From Strategic Hyperlink Networks to Cognitive Issue Networks: 
Advancing a Dual Structurational Model of Social Issue Emergence on the Web

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Abstract
The web is a forum for defining social issues and a source of information for evaluating them. As such, it is important to examine how its socio-technical properties influence how some groups relationally construct issue boundaries and others make subsequent decisions about them. While Web2.0 platforms make explicit the sociality of the web, the social capacity of Web1.0 technologies like websites and hyperlinks remain relevant, especially as they structure spaces of change. Recognizing the epistemological function hyperlinks play, scholars argue that “net presence” and perceived relevance is largely determined by an organization’s online relationships. Thus, hyperlinks are strategic tools used by claims-makers (e.g., advocacy groups) to demarcate their relationships and positions within the larger web ecology as well as heuristic mechanisms for decision-makers (e.g., funding groups) as they structure their perceptions of the issues they evaluate. In this paper I present and defend a novel structurational model of social issue emergence that outlines processes by which social issues are jointly enacted through claims-makers’ strategic use of hyperlinks to build their online presence and third party groups’ appropriations of those relationships in the decision making process. I then propose an analytic framework designed to translate the model’s propositions and assumption into hypotheses that can be tested using network analytic techniques.
I. INTRODUCTION

Broadly defined, a social issue is a matter that directly or indirectly affects members of society and is considered to be a problem or point of concern in that it challenges a social standard. As such, social issues are not inherent, objective phenomena waiting to be discovered, but rather are enacted constructs brought to life through a dynamic system of interaction between issue claims-makers (i.e., parties that advocate for, raise awareness of, and provide services around a perceived problem) and issue decision makers (i.e., parties that are charged with the task of interpreting the communicative acts of claims-makers as they structure their personal understandings and responses to the problem (Blumer 1971; Kitsuse & Spector, 1973).

It is becoming increasingly apparent that, regardless of their type or orientation, most 21st century organizations are at the center of how social issues are constructed, either as claims-makers or third party decision makers. Some organizations, like Greenpeace, enter an issue space as claims-makers, devoting themselves exclusively to making asserted claims about and combating a social problem. Alternatively, other organizations find themselves in a position of responding to, evaluating, and making decisions about social issues and the actors who are actively involved. For example, accounting firms have found themselves in an environment of intense media scrutiny and information transparency, which often compels them to take stances on social issues like corporate ethics, even though their core operations lie in other domains. And still other organizations, like government watch groups and funding agencies find themselves giving money and other support for research into social causes. In short, decision makers in many organizations find themselves proactively or reactively trying to figure out what social issues affect them and making determinations about how the organization will respond to or shape those issues.

For most parties faced with responding to a social problem, such as those described above, making effective decisions about the issue requires that they first learn about it and organize what they learn so that a
clear mental map – i.e., a working definition of the issue or problem that is to be decided on – emerges, delineating what themes and voices constitute the problem and how each of those elements are related to one another (Carley, 1986). In this sense, decision makers must first define the boundaries of the social issue before they can make an effective judgment about it.

However, as social problems become more complex so, too, do decision-making processes due to the amount and diversity of information that must be cognitively managed toward these ends. As Simon (1957) argues, actors are limited in their cognitive capacity to formulate and solve complex problems. Consequently, they look for ways to satisfy information needs (as opposed to optimize them) and simplify the decision process by following learned rules and established repertoires of action to help reduce the complexity of the issue (March & Simon, 1993; Choo, 1996). This begs the question: What are the mechanisms that decision-makers rely upon to bring structure and order to their comprehension of a complex issue?

In a web-based information economy, one heuristic mechanism that decision-makers have at their disposal is the hyperlink infrastructure on which the web is built. Hyperlinks, as both a technological and social capability, bring structure to a social issue by situating deposits of information, such as websites, and the claims-makers behind them in the context of one another (Rogers & Marres, 2000; Shumate & Dewitt, 2008), thereby carving out an ‘issue space’. Thus, while the actual content on a website informs an individual’s understanding of an issue, the links between independent websites enable decision makers to actually place the content into a broader context of voices (Ackland & Gibson, 2004). As Carley (1986, p. 149) writes, “concepts are meaningless in isolation and can only be defined by their relationship to other concepts.”

Although decision makers may navigate hyperlinks to aid them in constructing the boundaries of an issue, it is likely that the actors that established those links were not primarily motivated to do so out of a conscious desire to create a social instantiation of the issue itself. Instead, research consistently finds that hyperlinks tend to be established for more strategic and self-interested reasons, for example to reinforce offline relationships (Rogers, 2004), to increase traffic to a website (Park, Barnett, & Nam, 2002), to form enclaves of shared perspectives, establish legitimacy and mobilize resources (Rogers, 2004; Shumate & Lipp, 2008;
Gonzalez-Bailon, 2009a), and even to express power and authority over other claims-makers (Sereno, 2010). It is out of this array of underlying strategic motivations that an empirical hyperlink network emerges.

In recognition of the epistemological role played by the networked architecture of the web, web researchers have argued that an organizational actor’s “net presence” and its perceived relevance to web users is in large part defined by the extent to which other online actors link to its website. From this perspective, hyperlinks are both, and simultaneously, strategic tools for web content producers as well as heuristic mechanisms for web-navigators. To illustrate the latter, consider a comparison of offline and online learning. In offline learning situations reading multiple documents produces cognitive representations that include connections between texts. For example, one text may have information that builds on the information learned in previous texts, which forces the reader to update their mental schematic of the issue (Perfetti, Rouet & Britt 1999). However, in online learning environments the process of making mental connections between texts is often facilitated for the reader by the physical presence of the hyperlink, which creates a visual cue that a connection indeed exists. As social psychologists have long recognized, people tend to form impressions based on what they see and what they think. But under many circumstances the former tends to outweigh and/or influence the latter simply because it is much easier to see than it is to think (Lieberman et al., 2002).

That said, a fundamental tension exists when an ‘issue space’ (Kim, Barnett, & Park, 2010; Rogers & Ben-David, 2008; Shumate, 2012), structured out of the strategically motivated relationships amongst one group of actors who jockey for attention in a competitive issue environment, is appropriated as a source of information and knowledge by another set of actors striving to organize their comprehension of an issue. Unpacking this tension and its implications for how social issues are enacted and evaluated is what motivates this dissertation research. By examining a “living” issue space on the web, this research will offer insight into the nature of the complex, and potentially problematic ontological relationship between the empirical hyperlink networks enacted by strategic organizational actors and the cognitive issue networks enacted by third party decision makers.
Building on a practice-based approach to technology use (Orlikowski, 2000), I propose a novel ‘dual structuration’ model of social issue emergence that outlines a process by which social issues are jointly enacted by what claims-makers say and do with hyperlinks to build their online presence and what third party decision makers take those hyperlink relationships to mean. Thus, the structurational framework on which this project draws has the advantage of providing a conceptual and analytic lens for understanding the relational patterns that emerge in a hyperlink network as a set of rules and resources that guide (or structure) third party users’ perceptions of that space and the subsequent decisions made based on those perceptions. By posing this framework, I expect to provide much-needed insight into how the social and technical properties of the web may influence how decision makers construct the boundaries of important social issues and inform a discussion about what this means for social change.

Furthermore, while some contend that the Internet provides otherwise marginalized voices the opportunity to level the playing field, a more somber perspective highlights the Internet’s potential to reinforce offline disparities that already exist among social issue actors. Therefore, given the increasingly complex and crowded issue ecology of the web, it is a socially relevant endeavor to leverage insight gained from theory-building and hypothesis testing toward establishing a clearer understanding of how and to what effect power imbalances do emerge within these online spaces. Toward this end, this research also lays groundwork for future praxis-oriented research aimed at developing schema for lifting marginalized parties out of the periphery of these spaces through thoughtful, strategic alterations in their linking practices that may position their goals and messages more prominently in the minds of institutional decision makers.

II. CONCEPTUAL FRAMEWORK

Having delineated the intellectual problem that this research seeks to unravel, I now provide a brief overview of the conceptual framework and model that I developed to conceptualize the implications of hyperlink technology on the enactment of social issues (see Young & Leonardi, 2012). This framework serves as the foundation for the empirical task of my dissertation research, which will be to operationalize
primary components of the model to develop and test its theoretical assumptions. As such, I now turn to explicating relevant literature that informs assertions made in the model.

**Modeling Social Issue Emergence: A Dual Structurational Perspective**

In the literature that examines the relationship between communication technologies and the actors who produce and consume them, structuration theory (Giddens, 1984) and its adaptations (DeSanctis & Poole, 1994; Orlikowski, 2000) are widely used. Informed by Anthony Giddens’ (1984) attempt to reconcile theoretical sociological dichotomies, such as debates over agency and structure, a structurational perspective dictates that to understand why and how systems emerge as they do, they should be understood as the products of the interdependent relationship between individual actions and the social structures in which those actions take place. Orlikowski’s (2000) practice lens represents the latest and one of the most influential structurational approaches to understanding the conditions that inform technology use and the outcomes they produce.

In her development of the practice lens, Orlikowski (2000) introduced an important distinction between a “technological artifact” and a “technology-in-practice.” She claimed that if a single technological artifact like a decision support system could be interpreted and used in different ways, then scholars should trace organizational changes resulting from technology use not to the artifact itself, but to the specific structures (i.e., rules and resources) routinely enacted as we use the technology (Orlikowski, 2000, p. 408). Overtime, these rules and resources structure, or condition, decisions about how to use the technology such that repetitive patterns of use emerge. Sometimes these repetitive patterns of use provide resources with which individuals can change the institutional contexts in which they occur, but more often they tend to provide capabilities for individuals to reinforce them (Leonardi, 2009a).

Structurational approaches have the advantage of providing a lens for understanding the relational patterns that emerge in a hyperlink network as a set of rules and resources that guide (or “structure”) subsequent linking practices within that space. However, as argued in previous work (Young & Leonardi, 2012), in their current forms these models are limited in their ability to effectively conceptualize the
enactment and consequences of cognitive issue networks. Most structurational studies of technology use have examined technologies like groupware decision-making software for which the use and consequences of these technologies are contained within the group who uses them. Thus, the use of the technology is construed, at least implicitly, as private in the sense that it is not known by others, or is known only by those who are in close enough proximity to see or hear about usage patterns.

In contrast to such private technologies, the web is a very public technology. When someone establishes a link between two sites, anyone else with Internet access can, in theory, see what was done with the technology. And, although the factors that motivate link creation remain imperceptible to most link navigators, hyperlinks themselves are observable and publicly available for others to use and interpret as they choose by drawing on available heuristics to help make sense of the relationships they signal.

That said, I suggest that when technologies are public (like the web) two interdependent instances of structuration occur. The first instance involves issue claims-makers (i.e., content producers) who establish links to build strategic relationships while the second instance involves the third party decision makers (i.e., content consumers) who absorb and interpret those relationships as they mentally organize their comprehension of the social issue. Thus, to properly conceptualize and operationalize the mechanisms behind the emergence of a social issue, a model is required that accounts for both structurational instances, not as separate processes, but as part of a unified sequence of interactions between both agent groups and the structures they enact through their uses of hyperlink technology. Such a model bridges the agentive disconnect between the linking practices of one agent group and the heuristic appropriation of hyperlinks by another.

To address these interdependencies, I propose a novel ‘dual structurational’ model (see Young & Leonardi, 2012) illustrated in Figure 1, as an initial step in theorizing how social issues emerge from the interdependent actions of claims-makers and decision makers. The model incorporates the three foundational elements of a traditional structurational framework, namely the agents who engage with
hyperlinks, the *conditions* that affect their engagement, and the enacted network *structures* that emerge out of that situated use.

[INSERT FIGURE 1 HERE]

However, what is noticeably different from previous structurational models is that two sets of each element are implicated. The first instance of enactment focuses on the participation of issue claims-makers and the relational patterns that emerge amongst them as they direct links to one another to signal associations, to manage identities, and/or to meet strategic needs (*see Block 1, Figure 1*). The second instance of enactment shifts attention to the participation of third party decision makers (*see Block 2, Figure 2*). Charged with the cognitive task of structuring their knowledge of the issue space and evaluating its constitutive members, decision makers have at their disposal the information embedded within the publicly available system of websites and hyperlinks to help them draw connections between actors and ideas and determine which are most relevant to the issue.

Tying together each distinct instance of enactment are three proposed interactions, whereby structurational elements of one block influences elements in the other (*see Arrows 5a-c, Figure 1*). Together these integrative processes draw a thread that makes explicit the connection between what issue claims-makers communicate through their use of hyperlinks and how decision makers incorporate those signals into their comprehension of the issue. With the model laid forth, I now turn to providing an overview of relevant literature that informs assumptions made about the factors that condition each instance of structural enactment.

**Block 1: Enacting the Empirical Hyperlink Network**

To establish an identity on the web, organizational claims-makers have at their disposal two core tools: websites and hyperlinks. As the “virtual face” of an organization, a website conveys information about its producer to visitors through its content and design (Park, Barnett, & Nam, 2002; Ackland & Gibson, 2004; Shumate & DeWitt, 2008). However, in the interconnected world of the web, many argue
that an organization’s “net presence” is determined not only by the content and design of its website, but just as importantly, by the organization’s “link economy” (Walker, 2002; Rogers, 2004).

This suggests that, through its social capabilities, hyperlink technology functions as a strategic tool to be used by issue claims-makers to communicate and manage its presence within a larger relational environment. From a practice perspective, why and how one engages with a technological artifact depends on a user’s “situation at hand” (Orlikowski, 2000) or the features of their environment that condition their interpretation of the artifact and its utility. For this reason, the precise nature of the identity that an issue claims-maker develops for itself depends on the types of relationships it seeks out and, hence, what factors condition or motivate its linking strategies.

Toward establishing a credible repertoire of mechanisms likely to inform decisions about whether or not to hyperlink to another claims-maker’s website, it is incumbent to understand a fundamental distinction between online and offline relationships between issue claims-makers. Precisely because of their public imprint and their ability to direct attention (or traffic), claims-makers’ hyperlink relationships are more obviously communicative and symbolic in nature than their relationships in offline environments. A directed hyperlink from one claims-maker to another is meant to visibly suggest to audiences an association from which one if not both claims-making parties can benefit.

Understanding that the value of a hyperlink connection derives more in the power of its suggestion, as opposed to what it tangibly delivers from one claims-maker to another, allows us to narrow the pool of credible explanations for why claims-makers establish hyperlinks to those that speak to desires to manage impressions. Drawing from an established body of research on organizational networks, five theoretical mechanisms stand out as plausible conditions that influence linking, namely ideological homophily, legitimacy enhancement, resource dependence, collective action and social embeddedness. This act of conditioned linking is identified as the first step in the dual structurational model (see Arrow 1, Figure 1). Below is a brief overview of each mechanism and how it is thought to affect hyperlinking decisions.

**Ideological Homophily**
For issue claims-makers, the intention to link to another organization’s website is often motivated by a perception of semantic similarity (i.e., the extent to which each organization shares a similar interpretation of the social issue or problem) or, more generally, topical similarity (Park & Thelwall, 2003). Within the context of public sphere studies (Dahlgren, 2007) and social movement research (Benford & Snow, 2000) scholars recognize that competitions often ensue amongst actors over who gets to speak for the issue. In the case of hyperlink networks comprised of issue claims-makers, the act of linking has been theorized as an implicit endorsement of how an organization conceptualizes the issue of concern (Rogers & Marres, 2000).

For example, in their study of NGO hyperlink networks, Shumate and Lipp (2008, p. 194) found that those with niche objectives were less likely to establish links to those with more heterogeneous and mainstream goals, conjecturing that specialists may view variations in goals more discriminatingly than do generalist NGOs. Thus, the decision not to link to another organization that actually shares the same struggle may reflect an attempt to exclude them from the discourse due to differences in the way they conceptualize the underlying causes and the particular solutions to the problem.

**Legitimacy Enhancement**

Another mechanism to consider is *legitimacy enhancement*. From an institutional perspective (DiMaggio & Powell, 1983), institutional environments are thought to place pressures on organizations to justify their activities through the mechanisms of status and legitimacy. Subsequently, these pressures motivate organizations to form relationships with other organizations with the express purpose of demonstrating or improving, through its association with others, its reputation, image, prestige, or congruence with prevailing norms in its institutional environment (Oliver, 1990).

Practically speaking, when an organization is motivated to form relationships with other organizations in order to enhance its legitimacy, attempts will likely be directed toward organizations that it perceives as having high levels of prestige or power in the network. Furthermore, legitimacy enhancement motives can also lead an organization to engage in what DiMaggio and Powell (1983) call “mimetic isomorphism,” where organizations that are faced with uncertainty imitate the practices of those
around them in order to appear to be doing the “right thing” (Sowa, 2009). As a motive for establishing hyperlink relations, desires to enhance legitimacy, credibility, and status are found to lead to “preferential attachment” to powerful others (Park, Barnett & Nam, 2002) – i.e., a steady gravitation toward popular organizations in the hyperlink network.

**Resource Dependence**

In the organizational literature, most studies on cooperative relationships, particularly those that involve non-profit organizations, adopt a *resource dependence* perspective (Provan, 1984; Zuckerman & D’Aunno, 1990). From this point of view, collaborations occur as “managerial responses to turbulent conditions in an organization’s resource environment” (Guo & Acar, 2005, p. 345). As such, in that no organization is completely self-sufficient, organizations necessarily face the need to engage in exchanges with their social environment in order to increase access to resources they can not otherwise obtain independently (Pfeffer & Salancik, 1978), while also reducing environmental uncertainty. As an organization seeks out collaborative opportunities that can help fulfill these survival needs, it is likely to hone in on those organizations that possess more resources than it has access to on its own. Critical resources of interest are likely to include financial capital (i.e., assets), human capital (i.e., knowledge, skills, and expertise), and social capital (i.e., the resources one can access from an organization via its connections with other organizations).

As Gonzalez-Bailon (2009a) notes, the distribution of hyperlinks amongst issue actors often reflects the same resource or status hierarchies present in the offline world. This suggests that organizations struggling to acquire resources, attention or sway within the issue space, may be compelled to establish hyperlinks to organizational actors that they perceive as having access to what they lack. Thus, it is through the virtual association with a more prominent actor that an organization hopes to mobilize needed assets to further its goals.

**Mutuality & Collective Action**

As noted, from the resource dependence perspective, organizations often forge ties to obtain and/or provide resources. However, these relationships are often based on dependence asymmetry,
leading to power imbalances that are detrimental to the weaker actor (Gulati & Stych, 2007). In contrast to the contingency of asymmetry, a mutuality and collective action perspective assumes that situations of resource scarcity can lead to inter-organizational relationships motivated out of the desire for cooperation, mutual support, and balance rather than domination, power, and control (Oliver, 1990).

Non-profit organizations, such as the issue claims-makers studied in this project, are often motivated to form relationships with one another out of the recognition that, together, they have a better chance of achieving their common interests. For this reason, organizations are anticipated to participate in a variety of relational structures that are found to enhance credible commitment, mobilize resources, and achieve common goals, such as reciprocal ties (Atouba & Shumate, 2010), dense clusters in the form of transitivity (Putnam, 2000; Coleman, 1988), and concentrated star formations (Shumate & Lipp, 2008).

**Social Embeddedness**

The concept of embeddedness has received much attention in the social network literature, primarily because it emphasizes the social context of cooperation (Guo & Acar, 2005). Drawing from an economic context, Granovetter (1985) argues that organizations are embedded in a wide variety of networks that both constrain their actions and provide opportunities for cooperation by “deepening awareness, trust, and commitment among parties within the relationship” (Guo & Acar, p.348; Larson, 1992). As such, the relational contexts in which actors are embedded and features of those relationships provide them with information for making subsequent decisions about forging new types of alliances.

For example, board interlock studies have found that organizations that have board members in common are more likely to form joint ventures (Gulati & Westphal, 1999). Essentially, the established relationship, in this case the board linkage, helps reduce the uncertainty of forming the new type of relationship, in this case a new joint venture. Claims-maker organizations that focus on the same issue and are located within the same geographic region are likely to be embedded in offline cooperative contexts. Thus, in trying to identify reasons why the same organizations establish connections with one another on the web, it is likely that aspects of their co-existing offline networks will provide useful insight.

*The emergence of a strategic hyperlink network*
In the end, the specific factors that motivate one actor’s linking practices are likely to differ from those that inform another actor’s linking behaviors. As such, the first step of the “dual structurational model” (see Arrow 1, Figure 1) is meant to explain the strategic generation of dyadic links, with the caveat that individual organizations are motivated differently and do not strive to create a holistic hyperlink network undergirded by a singularly shared motivation. However, their self-motivated linking behaviors do eventually aggregate to constitute what can be read as a digitally instantiated and, as such, publically available and navigable hyperlink system (see Arrow 2, Figure 1), characterized by particular relational patterns, or configurations, that can be attributed to a combination of the generative mechanisms discussed above. Determining what effect those distinct relational patterns have on how decision makers structure their comprehensions of the relational dynamics of the issue space is the primary analytic objective of this project, an approach to which will be outline in the next section.

**Block 2: Enacting the Cognitive Issue Network**

In a contemporary information environment, the process of constructing a clear mental map of an issue or problem space and activating that knowledge toward subsequent decisions about the issue has become increasingly complicated as the amount of information that must be cognitively managed toward these ends also increases. For this reason, individuals will turn to learned rules or heuristic toolkits to help them organize their knowledge. For example, rather than evaluating each issue claim-maker on the merits of their claims relative to one another, decision makers may fall back on previously held dispositions toward these groups, such as perceptions of a claim-maker’s power and influence, to help them make judgments about their role within the issue environment.

However, with information becoming increasingly available online, another way that decision makers gather and process information to construct the boundaries of an issue is by turning to the web to see what issue claims-makers have to say about the issue. To illustrate the ecological validity of this claim, consider the following testimony taken from an interview with an organizational decision maker.

Web linking patterns are incredibly helpful in figuring out the boundaries of an issue for funding. Take a disaster like [Hurricane] Katrina. It’s a terrible tragedy, but it provides
opportunities for conducting science that will help reduce the severity and devastation of future tragedies. So if you go to the City of New Orleans website right after the hurricane and see they’re linking to the Orleans Parish Sherriff’s website, the Red Cross’s website, and like the Army Corps of Engineers site, or something, you get a sense of the complexity of the problem. So this knowledge directly affects how we shape our calls [for proposals]. We’ll make the call contain priorities for funding around questions of law enforcement, emergency medical care, and civil engineering because we have a sense that all of these areas are connected and, to some extent, define the boundaries of the issue (Program Officer, Large Federal Funding Agency, November 2010).

As the decision maker in this excerpt attests, to understand what boundaries demarcate the issue, she turns to the web and navigates a system of hyperlinks, reflexively monitors the associations (and lack of associations) between websites, and takes the associations she does or does not see as evidence of the topics and players involved in the social issue.

In what follows, I devote attention to the heuristic mechanisms that are likely to influence (or condition) how decision makers structure their comprehensions of an ‘issue space’ and the social relationships that bring it form and meaning. These conditioned interpretations are represented in step 3 in the dual structurational model (see Arrow 3, Figure 1) as well in the integrative processes that feed into step 3 (see Arrows 5a and 5b, Figure 1).

**Effects of a decision-maker’s subjectivities**

From a structurational perspective, hyperlinks can function as guides or ‘rules’ for a web user’s actions and interpretations. However their effect is not certain. As individuals engage with the web’s relational architecture they have the ability to circumvent certain paths, choosing some while disregarding others, and discount cues of endorsement and relevance based on their own personal framework of understanding that is exogenous to the web space itself.

For example, while navigating an issue space, an individual may choose to follow a link to a governmental organization’s website or spend considerable time reading content on such a website because they perceive government agencies to be trustworthy sources of information. Here, the choice to visit the website and pay attention to its content is primarily informed by the individual’s preconceived notion of the organization and not simply because a link was presented to her. Thus, it is probable that what a web user comes to understand about an issue after having explored an issue space is only partially
influenced by the manifest structure of that space. Other factors that constitute one’s interpretive scheme also modulate what information an individual chooses to access, whether or not the individual accepts that information, and the value they place on it (Carley, 1986).

As individuals attribute meaning to their environments, they often rely on cognitive schemas developed through their ongoing interactions with their environment (Fiske and Linville, 1980; D’Andrade, 1995; Goldberg, 2011). As Goldberg (2011) notes, these mechanisms allow us to efficiently and seamlessly process information by relying on prior knowledge and experience. Thus, when we organize our comprehension of an issue, we are essentially categorizing and prioritizing what we know based on previous understandings, reinforcing and habituating our subjectivities.

While personal schema emerge from past experience, making them hard to empirically capture, it is possible to identify certain mechanisms, such as the degree to which a decision maker is familiar with what an organization does (Gefen, 2000) and their perceptions of how influential that organization is (Krackhardt, 1990; Welbourne & Trevor, 2000), are likely to feed into the development of our schemas and help us reduce the complexity of the information environment. The influence of these mechanisms is represented in Arrow 3 in Figure 1.

Effects of claims-makers’ motivations for hyperlinking

Another set of conditions that may influence how decision makers understand the relational dynamics of the issue space derive from the motivations of the claims-makers themselves. In the previous section, I outlined a series of theoretical mechanisms (or motivations) likely to influence a claims-maker’s decision to establish hyperlink connections with other claims-makers. In that institutional decision makers are charged with knowing an issue space, it is likely that their evaluations have led to some preconceived notions of why some organizations cooperate and others do not. For example, decision makers might think that claims-makers cooperate because they focus on the same issues. In this case, the mechanism of homophily, described previously as an empirical mechanism, functions as a perceived mechanism of cooperation in the mind of a third party observer of the space. For this reason, these same mechanisms are likely to influence decisions
makers’ perceptions of which claims-maker organizations cooperate with one another. The influence of these mechanisms is represented in Arrow 5a in Figure 1.

*Effects of hyperlink structure*

Although the strategies that motivate link creation may be out of most link navigators’ views, once established hyperlinks have public implications for decision makers who seek to mine the information embedded in link pathways. What connects the two instances of structural enactment in the model is the navigable hyperlink. Arrow 5b in Figure 1 indicates this transition. As structurationist researchers of technology have suggested, in enacting the structural properties of a technological artifact the pattern of use that emerges tends to serve as a “behavioral and interpretive template” (Orlikowski 2000, p. 410) for an actor’s continued, situated use of that technology. The novelty in this model is that the hyperlink network, as the outcome of patterned hyperlink usage by one group of actors, also becomes a “behavioral and interpretive template” for third-party actors that extract information from the web and the relational structures embedded within it to better understand the issue space in question.

In offline learning situations, Perfetti, Rouet and Britt (1999) argue that reading multiple documents (like visiting multiple websites) produces cognitive representations that include connections between texts. For example, one text may have information that builds on the information learned in previous texts, forcing the reader to update their mental schematic of the issue. The difference between the offline and online learning environments is that in the online environment the process of making these mental connections between texts is facilitated for the reader by the physical presence of the hyperlink, which makes explicit that a connection indeed exists. Thus, although the strategies that motivate link creation may be out of most link navigators’ views, once established hyperlinks are a physical cue of a connection between two deposits of information.

Furthermore, it is possible that as a decision-maker attempts to make sense of an issue while navigating through an online issue space, the cognitive issue network that h/she constructs afterward will reflect, at least to a certain degree, the same selective biases that inhere in content producers’ linking practices. As Rogers and colleagues (Rogers, 2004; 2008; Rogers & Marres, 2000; Rogers & Zelman,
2002) have argued, the act of linking is not random but rather is a selective practice that tends to coalesce organizationally into a brand of linking or a politics of association. Structurally speaking, the consequence of selective linking tactics and organizationally instantiated linking norms is that web spaces get shaped out of limited acts of association that demonstrate the particular proclivities of the actors creating the links. Consequently, if a web user enters an issue space in which the actors direct most of their links to like-minded websites, for example, they will likely construct a mental map of the issue that resembles the one-dimensional content structure of that space and make subsequent decisions about the issue that conforms to that picture.

This is not to say that online learners are passive consumers of information, taking what they are exposed to as absolute truth. However, as discussed in the introduction, the complexity of our information environment often compels decision makers who must make sense of information to satisfice (as opposed to optimize) their information needs (March & Simon, 1997), often doing so by relying on processing shortcuts. One such mechanism is a hyperlink, such that when directed toward a website it can be conceived of as an endorsement of its relevance or authority and, hence, important to incorporate into one’s working definition of the issue.

*The emergence of a cognitive issue network*

The boundaries of a social issue do not exist “out there” waiting to be found. They are enacted into being by those who have an invested interest in creating a framework of understanding for a particular social issue. Having navigated the issue space and monitored her interpretations of the content and relationships to which she was exposed, a decision maker is then able to construct a cognitive map (or network) of what the social issue actually is to them and who its most relevant voices are. This marks the commencement of the cognitive enactment of an issue network (*see Arrow 4, Figure 1*), which represents the structural embodiment of a decision maker’s knowledge gained from her research and learning experience.

Scholars have noted that to understand how people deal with social issues it is important to study the structure and organization of their knowledge in addition to the content of that knowledge (Jones & Read, 2005). The idea being that the comprehension of an issue is contingent on the way that knowledge is patterned
and tied together. Perfetti, Rouet, and Britt (1996, p. 99) write, “the intelligent use of texts entails mental representations of specific texts, situations described in texts, and relations among texts.” The phrase “intelligent use” is telling because in order for the acquired information to transform into actionable knowledge, it must be effectively organized into a cognitive model (or network) of information sources and claims positioned vis-à-vis one another.

That said, a decision maker’s perceptions of which actors and viewpoints relate to one another function as the constitutive elements of the cognitive issue network that a decision maker enacts after structuring their knowledge of the ‘issue space’. And, like the empirical relationships in the hyperlink network, the perceived relationships in the cognitive issue network function like a set of rules and resources that inform and have consequences for subsequent decisions about the issue. As the testimony in the introduction revealed, issue networks become concretized in persuasive appeals to policymakers and in funding priorities for research and activist groups. Furthermore, what comes out of the decisions made by link navigators is likely to feed back and inform the subsequent linking strategies of claims-makers who seek to reap the benefits of such decisions in the future (see Arrow 5c, Figure 1).

III. ANALYTIC FRAMEWORK

Given the contention that the hyperlink network and issue network are interdependent yet distinct structural enactments, the analytic objective of this dissertation project is to identify whether and how features of the enacted hyperlink network influence (or condition) the structural properties of a decision maker’s cognitive issue network and vice versa. I now turn to the task of introducing an analytic framework that translates the assumptions made in the conceptual model into hypotheses, which can be operationalized and tested in a probabilistic fashion using a class of network analytic techniques called p*/exponential random graph models (ERGMs). When set into motion, this analytic framework will provide means to empirically determine the extent to which hyperlinks -- the technological threads that stitch together the social and relational fabric of the web – are implicated in how the boundaries of a social issue are relationally constructed and subsequently interpreted in the public sphere.
Translating Assumptions into Hypotheses

The intention of this paper is two-fold: (1) to present and defend a conceptual framework for understanding how the social and technical properties of the web are implicated in the enactment of a social issue, and (2) to propose a viable method to analyze these processes. As such, it is beyond its scope to actually operationalize mechanisms and perform the empirical analysis required to estimate their effects. However, the hypotheses presented below are meant to exemplify how the concepts like “conditions” can be translated into empirical effects and why the network analytic technique described below is appropriate for estimating the magnitude of these effects on each of the enacted network structures implicated in the relational construction and boundary formation of a social issue.

Hypotheses (Block 1)

As previously described, Block 1 of the dual structurational model (see Figure 1) demonstrates the constitutive elements and processes that lead to the enactment of a strategic hyperlink network. As such, the primary analytic goal in Block 1 is to identify the set of conditions (i.e., the theoretical mechanisms) that explain and predict claims-makers’ linking practices within the defined ‘issue space.’ In that predicting network structure is the phenomena of interest, the dependent variable is the structure of the hyperlink network or, more precisely, the likelihood of a link being present beyond what would be expected by chance. From the assumptions made in the conceptual framework in Block 1, a number of propositions or hypotheses can be constructed regarding the effects of each theoretical mechanism on linking practices. For example:

Hypothesis 1 (on issue framing motives): In attempts to control the issue frame, claims-maker organizations (CMOs) are more likely to hyperlink to organizations in the issue space that focus on the same aspects of the social problem or share the same interpretation of it.

Hypothesis 2 (on legitimacy enhancement motives): To gain legitimacy in the issue space, CMOs are more likely to hyperlink to organizations that are more tenured, professionalized, and/or popular in the network.
**Hypothesis 3** (on resource dependence motives): In their hyperlinking practices, CMOs will reinforce offline power asymmetries by hyperlinking to organizations that have more resources than they do.

**Hypothesis 4** (on collective action motives): To facilitate the efficient mobilization of resources toward collective action goals, CMOs will direct their hyperlinking around organizations in the network that occupy central positions of authority.

**Hypothesis 5** (on social embeddedness motives): To reinforce their offline relationships, CMOs that interact offline are more likely to have a hyperlink connection.

**Hypothesis 6** (on the effect of cognitive structure on hyperlink structure): CMOs that are perceived as cooperating by third party decision makers, are more likely to have a hyperlink connection.

**Hypotheses (Block 2)**

In Block 2 of the model the constitutive processes leading to the enactment of the cognitive issue network are shown. Like Block 1, the primary goal is to identify the conditions (i.e., the theoretical mechanisms) that undergird the properties of the enacted network, which in this case are decision makers’ perceptions of the relational structure of the ‘issue space’ (i.e., their cognitive issue networks). As a singular dependent network, the cognitive issue network is an aggregation (using consensus methods of aggregation) of each decision makers’ perceptions of which of a designated set of claims-maker organizations (CMOs) cooperate with whom.

Again, drawing from assumptions made in the conceptual framework, a number of propositions can be constructed regarding how facets of the enactment of the hyperlink network influences decision makers’ perceptions of who cooperates with whom. As demonstrated in the model and discussed in the conceptual framework, there are two pathways by which this can occur. First, the same empirical mechanisms that are hypothesized to motivate claims-maker’s hyperlinking decisions are likely to function as perceived mechanisms of cooperation in the mind of a third party observer of the space (*see Arrow 5a*,
A second and more direct route through which the enactment of the hyperlink network influences the enactment of the hyperlink network is the structure of the hyperlink network itself. As signaling agents, hyperlinks and the associations they promote function like “interpretive templates” for audiences. In the language of the dual structuration model, they act as conditioning factors with the potential to influence decision makers’ perceptions (see Arrow 5b, Figure 1). As such, the following hypotheses are formulated:

**Hypothesis 7** (on issue framing motives): Decision maker organizations (DMOs) are more likely to perceive a cooperative relationship between claims-maker organizations (CMOs) that focus on the same aspects of the social problem or share the same interpretation of it.

**Hypothesis 8** (on legitimacy enhancement motives): DMOs are more likely to perceive that CMOs cooperate with more tenured, professionalized, and/or popular organizations in the network.

**Hypothesis 9** (on resource dependence motives): DMOs are more likely to perceive that CMOs cooperate with organizations that have more resources.

**Hypothesis 10** (on collective action motives): DMOs are more likely to perceive that CMOs, in their attempt to facilitate the efficient mobilization of resources toward collective action goals, will cooperate with organizations in the network that they also perceive occupy central positions of authority.

**Hypothesis 11** (on social embeddedness motives): DMOs are more likely to perceive a cooperative relationship between CMOs that actually cooperate with one another.

**Hypothesis 12** (on the effect of hyperlink structure on cognitive structure): DMOs are more likely to perceive a cooperative relationship between CMOs that hyperlink to one another.

**Modeling the probability of network structure using p*/ ERGM analytic techniques**

Which of the main effects hypothesized above predict the structural properties of each enacted network structure can only be ascertained using probabilistic methods of analysis designed specifically
for network data. Analyzing relational data, as we are here, presents challenges to researchers because traditional methods of statistical analysis, like linear regression techniques, assume that observations are independent of one another. However, unlike data collected from independent units of observation, relational data usually show strong interdependencies. For example, in the context of a hyperlink network, the existence of a link between two issue claims-makers may depend on the total number of links that either issue claims-maker has, what other online collaborators the claims-maker has and/or the links that exist between a claim-maker’s existing ties and potential new ties. As such, these inherent interdependencies make it inappropriate to analyze network data using traditional statistical analysis approaches.

Instead, to test hypotheses about networks without losing information about interdependencies among relations, social science researchers have begun to use a class of techniques for probabilistic network analysis referred to as p*/ Exponential Random Graph Models (ERGM). Well suited to the interdependencies present in network data (Pattison & Wasserman, 1999; Robins, Pattison, Kalish, & Lusher, 2007; Wasserman & Pattison, 1996), ERGMs can be used to assess the statistical likelihood of specific network configurations, such as dyadic ties or triads, by examining the prevalence of these structures above what would occur by chance alone (Shumate & Palazzolo, 2010). As such, it adapts the logic of logistic regression to examine the probability of certain network properties occurring.

Furthermore, ERGMs offer the opportunity to simultaneously estimate endogenous and exogenous mechanisms. Endogenous mechanisms are the effects that the observed network itself has on continued interactions within the networks. In a hyperlink network, an example of an internal effect is reciprocity, which occurs when A sends a hyperlink to B and B directs one to A. Exogenous mechanisms, on the other hand, are the effects of factors external to the network, such as the attributes of organizational claims-makers and attributes of their dyadic relationships. For example, larger claims-maker organizations may be more popular targets of hyperlinking, or claims-makers that cooperate offline may be compelled to also hyperlink to one another. Together, endogenous and exogenous mechanisms simultaneously drive the creation, maintenance and dissolution of network ties and can do so at multiple
levels of analysis (Contractor et al., 2006). As such, ERGMs provide a means to determine what combination of these internal and external mechanisms significantly predict the structure of the dependent network.

When using ERGMs to test hypotheses about a particular network structure, the generative mechanisms of interest (e.g., ideological homophily, legitimacy enhancement, etc.) are operationalized as local structural configurations of the network, each with a corresponding model parameter. As Ackland & Lusher (2009) explain, parameter estimates of the configurations of interest in the observed network are compared to those in a hypothesized distribution of networks of similar numbers of nodes and ties. This makes it possible to see if there are more or less of these configurations in the observed network than might be expected by chance.

Thus, in their ability to simultaneously estimate the effects of internal and external mechanisms that occur at multi-levels of analysis, ERGMs offer an appropriate means to test the hypotheses above, which implicate endogenous and exogenous main effects that occur at multiple levels. In moving forward, this project will employ the analytic prowess of exponential random graph modeling toward constructing and testing two ERGMs using a multitheoretical, multilevel (MTML) framework (Monge & Contractor, 2006). The first will estimate effects of conditions that can influence the probability of hyperlink structure, while the second model will do the same on the probability of cognitive social structure.

Table 1 provides a summary of the MTML framework for each model. The table is organized first by instance of enactment and then by network hypotheses. For each hypothesis, the location of the main effect (i.e., its endogenous or exogenous designation and the level of observation at which it occurs) and a feasible measure of that effect are identified.

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In the end, the ability to test hypotheses about each of these network structures is important for understanding which mechanisms motivate their emergence and, more specifically, the degree to which the hyperlink network influences third party decision makers’ perceptions of the relational dynamics of the issue space. On a more substantive level, in order to have a conversation about why it matters that the
structure of a strategic hyperlink network may be conditioning a third party decision maker’s perceptions and comprehension of the social issue, then it becomes incumbent to have information about the mechanisms behind claims-makers’ linking practices and decision makers’ perceptions. With the conditioning factors (or generative mechanisms) that affect both instances of structural enactment identified, it becomes possible to unpack whether the association between hyperlink patterns and cognitive patterns is attributable to similarities and/or differences in the types of generative mechanisms at play in the structuration of each network. Further, by comparing the mechanisms that undergird each structural enactment, I can begin to problematize linking strategies on the basis of whether or not they fit the interpretive mechanisms that decision-makers apply when evaluating the relational dynamics of the issue space.

**IV. CONCLUSION**

Beneath the surface of the conceptual and analytic frameworks proposed in this paper is the theoretical premise that social issues are not inherent, but rather are enacted constructs brought to life through both what issue claims-makers do and say about the issue and how third party audiences interpret these communicative acts as they structure their personal understandings and responses to the issue. And, in an era when individuals and groups turn to the web as a public forum for defining an issue and as a source of information for evaluating an issue, it is timely and important to examine how the social and technical properties of the web (i.e., who links to whom) may influence how third party publics cognitively construct the boundaries of important social issues.

Scholars of the web argue that an actor’s presence on the web and its perceived relevance to third party web navigators is in large part defined by the quantity and quality of its online social relationships formed through the use of hyperlinks. From this perspective, hyperlinks are both strategic and social tools used by claims-makers to demarcate their relationships and positions within the larger web ecology as well as potential heuristic mechanisms and learning tools for third party decision makers to structure their perceptions of the ideological space. With regard to social issues, perceptions of relevant relationships between issue
claims-makers and their ideas have very real consequences for funding decisions, policy decisions and other important social changes precisely because they create boundaries of salience, which include some parties and marginalize others.

In the established corpus of research regarding the uses and applications of hyperlink technology a conceptual disconnect exists between those who focus on the strategic production of hyperlinks by content producers and those who focus on the consumption of hyperlinks by web users. The consequence of this intellectual divide is that the interdependent relationship between these perspectives is obscured. This research aimed to fill this gap by presenting a novel ‘dual structurational’ framework that provides a conceptual and analytic lens for understanding the relational patterns that emerge in an issue-oriented hyperlink network as a possible set of rules and resources that influence (or structure) a third party decision maker’s conceptualization of the issue and their judgments that follow.

The intellectual merits of this research include: (1) providing an improved understanding of how hyperlinks, through their presence and absence, may affect how social issues are conceptualized; and (2) demonstrating how micro-level practices of organizational linkers can have wide reaching macro-level affects on the institutional order in which decisions are made. At a broader level, like a gate or fence, the cognitive boundaries that a decision maker creates around a social issue are designed to include some parties and marginalize others. For this reason, it is socially relevant to leverage insight gained from theory building and hypothesis testing toward upsetting what is often an uneven balance of power within hyperlink spaces.
References


Figures and Tables

Figure 1. Dual Structurational Model of Issue Network Emergence
Table 1. Summary of MTML frameworks to test hypotheses about the hyperlink and cognitive issue networks

<table>
<thead>
<tr>
<th>Model 1: The Enactment of the Strategic Hyperlink Network</th>
<th>Location of Main Effect</th>
<th>Specific Measures</th>
</tr>
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<tbody>
<tr>
<td><strong>H1</strong>: Claims-maker organizations (CMOs) are more likely to hyperlink to organizations in the issue space that focus on the same aspects of the social problem or share the same interpretation of it. [Issue homophily]</td>
<td>Exogenous: Actor level</td>
<td>Same Primary concern</td>
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<td><strong>H2</strong>: To gain legitimacy in the issue space, CMOs are more likely to hyperlink to organizations that are more tenured, professionalized, and/or popular in the network. [Legitimacy Enhancement]</td>
<td>Exogenous: Actor level</td>
<td>Difference in age, difference in staff size</td>
</tr>
<tr>
<td></td>
<td>Endogenous: Network level</td>
<td>Centralization</td>
</tr>
<tr>
<td><strong>H3</strong>: In their hyperlinking practices, CMOs will reinforce offline power asymmetries by hyperlinking to organizations that have more resources than they do. [Resource Dependence]</td>
<td>Exogenous: Actor Level</td>
<td>Difference in organizational assets</td>
</tr>
<tr>
<td><strong>H4</strong>: To facilitate the efficient mobilization of resources toward collective action goals, CMOs will direct their hyperlinking around organizations in the network that occupy central positions of authority. [Collective Action]</td>
<td>Endogenous: Network level</td>
<td>Centralization</td>
</tr>
<tr>
<td><strong>H5</strong>: To reinforce their offline relationships, CMOs that interact offline are more likely to have a hyperlink connection. [Social Embeddedness]</td>
<td>Exogenous: Network level (other relations)</td>
<td>Offline cooperation network</td>
</tr>
<tr>
<td><strong>H6</strong>: CMOs that are perceived as cooperating by third party decision makers are more likely to have a hyperlink connection [Perceived Social Embeddedness]</td>
<td>Exogenous: Network level (other relations)</td>
<td>Cognitive Issue Network</td>
</tr>
</tbody>
</table>

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<tr>
<th>Model 2: The Enactment of the Cognitive Issue Network</th>
<th>Location of Main Effect</th>
<th>Specific Measures</th>
</tr>
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<tbody>
<tr>
<td><strong>H7</strong>: Decision maker organizations (DMOs) are more likely to perceive a cooperative relationship between claims-maker organizations (CMOs) that focus on the same aspects of the social problem or share the same interpretation of it. [Perceived Issue Homophily]</td>
<td>Exogenous: Actor level</td>
<td>Same Primary concern</td>
</tr>
<tr>
<td><strong>H8</strong>: DMOs are more likely to perceive that CMOs cooperate with more tenured, professionalized, and/or popular organizations in the network. [Perceived Legitimacy Enhancement]</td>
<td>Exogenous: Actor level</td>
<td>Difference in age, difference in staff size</td>
</tr>
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<td></td>
<td>Endogenous: Network level</td>
<td>Centralization</td>
</tr>
<tr>
<td><strong>H9</strong>: DMOs are more likely to perceive that CMOs cooperate with organizations that have more resources. [Perceived Resource Dependence]</td>
<td>Exogenous: Actor Level</td>
<td>Difference in organizational assets</td>
</tr>
<tr>
<td><strong>H10</strong>: DMOs are more likely to perceive that CMOs, in their attempt to facilitate the efficient mobilization of resources toward collective action goals, will cooperate with organizations that they perceive occupy central positions of authority. [Perceived Collective Action]</td>
<td>Endogenous: Network level</td>
<td>Centralization</td>
</tr>
<tr>
<td><strong>H11</strong>: DMOs are more likely to perceive a cooperative relationship between CMOs that actually cooperate with one another. [Perceived Social embeddedness]</td>
<td>Exogenous: Network level (other relations)</td>
<td>Offline cooperation network</td>
</tr>
<tr>
<td><strong>H12</strong>: DMOs are more likely to perceive a cooperative relationship between CMOs that hyperlink to one another. [Perceived Social embeddedness]</td>
<td>Exogenous: Network level (other relations)</td>
<td>Hyperlink Network</td>
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