

Connective collective action online: An examination of the hyperlink network structure of an NGO issue network

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Nonprofit, nongovernmental organization (NGO) hyperlink networks are connective public goods, or sets of interorganizational links that enable members and nonmembers to reach like-minded organizations in order to enhance the visibility of the network's goals. We extend collective action theory to account for both the level and structural signatures of contributions that generalist and specialist organizations make to these connective public goods. This study examines contributions that 48 English Speaking Islamic Resistance organizations make to a NGO hyperlink network. We found that generalist organizations, or organizations with heterogeneous goals, play several key roles in the connective public good. Generalist NGOs promoted the most legitimate face of the issue network, acting as brokers and authorities to other generalist NGOs, and initiators for both specialist and generalist NGOs.

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According to many scholars, the advent of the internet-based communication technologies (ICTs) has transformed modern collective action (Bimber, Flanagan, & Stohl, 2005; Lupia & Sin, 2003). These modern collective action organizations utilize ICTs to communicate their aims to disparate publics, coordinate action across wide geographic spaces, and launch campaigns against multinational actors. For example, the Zapatista movement (Castells, 1997; Ronfeldt, Arquilla, Fuller, & Fuller, 1998)

used ICTs to gain the support of activists in the global North. The landmine ban movement (Rutherford, 2000; Scott, 2001) used ICTs to form a large and international coalition to encourage nation-states to sign the international treaty to ban landmines. The antideforestation movement (Bendell & Murphy, 2000; Keck & Sikkink, 1998) used ICTs to launch a campaign to encourage home improvement stores to change the type of wood that they carry. Communication processes, essential to the organizing and persuasion activities of these movements, have been shaped by the use of ICTs.

However, communication collective action theorizing has not kept pace with increasing changes in this sector. Bimber and colleagues (2005) begin to meet this challenge by problematizing membership and formal organizing in technology-enabled environments. Shumate and Dewitt (2008) contributed to theorizing, noting that nonprofit, nongovernmental (NGO) hyperlink networks are a public good and the NGOs' joint contributions to the network are a type of collective action. The current research extends this prior work. First, refining Shumate and Dewitt's argument, we suggest that hyperlink networks are best understood as *connective* public goods. We define connective public goods as a set of interorganizational links that enable members and nonmembers to reach a homogenous set of like-minded organizations in order to enhance the visibility of the network's goals. Following Shumate and Dewitt, the creation of a hyperlink network is considered a form of collective action in itself. While hyperlink networks may or may not related other forms of collective action, the creation of the hyperlink network has implications for the scope of social issue discourse online (Ackland, O'Neil, Bimber, Gibson, & Ward, 2006). Second, we note the important role that the heterogeneity of organizational goals, or the degree to which NGOs are generalist or specialist organizations (Keck & Sikkink, 1998; Knoke, 1990; McPherson, 1990), play in collective action theory. This study focuses on the role that generalists play in online collective action, but examines the contributions of both specialist and generalist organizations to the network. Finally, we argue that generalist NGOs may play at least four roles in connective public goods and the role that generalist NGOs play within a segment of the network is influenced by the heterogeneity of the network's goals. These theoretical developments lead us to test four sets of hypotheses in an analysis of an NGO network.

Literature Review

NGOs, Communication and Collective Action

Collective action theory elucidates the rational choice that individuals make to pursue a public good through NGOs or the choices that NGOs make to contribute to a public good through a coalition (Marwell & Oliver, 1993; Oliver & Marwell, 1992; Olson, 1965). Traditional examples of public goods include public works such as roads and parks (Marwell & Oliver, 1993) and labor unions (Olson, 1965). Knoke (1990) extends Olson's economic model to public goods in the realm of political economy, noting that political collective actions seek to garner public goods such as tax rates, election reforms, or the right to own firearms.

Many public goods are communication-based. Communication-based public goods may range in complexity from electronic databases to the Internet itself (Connolly & Thorn, 1990; Monge et al., 1998). Contributions to these systems become a public good only if others also contribute. Thus, communication-based public goods are sustained through collective actions of individuals and/or organizations. Communication-based public goods can be further divided into connective and communal public goods (Child & Shumate, 2007; Fulk, Flanagin, Kalman, Monge & Ryan, 1996). Communal communication-based public goods, hereafter referred to as communal goods, are collections of information derived through contributions from members which are accessible to publics (Monge et al., 1998). An example of this type of public good is an online database of class teaching materials, syllabi, and case studies. Contributions to this public good involve uploading one's class material for public use. In contrast, connective communication-based public goods, hereafter referred to as connective goods, are technology-enabled communication systems that connect members of a collective directly to other members of that same collective (Hollingshead, Fulk, & Monge, 2002; Monge et al., 1998). For example, the Community of Science is a searchable database of academic researchers across organizations based upon the self-identifying information that each individual makes available. In this database, members can search for contact information of other members, regardless of organizational membership, based upon academic expertise. Contributions to this database take the form of uploading one's research interest, curriculum vitae, and contact information. We argue, however, that two important revisions to modern collective action theory have important implications for defining connective goods.

In modern collective action, ICTs have considerably blurred two important dimensions of traditional collective action theory. The first of these is membership. With the advent and use of ICTs, the level of contribution necessary for a collective action has been reduced, blurring the boundary between members and nonmembers of the collective action (Bimber et al., 2005). Second, traditional collective action theory assumed that a formal organization was necessary in order to coordinate activity. However, new forms of collective action have demonstrated that groups can use ICTs to coordinate activity in loose networks rather than through traditional organizations (Bimber et al., 2005). Following Bimber and colleagues revisions to collective action theory, we contend that these two changes have important implications for connective goods.

Following Bimber and colleagues (2005), we expand the definition of connective goods by arguing that ICT systems may connect nonmembers as well as members to other members of the interorganizational collective. Additionally, we contend that connective goods may not require such formal organizing strategies as a central database, instead operating in a network-generalized exchange model (Sohn & Leckenby, 2007). Thus, we define a connective good as a set of interorganizational links that enable members and nonmembers to reach like-minded organizations in order to enhance the visibility of the network's goals.

Hyperlink networks as a connective public good

A NGO hyperlink network serves to connect both members and nonmembers to other members of the NGO issue network through informal organizing strategies (see Shumate & Dewitt, 2008 for a summary). Members of this interorganizational collective are those NGOs engaged in activities related to an issue (e.g., AIDS, human rights). Hyperlinks provide a powerful way for both members and nonmembers (e.g., NGOs engaged in another issue, publics) to locate and make sense of the number of NGOs working on an issue. Once an interorganizational hyperlink network is created, both members and nonmembers interested in an issue can navigate to the other organizational members easily. Additionally, search results for hyperlinked organizations are enhanced. For example, Google's search algorithm uses number of links to establish the rank order, relative importance, and validity of webpages (Brin & Page, 1998; Henzinger, 2001; Vreeland, 2000).

Hyperlinks among organizational websites are evidence of a symbolic relationship between the entities (Barnett & Sung, 2005; Park & Thelwall, 2003; Rogers & Marres, 2000). However, unlike traditional organizational networks in which resources and/or communication flow between the actors (see Bonacich, 1990), hyperlink networks are representational networks. Representational networks are networks of affiliation, where links represent the public affiliation of two or more actors (see Stewart, Denton, & Smith, 1989 on the role of alignment in public communication). Other representational networks include cobranding and personal networks on social networking websites. Hyperlink networks, as representational networks, "help to establish the structure and boundaries of political communication on the web" (Ackland et al., 2006, p. 4).

Following Shumate and Dewitt (2008), we argue that the creation of a hyperlink network is best explained by collective action theory. "Collective action theory poses that individuals and organizations rationally contribute to public goods which they could not create alone and which are accessible to publics" (p. 408). There are three key factors that define public goods: jointness of supply, impossibility of exclusion, and commonality (Olson, 1965). Hyperlink networks meet all of these criteria. Jointness of supply means that public goods can be consumed in common, with no one person's consumption of a good diminishing any other person's consumption (Hardin, 1982; Samuelson, 1954). A hyperlink network can be utilized by many individuals to search the issue network without diminishing the public good for others and thus is characterized by jointness of supply. Impossibility of exclusion means that no person within the public, for which the good was designed, can be excluded from the use of the public good (Olson, 1965). Hyperlink networks are publicly accessible to any individual with a computer and internet connection and, thus, are also characterized by the impossibility of exclusion. The third factor from Olson's original conceptualization is that the good needs to be common to all the organizations. In the case of a communication-based public good, this means that the organizations must have a) a common purpose (i.e. profit making through information sharing in business organization or issues for which NGOs advocate), and b) must speak the same

language(s). NGOs that lack a common purpose, but are hyperlinked, would not commonly benefit from the creation of a hyperlink network. Similarly, NGOs that do not share common language(s) would not benefit from added flow of users who may not be able to translate their site. As such, NGO hyperlink networks must be homogenous in both language(s) used and purpose in order to be a public good.

The purpose of this paper is to examine how rational contributions to this public good are influenced by the heterogeneity of NGOs' goals. While this paper focuses on the role that generalist organizations, or organization with heterogeneous goals, play in the network, both the contributions of generalist and specialist organizations are examined. The purpose of the paper is not to empirically support the conceptualization that hyperlink networks are a public good. Instead, this research extends collective action theory by examining the contributions that generalist and specialist organizations are likely to make to a public good. This extension is discussed in the next section.

A Collective Action Theory for Connective Goods

While research and theorizing about communal public goods often examines the causal and predictive relationships among independent variables (for example see Yuan et al., 2005) in motivating individuals to participate in group-generalized exchange (see Sohn & Leckenby, 2007), contributions to a connective public good like a hyperlink network are not made to a central pool of resources. Instead, when organizations link to others in a hyperlink network, they make decisions about whether to participate and to which other websites to link. Specifically, organizations contribute by placing a reference that contains a destination anchor, in the appropriate language (i.e. HTML, XML). In this study, we only examine hyperlinks with a destination anchor in a separate domain. Sohn and Leckenby (2007) describe contributions online that are marked with destination anchors as operating in a network-generalized exchange architecture. Instead of contributions expanding the resources of a commonly available repository or database (i.e., group-generalized exchange), in a network-generalized exchange architecture contributions create a network.

Theorizing about connective goods with network-generalized exchange architectures must examine *both* the level of contributions and their structural signatures (Contractor, 2006; Shumate & Dewitt, 2008). A structural signature refers to the pattern, or signature, of contributions organizations make when they choose to list a hyperlink on their website. Thus, information provision in this architecture is composed of two choices: (a) whether and how many hyperlinks to list (i.e., level of contribution), and (b) to which other organizations' websites to hyperlink (i.e., the structural signature of the contribution). As noted by Shumate and Dewitt, a structural signature is considered prevalent when it occurs beyond what might occur by chance alone. In Figure 1, all three networks consist of six nodes and six links. In the first network (left), while the links occur at random, there are some

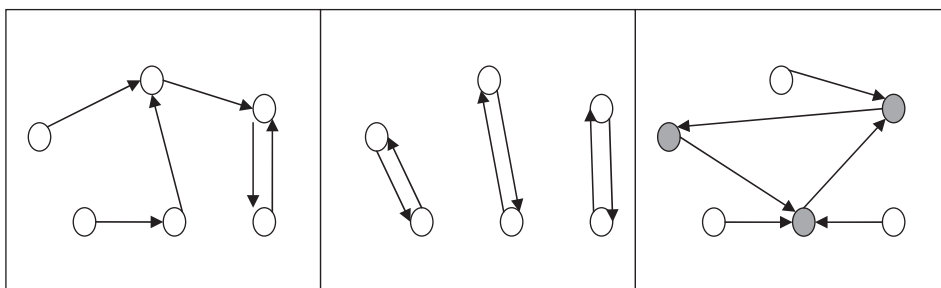


Figure 1 Shumate and Dewitt's (2008) illustration of 3 networks with six nodes. The network on the left is random. The network in the middle pane demonstrates reciprocity. The network on the right favors the choice of the shaded nodes and the disfavors the choice of the non-shaded nodes.

structural signatures (e.g., reciprocal ties). However, no structural signature occurs more or less frequently than might be expected by chance alone. In the second network (middle), there are a greater number of reciprocal ties than would be expected by chance alone². Finally, in the third network (right), shaded nodes are more likely to receive ties than by chance alone and nonshaded nodes are less likely to receive ties than would be expected by chance alone. In other words, the structural signatures of contributions from six nodes have implications for the resulting network, even while network density (i.e., total level of contribution) remains constant.

Extensions to Collective Action Theory

In this section, we extend collective action theory to examine the structure of the network resulting from contributions to the connective public good. Structural signatures not only suggest that NGOs make rational and nonrandom contributions to a connective public good, but highlight that different actors within the network may construe the connective public good differently. In particular, structural signatures may be influenced by whether the NGOs are generalists or specialists organizations.

In population ecology theory, generalist organizations “depend on a wide range of environmental resources for survival” and “compete in a variety of domains simultaneously” (Carroll, 1985, p. 1266). In contrast, specialist organizations “survive in a specific environmental condition, or within a narrow range of environmental resources” and “focus on only one of a limited few” domains or niches (p. 1266). When examining NGOs, niches are defined by the generality of the organizations’ goals. Following McPherson (1983, 1990), NGOs with more heterogeneous goals are generalist organizations and NGOs with narrowly defined goals are specialist organizations. For example in the environmentalist NGO network, the Sierra Club would be considered a generalist NGO, since it holds many environmental concerns including wildlife preservation and global warming as important.

In contrast, the Ocean Conservancy focuses on marine wildlife and habitat issues and would be considered a specialist NGO.

The NGO choice to link to a particular other organizational member is influenced by the diversity of goals of both organizations. We defined a connective good as a set of interorganizational links that enable members and nonmembers to reach *like-minded* organizations in order to enhance the visibility of *the network's goals*. NGOs vary in the specificity of their goals (Knoke, 1990). The choice of the Sierra Club and Ocean Conservancy to hyperlink to one another would depend upon their view of the issue (i.e., environmental protection in general or awareness about ocean conservation in particular). Thus, different organizations may have different view of both *like-minded organizations* and *the network's goals*.

In many ways akin to social dilemmas (Axelrod, 1985), generalist and specialist organizations face a decision about whether to adopt an individual versus a collective rationality. The individual rationality, in this extension, is a *niche rationality*, in which specialist organizations seek to benefit those other organizations within their niche only. In short, this paper suggests specialist organizations are more likely to engage in niche rationality, while generalist organizations are more likely to engage in collective rationality.

Thus, generalist organizations may play a broader role in interorganizational collective action (Barnett, Mischke, & Ocasio, 2000). Generalist organizations, because they are seeking to raise the visibility of a variety of aspects of a particular issue, have greater incentives to hyperlink to other generalist organizations that are like-minded. Generalist NGOs will be more likely to align themselves with other organizations that are viewed as legitimate to enhance the persuasiveness of their position (see Stewart et al., 1989). Generalist organizations are viewed as the more ideologically cooperative to outside populations (McAdam, McCarthy, & Zald, 1996), and are therefore more likely to be the target of hyperlinking behavior, because it will enhance the goals of the network *in general*.

In contrast, specialist organizations will be less likely to hyperlink to other NGOs that do not support their same narrow set of goals. Instead, the *network's goals* for these NGOs would be to enhance the visibility of a network of specialist organizations with similarly narrow goals. Specialist organizations that have divergent goals will be less likely to hyperlink to one another or to generalist organizations, since such connections would not enhance the narrow goals of these organizations.

This paper focuses on the role that generalists play within the hyperlink network. We chose to focus on generalists because generalists are hypothesized to play a broader role in interorganizational collective action. We argue that there are four important roles that generalist NGOs may play: reciprocator, broker, authority, and initiator. Each of these roles is illustrated in Figure 2.

Reciprocators link back to those NGOs that link to them. Reciprocal network relations are often explained by social exchange (Aldrich, 1982; Monge & Contractor, 2003) and resource dependency (Monge & Contractor, 2003; Pfeffer & Salancik, 1978) theories. Reciprocal ties are evidence of an awareness of others hyperlinking

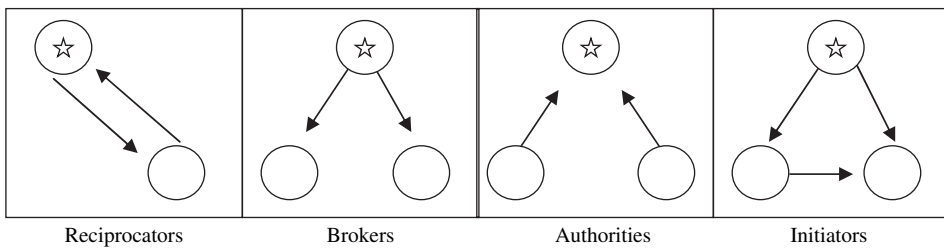
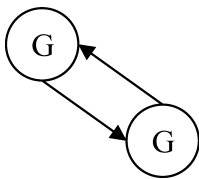


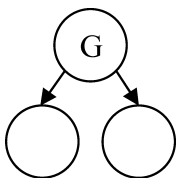
Figure 2 Illustration of four network roles in connective goods. The starred node represents the actor's contribution of focus in each illustration.

behavior and seeking mutual benefits. In hyperlink networks, reciprocal hyperlinks benefit each organization in the dyad in search engine results. Further, reciprocal hyperlinking has the potential to enhance webflow traffic between the two NGOs' websites. As in contributions to all public goods, reciprocal linking is not without cost to the NGOs. The presence of many nonreciprocated links can enhance rank order in some search algorithms (Kleinberg, 1999; Rogers & Marres, 2000). Generalist NGOs are more likely to see one another as participating in the same common goal than specialist organizations that have more specific goals. As such, we hypothesize that generalist organizations would be more likely to enter into social exchange relationships with one another. Specifically, we hypothesize:

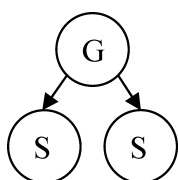


H1: Generalist NGOs will be more likely to reciprocate links to other generalist NGOs than would occur by chance alone.

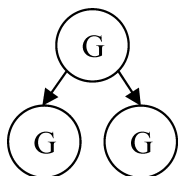
A *broker* in the interorganizational network links to one or more unconnected NGOs. These organizations fill structural holes within the network (Burt, 1982; Stohl & Stohl, 2005). Brokers, by the act of linking to other unlinked organizations, further the connective good by linking members and nonmembers to several others within the greater hyperlink network. Generalist NGOs are likely to act as *brokers* for other NGOs. Like the organizations that make foundational collective action contributions (Taylor & Doerfel, 2003), we argue that these generalist NGOs will be central within the collective action. As such, we argue that generalist NGOs will act as brokers to the larger NGO network, thereby enhancing the visibility of their heterogeneous issue.



H2: Generalist NGOs are more likely to act as brokers to other NGOs in the hyperlink network than would occur by chance alone.

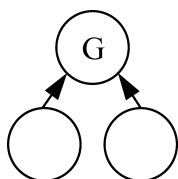


H2a: Generalist NGOs are more likely to act as brokers to specialist NGOs in the hyperlink network than would occur by chance alone.

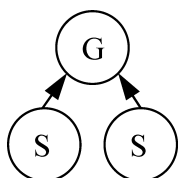


H2b: Generalist NGOs are more likely to act as brokers to generalist NGOs in the hyperlink network than would occur by chance alone.

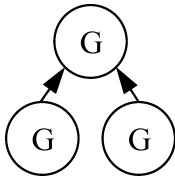
Authorities also play an important role within the hyperlink network. Authorities are NGOs that receive links from unlinked NGOs. Authorities are chosen in the network by social influence among sites and recognition of the legitimacy of the NGO. Social influence should not be viewed in this context as an alternative explanation for collective action, but instead an important element in collective action theory. In fact, Olson (1965) contended that social influence could be a selective incentive for participation in a public good. Knoke (1990) goes further, arguing that affective bonds and normative conformity, or conformity to a standard of conduct based upon social values, can be important motivational factors in the decision to participate in a collective action. We further this argument, noting that normative hyperlinking patterns in connective goods can further the values and goals of the network. Authorities represent the most prominent face of a movement. NGOs that link to authorities promote web traffic to these websites through both hyperlinks and search engines, thereby enhancing the connective good. Because of their legitimacy, the heterogeneity of their goals, and their relationship with publics, we hypothesize that generalist NGOs are likely to be authorities in the hyperlink network.



H3: Generalist NGOs are more likely to be authorities among other NGOs in the hyperlink network than would occur by chance alone.

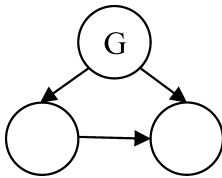


H3a: Generalist NGOs are more likely to be authorities among specialist NGOs than would occur by chance alone.

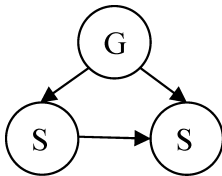


H3b: Generalist NGOs are more likely to be authorities among generalist NGOs than would occur by chance alone.

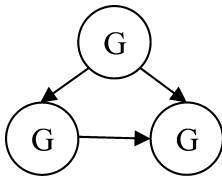
Initiators are the fourth role that NGOs may play within the connective good. Initiators promote links between other organizations by linking to both organizations. Such a relationship is referred to as a transitive network structure (Monge & Contractor, 2003). Initiators encourage other organizations to acknowledge one another, enhancing the connectivity, and reducing the distance between unlinked groups within the connective good. Generalist NGOs may promote hyperlinks between NGOs within the larger network by hyperlinking to both organizations, since they would tend to see the various aspects of the issue as a single set of issues. Therefore we hypothesize:



H4: Generalist NGOs are more likely to be initiators among other NGOs in the hyperlink network than would occur by chance alone.



H4a: Generalist NGOs are more likely to be initiators among specialist NGOs than would occur by chance alone.



H4b: Generalist NGOs are more likely to be initiators among generalist NGOs than would occur by chance alone.

In combination, we argue that structural signatures of contributions that generalist and specialist organizations make the hyperlink network are influenced by both the heterogeneity of the NGO's goals and the roles that generalist NGOs play within the network. These two mechanisms are interdependent. We argue that generalist organizations are more likely to play each role. We note that both the level and structural signatures of contributions are important in understanding connective public goods. The heterogeneity of organizational goals within the

network may explain the structural signatures of contributions to the connective good.

Methods

Sample

We tested our hypotheses by focusing on an interorganizational hyperlink network of English Speaking Islamic Resistance Organizations (ESIROs). Islamic activism has been defined as “the mobilization of contention to support Muslim causes” (Wiktorowicz, 2004, p. 2). We distinguished ESIROs from other Islamic activists by several characteristics including: a) the dominant language of the public which these groups engage, b) their collective identity that challenges dominant western cultural codes (Melucci, 1996) while engaging Western publics, and c) their diagnostic frame (Wiktorowicz, 2004).

In order to sample these organizations, we used the Database of Terrorist Websites and E-Groups (DTWE)³. We examined only English language websites, excluding e-groups, online forums, and websites no longer in existence. We chose to examine organizations that used a common language in keeping with our definition of homogenous NGO hyperlink networks as a connective public good. An additional benefit was that by examining a homogenous sample, language differences were eliminated as a confound to generalist/specialist differences. This reduced the population of eligible organizations to 48 ESIROs. Additionally, the DTWE did not distinguish between organizations that have a website or websites that exist without a formal organization. Since collective action theory is increasingly concerned with both types of organizing (see Bimber et al., 2005), we also did not distinguish between these two types.

Procedures

This research used hyperlink network analysis to examine the links between ESIRO websites. SocSciBot 3 (Thelwall, 2004) was utilized to record the hyperlinks among the 48 identified websites in our sample. The SocSciBot 3 program crawled a maximum of 5000 pages for hyperlinks on any website. The crawl of each page on the website sampled cataloged any hyperlinks present and indicated whether those hyperlinks connected to any other sites present in the sample. The crawler recorded hyperlinks between the specified web domains. The average number of links to other websites in the sample was 2.65. Six of the websites were isolates, meaning that they had no hyperlinks to any of the other 42 websites in the sample. The density of the network was 0.06.

Measures

Affiliation and Specialist/Generalist: The ESIROs examined include both generalist and specialist organizations. In this context, *generalist ESIROs* supported the expression of the Islamic faith in Western countries and resistance to Western incursion into Islamic states in general (e.g., Israeli state, United States’ role in the Middle

East). Their goals are more diverse and as such, they are likely to attract a heterogeneous membership. Generalist organizations ($n = 29$) included CAIR, AEL, terrorist propaganda, proterrorist, and jihadist affiliations noted by DTWE³. For example, the Arab European League, one of the generalist organizations in our sample, stated that they have 19 goals and principles. In summary, they state that “The Arab European League (AEL) is a political and social movement that stands for the Rights of the Arab and Moslem communities in Europe and the Arab causes *in general*. The AEL stands also for solidarity with all Muslim peoples and communities and all the oppressed peoples of the world” (<http://www.arabeuropean.org/vision.php>, italics added for emphasis).

In contrast, *specialist ESIROs* had fewer and more narrowly defined goals within the larger Islamic resistance movement. These include resisting the incursion of Russia into Chechnya, the Palestine/Israeli conflict, and goals related to the Lebanese/Israeli conflict. Specialist organizations ($n = 19$) included websites with Al-Qaeda, Jammalt-e-Islami, Hamas, Fatah/PLO, Chechen, and Hezbollah affiliations. These organizations are likely to have a more homogenous membership because of their more narrowly defined goals. For example, Khilafah, a specialist ESIRO affiliated with Hizb ut-Tahrir, describes the goals of the Hizb ut-Tahrir in detail, but makes a point that they are not linked to any other Islamic organizations or affiliations. They state that their goal is “to bring the Muslims back to living an Islamic way of life under the shade of the Khilafah (Caliphate) State following an exclusively political method” (<http://www.khilafah.com>).

Network Measures: This research utilized several network measures, based upon the structure of the network itself. These included choice, reciprocators, authorities, brokers, and initiators (see the hypotheses and figure 2 for visualizations of each type). In each case, as described above, we examined the number of each structural signature. This count was then analyzed using the exponential random graph modeling analysis described below. *Choice* was defined as the presence of a link from one actor to another (Monge & Contractor, 2003), or the number of links present in the network. Choice was included in all network models as a control in this research. *Reciprocators* were organizations that reciprocate links to another organization. In this case, we examined the number of reciprocal ties that both originated from and were received by generalist NGOs. *Authorities* were defined as organizations that receive links from two nonlinked organizations. In this parameter, we examined the prevalence of 2-in-star parameters (see Pattison & Wasserman, 1999 for a mathematical description this parameter), in which the origin and the terminus of the links were of the type specified in H2a and b. *Brokers* were defined as organizations that link to two nonlinked organizations. For this parameter, we examined the prevalence of 2-out-star parameters, in which the origin and terminus of the links were of the types specified in H3a and b. The presence of an *initiator* was measured by the prevalence of transitivity within the network. Transitivity was defined as *node A* having a tie to *node B*, *node B* having a tie to a third *node C*, and *node A* also having a tie to *node C* (Monge & Contractor, 2003). Three websites had

a transitive relationship if two websites who link to one another also mutually link to a third website. We examined the prevalence of transitive triads of the types specified in H4a and b.

Analysis

Hypotheses 1 through 4 stated that the ESIRO hyperlink network would exhibit reciprocators, brokers, authorities and initiators within selected generalist/specialist blocks. In order to test these hypotheses we used MultiNet 4.55 to conduct an exponential random graph (p^*) analysis with a complex blockmodel to assess the likelihood of the predicted structural signatures (see Pattison & Wasserman, 1999; Wasserman & Pattison, 1996). While p^* is a relatively new technique for communication researchers, it was described in Monge and Contractor's (2003) book and utilized by Monge and Matei (2004) and Lee, Monge, Bar, and Matei (2007) to examine the international telecommunications network and Palazzolo (2005) to examine transactive memory networks (see Seary & Richards, 2000 for a guide to fitting p^* models in MultiNet).

This method estimates the prevalence of the structural signatures in the network to the likelihood of the structural signature occurring in the same size network by chance alone. As such, it adapts logistic regression to examine the likelihood of structural signatures. As in logistic regression, positive and significant beta values indicate that the structure is more likely than chance alone and negative and significant beta values indicate that the structure is less likely than by chance alone. The model fit is the degree the network predicted by the estimated structural signatures corresponds with the observed network. The analysis provides a -2 Log Pseudo likelihood measure of fit, based upon the percentage of links correctly predicted, the percentage of links observed but not predicted, and the percentage of links predicted but not observed. Lower -2 Log Pseudo likelihood scores indicate a better fit.

Results

Hypotheses 1 through 4 were tested using p^* analysis (see Table 1 for results of selected models). In this analysis, a series of 20 nested models were compared. The *first baseline model* included choice across the entire network as the only variable. The -2 Log likelihood of this model was 906.58. The single parameter included, choice, was negative and significant ($\beta = -2.53$, $p < .01$), indicating that the network was less dense than would be expected by chance alone.

The *second baseline model* included block parameters for generalist to generalist, specialist to specialist, generalist to specialist, and specialist to generalist links. This model provide a better fit than the first baseline model (-2 Log Likelihood = 862.24). Each of the choice parameters in this model were significant and negative, indicating that although allowing the parameters to vary by organization type pair provided a better fit, all of the choice parameters were less likely to occur than by chance alone.

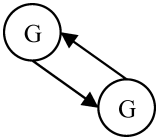
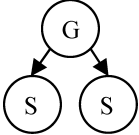
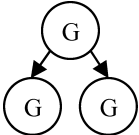
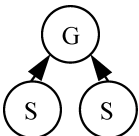
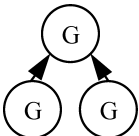
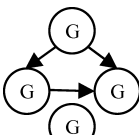
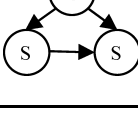
Table 1 Selected models and their comparative fit

<i>Hypotheses</i>	<i>Parameters</i>	<i>−2 Log Likelihood</i>	<i>B</i>	<i>SE</i>	<i>Δ −2 Log Likelihood</i>
Constant only	Choice	906.58	−2.53**	.09	
Constant only with blocking	Choice (G→G)	862.24	−1.95**	0.12	44.34
	Choice (G→S)		−3.52**	0.29	
	Choice (S→G)		−2.71**	0.20	
	Choice (S→S)		−3.37**	0.36	
	Choice (ALL)	834.43	−2.79**	0.11	72.15
Choice + 1	Reciprocity (G→G)		2.36**	0.25	
	Choice (All)	817.08	−3.07**	0.13	89.50
	Broker (G←G→G)		0.23**	0.02	
Choice+ 2a, b	Broker (S←-G→S)		0.02	0.05	
	Choice (ALL)	839.22	−2.96	0.13	67.36
	Authority (G→G←G)		0.20**	0.02	
Choice+3a, b	Authority (S→G←S)		−0.14	0.17	
	Choice (All)	758.01	−3.46**	0.17	59.07
	Reciprocity (G→G)		1.47**	0.28	
	Broker (G←G→G)		0.18**	0.26	
	Broker (S←-G→S)		0.08	0.05	
	Authority (G→G←G)		0.13**	0.03	
Choice + 1 + 2a,b+ 3ab	Authority (S→G←S)		−0.06	0.18	
	Choice (All)	639.14	−3.39**	0.17	118.87
	Reciprocity (G→G)		−0.17	0.38	
	Broker (G←G→G)		0.03	0.04	
	Broker (S←-G→S)		0.01	0.	
	Authority (G→G←G)		0.01	0.04	
	Authority (S→G←S)		−0.62*	0.31	
	Initiator (G ₁ ← G* → G ₂ → G ₁)		0.43**	0.05	
	Initiator (S ₁ ← G* → S ₂ → S ₁)		0.48**	0.13	
Best fit final model with all non-significant parameter removed.	Choice (G→G)	619.48	−4.82 **	0.45	19.66
	Choice (G→S)		−4.09 **	0.37	
	Choice (S→G)		−2.71 **	0.21	
	Choice (S→S)		−3.37 **	0.36	
	Broker (G←G→G)		0.11 *	0.05	
	Authority (G→G←G)		0.12 *	0.05	
	Initiator (G ₁ ← G* → G ₂ → G ₁)		0.47**	0.05	
	Initiator (S ₁ ← G* → S ₂ → S ₁)		0.37**	0.08	

Note: $N = 42$; * $p < .05$ ** $p < .01$; $\Delta - 2 \text{ Log Likelihood}$ indicates change from best fit previously nested model.

The remainder of the models included a selected set of hypothesized parameters. In each case, the model fit improved when the additional hypothesized parameters were added. The *full model*, including all of the hypothesized parameters, had better fit than any of the previously nested model ($-2 \text{ Log Likelihood} = 639.14$). However,

Table 2 Results in Summary

H	Structural signatures	Hypothesis	Supported?
1		Generalist NGOs will be more likely to <i>reciprocate</i> links to other generalist NGOs than would occur by chance alone	No
2a		Generalist NGOs are more likely to act as <i>brokers</i> to specialist organizations in the hyperlink network than would occur by chance alone.	No
2b		Generalist NGOs are more likely to act as <i>brokers</i> to generalist NGOs in the hyperlink network than would occur by chance alone.	Yes
3a		Generalist NGOs are more likely to be <i>authorities</i> among specialist NGOs than would occur by chance alone.	No
3b		Generalist NGOs are more likely to be <i>authorities</i> among generalist NGOs than would occur by chance alone.	Yes
4a		Generalist NGOs are more likely to be <i>mediators</i> among specialist NGOs than would occur by chance alone.	Yes
4b		Generalist NGOs are more likely to be <i>mediators</i> among generalist NGOs than would occur by chance alone.	Yes

the *best fit model* included blocked choice parameters and only the significant hypothesized parameters ($-2 \text{ Log Likelihood} = 619.48$).

Hypothesis 1 stated that generalist organizations would reciprocate more links with generalist organizations than would occur by chance alone. In the model where reciprocity among generalists and choice were the only predictors, there was a positive and significant realization of this structural signature ($\beta = 2.36, p < .01$). However, in the *full model*, generalist organizations did not reciprocate links to other generalist organizations ($\beta = -0.17, p > .05$). Therefore, hypothesis 1 was not supported, meaning

that the generalist reciprocator structural signature was not more prevalent than what would occur by chance alone. This parameter was dropped from the *best fit model*.

Hypotheses 2a and 2b stated that generalist NGOs would act as brokers to both specialist organizations and generalist organizations. In the model where broker prevalence, controlling for choice, was the only structural signature, generalist NGOs were more likely than by chance alone to act as brokers to other generalist NGOs ($\beta = 0.23, p < .01$), but not to specialist NGOs ($\beta = 0.02, p > .05$). In the *full model*, this structural signature was not a significant parameter ($\beta = 0.03, p > .05$). However, in the *best fit model*, generalists brokering to other generalists was a positive and significant parameter ($\beta = 0.11, p < .05$). Therefore, hypothesis 2b was supported and hypothesis 2a was not supported.

Hypotheses 3a and 3b predicted that generalist NGOs would be more likely than by chance alone to be authorities within the hyperlink network to other generalists and to specialists respectively. In the model containing the generalist authority parameters, and controlling for choice, the generalist NGOs were more likely to be authorities among generalists ($\beta = 0.20, p < .01$), but not among specialists ($\beta = -0.14, p > .05$). In the *full model*, generalists were less likely than by chance alone to be authorities to specialist organizations ($\beta = -0.62, p < .01$) and the generalists authority parameter was not significant ($\beta = 0.01, p > .05$). However, in the *best fit model*, generalist authorities to other generalists were a significant and positive parameter ($\beta = 0.11, p < .05$). Therefore, hypothesis 3b was supported and hypothesis 3a was not supported.

Hypotheses 4a and 4b predicted that generalist NGOs were more likely to be initiators in the hyperlink network to both generalists and specialists respectively. Since transitive links are a higher-level structure, no model was created to test only the initiator structural signatures⁴. In the *full model*, generalists organizations were more likely to be an initiator to both generalist organizations ($\beta = 0.43, p < .01$) and specialist organizations ($\beta = 0.48, p < .01$) than by chance alone. In the *best fit model*, generalists remained more likely to be initiators to generalists NGOs ($\beta = 0.47, p < .01$) and specialists NGOs ($\beta = 0.37, p < .01$) than by chance alone. Therefore, hypotheses 4a and 4b were supported.

Discussion

In this study, we examined hyperlink networks as a connective good. We defined connective goods as the set of interorganizational links that enable members and nonmembers to reach *like-minded* organizations in order to enhance the visibility of the *network's goals*. NGOs benefit from the connective good, since members and nonmembers can navigate to different NGOs' websites about the same issue, and the number of hyperlinks to a website influences the ranking in some search engine results (Henzinger, 2001). In this study, we examined the particular roles that generalist organizations are likely to play in the hyperlink network. We examined four distinct roles that generalists might play in the network: reciprocators, brokers,

authorities, and initiators. The results of this study suggest that generalists are more likely than by chance alone to act as brokers for other generalist organizations, authorities for other generalist organizations, and initiators for both generalist and specialist organizations than by chance alone.

Thus, generalist NGOs play an important role in connective goods. Generalist NGOs were brokers among generalists, meaning that they linked to other generalist NGOs that did not link to one another, filling a structural hole (Burt, 1982; Stohl & Stohl, 2005). These organizations thereby supported the recognition and connectivity among the set of generalist organizations (Hypothesis 2b). Additionally, generalists were likely to be authorities among generalist NGOs in the network (Hypothesis 3b). Finally, generalists play the initiator role in furthering connectivity among generalist and among specialist organizations (Hypotheses 4a and 4b). In combination, these results suggest that generalists are central actors among generalist organizations within the connective good. These NGOs promote a broad range of goals within the issue network, rather than focusing on specific goals. As such, they are more likely to act as brokers and authorities for other generalist NGOs. Additionally, generalists promote collective action by acting as initiators among both specialist and generalist NGOs. Generalist organizations, thus, act as the promoters of the connective good. The structural signatures of their contributions suggest that they are drawn to the most legitimate and central organizations, and by hyperlinking to these NGOs, they make these organizations the most public face of the interorganizational network online.

In addition, the results of this study suggest that the amount of connectivity between specialist and generalist NGOs differs. The best fit model included a choice parameter that varied between the four blocks in the network (i.e., generalist to generalists, generalists to specialists, specialists to specialists, and specialists to generalists). In examining the prevalence of ties among generalists and specialist organizations, there were 81 ties among generalist organizations ($M_{outdegree} = 2.79, n = 29$), 26 ties among specialist organizations ($M_{outdegree} = 1.37, n = 19$), 12 ties from generalist organizations to specialist organizations ($M_{outdegree} = 0.41, n = 29$), and 8 ties from specialist organizations to generalist organizations ($M_{outdegree} = 0.42, n = 19$). Thus, generalists organizations were more active in the hyperlink network, contributing a total of 93 ties ($M_{outdegree} = 3.21, n = 29$) to the network in comparison to the 34 ties ($M_{outdegree} = 1.79, n = 19$) specialists contributed.

These results demonstrate that specialist organizations are less likely to contribute to heterogeneous collective action online. These organizations may view other organizations as competitors for scarce resources (see Freeman, 1979; McAdam et al., 1996; McCarthy & Zald, 1977; Zald, 1992 for an explanation of key resources for social movements). Alternatively, these organizations may view variations in goals more discriminatingly than generalist NGOs do, operating on the basis of an individual or niche rationality instead of a collective rationality. As such, these organizations may see larger chasms in goals than do generalist organizations.

The only exception to this finding is that specialist NGOs are more likely to link to other specialist NGOs that receive ties from the same generalist NGO (H4b). These results suggest that when generalist NGOs link to specialist NGOs, it stimulates additional linking among specialist NGOs. One possibility for this tendency is that generalists, by hyperlinking to specialist organizations, distribute legitimacy to these specialists. Thus, specialist NGOs may choose to hyperlink to another specialist NGO that they would not hyperlink to otherwise, because of the conferred legitimacy that generalists instill.

Additionally, generalist NGOs are less likely to link to specialist organizations. Risk is involved for generalist linking to specialist organizations of any affiliation, as it is common for specialist organizations to not only be limited in their goals but also potentially more radical (McAdam et al., 1996). Increasing connectivity to these specialist organizations may be seen as a threat to the greater network's goals. For example, in this study the Arab-European League did not link to any of the Chechen groups. While the Arab-European league seeks to promote Arab and Muslim causes in general, specifically within Europe, the Chechen groups have more limited goals that may alienate some publics that the groups wishes to influence. Thus, extending Stewart and colleagues' (1989) argument, generalist organizations with some legitimacy may avoid affiliating with specialist NGOs they view as less legitimate for the sake of their broader goals.

In summary following Shumate and Dewitt (2008), we argue that a collective action theory of connective goods must account for *both* the level of contributions and the structural signatures of those contributions. While previous theorizing has primarily examined the level of contributions to a public good (Connolly & Thorn, 1990; Marwell & Oliver, 1993; Yuan et al., 2005) within a group-generalized exchange architecture (Sohn & Leckenby, 2007), the current theory and research contributes to understanding the structural signatures of those contributions to connective goods with network-generalized exchange architectures. We found that the structural signatures of generalists and specialists' contributions to the connective public good were influenced by the heterogeneity of the goals of the other NGOs in the network. Generalist NGOs promote the most legitimate face of the issue network, acting as brokers and authorities to other generalist NGOs and initiators for both specialist and generalist NGOs. In contrasts, specialists seem to play a more isolated role within the network, perhaps not viewing the goals of the larger network as beneficial for their specialist goals or their NGO.

Implications

The purpose of this paper was to extend collective action theory to address the contributions that generalist and specialist NGOs were likely to make to an issue-specific hyperlink network. This research utilized the hyperlink network of ESIRO websites as an entry point to the study of this theoretical extension. As such, it provides an examination of collective action through the analysis of ESIROs'

activism (Wiktorowicz, 2004). However, the hypotheses and theoretical extensions of this study also have implications for other social issue populations. Prior research has suggested that when organizational populations mature, specialist organizations emerge to take advantage of niche resources (Swaminathan, 2001). Similarly, any social movement issue that has matured will have specialist organizations. For example, HIV/AIDS NGOs have niche organizations that have formed around the issues of microbicides and needle exchange programs (Shumate, 2008). While generalist organizations may address HIV/AIDS in general, the specialist organizations have a limited focus. Similarly, environmental groups that emerge around a single species or locale would be specialist organizations, while generalist organizations may be concerned about environmental conservation in general.

This research suggests that generalist and specialist organizations make different contributions to the hyperlink network. As such, we anticipate that whether we examine Islamic Resistance Organizations, HIV/AIDS NGOs, or environmental NGOs, generalists and specialists will play different roles in connective collective action online. We hypothesized that specialists would exhibit niche rationality in collective action online, while generalists would exhibit collective rationality. The results suggest that the hyperlinks between generalists and specialists are limited and that generalists tend to limit their collective rationality largely to other generalist NGOs.

This finding has practical implications for the study of Islamic Resistance Organizations, in particular. Prior research has suggested that organizations without affiliations tend to be more extreme than organizations that have open relationships with one another (McCarthy & Zald, 1977). As such, the results of this study suggest that the failure of generalist organizations to affiliate with specialist organizations may lead to these specialist organizations to become more disenfranchised from the mainstream issues and potentially more radical.

Limitations and Future Research

This study examines a network of ESIROs. Future research should investigate the various roles that generalist and specialist NGOs play in other issue networks. Additionally, the DTWE database provided the best available sample of ESIRO websites. However, the DTWE was created by a political group with its own selection biases. Why some organizations were included at the cost of others cannot be known and does not confer any sense of representativeness.

Further, this study collected very sparse information about each organizational actor. General characteristics of organizations are knowable from the DTWE database, but little contextual data were collected from the organizations themselves. Future research could choose to examine the goals of the organizations more closely in the form of a textual analysis. Such research could create a more nuanced measure of the heterogeneity of issues that each NGO addresses.

Finally, this research and Shumate and Dewitt's (2008) study suggest that organizational attributes are an important part of understanding the nature of connective

public goods online. Future research should examine how geography, issue framing, funding, and activities each influence the level of contribution and the structural signatures of those contributions. Additionally, future research should investigate how organizational attributes and hyperlink networks coevolve over time.

Conclusion

This study sought to accomplish two goals. First, following Shumate and Dewitt (2008), we identified NGO hyperlink networks as connective goods, or the set of interorganizational links that enable members and nonmembers to reach like-minded organizations in order to enhance the visibility of the network's goals. Individual NGOs could choose to contribute by hyperlinking to others within the larger movement. Such action increased the value of the public good by a) increasing the connectivity among different actors and b) increasing the ranking of webpages within some search engines (Henzinger, 2001). However, we noted that organizations may have different perspectives about which organizations were like-minded and what the network's goals ought to be. As such, we began an examination of the factors that might influence the choice to hyperlink to particular organizations.

Second, this research theorized that generalist NGOs play different roles within the connective good. Like organizations that make foundational investment in public goods (Taylor & Doerfel, 2003), generalist organizations play a more central role in connective goods than do specialist organizations. First, generalist organizations act as brokers and authorities to other generalist organizations. Second, generalist organizations acts as initiators among generalist and among specialist organizations, making it more likely that two NGOs will hyperlink to one another if linked by the generalist organization. Finally, generalist organizations contribute more hyperlinks to the connective good than do specialist organizations.

The structural signatures of contributions to connective goods have been largely ignored in the collective action literature as an area of study. Future studies would do well to examine how variations in connectivity appears not to be a random property of communication-based public goods, but rather a highly integral part of online collective action. While ICTs have made connectivity easier, more research is needed to understand how connective forms of collective action occur online.

Notes

- 1 Structural signature is a new term that is currently being used among social network analysis scholars to describe the unique patterns prevalent in the network (see Shumate & Dewitt, 2008). Previous terms include network parameters (Monge & Contractor, 2003) and network structures (Palazzolo, 2005). While the term is used to describe these unique patterns, the meaning here is synonymous with other terms.

- 2 In the case of this network, there are three components made up of dyads. The set network boundaries in this case include all six nodes and all three components (see Laumann, Marsden, & Prensky, 1992 for a discussion of network boundaries).
- 3 While we do not agree that each of the websites the DTWE lists can be classified as terrorist organizations from a communication research standpoint (see Stohl, 1988 for a more refined definition of terrorism), this database provides a listing of Islamic resistance websites, as identified by webmasters scanning their domains. The DTWE is inclusive of Islamic resistance websites that its creators, the Antiterrorism Coalition, locate through an examination of website claims, reports of FBI investigations into the organizations/websites, and news reports of the organizations' activities.
- 4 Initiator structures contain broker structures. Thus, it is important to initially include broker structures when examining the prevalence of initiators.

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