The power of message networks:

A big-data analysis of the Network Agenda Setting Model and issue ownership

Abstract

This paper presents an empirical study that tests a new concept "issue ownership network," which is based on the Network Agenda Setting (NAS) Model and the theory of issue ownership. Big data analytics and semantic network analysis were used to examine the large dataset collected on Twitter during the 2012 U.S. presidential election. Results showed that the news media could determine the public's identification of a political candidate with not just individual issues, but also entire networks of issues. Here we argue that traditional news media still set the public agenda in this new media environment, and do so in ways more complicated through constructing message networks. The study also demonstrates that the NAS model and its unique focus can potentially enrich the understanding of other communication and social science theories and concepts.

Keywords: Network Agenda Setting Model, agenda setting, issue ownership, network analysis, sentiment analysis, big data

The Network Agenda Setting Model (NAS) asserts that news media not only tell us what to think and how to think about it, they also construct network agendas to determine how we *associate* different messages (Guo, 2013; Guo & McCombs, 2011a, 2011b). Empirical evidence has been found to support this new media effects model in areas such as political communication, public relations and public opinion research (e.g., Kiousis et al., 2014; Vargo, Guo, McCombs, & Shaw, 2014; Vu, Guo, & McCombs, 2014). As these studies demonstrate, the NAS model contributes to the discussion of new media and communication theories by enabling a more nuanced representation of information networks and by offering an approach to better measure the flow of such networks between different entities (e.g., news media, the public, political organization). Maxwell McCombs, one of the founders of agenda setting, coins the model as "the third level" of the theory in his recent book *Setting the Agenda* (McCombs, 2014, p. 55).

We argue that, in addition to its practical applications, the NAS model can also enrich the understanding of other communication and social science theories. This present study showcases its potential contribution to the theory of "issue ownership," which indicates that voters tend to associate certain issues with certain political parties or candidates (Budge & Farlie, 1983; Petrocik, 1996). Based on the NAS model and issue ownership, we propose a new concept *issue ownership network* in this paper. It suggests that news media and political campaigns can determine the public's identification of a political party or a candidate with not just individual issues, but also entire networks of issues. In such issue networks, some issues may serve as bridges to link the given party or candidate to other issues. The new theoretical perspective expands the boundary of both

the NAS model and the theory of issue ownership. It also provides insights to more effectively construct campaign messages during political elections.

The purpose of this paper is twofold. It first seeks to explicate the new concept of issue ownership network. Secondly, the paper aims to empirically test the concept in the new media environment. In light of the increasing number of media platforms, scholars have questioned the applicability of traditional media effects models such as agenda setting in this complex, fragmented media landscape. While some studies suggest that traditional news media still lead the public opinion (e.g. Weeks & Southwell, 2011; Vargo et al., 2014), others found a two-way relationship between the media and public agenda (e.g., Ragas, Tran & Martin, 2013; Neuman, Guggenheim, Jang, & Bae, 2014). This present study is ambitious in that it not just asks whether media such as newspapers and televisions set the public agenda, it explores whether they can do so in ways more complicated through constructing issue networks. Additionally, the study compares the agenda-setting impact of news media with that of political campaigns.

Methodologically, the study analyzes a large dataset of news, campaign and public opinion messages on Twitter against the backdrop of the 2012 U.S. presidential election. Unlike traditional surveys, Tweets from ordinary users reflect their unsolicited thoughts about a variety of topics including their perceptions of political candidates and issues related to them. Big Data analytics and semantic network analysis were used to investigate millions of Tweets. Conclusions and implications of the new theoretical perspectives are discussed.

Theoretical Framework

The Network Agenda Setting Model

Agenda-setting theory describes the transfer of salience, or the prominence of objects or attributes, from the media to the public agenda. Objects can be public issues, political candidates and consumer brands (McCombs & Ghanem, 2001). Studies of objects are referred to as the first level of agenda setting. Studies of the attributes that detail and describe the given objects are referred to as the second level of agenda setting. Since the seminal 1972 Chapel Hill study (McCombs & Shaw, 1972), researchers around the world have demonstrated that the public does consider what the media highlights as important.

However, the emergence of social media and many other new online platforms create far more news and information than any individual can consume. In a media landscape of information overload, the traditional agenda-setting approach of tracing a list of discrete objects or attributes as it appears in news coverage and then on public polls seems insufficient to capture the complexity of the current media environment.

Unlike the traditional agenda-setting theory, the Network Agenda Setting Model focuses on the *interconnections* among issues and attributes rather than individual elements (Guo, 2013). It investigates news media's capability to influence how people connect different messages in their minds. The core hypothesis of the NAS model asserts that the ways in which news media associate different messages, concepts and ideas (e.g., the September 11 attack and the Saddam Hussein's regime) dictate the way the public makes associations.

From the perspective of cognitive psychology, the NAS model measures the associative model of memory. It does so by borrowing methods from network analysis. The idea of a "network" presents an individual's cognitive understanding of social reality

as a picture where numerous nodes are connected to one another (Kaplan, 1973). Nodes

can be single words; objects and its attributes; or higher level constructs such as schemas

and frames (Lindsay & Norman, 1977; Price & Tewksbury, 1997; Rumelhart & Norman,

1978). Semantic network theorists explore co-occurrence and distances between these

nodes in individual's cognitive maps. They posit that focusing on the interactions

between nodes in addition to the nodes themselves reveals more contextual information

about how people make sense of the world (Danowski, 1993; Doerfel, 1998).

The NAS model examines the role news media play in the audience's cognitive

network. It asserts that news media have the power to build new connections as well as to

enhance the existing ones (Guo, 2013). In general, the more frequently two elements are

associated in the news coverage, the more likely the audience will consider the two

interconnected. For instance, according to the model, if the U.S. news media emphasize

the association between the country's domestic economic problems and its foreign policy,

the audience might consider the two objects are related. News media *construct* the

connection and then transfer it to the audience. In the NAS model, the network of nodes

that represents the news coverage is labeled the media network agenda, and the network

that represents the public opinion is labeled the public network agenda.

Semantic network analysis is used to quantify network relationships among

objects and attributes represented in the news coverage and public polls. Those different

types of network agendas are then compared to each other via statistical correlations and

regressions as outlined in Guo (2012).

Studies have provided empirical evidence to the NAS model. For the 2002 Texas

gubernatorial election, Guo and McCombs (2011a) compared the ways in which

newspaper coverage associated different personal attributes (e.g., leadership, credibility, intelligence) to describe two political candidates and the public's perception of them. Results showed significant correlations between the media and public network agenda. The authors replicated the study using a new set of data collected from the 2010 Texas governor election and found similar results (Guo and McCombs, 2011b). More recently, Vargo, Guo, McCombs and Shaw (2014) tested the model in the Twitter sphere, and found significant network agenda setting effects between different types of news media and candidate supporters. Obama supporters tended to follow the network agenda of vertical, mainstream media whereas Romney supporters were more in line with the conservative, niche media.

Kiousis et al. (2014) used the model to evaluate and measure public relations effects. From an agenda-building theoretical perspective, the researchers examined the impact of political campaign information subsidies (e.g. news releases, campaign blogs) on national media coverage during the 2012 U.S. presidential election pre-convention period. The results demonstrate significant third level effects. The potential to apply the NAS model and its focus on message networks to other groups outside of the media and public remains strong.

Issue Ownership

This study applies the NAS model to the theory of issue ownership (Budge & Farlie, 1983; Petrocik, 1996; Petrocik, Benoit, & Hensen, 2003). Petrocik (1996) says issue ownership occurs when "a candidate successfully frames the vote choice as a decision to be made in terms of problems facing the country that he is better able to 'handle' than his opponent" (p. 826). As a result of issue ownership, voters will identify a

political candidate and its affiliated party with a given set of issues. When a certain issue

gains prominence among the public agenda, chances are high that citizens will vote for

the political candidate who "owns" the issue.

Issue ownership depends on the social basis of a party as well as a party's

historical reputation for handling certain issues. For example in U.S. politics, Democrats

have been traditionally considered to be better at dealing with education while

Republicans have had a better reputation in lowering taxes.

Such "ownership" is always in flux (Walgrave, Lefevere, & Nuytemans, 2009).

Political candidates are constantly engaged in the discursive competition to claim, or to

disclaim, the ownership of certain issues. News coverage is an important factor that leads

to significant shifts in the audience's perception of issue ownership, especially for short-

term dynamics. Outside of marketing and political debates, public knowledge of

candidates is mediated through news coverage.

Researchers have distinguished between two dimensions of issue ownership

(Walgrave, Lefevere, & Tresch, 2012). The "associative" dimension refers to the

identification of a political candidate with a given issue regardless of the candidate's

capability to handle the issue. The "competence" dimension designates whether a party is

considered to be best suited in dealing with an issue. Walgrave and colleagues found that

the two dimensions are substantially different, and each can be an independent

determinant of voting behavior.

A New Concept: Issue Ownership Network

Using terminology from the NAS model, issue ownership addresses the

interconnection between two objects—a political candidate and a given issue. Political

campaigns and news coverage can both activate and enhance the association at the associative and the competence level.

The NAS model can theoretically expand the concept of issue ownership by allowing more sophisticated understanding. Combining the theoretical framework of the NAS model and issue ownership, we offer the new concept *issue ownership network*. According to this concept, an individual will connect a political candidate with *multiple* issues in his or her cognitive network. Those issues can also be *interconnected* with one another. For example, when a political candidate repeatedly discusses the relationship between the country's unemployment rate and its foreign trade, citizens might identify the candidate with both issues. Moreover, the issues may become linked to each other.

In other scenarios, a political candidate may strategically establish connections between an established party issue and a new, or contested issue in order to "own" the latter. For instance, when a Republican candidate relates his or her tax policy—a traditionally Republican issue—to economic recovery—an issue debated by both parties, the candidate leverages an existing association to establish credibility with a new one. From a networked perspective, in this case tax possesses high centrality (Wasserman & Faust, 1994), which serves as a bridge between the political candidate and the issue of economic recovery.

To summarize, the concept of issue ownership network suggests that not only can a political candidate or a party "own" individual issues (e.g., employment rate, foreign trade, tax or economic recovery), they can also be associated with, and/or be capable of handling, the interaction between different issues or issue clusters. Issue ownership can be represented as a network of issues that are associated with a given political candidate

or a party. In network analysis this can be considered as an ego network, where a given candidate serves as the "ego," or the focal node. Directly tied to the ego are other nodes (issues) plus ties, if any, among them (Borgatti, Everett, & Freeman, 2002; Wasserman & Faust, 1994). An analysis of candidate/party ego networks will generate insights into media and campaign effects during political elections.

In this paper, we test the proposed concept of *issue ownership network* in the context of the 2012 U.S. presidential election in which the Democratic nominee, incumbent President Barack Obama defeated the Republican challenger Mitt Romney. The analysis focuses on the effects of news media and political campaign messages on public opinion with respect to the two candidates' issue ownership networks. Borrowing Walgrave et al.'s (2012) definition, we investigate both the "associative" and "competent" issue networks. The research seeks to present empirical evidence for a new concept, and is also the first study that considers affective dimension in the analysis of network agenda setting effects.

The following hypotheses are provided to investigate the concept of issue ownership network. The first set of hypotheses examines the effects of traditional news media on the public's perceived issue ownership networks regarding the two candidates.

H1a-b: The news media had a positive impact on the public perception of the "associative" issue ownership network of Obama (a) and Romney (b).

H2a-b: The news media had a positive impact on the public perception of the "competent" issue ownership network of Obama (a) and Romney (b).

H3a-b: The news media were more effective in constructing the public perception

of the "associative" issue ownership network than the "competent" network for

Obama (a) and Romney (b).

The following list of hypotheses focus on the effects of political campaign messages.

H4a-b: The political campaigns of Obama (a) and Romney (b) had a positive

impact on the public perception of the "associative" issue ownership network.

H5a-b: The political campaigns of Obama (a) and Romney (b) had a positive

impact on the public perception of the "competent" issue ownership network.

H6a-b: The political campaigns of Obama (a) and Romney (b) were more

effective in constructing the "associative" issue ownership network than the

"competent" network perceived by the public.

We then compare the media effects and political campaign effects on public opinion.

H7a-b: The news media better predicted the public perception of candidates'

issue ownership network than the political campaigns of Obama (a) and Romney

(b).

Lastly, we seek to describe how the issue ownership networks regarding the two

candidates differed in the public opinion.

R1a: How did the "associative" issue ownership networks differ in regards to the

two political candidates perceived by the public?

R1b: To what extent had the "associative" issue ownership networks regarding

the two candidates changed throughout the election?

R2a: How did the "competent" issue ownership networks differ in regards to the

two political candidates perceived by the public?

R2b: To what extent had the "competent" issue ownership networks changed throughout the election?

Method

Big data analytics and semantic network analysis were employed to analyze the issue ownership networks regarding Obama and Romney. We collected data from Twitter during the 2012 U.S. presidential election. Tweets from three groups—citizens, news media, and political campaigns—were retrieved and stored in a 22-gigabyte corpus. Network analysis was performed to investigate and compare how these three groups associated a given political candidate with a network of issues.

Data Collection

Version 1.0 of Twitter's API was called to download relevant Tweets during the election period. Specifically, the Streaming API call was used to download public messages from Twitter that mentioned the terms "Obama" or "Romney."[1] The collection started on August 1st, 2012 and ended on the Election Day, November 6th. In all, 70 million Tweets were collected and analyzed.

Citizens: Liberals and Conservatives. From those Tweets, 5,459,792 unique users were found. At the time of this analysis Twitter profiles could only be downloaded via the API at the rate of 720 per hour. At this rate it would have taken 12 computers 26 days to download all the profiles. To make this operation more feasible, only users with at least 4 Tweets in the data were included. 2,966,383 profiles were queried for download via the REST "Get Users" API call. 2,048,397 were successfully downloaded. The remaining users' profiles were no longer activated on Twitter.

In order to investigate the media and campaign effects on citizens with different

political ideologies, we further sorted out users who self-identified as Liberals and those

who self-identified as Conservatives. Several rounds of manual content analysis and

intercoder reliability were performed. First, 500 random user profiles were pulled from

the user profile dataset. Two human coders labeled profile descriptions as liberal,

conservative or neither. While most profiles offered no affiliation, those that did offered

straightforward affiliations were coded. The intercoder reliability was 99%. In line with

previous studies (e.g., Lombard, Snyder-Duch, & Bracken, 2002), we consider variables

that exceed 90% percent agreement to have achieved robust intercoder reliability.

Keyword lists were then created based on popular words found in the manual

content analysis. Each word was then queried, and the profile results were inspected for

each word. Only words that correlated very highly with positive matches were used. The

lists of keywords to indicate Liberals and Conservatives as well as those mentioned later

in the article are all available upon request. Using computer-assisted analysis, if a

keyword was found in a profile for one, but not both of the lists, the user was identified as

liberal or conservative.

To verify the lists of keywords, another round of manual content analysis was

performed to compare the results of the human annotations and those from machine

coding. 400 profiles were randomly sampled and then annotated by two human coders.

The two coders were in perfect agreement and agreed on the computer annotations 97%

of the time for Conservatives and 98% for Liberals. Again, the researchers credit the

straightforwardness of political affiliations in Twitter bios as the primary reason for such

robust reliability. In all 19,509 Liberals and 26,494 Conservatives were identified. The 46,003 users created 2,686,490 messages on Twitter during the time sampled.

News Media. Twitter messages from the official accounts of top 25 U.S. newspapers by circulation (Lulofs, 2013) and major broadcast news networks were pulled from the big dataset (n = 1,588).

Political Campaign Messages. Finally, the REST "GET User Tweets" call was performed on Obama and Romney's official Twitter accounts: @BarackObama, @Obama2012, @MittRomney, and @TeamRomney. This ensured that all campaign messages on Twitter were included in the analysis (n = 1,722).

Issue Selection and Coding

Based on the review of issue ownership and agenda-setting literature and a preliminary analysis of Tweets in our dataset, a total of 16 issues were selected for analysis: (1) Tax; (2) Jobs/unemployment; (3) Federal budget deficit; (4) Economy in general; (5) Foreign affair; (6) Immigration; (7) Health care; (8) Public order; (9) LGBT/same-sex marriage; (10) Abortion; (11) Environment/climate; (12) Energy; (13) Education; (14) Role of government; (15) Middle class; (16) Welfare.

The initial lists of keywords to indicate each issue were created based on the keywords used in the previous research (e.g., Neuman et al., 2014; Vargo et al., 2014). Several rounds of reliability tests were performed to refine the keywords lists. First, a stratified sample of 600 Tweets was pulled by each Tweet category (news media, citizens, and campaign messages). Two coders were asked to assign each Tweet by issue it mentioned. Initial agreement for citizens' Tweets was 94%. Agreement for campaign messages was 95% and agreement for news media's Tweets was 94%.

Words that were correlated positively with the coders' annotations were placed into corresponding issue lexicons for computer-assisted analysis. Again, manual content analysis was performed to compare the human and machine coding results. Specifically, a stratified sample of 800 Tweets were then pulled by each issue category. After three rounds of reviewing the pulled samples and adjusting the lexicons, the final agreement human to computer coding was 97% with no individual issue scoring below 92%. Intercoder reliability between humans was 100%. For final computer annotation, two sets of lexicons were established for identifying issues. Exact matching and non-exact matching was used to reduce false positives (i.e. "gas" returning matches for "vegas").

Constructing Issue Ownership Network

Network analysis was used to construct issue ownership networks regarding the two political candidates in three groups: new media, campaign messages and citizens. In this study, a candidate's issue ownership network is represented as an ego network in which the candidate serves the single "ego" that is connected with other nodes (i.e. issues). If a Tweet mentions a candidate and one of the 16 analyzed issues, an association was identified. In ego networks, the issue nodes may also have ties among each other. As such, when two issues were mentioned in the same Tweet, the connection was documented. As an example: "'We know—all of you know—that in a 21st century economy higher education is the single best investment in your future.' —President Obama." In this Tweet, the ego, Obama, is coded to have a tie with economy, and a tie with education. The two issues are also considered to be associated with each other. Here, the affective dimension of association is not considered. The connection can be positive,

neutral or negative. The goal was to construct "associative" issue ownership networks in this step.

    A computer-assisted analysis was then conducted to calculate the total number of ties between the ego and issues and ties among the 16 issues when referring to a candidate. Matrices were used to represent the "associative" issue networks regarding the two candidates in news coverage, campaign messages and public discussions on Twitter.

    To create "competent" issue ownership networks, automated sentiment analysis was performed to detect positive association between a candidate and the set of issues. Given that the size of the corpus was extremely large, the lexicon-based sentiment analysis tool Sentistrength was used (Thelwall et al., 2012). The algorithm provided by Sentistrength claims "human-level accuracy for short social web texts in English" (Thelwall et al., 2010). Specifically, the sentiment analysis scores (-4 to +4) were used in conjunction with the ego assignments and issue assignments to measure the "competent" dimension. Positive scores (+1 to +4) indicate positive associations. Consider the following Tweet as an example: "Romney was correct about everything he said and would have had our economy well on the road to repair by now." In this Tweet, the ego, Romney, is assigned a tie with the issue of economy. In addition, the tie is considered as a positive one, which suggests that Romney is competent in handing the issue of economy. Using sentiment analysis scores, we tallied all the positive ties between the ego and issues and among different issues to construct "competent" issue ownership networks of the two political candidates in the form of matrices.

Data Analysis

In answering hypotheses and research questions, we constructed three time periods: (1) Pre-election period: August 1st to 31st, 2012; (2) Presidential campaign and debate period: September 1st to October 22nd, 2012; and (3) Election period: October 23rd to November 6th, 2012.

In order to address the hypotheses (H1-7), the quadratic assignment procedure (QAP) regression analysis was used to assess the relationship between different issue ownership networks. For each candidate, the tests regressed the public opinion data during Period 3—dependent matrix—on, respectively, the news media and political campaign data during Period 2—independent matrices. Using the network analysis software Ucinet (Borgatti et al., 2002), a total of 16 QAP regression tests were performed (see Table 1 and Table 2).

In investigating research questions (R1-2), the matrices that represent public opinion data in Period 1 and Period 3 were compared. Specifically, top issue dyads— pairs of issues—associated with each candidate were identified. In addition, NetDraw (Borgatti, 2002) was used to visualize the issue ownership networks regarding the two candidates in different time periods.

Results

Table 1 and Table 2 detail the results of all the statistical tests performed in this study. In answering H1 and H2, results showed that the news media had a significant impact on the perceived issue ownership networks regarding Obama and Romney. The strong, positive effect was found at the "associative" and "competent" level and on both Liberals and Conservatives. H1 and H2 were strongly supported.

<Insert Table 1 and Table 2 about here>

H3 focused on the potential difference between the "associative" and "competent" issue ownership networks. Results showed that the QAP regression coefficients for the "associative" issue networks were higher than the "competent" networks across all tests. H3 was supported.

H4 and H5 explored the extent to which the political campaigns affected the public perception of issue ownership networks regarding the two candidates. Results showed that both the Obama and Romney campaigns on Twitter had a significant, positive effect on the public opinion. H4 and H5 were supported. The coefficient (r squared) with respect to the Obama campaign ranged from 0.36 to 0.63. In comparison, the Romney team saw a weaker campaign effect, with r squared ranging from 0.12 to 0.36. For Conservatives, Romney's campaign messages on Twitter could only explain slightly over 10% of the variance in their perceived issue ownership network, whether the network was at the "associative" or "competent" level.

In answering H6a, results showed that Obama's campaign messages were more effective in constructing the "competent" level than the "associative" level with the public. This pattern was found among both Liberals and Conservatives. H6a was not supported. On the other hand, the Romney campaign via Twitter demonstrated opposite effects, where a stronger correlation was found at the "associative" level than the "competent" level. H6b was supported.

H7a-b sought to compare the media and political campaign effects regarding the construction of issue ownership networks. Results showed the news media outperformed the political campaigns of Obama and Romney on Twitter across all QAP regression tests. H7a-b were strongly supported.

R1a asked how the public perceived the "associative" issue ownership network of the two candidates differently. R1b explored the change of such networks across time. To demonstrate the results of these two questions, Table 3 and Table 4 list the top issue dyads owned by each candidate in Period 1 and Period 3.

<Insert Table 3 and Table 4 about here>

Additionally, as examples of network visualization, Figures 1 to 4 demonstrate how Conservatives associated Obama and Romney with the network of issues during two different time periods. The relationship between any two nodes is represented by its relative location and by strength of the line connecting them. The closer two nodes are, or the thicker the line between two nodes is, the more connected the two elements are for Conservatives.

<Insert Figure 1-4 about here>

Consider the issues of jobs and unemployment. Both candidates were associated with this issue to a certain degree. But the public related the candidates with this issue in very different contexts. Obama was more frequently associated with jobs and unemployment through energy and healthcare. In Romney's case, the same issue was connected with taxes and foreign affairs. The Tables and Figures also showcase that Liberals and Conservatives linked the candidates with different clusters of issues in Period 1 and Period 3, before and after the presidential campaign.

R2a and R2b focused on the exploration of "competent" issue ownership networks regarding the two candidates. Table 5 and Table 6 provide the lists of top issue dyads associated with the two candidates in Period 1 and Period 3. Note that the

associations indicated in these two tables were all positive. Candidates were considered to be competent in dealing with these issue clusters.

Taking the example of jobs and unemployment again, similar patterns were found in "competent" issue ownership networks. Interestingly, while Conservatives said Obama could better handle the unemployment problem by addressing the energy sector (e.g., the creation of green energy jobs) in Period 1, they associated the issue dyad with Romney during Period 3. Also notably, Conservatives considered Obama to better deal with energy and taxes— a traditionally Republican issue—after the presidential campaign and election. The "competent" issue networks regarding the two candidates did indeed vary across time.

Conclusion and Discussion

In this paper, we present an original, empirical study to illustrate the effectiveness of an emerging media effects model, the Network Agenda Setting Model, and demonstrate how the model can enrich other communication and social science theories such as issue ownership through its unique concepts. News media and political campaigns affected the public's identification of a given candidate with unique issues. They also determined how citizens associated a candidate with a *network* of issues. This "issue ownership network" effect is illustrated here for the first time. Focusing on the association and interplay between different stakeholders, messages, ideas and concepts, issue ownership network and the NAS model in general allow researchers to investigate more contextual information embedded in the communicating text. As a result, we are able to discover more nuanced communication effects. The use of big data analytics and semantic network analysis enables the visualization of message networks on the Twitter

sphere. We can *see* how the public, the media and campaigns linked issues together. In a way, this paper illustrates different cognitive networks of the election.

In particular, the results shed light on media effects in the context of political elections. Network theorists suggest that when two issues are associated, network phenomena such as bridging can occur. This can result in a transfer of perceived expertise, when the competent dimension of the orginating issue is positive. The results from this analyis might suggest for instance that public opinion of Obama's competency in dealing with the issue of taxes—a traditionally Republican issue (e.g., Petrocik et al., 2003)—may have increased because (1) the news media linked the issue with energy in their coverage of Obama, and (2) Obama had a better reputation in dealing with energy issue than did Romney (Koch, 2012). With the substaintal support given to issue ownership networks this paper provides, further analysis may tie these results to voting outcomes to further explicate such a "bridging" effect.

Here we also incorporate the distinction of affective sentiment to the NAS model. Previous NAS model studies suggest that news media can tell us how to associate different elements, but none of these studies distinguish between positive, neutral or negative associations. Borrowing the concept of "competent" issue ownership (Walgrave et al., 2012), the study demonstrates that the positive association between a given candidate's network of issues and between issues themselves can also be transferred from media and campaign messages to the public's mind. Thus, this study adds an affective level of analysis to the NAS model. This effect, while less than non-affective salience transfer, was still significant.

Results also showed that the traditional news media was a stronger predictor of the public's perception of issue ownership networks when compared to political campaign messages. Indeed, social networking sites and other emerging media platforms have provided unprecedented opportunities for individuals or organizations to broadcast their messages to a large mass audience. Their effects on public opinion are nevertheless limited. The traditional news media still represent the mediated center that stages social reality (Couldry & Curran, 2003). While the boundary between mass communication and interpersonal communication continues to blur in this digital age, the symbolic power of traditional news media still remains. Simply put, news media still set the public agenda, and do so in ways more complicated than previously thought. They construct message networks. To further explore the relative importance of news media, future research should compare the NAS effects of news media with that of other social actors such as corporations and different interest groups.

As the results illustrate, the proposed concept "issue ownership network" has several practical implications for public relations practitioners and journalists. Drawing upon network theories, the concept suggests an effective way to design political campaign messages by *linking* different issues to establish the ownership of new issues. When it comes to news coverage, journalists should be more cautious in associating multiple issues when refering to a given candidate. This "association" may impact the public's perceived ability to handle that issue, even when that competency is not explicitly stated. Overall, the study also shows that a network analysis approach is useful in evaluating campaign, or media effects.

The rapidly changing mediascape requires new theories, models and concepts. This paper presents the NAS model and the new concept of issue ownership network, which allow the analysis of communication effects in a networked information environment. Future studies may consider applying the NAS model to other media and communication concepts such as schema, framing and priming. Scholars may also use the framework of issue ownership network to predict public opinion in other communication contexts.

Note:

1. Due to the limitation of the Twitter Streaming API, the more search terms one uses, the less likely the sample becomes representative. See Morstatter, Pfeffer, Liu, & Carley (2013) for a detailed review of the Twitter Streaming API as it pertains to social science research. Therefore, we decided to include only two search terms "Obama" and "Romney" to retrieve a representative sample of the most relevant data. However, the approach may bias the sample by excluding Twitter users who used other terms (e.g., nicknames that are negative in nature) to refer to the two candidates. This is a limitation of this study.

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Table 1: The issue ownership network for Obama

	News media		Obama's campaign	
	Associative	Competent	Associative	Competent
Liberals	0.98	0.92	0.53	0.63
Conservatives	0.95	0.86	0.36	0.38

Note: All tests showed statistically significant results, p<0.01.

Table 2: The issue ownership network for Romney

	News media		Romney's campaign	
	Associative	Competent	Associative	Competent
Liberals	0.95	0.83	0.36	0.12
Conservatives	0.85	0.74	0.21	0.13

Note: All tests showed statistically significant results, p<0.01.

Table 3: Top issue dyads perceived by the Conservatives (the associative level)

Pre-election Period (Aug 1 to 31)		Election Period (Oct 23 to Nov 6)	
Obama	Romney	Obama	Romney
Energy, Jobs	Tax, Fedbudget	Foreign affair, Healthcare	Foreign affair, Jobs
Foreign affair, LGBT	Tax, Jobs	Foreign affair, LGBT	Economy, Jobs
Economy, Fedbudget	Tax, Foreign affair	Energy, Tax	Jobs, Tax
Economy, Healthcare	Tax, Middle class	Foreign affair, public order	Economy, Foreign affairs
Economy, Foreign affair	Tax, Economy	Jobs, Healthcare	Tax, Fedbudget

Table 4: Top issue dyads perceived by the Liberals (the associative level)

Pre-election Period (Aug 1 to 31)		Election Period (Oct 23 to Nov 6)	
Obama	Romney	Obama	Romney
Economy, Jobs	Tax, Middle class	Economy, Jobs	Foreign affair, Jobs
Energy, Jobs	Tax, Foreign affair	Foreign affair, Healthcare	Foreign affair, Tax
Economy, Healthcare	Tax, Fedbudget	Foreign affair, Economy	Tax, Middle class
Energy, Foreign affair	Tax, Healthcare	Energy, Jobs	Tax, Jobs
Jobs, Healthcare	Tax, Jobs	Jobs, Healthcare	Tax, Economy

Table 5: Top issue dyads perceived by the Conservatives (the competent level)

Pre-election Period (Aug 1 to 31)		Election Period (Oct 23 to Nov 6)	
Obama	Romney	Obama	Romney
Economy, Healthcare	Economy, Jobs	Foreign affair, LGBT	Foreign affair, Jobs
Jobs, Energy	Energy, Environment	Foreign affair, Healthcare	Economy, Jobs
Healthcare, Education	Economy, Energy	Economy, Fedbudget	Jobs, Energy
Economy, LGBT	Healthcare, Fedbudget	Tax, Energy	Jobs, Fedbudget
Jobs, Immigration	Healthcare, Foreign affair	Tax, Foreign affair	Foreign affair, Abortion

Table 6: Top issue dyads perceived by the Liberals (the competent level)

Pre-election Period (Aug 1 to 31)		Election Period (Oct 23 to Nov 6)	
Obama	Romney	Obama	Romney
Energy, Jobs	Foreign affair, Jobs	Economy, Fedbudget	Foreign affair, Jobs
Jobs, Education	Foreign affair, Healthcare	Economy, Jobs	Foreign affair, Energy
Economy, Jobs	Fedbudget, Education	Energy, Jobs	Jobs, Education
Economy, Healthcare	Fedbudget, Healthcare	Tax, Fedbudget	Fedbudget, Foreign affairs
Economy, Education	Abortion, Healthcare	Jobs, Middle class	Foreign affair, Education

Figure 1: Obama's "associative" issue ownership network perceived by the Conservatives (Period 1)
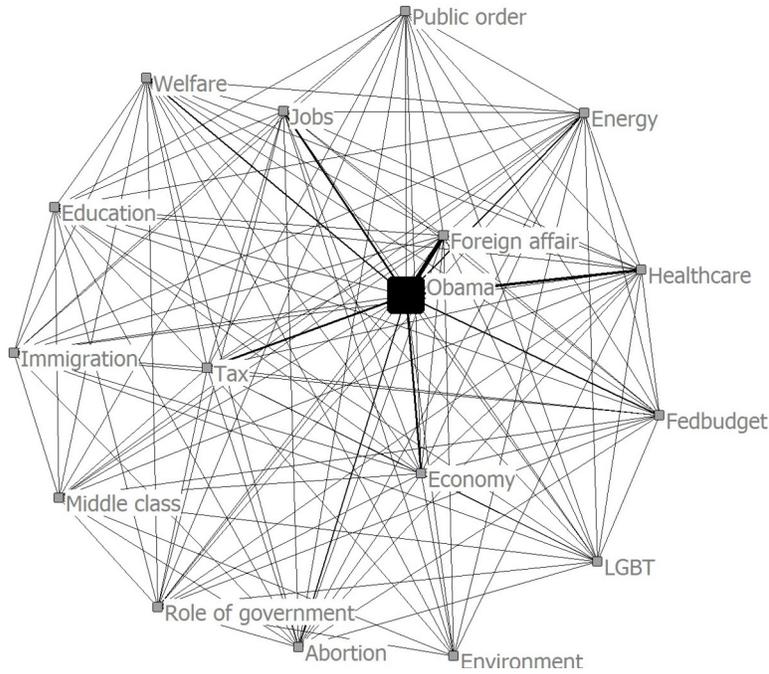

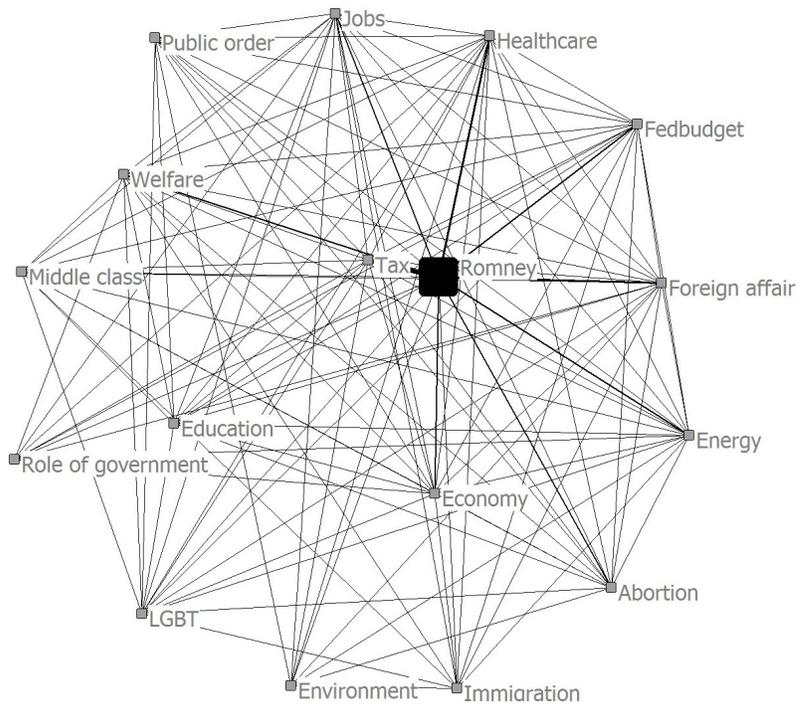Figure 2: Romney's "associative" issue ownership network perceived by the Conservatives (Period 1)

Figure 3: Obama's "associative" issue ownership network perceived by the Conservatives (Period 3)
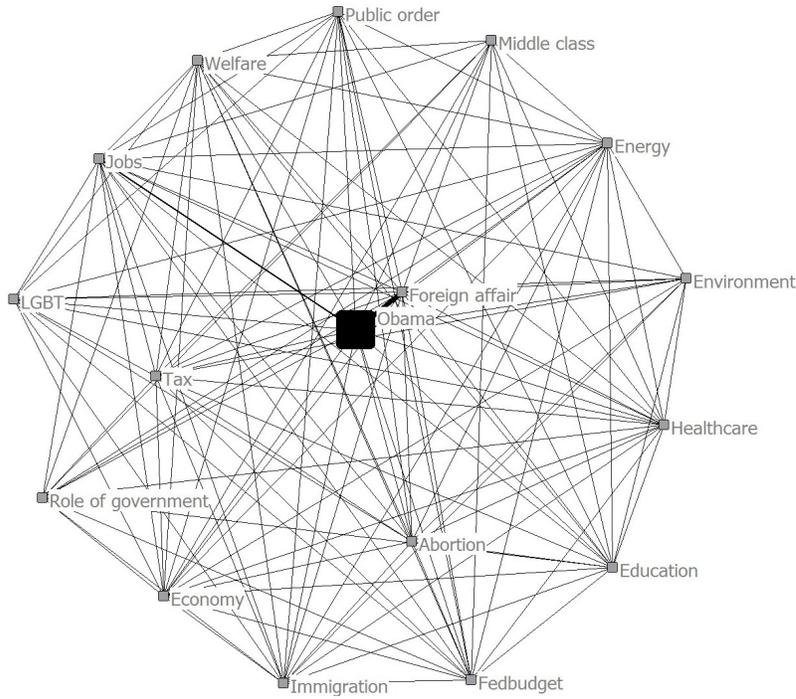

Figure 4: Romney's "associative" issue ownership network perceived by the Conservatives (Period 3)