010). Automatic mapping of social networks: Time-series analysis of news sentiment and presidential job approval. Paper presented to the Political Communication Division at the annual meeting of the International Communication Association, Singapore, June 22-26.
- Danowski, J. A. (2011). Changes in Muslim nations' centrality mined from open-source world jihad news: A comparison of networks in late 2010, early 2011, and post-Bin Laden. *Proceedings of European Intelligence and Security Informatics Conference (EISIC)*, pps 314-321. doi: 10.1109/EISIC.2011.69
- Danowski, J. A. & Cepela, N. (2010). Automatic mapping of social networks of actors from text corpora: Time-series analysis. *Data mining for social network data. Annals of Information Systems, 12*, 31-46. doi: 10.1007/978-1-4419-6287-4\_3
- Entman, R.M. (2007). Framing bias: Media in the distribution of power. *Journal of Communication, 57*, 163-173.
- Erikson, R. S., & Tedin, K. L. (2011). American public opinion: Its origins, content, and impact, 8th Edition. New York: Longman.
- Fowler, J. H. (2006). Legislative cosponsorship networks in the US house and senate. *Social Networks, 28*, 454-465.
- Fowler, J. H., Heaney, M. T., Nickerson, D. W., Padgett, J. F., & Sinclair, B. (2011). Causality in political networks. *American Politics Research, 39*, 437-480.
- Freeman, L.C. (1977). A set of measures of centrality based on betweenness. *Sociometry, 40* (1): 35-41.

- Freeman, L. C., Borgatti, S. J., & White, D. R. (1991). Centrality in valued graphs: A measure of betweenness based on network flow. *Social Networks*, 13(2), 141-154. doi:10.1016/0378-8733(91)90017-N
- Graber, D.A. (1993). *Mass Media and American Politics*. Congressional Quarterly Press.
- Gronke, P., & Newman, B. (2000). FDR to Clinton, Mueller to?: A field essay on presidential approval *Political Research Quarterly*, 56(4), 501-512. doi: 10.1177/106591290305600411
- Hanneman, R. A. & Riddle, M. (2005). *Introduction to social network methods*. Riverside, CA: University of California, Riverside (<http://faculty.ucr.edu/~hanneman/> )
- Hofstede, G. (1980). *Culture's consequences: International differences in work-related values*. Beverly Hills, CA: SAGE.
- Katz, E. (1957). The two-step flow of communication: An up-to-date report on an hypothesis. *Public Opinion Quarterly*, 21 (1): 61-78. doi: 10.1086/266687
- Katz, E., & Lazarsfeld, P. (1955). *Personal influence*. New York: Free Press.
- Knoke, D. (1994). *Political networks: The structural perspective*. Cambridge University Press.
- Krebs, V. (2002). Mapping networks of terrorist cells. *Connections*, 24(3), 43-52.
- Kurtz, H. (1990). Is the economy suffering from media malady? *Washington Post*, October 28, p. H1.
- Lazarsfeld, P. F., Berleson, B., & Gaudet, H. (1948) *The people's choice. How the voter makes up his mind in a presidential campaign [1944]*. New York: Columbia University Press.
- MacKuen, M.B. (1983). Political drama, economic conditions and the dynamics of presidential popularity, *American Journal of Political Science*, 127, 65-192

MacKuen, M.B., Erikson, R.S., & Stimson, J.A. (1992). Peasants or bankers? The American electorate and the U.S. economy, *American Political Science Review*, 86 (3), 591-611.

Pennebaker, J.W., Booth, R.J., & Francis, M.E. (2007). Linguistic Inquiry and Word Count: LIWC [Computer software]. Austin, TX: LIWC.net.

Stimson, J. A. (2004). *Tides of consent: How public opinion shapes American politics*. Cambridge, UK: Cambridge University Press.

Stone, P. J., Bales, R. F, Namenwirth, Z, & Ogilvie, D. M. (1962). The General Inquirer: A computer system for content analysis and retrieval based on the sentence as a unit of information. *Behavioral Science*, 7(4), 484-498. doi: 10.1002/bs.3830070412

Swanson, C. E. (1949). Midcity Daily: The news staff and its relation to control. *Journalism Quarterly*, 26, 20-28

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