Networks and Innovation in the Production of Communication: Explaining Innovations in U.S. Electoral Campaigning From 2004 to 2012

Daniel Kreiss & Adam J. Saffer

We outline a network analytic framework for analyzing the production of communication. In our framework, individuals—in part the products of the history of their social and professional ties—merge from various fields and a medley of prior production experiences within organizations to produce communicative innovations. Organizations with individuals who have diverse backgrounds and significant overlap in work experiences will be more innovative. We demonstrate this through a network analysis of the professional biographies of 629 staffers on U.S. presidential campaigns from 2004 to 2012. Democratic staffers came from more diverse organizations and shared significant overlap in prior experiences than their Republican counterparts. Through interview data, we argue that this in part explains Democratic innovativeness in technology during this period.

Keywords: Production Studies, Digital Media, Political Communication, Innovation, Network Analysis.

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For three decades, scholars working under the rubric of “production studies” have sought to understand how media organizations create cultural products and audiences. Broadly, these scholars are interested in media professions, industries, fields, formal organizations, routines, practices, technologies, and genres that reliably produce a stable body of communications content and audiences. For these scholars, a central question is how a diverse array of formal organizations regularize the production of cultural products and audiences. The import of this work cannot be overstated. In their orientation toward the “industrial construction” of content and audiences (Turow, 2006), scholars have excelled at explaining regularity and stability.

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There are comparatively less developed theories of how cultural content changes over time and, more specifically, when, why, and how innovations in cultural products occur. For instance, why is it that even amid such patterning in industrial media work and routinized production of cultural content and audiences there are particular works of popular entertainment, journalism, and politics that win acclaim for their innovativeness? Why are there particular video game companies, political campaigns, technology companies, and movie production studios that are well known for their innovations? A number of scholars have taken up these questions in communication and sociology (Hirsch, 1972, 2000; Turow, 1982), variously positing that exogenous shocks, technological change, new entrants to cultural fields, continual contestation (see Fligstein & McAdam, 2012), growing institutional porousness (Shoemaker & Reese, 2014), and organizational leadership and culture (DiLiello & Houghton, 2006) give rise to innovation.

This paper contributes to these disparate literatures on innovation by developing an analytic framework that argues, broadly, that groupings of individuals within organizations influence their capacity to produce innovations. This occurs through the recombination of individuals’ prior production experiences. We argue that individuals are the outcome of their work experiences during their careers in various organizations and fields (Benson, 2006). Organizations bring constellations of people with disparate knowledge, understandings, and skills together, which we reveal through a network analysis of individuals’ work histories. Following de Vaan, Vedres, and Stark (2015), and building on previous scholarship on innovation in political communication (Kreiss, 2016; Kreiss & Jasinski, 2016), we assert that organizations with staffers rich in diversity and shared work experiences can create network structures that foster innovation. Drawing from Padgett and Powell (2012), we define innovation as “something neither present nor anticipated by anyone in the population. … Innovations improve on existing ways (i.e., activities, conceptions, and purposes) of doing things…” (p. 2).

Our empirical case for studying innovation in the production of communication is drawn from U.S. politics. To date, scholars have generally pursued separate lines of inquiry into entertainment media and political communication. However, scholars in these fields provide largely parallel accounts of production processes, marketing and branding, and audience research (Mayer, 2011; Serazio, 2015; Turow, 2006), as well as structure and power across the fields of culture and politics (see Benson, 2006). Political practitioners, like their entertainment and journalistic counterparts, regularly recognize innovation. They document when some parties and campaigns stand apart in terms of utilizing digital communications for electoral advantage. For instance, in the wake of Obama’s reelection victory, the GOP (2013) produced a Growth and Opportunity Project Report that entailed over 2,600 interviews, in-depth focus groups with voters, and surveys to explain the outcome. They found that the Obama campaign not only innovatively married “grassroots politics with technology and analytics,” but the U.S. Democratic Party as a whole created an “environment of intellectual curiosity” and a “culture of data and learning” (GOP, 2013, pp. 24–25). The researchers
repeatedly pointed to the Democratic edge in its pool of technically skilled staffers, connections to industry, and culture of collaboration as giving rise to campaign innovations. These GOP researchers not only reveal Democratic innovation as a whole, but also offer intriguing hints as to the source of it: ties among its staffers to the technology industry. This finding was confirmed descriptively by Kreiss (2016) and Kreiss and Jasinski (2016), who showed that Democratic campaigns hired from more diverse fields than Republican campaigns and spun off new organizations at a greater rate.

In this paper, we build on Kreiss (2016) and Kreiss and Jasinski (2016) in two primary and significant ways. First, we develop their theoretical argument about innovation in the context of electoral politics to apply to production across media industries as a whole, and specifically situate a network production perspective against the existing literature. Second, we conduct the first network analytic empirical test of their dataset of the professional biographies of technology, digital, data, and analytics staffers working in electoral politics from 2004 to 2012. While the work of Kreiss (2016) and Kreiss and Jasinski (2016) was limited to frequencies of hiring patterns and other descriptive statistics, the novel network analysis we provide here demonstrates empirically how the two parties’ networks have evolved, both overall from 2004 to 2012 and during discrete election cycles. We submit that our network analytic procedures, which reveal the network positions of the most innovative campaigns during discrete cycles, have wide applicability for production studies and communication research. Aligning with the Republican Party’s own self-assessment and previous research, we find comparatively greater “cognitive diversity” (defined in terms of staffers coming to campaigns after work in a broad array of organizations; de Vaan et al., 2015) on Democratic presidential campaigns and across the party. This was coupled with the Democratic Party’s campaigns hiring individuals with overlapping work histories from cohesive groups of organizations (“structural folding”; de Vaan et al., 2015). Using network analysis, original interview data, and secondary literature, we demonstrate that certain network features help explain the Democratic Party’s well-documented advantages (Engage, 2012; GOP, 2013; Hatch, 2015; Kreiss, 2016).

**Bringing people and groups back into production studies**

Across many communication subfields, scholars have long been interested in the relationship between industries, professions, fields, organizations, media production, and the construction of audiences. The dominant orientation across this scholarship has been toward the macro- and mesolevel structures that shape communications output, including professional understandings, organizational structures, and occupational roles and identities, to name a few. Scholars draw on these ideas to explain constancy (Barnhurst & Nerone, 2002). As Turow (2005) argued, “Whether the subject is news or entertainment, the product is the result of a regularized, collaborative effort.” For 40 years, the dominant view of production scholarship was generally to explain stasis (Benson, 2014). Field and other structural theories are oriented toward understanding how and why little changes (for an exception see Hirsch, 1972).
One prominent example of a dominant theory of production in the field is Shoemaker and Reese’s (2014) hierarchy of influences model that has provided a framework for understanding the “forces that work to shape media content” (Reese, 2007, p. 30). The model situates individuals, with their “professional backgrounds, roles, and ethics” and “personal attitudes, values and beliefs,” within larger organizations, economic, political, and cultural contexts, and overarching ideologies that shape, if not determine (see Shoemaker & Reese, 2014, chap. 8), the media and content they produce (for a critique, see Keith, 2011). Given this framework, the conceptualization of individuals and groups within organizations is narrow in much of the literature. Scholars generally subsume individuals and project teams within larger structures that serve to institutionalize creative output, such as the professional standards that individuals are socialized into and which influence how they approach their work across organizational contexts. Meanwhile, units within organizations, such as formal and informal project teams, are rarely included as an object to study in the production studies literature.

For example, while they do not explicitly theorize innovation, Shoemaker and Reese (2014) locate possibilities for innovation in the erosion of professional boundaries and the emergence of new and external actors in the journalistic field. This includes entities such as the Knight Foundation (Lewis, 2011) and WikiLeaks (Coddington, 2012). Shoemaker and Reese (2014) argue that individual and organizational actors’ work are largely shaped by meso- and macrolevel forces:

media are institutions and part of a web of institutional relationships. … The social institutional level helps us think more clearly about the way media practices are situated in relation to other centers of social power. We need to understand how those relationships have developed historically and how institutions like journalism are shifting into new forms of equilibrium. … We see individual behavior and organizational response within the context of larger pressures on the journalistic field leading to the large macro-level adaptations. (p. 127–128)

Other scholars, by contrast, have posited a more agentic role for individuals. Ettema and Whitney’s (1982) comparatively early volume offers an intriguing set of arguments about the relationship between organizational constraint and individual autonomy. Contributors to this volume note that complex organizations, functioning within legal, economic, and institutional environments, generally constrain the work of individuals—from journalists to book editors. At the same time, a number of chapters point toward the ways individuals have autonomy and, by extension of our article here, that groups of individuals have agency vis-à-vis structural constraints. Ettema (1982), for instance, sketches a model of a public television producer as a bricoleur of sorts, navigating the constraints of genre and format. Newcomb and Alley (1982) reveal the considerable agency producers have to engage in the organizational building that helps realize new cultural forms in the industry. Turow (1982) develops a structural model, where field position (i.e., unestablished firms at the outskirts of a field and television networks failing in ratings) creates symbolic and economic opportunities for innovation that individuals can exploit.
However, in these accounts, which seek to explain innovation, there is often little discussion of the individuals who actually work within these organizations. These chapters, along with more contemporary work on the hierarchy of influences, offer little discussion of individuals beyond their demographics or thin gestures toward things such as intelligence, skills, and creativity. Even when these things are discussed, they are often subordinated to organizations. Many in the Ettema and Whitney (1982) volume, for instance, seek to dispel the romantic myth of the creative artist or the exceptional journalist, focusing instead on how any form of cultural production requires, and is constituted by, complex webs of interactions, standards, and organizations, what Becker (1984) called “worlds” in the context of art.

In contrast, Kreiss’s (2016) historical analysis of technology and campaigning across three presidential cycles inductively developed a multilevel account of four clusters of factors that gave rise to campaign innovation: resource, structural electoral cycle, infrastructural, and, the subject of this paper, organizational factors, which include the explicit role of groups of individuals within campaign organizations. Organizational factors include organizational culture, structures, including the autonomy that staffers have to ply their trade, the jurisdiction of units, and management that an expansive literature on and outside of politics has revealed. Organizational factors also include, however, the staffers that campaigns recruit, such as political professionals and field crossers (Kreiss, 2016) who potentially bring new knowledge and understandings to a field after work in other domains.

de Vaan et al. (2015) contend that innovation “is driven by the intersection of cohesive groups where actors have familiar access to diverse resources available for recombination” (emphasis in the original, p. 1151). The intercohesion of groups fosters innovation through “creative tensions of familiarity and diversity [that] promote group performance … [and] foster a creative disruption that generates the dispersion of group members who become available for later regrouping” (p. 1152). Drawing from Simmel ([1922] 1964), intercohesion posits that individuals are often members of multiple cohesive groups and bring with them past experiences and present connections to new project groups (Vedres & Stark, 2010). This challenges dominant “brokerage-plus-closure” network perspectives that view individuals’ connections as mere conduits for facilitating new information and ideas (cf. Burt, 2005; Obstfeld, 2005). The intercohesion perspective accounts for individuals’ work histories and present group affiliations that recombine in an alchemic manner to foster the creative tensions necessary for innovation.

Here we draw from Vedres and Stark’s (2010) two network analytic concepts — structural folding and cognitive diversity — to provide the first empirical study of innovation in political networks. Structural folding entails “the network property of a cohesive group whose membership overlaps with that of another cohesive group” (de Vaan et al., 2015, p. 1145). A structural fold, while similar to the concept of brokerage from structural holes theory (Burt, 2005), is conceptually different. Brokers “fill” the structural holes between unconnected parts of a network whereas structural folds are the points of overlap. Analytically, the concept of structural holes identifies brokers
who access new ideas and information whereas the concept of structural folds reveals
the points of recombination—where connections overlap with others embedded in
other cohesive groups. Those at structural folds have connections to familiar others
in various cohesive groups.

In contrast, cognitive diversity (de Vaan et al., 2015) is the melding of ideas and
information from diverse fields brought together by a structural fold. Whereas a
structural fold is concerned with the connections among cohesive groups within
a network, cognitive diversity is concerned with the “diversity of stylistic elements
available for reworking” (de Vaan et al., 2015, p. 7). Cognitive diversity recognizes
that a group’s knowledge base is not bound to the organization. Individuals come
to each new episode of production with past experiences and unique styles from
previous work. Innovation and change occur when staffers recombine their routines
and resources from diverse histories (de Vaan et al., 2015).

To use an example from electoral politics, a staffer who comes to a presidential
campaign after working at a data analytics firm brings with her production routines
as well as the production routines from earlier employers. Her knowledge of past
production routines combines with that of other staffers, who have their own histo-
ries of production routines. Ideally, from the standpoint of innovation, these staffers
come from an array of organizations (i.e., cognitive diversity). The recombination of
the team members’ production routines causes a disruptive tension that is part of the
innovative process. At the same time, organizations are at points of structural folding
where their staffers, via their employment histories, come from cohesive groups of
organizations that significantly overlap via their prior employment of staffers. This
ensures that staffers have familiar access to the diverse resources available to be
recombined.

Using the theoretical approach of de Vaan et al. (2015), existing academic liter-
ature, journalistic accounts, and the Republican Party’s own accounting of its tech-
nological shortcomings between 2004 and 2012, we hypothesize that the Democratic
Party and its presidential campaigns will be positioned at structural folds and have
greater cognitive diversity. At the same time, we recognize that structural folding and
cognitive diversity are only a portion of the factors that influence the potential for
technological innovation. Our aim is to reveal the role of cognitive diversity and struc-
tural folding in fostering innovation. To that end, we demonstrate through previously
unreported qualitative interview data and a review of the secondary literature how
structural folding and cognitive diversity intersect with other factors detailed above.

Method

For both descriptive and analytical reasons, we focus on the individuals and organiza-
tions that converged within U.S. presidential campaigns from 2004 to 2012. We adopt
Padgett and Powell’s view that innovations “improve on existing ways of doing things”
(2012, p. 2). We look at how practitioners themselves evaluated what constitutes an
innovation through interviews and extensive primary and secondary literature. For
each election considered, there was a widespread consensus in most, but not all cases. In other words, the theoretical expectations of network theory fit with qualitative assessments of innovation. A field of practitioners and the existing literature may misrecognize what is truly innovative. However, we believe our approach has the considerable strength that it is in part based on the self-assessment of a field, which has considerable financial, reputational, and institutional consequences.

Analysis of staffers’ employment history

Using data from “Democracy in Action,” which organizes Federal Election Commission (FEC) and other public data on campaign staffing, we compiled a list of all staffers who either worked in campaign divisions dedicated to technology, digital, data, or analytics or who had these words in their titles from the 2004, 2008, and 2012 presidential cycles (for a previous use of this dataset and description of it see Kreiss, 2016; Kreiss & Jasinski, 2016). The data set includes 629 staffers (507 Democratic and 123 Republican staffers, with 1 staffer working on both sides of the aisle). Coders gathered staffers’ employment biographies from publicly available websites. They categorized data into two categories: staffers’ employment history (i.e., dates and organizations employed at) and organizational type by field or sector.

Affiliation matrices and networks

Affiliation matrices for the three presidential cycles for both political parties were constructed from the staffers’ work histories. The matrices indicated staffers’ connections to various organizations (presidential campaign or other). Organizations’ shared employment of a staff connected them to each other (see Table 1 for descriptions of each organizational type). For example, if a staffer in the Republican network worked on Bush 2004, then worked at the Republican National Committee (RNC) from 2005 to 2011, before joining the Romney 2012 campaign, then Bush 2004, the RNC, and Romney 2012 were connected by this staffer. Again, our primarily theoretical interests are the connections among organizations and presidential campaigns that reveal structural folding (organizations that have overlapping membership to other cohesive organizations) and cognitive diversity (people who have worked in different organizational types).

The base affiliation matrices used are 2-mode staffer-by-organization networks where individuals share “some kind of participation or membership … in events, projects, or groups” (Borgatti & Halgin, 2011, p. 420). We transformed the 2-mode matrices into 1-mode organization-by-organization matrices following standard procedures (Bonacich, 1991; Bonacich & Domhoff, 1981; Borgatti & Everett, 1997) and were set to where $ij$th cell gives the number of staffers employed at organization $i$ and organization $j$.

The networks were analyzed for the 2004, 2008, and 2012 presidential election cycles. Therefore, the connections between the organizations were based on staffers’ employment dates. All matrices for each presidential cycle are based on staffers’ employment histories for the year of the election and prior. For instance, the two
Table 1  Types of Organizations that Employed Staffers

<table>
<thead>
<tr>
<th>Organizational Type</th>
<th>Brief Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Campaign</td>
<td>Any campaign (e.g., congressional campaign), not presidential</td>
</tr>
<tr>
<td>Commercial industry firm</td>
<td>Any firms that were not technology, data, analytics, or political consulting firms</td>
</tr>
<tr>
<td>Data analytics</td>
<td>Firms that primarily gather, maintain, and/or analyze data</td>
</tr>
<tr>
<td>DNC/RNC</td>
<td>Employment at either party’s national organization</td>
</tr>
<tr>
<td>Education</td>
<td>Organizations with the primary purpose of educating or providing education services</td>
</tr>
<tr>
<td>Entertainment media</td>
<td>Firms that produce entertainment media such at MTV and BET</td>
</tr>
<tr>
<td>Government</td>
<td>Organizations at the local, state, or national levels in the public sector</td>
</tr>
<tr>
<td>Journalism</td>
<td>Outlets for news and information such as CNN, Vox, and CNBC</td>
</tr>
<tr>
<td>Legal</td>
<td>Law firms or legal aid organizations</td>
</tr>
<tr>
<td>Political consultancy</td>
<td>Firms that provide political strategy or consulting</td>
</tr>
<tr>
<td>Political advocacy</td>
<td>Organizations such as nonprofits, social movements, or institutes that regularly engage in political advocacy</td>
</tr>
<tr>
<td>Presidential campaign</td>
<td>Any organizations or campaigns specific to a presidential election (e.g., Obama 2012, Romney 2012, etc.)</td>
</tr>
<tr>
<td>Technology</td>
<td>Firms that primarily provide digital or mobile technologies</td>
</tr>
</tbody>
</table>

Note: DNC, Democratic National Committee; RNC, Republican National Committee.

matrices (one Democratic, one Republican) for the 2004 presidential election consist of staffers’ work histories for 2004 and before. If a staffer was employed at the Net Party ’96 in 1996, the American Civil Liberties Union (ACLU) in 2000, the Kerry campaign in 2004, and Grassroots Enterprise in 2005, only those prior to 2004 were included in the 2004 analysis.

Analytic procedures and measures
Multiple techniques exist for measuring structural folding (Burt, 2015; de Vaan et al., 2015; Stark & Vedres, 2009; Vedres & Stark, 2010). Building from structural holes calculations, Burt (2015) offers the reinforced structural holes (RSH) measure to assess how well-connected an organization is to others and how well that organization’s connections are connected (Burt, 2015). RSH scores range from 0 to 1. A score of 1 indicates an organization’s connections are all connected as a cohesive part of the network and those connections exclude the organization from any other connections (Burt, 2015, p. 154). An organization will have a high RSH score when it is connected, via its staffers’ employment histories, to cohesive (i.e., well-connected) organizations that have overlapping and cohesive connections among themselves from their own
overlap in employment of staffers. The RSH calculation available in UCINET 6.22 was used (Borgatti, Everett, & Freeman, 2002).

Cognitive diversity was assessed through a series of E-I analyses that calculated the connections among the various organizational types (classified by field). The organizational types were paired with the network 1-mode matrices to measure the embeddedness of organizational types by “comparing the number of ties within groups and between groups” (Hanneman & Riddle, 2005, chap. 8, para. 37). The E-I analysis produces an index score for the overall network and for each organization by measuring the ratios of ties between different organizational types (external) and among similar organizational types (internal). The E-I index is a normalized value that ranges from +1.0 (only external relationships) to −1.0 (only internal relationships; Krackhardt & Stern, 1988). An expected E-I value for the network level is produced through a series of permutations (5,000 is the default) to indicate if the observed E-I index would occur if the ties were randomly distributed while maintaining the network density of the observed network (Hanneman & Riddle, 2005, 2011).

Findings and discussion

Structural folding and cognitive diversity in the Democratic and Republican Parties

From 2004 to 2012, journalists chronicling campaigns (Issenberg, 2012), academics (Kreiss, 2016; Stromer-Galley, 2014), and practitioners themselves (GOP, 2013) overwhelmingly pointed to the Democratic Party as driving technological innovation in the political field. This accords with the aggregate network data on the two parties.

As expected, the Democratic Party had more ideal network characteristics for fostering innovation than the Republican Party. Take, for instance, the overall structure of the Democratic network of organizations from 2004 to 2012, which yielded an average RSH score of 0.321 ($SD = 0.163$). Notably the Democratic presidential campaigns have the highest RSH and therefore have the strongest indications of being situated at structural folds: Obama 2012 (RSH = 0.986), Obama 2008 (RSH = 0.974), Organizing for America (RSH = 0.963), DNC (Democratic National Committee; RSH = 0.953), and Kerry 2004 (RSH = 0.937). In the Democratic network, the presidential campaigns are situated at structural folds in the network by way of their staffers’ employment histories.

In contrast, the GOP network structure reveals that its presidential campaign staffers have work histories at organizations that have fewer overlapping ties and are limited in the connections and resources they bring to presidential campaigns. Between 2004 and 2012, the average RSH score was 0.218 ($SD = 0.15$) and only two presidential campaigns are among the top five RSH scores: Romney 2012 (RSH = 0.968) and McCain 2008 (RSH = 0.869). The structural folding in the Republican network is notably less than the Democratic network.

The same differences emerge when looking at the cognitive diversity for the Democratic and Republican networks from 2004 to 2012. For the Democratic network, the E-I index value is 0.823 with an expected value of 0.811.6 Organizations
in the Democratic network hired staffers from a diversity of other organizations, and when those staffers left the presidential campaigns they went to an array of organizations. The general election Democratic presidential campaigns between 2004 and 2012, in particular, stand out for exceeding the expected E-I index values: Kerry 2004 (E-I = 0.972), Obama 2008 (E-I = 0.972), and Obama 2012 (E-I = 0.990).

For the Republican network, the E-I index value was lower, at 0.759 with an expected value of 0.837, suggesting that organizations in the Republican network did not hire staffers from different types of organizations. Of the 13 different types of organizations, the party (RNC), entertainment media, legal, and data analytics had the strongest E-I scores. The Republican presidential campaigns since 2004 have generally been above the expected E-I index: Bush 2004 (E-I index = 0.795), McCain 2008 (E-I index = 0.895), and Romney 2012 (E-I index = 0.976). Still, these indices are below their Democratic counterparts, suggesting the Democratic organizations had greater diversity of ties to different types of organizations.

What was innovative about the Democratic Party? Practitioners pointed to organizational innovations, especially the development of new types of firms in the party’s network that produced new knowledge regarding the practice of politics and skills required to enact it, including many founded by these campaign staffers (Kreiss, 2016). The literature also revealed that Democrats arrived at specialization in campaign staffing and consulting services much quicker than the Republicans and better utilized the talents of field crossers, which led to innovations such as individual-level predictive modeling that Issenberg (2012) has extensively documented, and that Republicans strove to match after the 2012 cycle (GOP, 2013).

Republican practitioners themselves also noted the lack of structural folding, although they did not use this term. On the Democratic side, the network data clearly reveals both cognitive diversity and structural folding. In contrast, when Republican organizations hired individuals from other domains, they were often disconnected from other staffers in terms of their work histories. As one former RNC digital and George W. Bush reelection bid staffer argued, speaking about the party as a whole from 2004 to 2014, one cause of the Republican Party’s failures to be innovative was an overreliance on unconnected outsiders:

I call it the “myth of the savior” — not a religious commentary but they, the Republican National Committee, has essentially four times now … like we lost and we need to invest more on this so we are going outside of politics to get some experts and this one expert is going to solve all of our problems. (personal communication, not for attribution due to practitioner not wanting to be seen criticizing the party)

In other words, while it is important to bring in people from the technology industry, as the Republican Party did a number of times after 2004 to run technology programs at the RNC, it is important that diversity is also grounded in commonality so there are familiar resources to be recombined, which makes innovation recognizable to the field. We turn now to an analysis of individual campaigns during discrete presidential cycles.
Figure 1 Comparison of the Republican and Democratic 2004 Presidential Campaign Network Structure. Note: The nodes (red = Republican, blue = Democratic) are organizations and the lines are the shared staffers organizations employed. Labels are for presidential campaigns party committees, a party’s committee, or other noteworthy organizations located at a structural fold.

2004 presidential election

The 2004 Democratic primaries featured a number of candidates vying for the nomination, foremost among them Howard Dean, Wesley Clark, John Edwards, and eventual nominee John Kerry. Of these campaigns, the digital innovations of Howard Dean (Kreiss, 2012; Teachout & Streeter, 2008) and Wesley Clark (Companys, 2016) in pursuit of the nomination are exceptionally well documented (Stromer-Galley, 2014). The Clark and Dean campaigns were highly innovative efforts that changed the field by introducing new organizational structures. This was comprised of stand-alone “Internet” departments with staffers who enjoyed autonomy and senior status, new organizational permeability, where volunteers played significant roles in contributing labor, and new technologies, including proto-social networking sites, systematic use of e-mail, and online video on the Dean campaign.

The innovative Clark and Dean campaigns fit the network data on structural folding and cognitive diversity well, while the Kerry campaign’s network position requires explanation given its unevenness in terms of technological adoption. The 2004 Democratic network, based on staffers’ employment histories that included 134 unique organizations, produced an average RSH score of 0.373 (SD = 0.54); thus suggesting a select few organizations were positioned at structural folds. These select few organizations were Kerry 2004 (RSH = 0.829), Clark 2004 (RSH = 0.801), and Dean 2004 (RSH = 0.616). Figure 1 visualizes their structural folds.
Turning to cognitive diversity, the 2004 Democratic network had an E-I index of 0.456 (expected value of 0.690). Overall, organizations had connections to different organizational types but to a lesser extent than expected. Notably, the three presidential campaigns positioned at structural folds had the highest E-I index scores: Kerry 2004 (E-I = 0.918), Clark 2004 (E-I = 0.957), and Dean 2004 (E-I = 0.889; see Table 2).

The Kerry campaign reveals the importance of the other factors detailed above that also shape campaign innovation. Kerry’s bid suffered from numerous technological breakdowns during the general election, and paled in comparison with its Republican rival on a technological level (Kreiss, 2016). One explanation for why the Kerry campaign came out so high in terms of structural folding and cognitive diversity is because it incorporated so many Dean and Clark staffers. At the same time, these staffers found themselves embedded within a very traditional organization, strapped for resources, and several steps removed from power (Kreiss, 2012). That said, the former Dean and Clark staffers who joined the bid did some interesting work. For example, Zack Exley (personal communication, 26 November 2008), a veteran of MoveOn.org and the Dean campaign who joined the nominee’s bid as the director of online communications and organizing after the primaries (and later became a senior advisor to the Sanders campaign), described that the Kerry campaign’s structure meant that:

[We were] really limited by not being in that inner circle, you know … it limited our ability to really give them (Internet staffers) what they, give them a real connection to the campaign and kind of involve them in all the exciting moments and decisions of the campaign. …

[However] it’s a little bit annoying for anybody that worked on the Kerry Internet department, on the Kerry Internet operation stuff. We did a lot of things that Obama got credit for being the first ….

The Republican network in 2004 was significantly different than the 2004 Democratic network. Staffers in the 2004 Republican network came from 26 unique organizations. The connections among these organizations indicated very little structural folding. Only one organization, the Bush 2004 campaign, returned a RSH score of 0.100. All other organizations in the network had RSH scores of 0.000. The network is sparse with six unique unconnected components (see Figure 1). Moreover, the 2004 Republican network had an E-I index of −0.125 with an expected value of 0.477. Thus, connections among the organizations in the network were more often among similar types of organizations (i.e., low cognitive diversity).

On the Republican side, it was the Bush reelection campaign that was innovative during the cycle. This had a number of factors, but largely was due to the Bush team’s “technical advantage of incumbency” (Kreiss, 2016) and significant work after the president’s narrow victory in 2000 to remedy failures, particularly in field organizing and its integration with new media (Nielsen, 2012). Bush’s reelection was the product of a core group of staffers who came from the RNC, and significant technological investments in marrying digital to other traditional aspects of campaigning.
Table 2  Top 10 Reinforced Structural Holes Scores and E-I Indices of the Democratic Networks 2004–2012

<table>
<thead>
<tr>
<th>Name of Organization</th>
<th>2004 Presidential Election</th>
<th>2008 Presidential Election</th>
<th>2012 Presidential Election</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>RSH Score</td>
<td>E-I Index</td>
<td>RSH Score</td>
</tr>
<tr>
<td>Kerry 2004</td>
<td>0.829</td>
<td>0.918</td>
<td>Kerry 2004</td>
</tr>
<tr>
<td>Clark 2004</td>
<td>0.801</td>
<td>0.957</td>
<td>Obama 2008</td>
</tr>
<tr>
<td>Dean 2004</td>
<td>0.616</td>
<td>0.889</td>
<td>Clark 2004</td>
</tr>
<tr>
<td>DNC</td>
<td>0.393</td>
<td>0.600</td>
<td>DNC</td>
</tr>
<tr>
<td>AT&amp;T</td>
<td>0.369</td>
<td>1.000</td>
<td>Edwards 2008</td>
</tr>
<tr>
<td>NCSE</td>
<td>0.369</td>
<td>1.000</td>
<td>Dean 2004</td>
</tr>
<tr>
<td>Peace Corps</td>
<td>0.369</td>
<td>1.000</td>
<td>Hillary Clinton 2008</td>
</tr>
<tr>
<td>USPIRG</td>
<td>0.369</td>
<td>1.000</td>
<td>Mayfield Strategy</td>
</tr>
<tr>
<td>The Accelerator Group</td>
<td>0.326</td>
<td>1.000</td>
<td>Blue State Digital</td>
</tr>
<tr>
<td>AFL-CIO</td>
<td>0.309</td>
<td>1.000</td>
<td>Richardson 2008</td>
</tr>
</tbody>
</table>


*The organization did not meet the requirement of having at least one external connection (i.e., connection to an organization of a different type) and one internal connection (i.e., connection to an organization of a similar type).
Michael Turk (personal communication, 22 January 2013), the former eCampaign director for Bush-Cheney 2004, argued that the Obama campaign in 2008 further innovated around the outgoing president’s reelection successes:

Betsy Meyers [2008 Obama campaign chief operating officer] actually gave an interview sort of post-election in 2008 where she talked very openly about the fact that they had studied very deeply and had a great deal of admiration for the Bush campaign’s ability to tie both the activity and the metrics together.

### 2008 presidential election

During the 2008 election, the networks of both parties grew substantially, perhaps owing to the lack of an incumbent and two robust fields of candidates. Republican staffers working on the presidential campaigns in 2008 came from 97 unique organizations. While the patterns of connections among the organizations evolved with the hiring of more staffers, the average RSH score remained low at 0.199 ($SD = 0.15$). The organizations with the highest indicators of being positioned at structural folds included the RNC (RSH = 0.784), Bush 2004 (RSH = 0.765), Romney 2008 (RSH = 0.716), McCain 2008 (RSH = 0.688), and Thompson 2008 (RSH = 0.597). These campaigns were connected to marginally cohesive portions of the network (see Figure 2). Notably, the Bush 2004 campaign re-emerged, which is explained by staffers going to other organizations like the RNC and returning to campaigns during the 2008 primary election. Overall, the results show a slight uptick in the structural folding in the 2008 Republican network compared to the 2004 network, but Republican staffers still came from organizations with an overall paltry number of overlapping connections with other organizations.

The cognitive diversity in the 2008 Republican network improved from the previous presidential election with an E-I index of 0.519 (expected value of 0.754). Still, though, the Republican network in 2008 had fewer connections to different types of organizations than expected. Staffers came to the presidential campaigns from a marginally more diverse array of organizational types. Romney 2008 (E-I = 0.909) featured more cognitive diversity than McCain 2008 (E-I = 0.840). Furthermore, the RNC and Bush 2004, two organizations positioned at structural folds, had E-I indices below the expected value (see Table 3), which meant staffers came from and went to different types of organizations but less than expected.

On the Democratic side, Barack Obama outlasted a vigorous Hillary Clinton campaign and spirited runs by Edwards, Biden, and Dodd. In 2008, Democratic staffers came from 377 organizations. The network averaged an RSH score of 0.216 ($SD = 0.14$), a relatively low indicator of structural folding. However, the network is quite expansive and, importantly, the presidential campaigns were positioned at structural folds. The RSH scores for the four presidential campaigns were in the top 10: Obama 2008 (RSH = 0.871), Edwards 2008 (RSH = 0.729), Clinton 2008 (RSH = 0.704), and Richardson 2008 (RSH = 0.593). These campaigns hired staffers from organizations with cohesive overlapping connections (see Figure 2).

The distinct element in the Democratic network when juxtaposed with the Republican network in 2008 is the top 10 RSH scores for the presidential campaigns.
Indeed, the Republican Party had only one presidential campaign in 2004, and Bush 2004 had the second strongest RSH score in the Republican network in 2008. Still, the Democratic network is distinct in that presidential campaign staffers between 2004 and 2008 went to organizations with overlapping connections, often founding consultancies (Kreiss, 2016). These individuals then rejoined 2008 presidential campaigns from organizations with considerable overlapping connections and with expertise in new ways of producing and using technology (see Figure 2).

In terms of cognitive diversity, the 2008 Democratic network had an E-I index of 0.588 (expected value of 0.767). Again, of all the connections in the network, most are among different organizational types but below the expected value. Importantly, the organizations positioned at structural folds maintained the highest E-I index.
Table 3  Top 10 Reinforced Structural Holes Scores and E-I Indices of the Republican Networks 2004–2012

<table>
<thead>
<tr>
<th>Name of Organization</th>
<th>RSH Score</th>
<th>E-I Index</th>
<th>Name of Organization</th>
<th>RSH Score</th>
<th>E-I Index</th>
<th>Name of Organization</th>
<th>RSH Score</th>
<th>E-I Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bush 2004a</td>
<td>0.100</td>
<td>N/Ab</td>
<td>RNC</td>
<td>0.784</td>
<td>0.700</td>
<td>Romney 2012</td>
<td>0.930</td>
<td>0.925</td>
</tr>
<tr>
<td>Bush 2004</td>
<td>0.765</td>
<td>0.688</td>
<td>McCain 2008</td>
<td>0.851</td>
<td>0.733</td>
<td>RNC</td>
<td>0.824</td>
<td>0.705</td>
</tr>
<tr>
<td>Romney 2008</td>
<td>0.716</td>
<td>0.909</td>
<td>Bush 2004</td>
<td>0.790</td>
<td>0.692</td>
<td>Romney 2008</td>
<td>0.769</td>
<td>0.879</td>
</tr>
<tr>
<td>McCain 2008</td>
<td>0.688</td>
<td>0.840</td>
<td>Thompson 2008</td>
<td>0.701</td>
<td>0.760</td>
<td>Thompson 2008</td>
<td>0.701</td>
<td>0.760</td>
</tr>
<tr>
<td>Thompson 2008</td>
<td>0.597</td>
<td>0.571</td>
<td>Giuliani 2008</td>
<td>0.688</td>
<td>−0.222</td>
<td>Interactive Giuliani 2008</td>
<td>0.681</td>
<td>0.677</td>
</tr>
<tr>
<td>Giuliani 2008</td>
<td>0.563</td>
<td>0.636</td>
<td>White House</td>
<td>0.410</td>
<td>0.077</td>
<td>Giuliani 2008</td>
<td>0.681</td>
<td>0.677</td>
</tr>
<tr>
<td>Thompson 2008</td>
<td>0.563</td>
<td>0.636</td>
<td>Republican Party of RI</td>
<td>0.409</td>
<td>N/Ab</td>
<td>Targeted Victory Freedom's Watch</td>
<td>0.635</td>
<td>0.692</td>
</tr>
<tr>
<td>Giuliani 2008</td>
<td>0.563</td>
<td>0.636</td>
<td>3eDC, LLC</td>
<td>0.397</td>
<td>N/Ab</td>
<td>OHO</td>
<td>0.688</td>
<td>−0.222</td>
</tr>
<tr>
<td>Thompson 2008</td>
<td>0.563</td>
<td>0.636</td>
<td>White House</td>
<td>0.410</td>
<td>0.077</td>
<td>Giuliani 2008</td>
<td>0.681</td>
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<tr>
<td>3eDC, LLC</td>
<td>0.397</td>
<td>N/Ab</td>
<td>White House</td>
<td>0.410</td>
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<td>Giuliani 2008</td>
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<td>Republican Party of RI</td>
<td>0.409</td>
<td>N/Ab</td>
<td>Targeted Victory Freedom's Watch</td>
<td>0.635</td>
<td>0.692</td>
</tr>
</tbody>
</table>

Note: aNo other organizations in the 2004 GOP network returned a RSH score above 0.000. bThese organizations did not meet the requirement of having at least one external connection (i.e., connection to an organization of a different type) and one internal connection (i.e., connection to an organization of the same type).

scores: Obama 2008 (E-I = 0.946), Clark 2004 (E-I = 0.944), DNC (E-I = 0.939), and Kerry 2004 (E-I = 0.860). As is clear, prior presidential campaigns (e.g., Clark 2004, Kerry 2004) reemerged with high E-I indices. Staffers from the Clark and Kerry campaigns went to work for a diverse array of organizations and some came back to campaigns during the 2008 cycle. These staffers’ movement from campaign cycle to various organizations and back to a campaign subsequently elevated the campaign E-I index, and further illustrates how the Democratic staffers move to various types of organizations (Figure 2).

In accord with the network data, the story of innovation during the 2008 presidential cycle was the Obama campaign. Briefly, given its considerable treatment in the literature (Chadwick, 2013; Kreiss, 2012; Stromer-Galley, 2014), the 2008 Obama campaign was lauded for its innovative uptake of social media in the context of an electoral bid, while also building on the work of the Bush campaign. The 2008 Obama campaign was the first to systematically use Facebook as an organizing tool, and also deployed the innovative My.BarackObama.com platform in the service of making volunteers more productive towards electoral ends. Also, in the long run what was truly groundbreaking was the adoption of “computational management,” or the delegation of design, message, and staffing decisions to the analysis of data (Kreiss, 2012).

2012 presidential election
The 2012 cycle pitted an incumbent president Obama against Mitt Romney. Staffers in the 2012 Democratic network had prior work histories at 1,233 organizations.
The average RSH score was 0.295 ($SD = 0.15$) and, like the previous Democratic networks, the presidential campaigns had the strongest RSH scores: Obama 2012 (RSH = 0.984), Obama 2008 (RSH = 0.971), Organizing for America (RSH = 0.957), the DNC (RSH = 0.940), and Kerry 2004 (RSH = 0.927). Again, presidential campaigns were positioned at a structural fold (Figure 3). And, this reappearance of campaigns from previous cycles suggests staffers go to other organizations between election cycles but return to campaigns. Compared to the 2008 cycle when many of the primary campaign staffers went on to work for Obama 2008, more presidential campaigns from 2004 to 2008 returned to the top RSH scores because of staffers’ work histories that included these previous campaigns. This is likely due to these prior organizations becoming further embedded in cohesive parts of the network as their alumni went on to work at other organizations that already shared overlapping ties. Turning to the cognitive diversity measure, the presidential campaigns in the 2012 Democratic network tended to have connections to different organizational types. The E-I index was 0.584 (expected value of 0.757), but the presidential campaigns maintained strong E-I indices as reported in Table 2.
For the 2012 Republican network, there was some growth in the number of organizations (n = 341) staffers came from but not to the scale of the 2012 Democratic network. The average RSH score was 0.231 (SD = 0.15). Organizations with the strongest indicators of structural folding were: Romney 2012 (RSH = 0.930), McCain 2008 (RSH = 0.851), RNC (RSH = 0.824), Bush 2004 (RSH = 0.790), and Romney 2008 (RSH = 0.769). While the network grew, the cognitive diversity turned downward. The results revealed a lower E-I index than the previous election cycle at 0.478 with an expected index of 0.663. Although organizations had a diversity of connections, the frequency of connections to different types of organizations went down. Staffers from previous campaigns appear to have gone to work for similar types of organizations, and the 2012 campaigns tended to hire from similar types of organizations.

The story of the 2012 presidential cycle, like 2008, was also the Obama campaign (MacKay, 2015; Sides & Vavreck, 2014). This is not a surprise given the outsized attention the Obama reelection campaign received in the media (Issenberg, 2012) and among academics (Kreiss, 2016; Stromer-Galley, 2014). In addition, in 2012 the top four scores for structural folding clearly reveal the influential network position of the DNC and Organizing for America as important tributaries in the Democratic network ecosystem. The innovative Obama 2012 campaign was almost the perfect case for the blending of cognitive diversity and structural folding. There were people who had both the institutional memory from the 2008 run and experiential knowledge gained through work for the party in the intervening years before the reelection bid. They were joined by those who were able to step outside of the fold after the 2008 campaign, work for other political organizations, and chart new technological developments in between presidential elections. Matt Compton (personal communication, 1 May 2015), who worked at the party during the 2010 cycle and served as the deputy director of digital content at the White House during the 2012 cycle and subsequently became the digital director of the party, describes what this looked like in practice during the reelection bid:

Analysts, designers, bloggers and writers, all those people learned a bunch from the 2010 election and made the transition to Chicago so there was incredible continuity in the work. That team obviously grew to six times the size to whatever it was and had great leadership with [digital staffers and 2008 veterans] Teddy [Goff] and Joe [Rospars] who had a different perspective than those of us who were here [at the party] in 2010. They had an opportunity to step back and reassess things from 35,000 feet in a way that those of us that were in the daily grind didn’t …

Meanwhile, these staffers were joined by others coming from fields such as the technology industry and commercial sector. While this helped fuel the campaign’s extraordinary innovation, it also caused organizational tensions that needed to be managed by people who had multiple overlapping ties to these individuals and their diverse fields (Kreiss & Jasinski, 2016). Numerous former staffers argued, for instance, that the campaign’s celebrated and innovative technology and analytics teams (see Issenberg, 2012) were often at odds with other departments precisely
because of the ways their approaches would often upend existing practice, such as using data as opposed to gut instinct regarding fundraising or making the most effective persuasive appeals. Even more, different groups of staffers also had different communicative styles. In this context, the job of senior management was to make sure staffers productively recombined the heterogeneous skills, knowledge, and languages on the reelection bid.

Conclusion

For over 20 years, scholars of media production have worked under analytical frameworks that leave little room for individuals, and the groups they collaboratively work in, to shape the communicative output of organizations. Communication scholarship has a very detailed set of theories outlining the macro- and mesolevel structural forces that regularize communication output, such as the vastly influential “hierarchy of influences” model. Scholars have developed attendant objects of analysis and methods of empirically documenting the fields, professions, and organizations that “industrialize” media production. As a result of the reigning theoretical models, scholars are far better at explaining stasis, rather than change, in media production. And, when innovation in creative output is discussed in domains such as journalism and film, scholars posit that it arises from macro- and mesolevel changes in fields and institutions, such as exogenous technological change or porousness at the boundaries of fields.

As our analysis has revealed, however, these models do not tell the whole story of media production or provide the full explanation of why communicative innovation occurs. Our primary contribution to the vast literature on media production across communication subfields is a theoretical model and network analytic approach that puts individuals, their biographies, and the teams they work in at the center of communicative innovation. Through the case studies on electoral politics presented here, we demonstrate that our model of innovation and network empirical approach identifies which organizations practitioners say are innovative in their media production. In doing so, we posit analytically and reveal empirically how cognitive diversity and structural folding within groups of individuals that work in concert shape communicative output. As such, we demonstrated that to understand nonroutine and innovative output scholars need to account for the people who actually do the work of media production. This is a new direction for communication research. Scholars have comparatively under theorized individuals and groups within organizations compared to the macro- and mesolevel structures they are embedded in. In the literature, scholars generally conceptualize individuals as raw material to be socialized into organizations and fields, and groups as entities that are brought together through and structured into organizations.

While organizations and fields undoubtedly are important, the existing literature leaves little room for understanding the work of individuals and teams. As a result, it misses the prospect of fully explaining why it is that certain organizations are more innovative than others. Why do some production and video game companies,
journalism organizations, publishing houses, and technology firms win critical acclaim in their fields? As we showed, presidential campaigns that practitioners collectively pointed to as being innovative were those that the network data revealed to be staffed by individuals with overlapping ties who were able to successfully recombine diverse ways of producing communicative outputs drawn from their professional histories. We conceptually argued and empirically demonstrated that individuals—products of their histories of moving through different fields and organizations over the course of their careers—bring different knowledge, skills, understandings, and routines to their work in organizations. We revealed that as different organizations and fields meet via individuals’ work histories, the possibility for innovations arises.

While we demonstrate that the role of individuals and teams is an important factor driving innovation in the political field, this framework has wide utility for studying innovation across communication industries. As de Vaan et al. (2015) reveal in their network analysis of production teams in the video game industry, groupings of diverse people with overlapping ties lead to more innovative games. Going forward, scholars can take a similar network analytic approach to test whether specific combinations of staffers within organizations ranging from Hollywood production studios to Silicon Valley start-ups result in innovative films and technology products. Scholars can further utilize the mixed method approach developed here and combine network analysis with qualitative interviews to reveal the content of ties, contributions of different individuals, and workings of organizations in the context of innovation. And, most importantly, scholars will need to think about what constitutes innovation in various fields. This is an analytical and empirical problem that we solved in a particular way (i.e., the recognition of practitioners themselves). Other domains have the potential for different outcome measures. This includes recognition for creative output or the accomplishments of teams such as Pulitzer Prizes for newspapers, critical reviews such as on the movie site Rotten Tomatoes, or industry analysis or consumer reviews such as those offered in Wired, Fast Company, and CNET.

At the same time, scholars can use a network analytic approach, or career data more generally, to go beyond innovation and extend our understanding of individuals, the composition of groups, and roles and specializations within media industries, as well as how they have changed over time. While our focus here is innovation, there are many other things that can be done with career data gleaned through public sources. Weber and Kosterich (2017), for instance, have been using a network approach to analyze the differential career paths of individuals, and differences in their skills and knowledge, who are plying their trade in legacy versus start-up journalism organizations. Scholars can reveal the changing composition of newsrooms or creative teams, the latter by analyzing the degree to which the production experiences of staffers on HBO, Amazon, and Netflix-produced series are different from those of individuals working on network television shows. To do so, scholars will not only have to follow our lead in placing individuals and teams at the center of their conceptual models of media production, they will have to draw on novel sources of data. In
this article, we showed the utility of coupling public career data with Federal Election Commission data, which documents disbursements to individuals and organizations, therefore allowing us to have complete lists of staffers paid directly by campaigns.

These data are not perfect. They do not enable us to chart the careers of individuals who worked for campaigns on the payroll of consultancies given the impossibility of reliably obtaining this information through the FEC or other sources (Kreiss, 2016). That said, we are confident of our quantitative network findings that align with practitioners’ own assessments of innovation, and fit with the historical data on the drivers of innovation in presidential politics during the period of this study. In the context of politics, future research is necessary to flesh out the dynamics of how cognitive diversity and structural folding intersect with the other factors of technological innovation identified by Kreiss (2016). Follow-up studies can also compare innovative campaigns with noninnovative campaigns. Going forward in other communication domains, scholars can also leverage digital public data sources, such as company organizational charts, nonprofit boards of directors, professional society membership, and public résumés to find records on organizational employment and careers in sectors (and across them) ranging from public relations to book publishing.

In the end, we have developed a new conceptual framework for understanding innovation that breaks with much of the existing scholarship on media production in developing a model of the role of individuals, their biographies, and teams in producing communication output. And, we have demonstrated the utility of this approach for predicting innovation in electoral politics. This model has wide applications across communication subfields from political communication and journalism to technology and entertainment studies, and requires a new empirical approach to studying communicative output. In the future, scholars of media production should pay more attention to individuals and their professional biographies, as well as how they work in concert with others within organizations. Doing so would help explain why certain organizations win awards and produce the groundbreaking communication that practitioners and audiences alike point to as driving media industries forward.

Notes
1 See Shoemaker and Reese (2014, chap. 8) for a discussion of how organizational position matters for individuals.
2 See Burt (2015) for a visual distinction between structural holes and structural folds.
3 In the subsequent discussion, we refer to the technology, digital, data, and analytics staffers as “technology staffers" or simply “staffers" for clarity's sake. When discussing innovation, we refer generally to “technology" as the overarching category that encompasses the work of all these different staffers.
4 Indeed, the number of Republican staffers is notably fewer than Democratic staffers. This is due to the differential hiring practices of the presidential campaigns. Between 2004 and 2012, the Republican presidential campaigns have hired fewer technology, digital, data, and analytics staffers in-house than Democratic presidential campaigns. A limitation of the dataset is that the work of outside firms and consultancies for campaigns is not accounted
for, simply because no reliable record of this exists in the FEC or other data (see Kreiss, 2016, for a full discussion).

5 The intercoder reliability met acceptable levels for staffers’ employment history (95.2% agreement) and organizational type (85.7% agreement).

6 The expected E-I value is a permutation-based (5,000 is the default) calculation that indicates whether the observed E-I value would occur if the nodes were drawn from a random sample and if the ties between (external ties) and among (internal ties) the categories of nodes were randomly distributed. The calculations maintain the observed network’s density and is not a calculation impacted by the overall size of a network (Hanneman & Riddle, 2011). The expected values are reported here to indicate if the observed E-I value is what could be expected to occur. For a detailed explanation of E-I values see Krackhardt and Stern (1988) and Hanneman and Riddle (2011, 2005).

References


