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RESEARCH ARTICLE

Organizational roles in a sustainability alliance network

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Abstract

Sustainability alliance networks offer a collaborative governance strategy to address both environmental and societal challenges too large for any single organization. While alliance networks, and particularly sustainability alliances, have been studied in a number of contexts, few alliances have been explored under the context of commercial building energy use—a sector with a multitude of policy, organizational, and technical barriers to the deployment of innovative energy- and cost-saving strategies. In this research, we articulate a framework wherein organizations can assume varying roles across an alliance network based on the organizations' objectives, organizational resources, and the relationships or ties formed with other alliance members. Further, we show that particular roles within one alliance network have implications for the types of knowledge gained and the knowledge shared across the network. Our mixed-method study draws from several data sources, employs analytic induction, and is supplemented by social network analysis in order to examine an energy efficiency-focused sustainability alliance comprised of a broad coalition of stakeholders, including US government agencies, federally funded research laboratories, private firms, and trade associations. We develop a typology for six types of organizational roles identified in an energy efficiency alliance network—each role possessing varying implications for the organization's access to and sharing of knowledge.

KEYWORDS

energy policy, environmental policy, multimethod, networks, organizational role, sustainability alliance

1 | INTRODUCTION

Energy efficiency in the commercial building sector presents a meaningful global energy resource to help reduce greenhouse gas emissions and combat climate change. Despite the myriad of existing technically, financially, and politically viable strategies to reduce energy consumption, energy efficiency in buildings remains a largely underutilized resource (Blumstein, Krieg, Schipper, & York, 1980; Paton, 2000; Pinkse & Dommissie, 2009; Revell & Blackburn, 2007).

Interorganizational alliance networks—composed of public, corporate, and nonprofit organizations, intended to diffuse knowledge, promote innovation, and support enhanced sustainability in areas such as energy efficiency in the built environment—have emerged as a common approach to address cross-sector and global environmental challenges (Albino, Dangelico, & Pontrandolfo, 2012; Feldman, 2012; Hahn, Figge, Pinkse, & Preuss, 2010; Paquin & Howard-Grenville, 2013; Rydin, 2013; Selsky & Parker, 2005; Starik & Heuer, 2002).

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Researchers have shown that alliance networks are capable of addressing sustainability challenges by enabling organizations to share risk, promote credibility, improve competences, increase market share, promote learning, drive sustainability initiatives through knowledge sharing, transform supply chains, and accelerate the development of new markets in a multidisciplinary and cross-sector manner (Albino et al., 2012; Eisenhardt & Schoonhoven, 1996; Gluch, Johansson, & Räisänen, 2013; Halme, 2001; Hartman, Hofman, & Stafford, 1999; Josserand, Kaine, & Nikolova, 2018; Ma, Sia, Li, & Zheng, 2016; Möller & Svahn, 2006; Robertson, Swan, & Newell, 1996). Previous research has also documented the emergence of interorganizational multistakeholder networks as a prominent governance strategy to encourage the development of both public and private benefits in areas too complex for a single organization, sector, or discipline to address on its own (Clarke & Roome, 1999; O'Toole, 1997; Peterman et al., 2014; Provan & Lemaire, 2012).

This research intends to articulate the varying roles that multi-sector organizations can assume across knowledge sharing alliance networks in supporting sustainability. In fact, over the last three decades, researchers concerned with organizations, alliance networks, and sustainability have investigated the varying roles assumed by governments, businesses, nongovernmental organizations (NGOs), and individuals in the pursuit of sustainability (Hartman et al., 1999; Starik & Heuer, 2002; von Malmborg, 2007). Researchers have shown that organizations can be role models, change agents, gatekeepers, or brokers across broad environmental movements (Hoffman, 2009; Klijn & Koppenjan, 2000; Knight & Harland, 2005). Governments, NGOs, and university researchers have been characterized as intermediaries, gatekeepers, or watchdogs; firms as competitors, leaders, stimulators, concept refiners, educators, legitimators, impact extenders, followers, or laggards; and nations as pollution havens or enforcers (Genus & Theobald, 2015; Goodman, Korsunova, & Halme, 2017; Prakash & Kollman, 2004; Shah, 2011).

Less understood are the roles that organizations assume in voluntary and bounded sustainability alliances intent on knowledge sharing. Thus, the primary aims of this research are to address the following research questions: First, what roles do organizations adopt in a multi-sector sustainability knowledge sharing alliance network? Second, what are the relationships between organizational roles and access to knowledge in a sustainability-focused knowledge sharing alliance network? In answering these questions, we aim to develop a framework to interpret interorganizational roles within an alliance network using both interactionist (qualitative) and positional (quantitative) data.

In the next section, we provide a theoretical background on organizational roles in networks. We then present our analytic inductive approach in studying one particular interorganizational sustainability knowledge sharing network, formerly known as the United States Department of Energy's (DOE) Commercial Building Energy Alliances (CBEAs). We supplemented qualitative interview data with social network analysis (SNA) to depict and validate our findings. In a related study (Peterman et al., 2014), this same alliance network and a narrower portion of the data set were used to analyze only the roles of government. In this study, we broadened our analysis across the

entire data set and identified the roles of not just government entities but also the roles of corporates and associations. In the subsequent section, we build a framework and typology of observed roles: integrator, director, sharer, user, outsider, and departed, including the implications of each role on access to and sharing of environmental knowledge. Finally, we conclude with a summary of the study's limitations and directions for future research.

2 | ORGANIZATIONAL ROLES IN SUSTAINABILITY

We conceptualize an alliance network as a voluntary form of inter-organizational cooperation involving significant sharing, partnerships in development, and subsequently an enduring commitment (see Gulati & Gargiulo, 1999). While we draw parallels between the alliance studied here to Yang, Uysal, and Taylor's (2018) description of sustainability activism networks—"... issue-driven networks in which several activist groups are brought together by their shared interests in issues such as climate change ..."—we distinguish our study and uniquely contribute by defining *organizational* roles across a sustainability-focused interorganizational alliance network, rather than individual roles across an activist network. This research defines organizational roles based on both *position* and *interaction*. Much of the prior research on "network theory" takes a positional perspective only, focusing primarily on methodology, while simultaneously omitting work processes, culture, or the inherent significance of particular ties (Fuhse, 2009; Salancik & Burt, 1995). Position defines opportunities and constraints on behavior but abstracts out the changes in respondents' understandings of these ties and their orientation or position towards them. This research intends to define roles using both quantitative (positional) and qualitative (interactionist) data.

Within the growing research on organizations and the natural environment, several studies describe clear patterns by which environmental stakeholders associate with one another. For instance, Hoffman (1999) illustrates how government, industry, NGOs, and insurance companies have interacted and formed alliances throughout the development of environmentalism within the US chemical industry. Van Wijk, Stam, Elfring, Zietsma, and den Hond (2013) examine the development of sustainable tourism networks across societal sectors over time with specific attention to cultural and network brokers. Furthermore, a considerable body of work explores the roles government might assume in relation to private firms (Hoffman, 1999; King & Lenox, 2000; Madsen, 2009; Peterman et al., 2014; von Malmborg, 2007). Von Malmborg (2007), for instance, identified the role of "local authorities" to act as "teachers" or "tutors" in regional sustainable development networks. Social movements (Sine & Lee, 2009), stakeholder groups (Kassinis & Vafeas, 2006), and different firms and industries (Prakash & Kollman, 2004) have been explored as the key actors in sustainability networks and fields. Goodman et al. (2017) analyzed the varying ways in which stakeholders can contribute to sustainable innovation in firms—identifying eight roles stakeholders play: stimulator, initiator, broker/mediator, concept

refiner, legitimator, educator, context enabler, and impact extender. While the researchers in this study, importantly, set up the notion that specific stakeholders assume varying roles at each stage of the sustainable innovation process, the context of the study does not focus on the roles assumed within a bounded multistakeholder alliance, as is the focus of this research. Finally, Åhlström and Sjöström (2005) have characterized the various roles civil society organizations assume—protestors, modifiers, preservers, and scrutinizers—in order to drive sustainability and social responsibility with private corporations. However, this research takes a relatively dyadic perspective of civil society organizations rather than focusing on the organizational roles assumed across a voluntary and hierarchical network intent on promoting energy and environmental knowledge.

The idea of organizational roles has been examined primarily in an implicit manner when observing patterns of interaction between actors in sustainability networks, with few pioneering exceptions (Bertels, Hoffman, & DeJordy, 2014; Goodman et al., 2017; Hoffman, 2009; Paquin & Howard-Grenville, 2013; Peterman et al., 2014; van Wijk et al., 2013). Hoffman (2009) and Bertels et al. (2014) explicitly analyzed network roles, in their cases, NGO roles within the environmental movement in the United States. However, similarly to van Wijk et al. (2013), these studies examine a broad environmental movement, instead of a specific goal-oriented, hierarchical, and membership-based sustainability network. Instead of focusing on central actors such as network orchestrators and entrepreneurs (Paquin & Howard-Grenville, 2013), our study explicitly analyzes how interorganizational roles are adopted on a network level and how they are associated with access to specific forms of knowledge. The alliance studied here is emergent, facilitated, and managed, unlike the one in Paquin and Howard-Grenville (2013).

While prior research on interorganizational roles and the implications for knowledge sharing within sustainability alliances is relatively scarce, there exists a body of research studying knowledge sharing networks in other contexts. In particular, researchers have explored strategic knowledge management networks and the enablement of knowledge sharing through use of information systems (Carlsson, 2003), the role of language, information sharing, and decision making across sustainability communities of practice (Perron & Duffy, 2012; Wenger, McDermott, & Snyder, 2002), linking social capital to knowledge transfer across “intraorganizational networks,” strategic business alliances, and industrial alliances (Inkpen & Tsang, 2005; Tsang, 1998) and balancing exploration and exploitation across supply chain networks (Lavie & Rosenkopf, 2006).

While these studies contribute extensively to understanding knowledge sharing across networks, our research uniquely focuses on the specific *interorganizational* roles assumed within a sustainability-focused knowledge sharing network. In studying sustainability alliances, in which organizations have come together to solve grand and multifaceted challenges often too difficult for any single organization to address on its own and wherein each organizational participant's motives, resources, and relationships is even more nuanced than many of the more traditional knowledge sharing networks in other contexts, it becomes increasingly important to incorporate the notions of work

processes, culture, and the meaning of relationships to define inter-organizational roles. A more complete understanding of the roles within a sustainability knowledge sharing network, thus, requires extension beyond position alone to incorporate interactional data. Further, the ubiquitous nature of knowledge sharing networks to promote environmental conservation signals the importance of understanding the significances of these relationships and roles within a very important yet underexplored form to address grand challenges (Feldman, 2012; Paquin & Howard-Grenville, 2013; Rydin, 2013; Wassmer, Paquin, & Sharma, 2014).

3 | MATERIAL AND METHODS

3.1 | Study setting

This study extends research from the same empirical setting as used in Peterman et al. (2014): A voluntary alliance program managed by the United States DOE formerly known as the CBEAs—currently referred to as the Better Buildings Alliance (2019). For the purposes of this research, we will continue to refer to the alliances as the CBEAs, including three suballiance networks: Retail Energy Alliance (REA), Commercial Real Estate Energy Alliance (CREEA), and Hospital Energy Alliance (HEA). At the time of conducting the study, “the CBEAs were comprised of representatives from 153 retail companies, commercial real estate firms, hospitals, trade associations, and U.S.-funded national research laboratories” (Peterman et al., 2014). Program marketing literature from the DOE website (2011) opportunities for members to partner in developing bargaining leverage with technology suppliers, discuss new technologies, partner in deploying emerging technologies, and establish a network of peers, competitors, and experts to aide in the deployment of energy saving technologies—all of which is in service of promoting the development of high-performance, sustainable, and energy-efficient commercial buildings. All member organizations were required to participate in one of 30 topic-focused subcommittees targeting a particular barrier or technology challenge related to building energy efficiency.

The CBEAs provided an exceptional setting to extend previous work on the roles of government entities within this alliance to better understand how competitors, corporate peers, NGOs, US-funded research laboratories, and the federal government are able to collaborate to share energy-related environmental knowledge and drive energy savings in the buildings sector (Peterman et al., 2014). In terms of scale, this network collectively represents many of the largest building owners and operators in the world. At the time of this study, the DOE noted that each alliance network within the CBEAs represents over 20% of market share in their respective industries nationally.

Our multimethod study primarily used analytic induction to analyze multiple sources of data. We then supplemented this analysis with descriptive SNA techniques in order to connect the structure of the networks with the rich interaction data derived through qualitative inquiry. The multimethod approach allowed us to use qualitative and quantitative data in a complementary fashion. Quantitative SNA

gives us a picture of positions within the entire network but ultimately does not explain why organizations are in specific positions. The qualitative data allow us to understand how organizations interpret their position and adopt roles within the network.

3.2 | Case sampling

We selected a sample of 28 organizational cases—wherein a case is defined as the entire organization irrespective of the quantity of individuals representing that organization within the alliance—to ensure representativeness of a diverse set of organizational roles across the population of organizations and to increase the potential for a richer theoretical contribution (Eisenhardt & Graebner, 2007; Glaser & Strauss, 1967). As (Peterman et al., 2014) outlined in a related study, three main criteria were used for the selection of cases: (1) representatives from all building sectors and organizational types: retail, commercial real estate, and hospital; (2) a diversity of organizational types: government-funded research laboratories, government agencies, public companies, private companies, nonprofits, and trade associations; and (3) a diversity of organizational resources, motivations, and reputations outside the alliance. Where access permitted, we attempted to collect data from multiple organizations with similar theoretical characteristics to improve reliability.

Peterman et al. (2014), in a previous study using portions of the same data, focused on the roles of government organizations in a cross-sector knowledge sharing alliance network. In this study and of the 153 participating organizations in the CBEAs, we selected 28 cases representing a broader cross section of public, private, and trade organizations. Nine cases of 44 retail members, six of 28 commercial real estate members, four of 39 hospital members were included after they indicated interest in participating in our research through an online survey. We created our sample to comprise key players involved in the setting up of the alliances, taking into consideration the diversity of actors involved as well as specifically targeting dissatisfied or departing organizations to minimize positive bias. In addition to companies, our sample included seven cases from national labs and the DOE, because they assumed a crucial role in establishing and managing the alliances and two of the 16 nongovernmental associations and trade associations involved. To preserve anonymity of research subjects, company aliases and partial descriptions are provided for each case in Table A1 (also appears in Peterman et al., 2014).

3.3 | Data sources

Dissimilar from (Peterman et al., 2014), this study draws on interview data collected from all representatives of 28 organizational cases. The first author conducted all interviews, adhering to a standardized open-ended format, over the course of 10 months—January–October 2011 (Patton, 1990).

Each informant served as the “lead” representative for their organization to one of the three suballiances. In 20 of our 28 cases, lead

informants were determined using information provided by the alliance administrators, published minutes from alliance meetings, press releases from the member organization, or through participant observations at alliance events. In eight of our 28 cases, where we were unable to determine the lead informant, we began by interviewing environmental managers, energy managers, or sustainability executives within the organization to ascertain the individual with the greatest knowledge of their organization's participation in the alliance network. In some cases, we were able to interview multiple informants from the same organization resulting in 37 total interviews. This was intended to improve the reliability of lead informants' responses. We perceived no systematic bias in perceptions of organizational objectives or resources between lead informants and supplementary informants. We also did not note any systematic bias among informants that were ascertained a priori versus those selected by snowball-sampling techniques (Scott, 2000).

All interviews were conducted over the telephone spanning 35–75 min in length, with an average of 53 min. Each interview was recorded and transcribed with the exception of two, because of technical errors. We began each interview with a brief overview of the study. We then followed up with questions to elicit the respondents' backgrounds at their organization, their degrees of participation with the CBEAs, and extents of their energy efficiency and environmental knowledge. Subsequent questions explored four broad thematic areas: (1) *organizational role*; (2) *interorganizational connections or ties*; (3) *reputation and motivation*; and (4) *policy and catch-all*. Interviews deviated from these thematic areas only when respondents became more comfortable and began to expose many of the emergent themes.

Three supplemental data sources were used: a survey, secondary data, and participant observations (Peterman et al., 2014). The survey was distributed to all actors in the alliance network to elicit advice-based relationships between organizational representatives on energy and sustainability topics. Responses were obtained only from the most active participating organizations, mainly the steering committee members (>95% response rate) and those members with advice ties connected to steering committee members (>60% response rate). These data were used for supplemental purposes only, given the lower than expected response rates. The DOE shared committee membership lists, which were used to define relational ties between organizations coparticipating in committees. These supplementary data were used to measure the network scores and are presented in the findings.

3.4 | Data analysis

Employing the same methodology as was used to analyze government roles across this same alliance network (Peterman et al., 2014), we used an analytic induction method on our interview data. This allows for iterative interactions between existing theories, our data set, and emergent theories from our analysis (Glaser & Strauss, 1967; Manning, 1982; Robinson, 1951). We started with an empirical

phenomenon and then reviewed the existing literature to develop a preliminary understanding of the important theoretical and practical issues in organizational, environmental management, and network literature. Similar in method to Bansal and Roth (2000), we formulated a preliminary explanation of the phenomena, returned to a particular case to observe the phenomena first-hand, iteratively adjusted our initial explanatory model, redefined the phenomena, and revisited a number of other cases. This process was continued until the discrepancies between the actual data and our theory were quite small (Robinson, 1951). We triangulated these findings using SNA methods (Knoke & Yang, 2008; Scott, 2000).

The first and second authors separately performed three rounds of focused coding on each of the lead informant interviews, including reliability tests (Charmaz, 2006). Drawing from the initial explanations of the empirical phenomena, the first and second authors then developed a refined coding schema relying on 10 primary code categories, including codes such as “external resources,” “perceptions about the alliance,” and “environmental knowledge” (Peterman et al., 2014). In the first round of coding, 49 subcodes were then specified to further assess empirical patterns across the data set.

After our first round of coding, a theoretical framework for an organization's role begins to emerge from the data. Mainly, organizational objectives for participation, resources or resource deficiencies, and network relationships were seen to be important themes emerging. Each case was then written up in a “memo format” (Charmaz, 2006) with the goals to further elucidate specific processes, assumptions, and actions associated with each code. Memos were written by the first two authors after randomly distributing the cases evenly. Case memos included a summary of alliance perception, organizational objectives, organizational resource base, connections within and outside the network, primary environmental knowledge outcome, and preliminary conception of an organizational role (Peterman et al., 2014). Case memos were pooled together and each of the authors independently attempted to identify categorical roles. Consensus was found between the first and second authors on 26 of the 28 cases yielding five organizational roles in the network of actors: integrator, director, sharer, user, and outsider. The remaining two cases were reconciled by reviewing the original transcripts and revising each of the memos jointly. After further review, the category of outsider was further divided into two categories, outsider and departed, resulting in the six roles described in the empirical findings. We further elaborate on these roles in the following sections.

3.5 | Social network analysis

To examine the structure of the CBEAs, we also conducted supplemental SNA. SNA conceptualizes social structure and organizational life as a configuration of social relations and positions. In essence, the behavior of organizations is influenced by the social relationships that exist within a group or set of organizations (Halme, 2001; Vergragt & Van Noort, 1996; Yang et al., 2018). Using UCINET 6 (Borgatti, Everett, & Freeman, 2011), we developed a complete affiliation network

inclusive of all CBEA members. Ties were defined between organizations when there existed a shared membership on a particular subcommittee (Wasserman & Faust, 1994). Strength of ties was established by enumerating the number of shared committees between each organization. From the affiliation network, we measured *degree centrality*, quantifying the number connections with each node, and *betweenness centrality*, measuring the number of paths that must pass through a given node (Knoke & Yang, 2008; Sparrowe, Liden, Wayne, & Kraimer, 2001). The affiliation network provides descriptive and supplemental support to the qualitative interaction data and is used to further describe the relative influence of a particular organization across the alliance (Knoke & Yang, 2008).

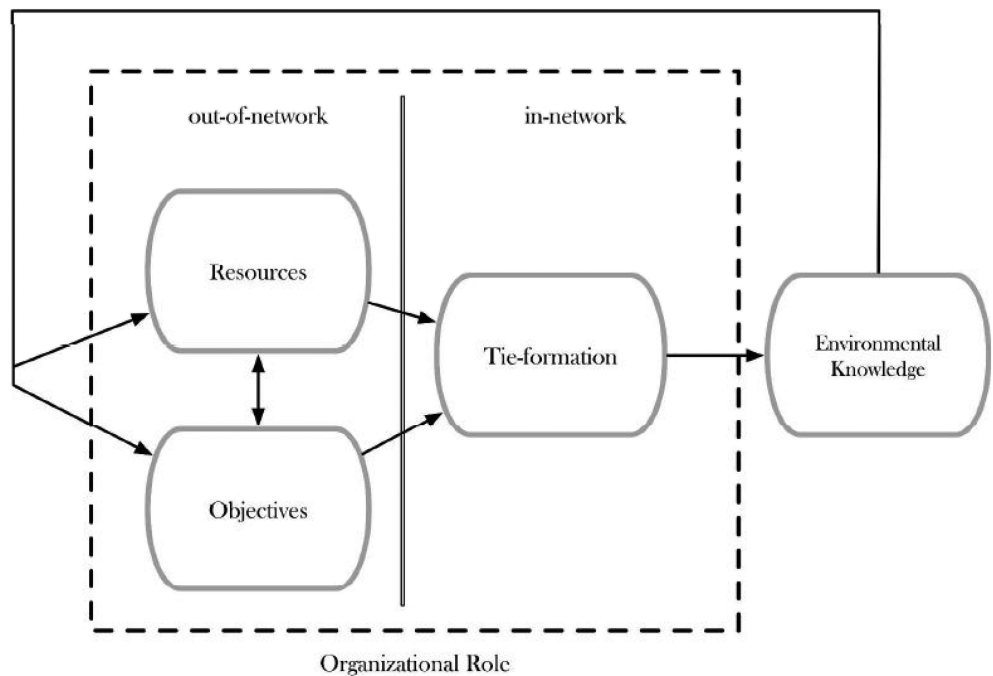
4 | RESULTING FRAMEWORK AND TYPOLOGY FOR ARTICULATING ORGANIZATIONAL ROLES

As was noted in a previous study of the same alliance network, descriptive SNA revealed a clear positional role partition between (1) core members, mainly government entities that bridged the sub-alliances, and (2) peripheral members, or “consumers of the network” (Peterman et al., 2014). With the highest average centrality and betweenness scores, the DOE and the federally funded laboratories occupied what some refer to as structural “brokerage roles” (Burt, 1992, 2005; Wasserman & Faust, 1994). Paquin and Howard-Grenville (2013) refer to this positional role as a “network orchestrator,” and Goodman et al. (2017) refer to these roles as “brokers/mediators” in a stakeholder network. It is not surprising to find government entities assuming brokerage positions given their mandate to establish, coordinate, and orchestrate the alliance.

Drawing from the emergent themes in the interview data, it became apparent that there existed a multitude of roles in purveying and accepting knowledge across this network beyond the core and periphery roles. Focusing on position alone ignores the underlying meaning of interactions between organizational representatives. As such, through interview data, we ascertained each organization's objectives for participation in the network and the effects of organizational resource strengths or deficiencies on relationships between organizations (Fine & Kleinman, 1983; Fuhse, 2009). Subsequently, we found that resources and motives, described more completely from the qualitative data, altered relationships and ultimately the role of the organization in knowledge sharing and acquisition across the alliance.

As depicted in Figure 1, our conceptualization of an organization's role in the network could be more fully articulated beyond position (ties) alone. In fact, two other interactional characteristics of each organization more completely defined organizational roles across the alliance: organizational resources and organizational-level objectives to join the alliance. These three components define an organization's role within the network and are central to the outcome of environmental knowledge for the member and across the alliance (Peterman et al., 2014). Table 1 provides illustrative quotes to describe our

FIGURE 1 Conceptual framework of an organizational role



interpretation of organizational resources and organizational objectives from interview data.

Resources and objectives helped to more completely unpack the meaning and implications of the relationships formed within the alliance. We defined organizational resources exogenous of the network as financial and technical competences, credibility or reputation perceived by other organizations' representatives or from outside the network, and staff resources within the organization to address energy efficiency and sustainability problems (Barney, 1992; Hart, 1995). Organizational-level objectives to join the alliance were defined by a desire to gain both economic or strategic advantage through partnership, to supplement internal organizational resource deficiencies, pressure from consumers or other stakeholders, regulatory pressure, ethical or moral motivations, or more typically a combination of each of the above (Dyllick & Hockerts, 2002; Ervin, Wu, Khanna, Jones, & Wirkkala, 2013). In a cyclical manner, organizations were able to update their organization's role within the network by acquiring and using environmental knowledge to change their organizational resources, objectives, and relationships or ties.

4.1 | Typology of organizational roles

Adhering to the analytic induction methodology, the 28 cases revealed cross-cutting configurations of resources, objectives, and ties formed, resulting in six organizational role types: integrators (7), directors (3), sharers (6), users (7), departed (2), and outsiders (3). Each role from integrator to outsider possessed a decreasingly central role in the creation and dissemination of the four forms of sustainability knowledge identified across the alliance: (1) knowledge that enables

benchmarking an organization's environmental performance relative to peers, (2) technical knowledge related to prototyping new technologies, validation of emerging technologies, and implementation best practices of technologies demonstrating a potential to reduce the risks (and cost) of adoption, (3) creation of energy efficiency technology standards and specifications enabling greater leverage with manufacturers and ultimately reducing the cost on new technologies, and (4) scientific research in the form of white papers, case studies, and other publications (Peterman et al., 2014). While we offer a cross-sectional descriptive analysis, we highlight a cyclical process between organizational role and environmental knowledge.

Table 2 summarizes the organizational roles observed in the qualitative analysis of the cases and presents SNA measures from the quantitative analysis. On the basis of degree centrality (number of links incident upon a node) and betweenness centrality (number of paths in the network that must pass through a given node) measures, we get an initial idea that structurally speaking there are differences between the roles (Knoke & Yang, 2008). In the table, the degree centrality indicates that identified roles have different levels of centrality and betweenness. Within Table 2, we outline a series of propositions for each role based on both interactional and positional data.

In Figure 2a,b, we present the qualitative analysis (roles) superimposed on the quantitative analysis (network structure). Figure 2a depicts the entire network with the case roles marked with different shapes (see Peterman et al., 2014), and Figure 2b shows how the case organizations are interconnected. In these figures, we see that integrators are the most central nodes within the network in terms of both betweenness and degree centralities, while those occupying the departed and outsider roles tended to be less central to the alliance network. Next, we discuss each role separately.

TABLE 1 Exemplary evidence of organizational resources and objectives

Organizational resources	Exemplary quotes	Summary
	We do not have the in-house expertise, like [Worldwide Retailers]; they have an absolute cracker jack engineering team... who has done a lot of work in this area.	Poor staffing resources
	I'm not the expert in every area. We do not have a lot of internal expertise...Some of the larger retailers...have more of a systematic process with respect to energy and sustainability...They have more resources that can participate. I'm sort of one person trying to participate on a lot of different committees while doing my regular work.	Expertise resource poor
	At [Worldwide Retailers], actually, we have a [sustainability] network. Depending on...whether it is packaging, or energy, sustainable farming, sustainable fishing... there's a whole big network. For what I work on, there's a sustainable building network and there is a team of people...	Personnel and expertise resource rich
	When you are out working with the new technologies, people...will go the extra mile to work with [our company] because they realize if we adopt it then, you know, there's going to be a huge market for it.	Reputation resource rich
	... We're kind of a leader so we bring a lot of [technologies] to the alliances and have tried a lot of those things.	Expertise resource rich
Organizational objectives	Exemplary quotes	Summary
	It has allowed me to have dinner with [Worldwide Retailers]. Just to talk. A personal meeting outside the alliance...it's those personal interactions that are off the record that you know are truthful and meaningful to help. You get to hear and say the things that you cannot hear and say in a formal meeting that's public.	Motivated to gain expertise
	These are the major retailers in the world coupled with tremendous resources in the National Labs. From selfish standpoint, I wanted to figure out what the heck we could steal from this and use in our buildings. So, that was really [our company's] goal coming in.	Motivated to gain expertise and personnel resources
	We're pretty small as a healthcare provider compared to the giants. So, it's one thing for all these other hospitals to, or as an analogy if [Worldwide Retailers] does something, you can think, 'well that's [Worldwide Retailers] they got unlimited budget and they can do stuff even if it does not make [financial] sense [sic].' It's a whole other game changer if your...local guy right next to you has the same size business or smaller...is able to do something then it resonates...and you believe you can do it. We represent the rest of healthcare, not the big guy. We	Motivated to improve reputation (conveyed as altruism)

TABLE 1 (Continued)

	<p>want to be that model or catalyst for others to do it.</p>	
	<p>Well, how do we look at the next [technology]? What should we anticipate so we are ready now? How do we have contingency scenarios? How do we implement technology[ies] and meet those new [regulatory] requirements, but also make sure we are choosing the right technology to be cost effective? So, that's [National Grocery's] goal.</p>	<p>Motivated to gain expertise</p>
	<p>...it gives us an opportunity to learn from others so we do not have to be experts in all areas, we can steal great ideas from other participating members ...</p>	<p>Motivated to gain personnel resources and expertise</p>
	<p>...that was actually what the whole basis [for the alliance]. It was to develop those standards so that the vendors knew what they could supply us [with] and what we would all want...With this newer technology, where people can go off on these different tangents, you help standardize it into something that people wanted in our type of retail...that's the basis: more volume, lower the costs.</p>	<p>Motivated to standardize and improve market leverage</p>
	<p>I do not think anybody on the alliance would be doing it if it wasn't building shareholder value, number 1. There are not a lot of altruistic people. It's saving money. It's improving the brand image. It's also mitigating risk of new regulations [and] being ahead of it.</p>	<p>motivated to improve financial resources, reputation, and expertise</p>

Note: Portions of the above quotes also appeared in Peterman et al. (2014).

5 | ORGANIZATIONAL ROLES AND IMPLICATIONS FOR KNOWLEDGE SHARING

5.1 | Expert integrators coordinated the platform

Integrators were tasked with designing, coordinating, and controlling the alliance. The DOE and federally funded National Laboratories assumed this integrator role. This, in fact, was by design. The DOE designed the CBEAs such that the laboratories and the DOE could facilitate noncompetitive sustainability knowledge sharing between competitive firms. As the alliance creators, integrators retained significant control over their own role and the role of other organizations. Integrators had the ability to revoke membership of any organizations.

Integrators possessed extensive technical expertise and organizational resources. They validated technologies, summarized best practices, and assisted in the development of product specifications. According to one alliance member, industry members provided the integrator labs with “a playground of real-world exempling [sic] rather than just laboratory results.” Integrators secured a central role in the alliance by combining this “real-world” data with the scientific

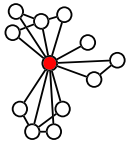
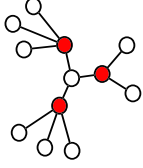
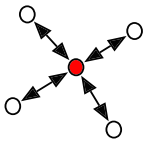
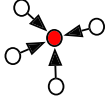
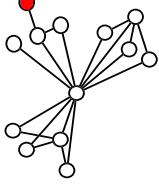
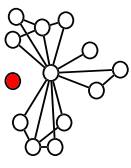
research developed in their labs. These data were interpreted, summarized, and shared with the rest of the alliance through other integrators (Peterman et al., 2014). As depicted in Figure 2a,b, integrators assumed a central role in this process—closing the gap between the three subnetworks: retail, commercial real estate, and hospital alliances (see Burt, 1992, 2005; Jemison, 1984). While the knowledge gained by integrators was narrowly confined to scientific findings, integrators' positions most often between other nodes, resources, and objectives allowed for the access and ability to disseminate knowledge broadly across the network to all three suballiances.

The data revealed both self-directed and alliance-wide criticism for the laboratories' and DOE's lack of management expertise. As one lab informant articulated, “One weakness ... is having engineers head this up. One of the key things to making this happen with the members is facilitation, communication, getting these groups together ... but as engineer[s] we're used to being focused on a research problem ... and group facilitation isn't one of [our] strengths.” Despite the perceived inadequacies, integrators, and mainly the DOE, retained their roles because of the simple fact that the DOE both created and funded these alliances.

TABLE 2 Role typology summary

Roles						
	Integrator	Director	Sharer	User	Outsider	Departed
Organizational resources	High technical and financial resources; low managerial resources	High technical, financial, personnel, and reputational resources	Medium-low technical, personnel, financial, and reputational resources	Medium-low technical, personnel, financial, and reputational resources	Varied	High technical, financial, personnel, and reputational resources
Organizational objectives	High participation motives to occupy central network position	High participation motives to occupy central network position	Motivated to supplement resource gaps or constraints through targeted relationships	Motivated to supplement resource gaps, reduce costs, reduce risks, and occupy low central position in network	Varied	Low-no motives for participation
Tie formation	Highly central within network and high betweenness observed	Medium-high central position in network	Medium-low central position in network; targeted tie formation to address resource gaps	Medium-low central position in network; targeted tie formation to address resource gaps	Low central position in network	Low-no position in network
Average betweenness score ^a	0.14	0.01	0.00	0.01	0.02	0.00
Average degree centrality score ^a	0.49	0.25	0.18	0.11	0.16	0.03
Types of environmental knowledge gained	Real-world data for fundamental scientific research knowledge	(1) Standards and specifications knowledge to leverage suppliers and manufacturers; (2) Reduce costs through advanced prototyping, technology validation, and best practice knowledge	(1) Advanced prototyping, technology validation, and best practice knowledge; (2) internal legitimacy to promote initiatives	(1) Standards and specifications knowledge to leverage suppliers and manufacturers; (2) Benchmarking knowledge; (3) Reduce costs through advanced prototyping, technology validation, and best practice knowledge	Very little knowledge gained	None
No. of observed cases	7	3	6	7	3	2
Case aliases	DOE 1; DOE 2; National Lab L; National Lab N1; National Lab N2; National Lab P1; National Lab P2	Big Box Retail; Hospital Campus; Worldwide Retailers	Big City Clinics; Fast Food Global; Global Hardware; Specialty Grocers; Clothing Stores; Malls Properties	A & B Properties; ABC Banks; US GSA; Historic Hospital & Clinics; National Grocery; University Medical Center; Warehouse Superstores	Valley Properties; National Building Association (NBA); Retail Association	Major Media; Outdoor Gear

TABLE 2 (Continued)

Roles					
Integrator	Director	Sharer	User	Outsider	Departed
					
1. As influential central actors, integrators have access to and broadly share sustainability knowledge.	2. As influential actors in part of the network, directors have access to environmental knowledge leading to leverage and standardization.	3. Sharer organizations gain access to broad forms of knowledge through sharing.	4. User organizations gain access to narrow types of knowledge only useful for them.	5. Outsider organizations have limited access to environmental knowledge as they are pushed out by dominant actors.	6. Departed organizations have limited access to environmental knowledge because of their own choice not to participate.

^aOutsider degree centrality and betweenness scores were calculated using coparticipation in subcommittees prior to NGO and trade association removal from various committees. In simplified network structures, the arrows point in the direction of which advice was given.

5.2 | Influential directors build consensus among members

Directors influenced the alliance, or large parts of the network, by uniting members and leveraging their combined clout. Directors in the CBEA possessed interest in positional centrality, desired to affect industry-wide change, and possessed substantially greater resources in all categories than most other members. Directors' centrality in the network is clearly depicted in Figure 2a,b. Structurally, directors assumed central positions in the network relative to others, but directors were not positioned with high betweenness centrality indicating a different structural position than that of the integrators.

Directors employed this central role to gain knowledge and build consensus in the development of product standards and specifications. As one director organization's lead informant said, "... We needed to be working together ... to get things to market quicker, and agree on technologies that we think save energy." Another informant echoed this, "We all get together and influence the manufacturing community, to say, 'we will buy more efficient equipment, but you have to make it.' We also want to buy it at a fair price, so if we give you a ... predictable volume of product to make, and what we think it is fair to buy it at, then everybody starts going down a more logical path."

Besides standards and specification development, interviewees from director organizations asserted they gained few, if any, other forms of environmental knowledge. Directors needed the alliance, the integrators, and other member organizations to protect themselves from accusations of anticompetitive behavior (Gulati, Nohria, & Zaheer, 2000; Stuart, 1998). They retained consensus among other members by sharing their successful best practice knowledge, technology validation, and data. The environmental knowledge acquired and shared by directors did not provide a resource for role updating but instead provided a means for reaffirming centrality across the alliance. As a director informant said, "... We have the technical staff in design, engineering, and internal R&D to be able to implement [energy efficiency] strategies [and] serve on various committees. We have the resources. Some of the other organizations, maybe it's just one guy working on the alliance. We try to help by utilizing all of our resources by having our employees on the project."

5.3 | Engaged sharers addressed deficiencies by helping others

Sharers both received and shared broad forms of environmental knowledge. In general, the six sharer organizations in this alliance possessed fewer organizational resources compared with the resources of directors. Sharers' primary objective was to *share* and *receive* sustainability knowledge to directly reduce energy consumption and they formed ties to address organization-specific resource deficiencies.

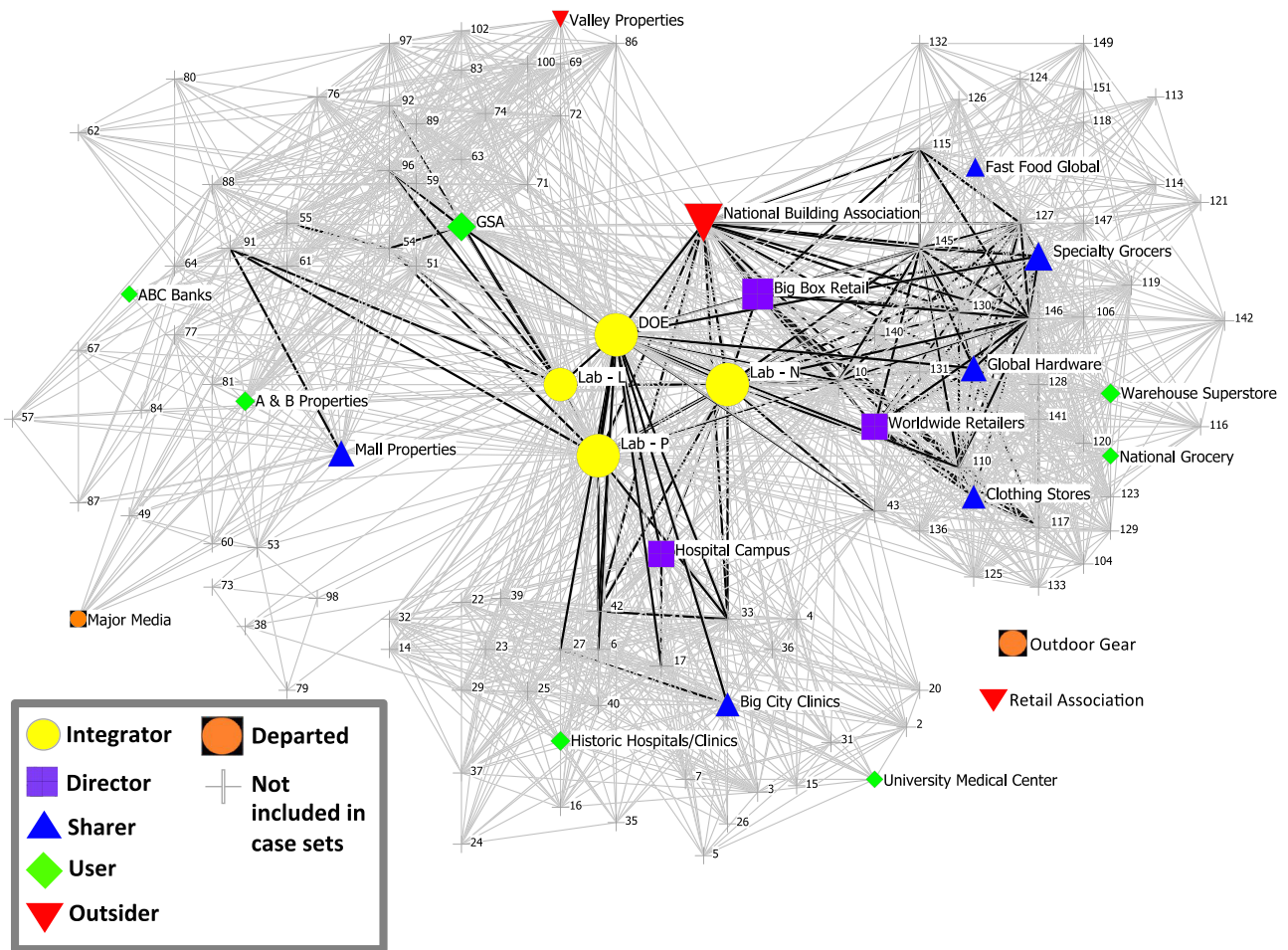


FIGURE 2 (a) Affiliation network. Shapes represent roles identified through analytic induction. Size of nodes represents degree centrality from social network analysis. Black lines represent affiliation ties between organizations within our case sets. Grayed out lines represent ties between organizations not within our case set. (b) Affiliation subnetwork displaying only those organizations in case sets. Size represents degree centrality in the network. Solid black lines represent more than one shared committee (or affiliation). Grey lines represent only one shared affiliation [Colour figure can be viewed at wileyonlinelibrary.com]

Sharer organizations gained knowledge in prototyping, validation of new technologies, and best practices for the deployment of emerging innovations. Sharers also reported gaining knowledge to enable benchmarking against peer organizations. Unlike directors, sharers lacked the collective influence and centrality across the network to shape standards development.

Knowledge gained by sharer organizations was used to supplement organizational resources and to convince internal senior leadership to alter objectives. For example, one sharer organizational informant reported, “[Senior leadership doesn’t] believe the government. They don’t believe the engineering firm. They don’t believe the utility. They don’t believe just about everyone, but they do believe another hospital ... the hospitals are very receptive to other hospitals on implementing ideas.” Lead informants from retail firms reiterated the importance of benchmarking against their peers, articulating the knowledge derived from the alliance allowed them to go before their executive committees and say, “Look, we need to go ahead and try this. Everyone else is doing it.”

5.4 | Parsimonious users fulfilled their needs

Users participated in the alliance solely to gain sustainability knowledge and supplement knowledge deficiencies. Resources across the seven user organizations varied more greatly than other roles. Similar to sharers, users with fewer resources than others in the network aimed to supplement these deficiencies. Unlike sharers, users were more likely to withhold sustainability knowledge from peer organizations in hopes of harnessing a competitive advantage: “[National Grocery] would just assume ... let others figure it out on their own.”

The clearest example of this was that of National Grocery (Figure 3). In order to address its lack of knowledge on lighting, National Grocery directly sought advice from five leading experts in lighting technologies. In surveys and interviews, no other firms reported obtaining advice from National Grocery. Other alliance members reported they were less inclined to share with an organization that did not reciprocate knowledge sharing, and as such, users were less central to the alliance.

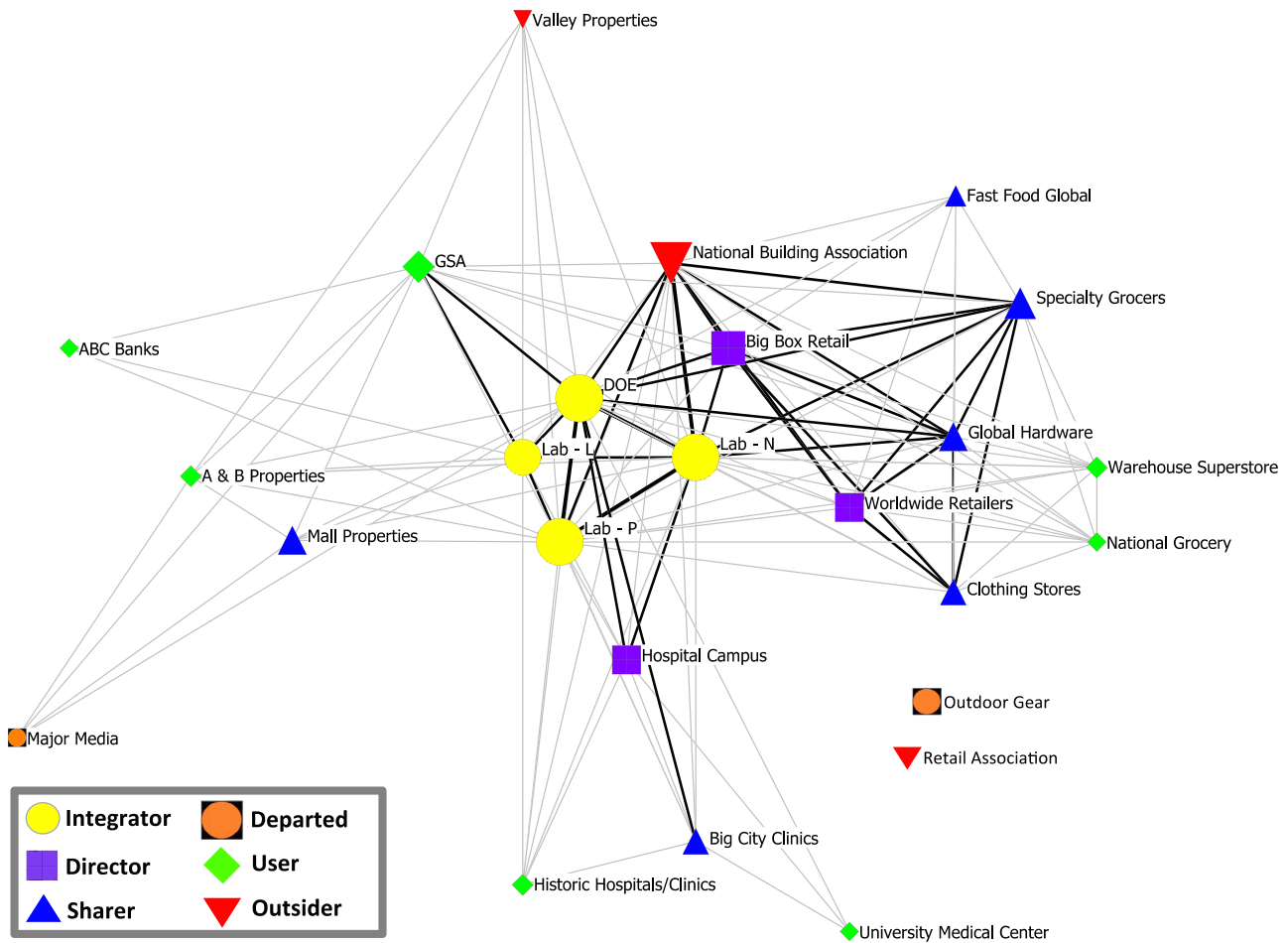


FIGURE 2 (Continued)

Highly resourced user organizations acquired environmental knowledge to enable benchmarking against peers and used technology standards knowledge. Informants referred to the alliance as a way to “gut-check” their environmental standing. With few other forms of environmental knowledge to gain, users took advantage of the director organizations’ standards and tended to take more “subordinate” positions in the alliance, letting others design the specifications while they reaped the rewards of reduced risk and lower cost technologies. When user organizations did gain technical knowledge, it tended to be quite narrow (i.e., lighting or heating equipment). Because other organizations were reluctant to share with the users—seeing asymmetric knowledge sharing—users were only able to access knowledge from a smaller subset of organizations still willing to share with them. In contrast, sharers reported gaining access to broader technology knowledge in a number of different areas.

5.5 | Disillusioned outsiders are pushed out by others

Outsider organizations became disillusioned by unsuccessful attempts to obtain a central role in the alliance (such as director or integrator).

We found three of these organizations. A representative from National Building Association (NBA) reported that her organization was “asked ‘please don’t come’ ... that was quite a blow. We thought we were making some progress, but apparently not.” Outsider organizations accepted subordinate roles in the network and obtained little knowledge through participation. Interviews revealed two reasons for outsider organizations’ failure to achieve central roles: (1) lack of organizational resources and (2) lack of authority within the network. The structural network data confirmed outsiders were, on average, less central to the network than other role types (in betweenness and degree centrality). The exception to this tendency was with those organizations engaged in conflict over a particular role (which is why the average degree centrality scores are elevated compared with user and sharer organizations).

Interestingly, the interviews revealed a degree of role competition or role conflict for particular integration roles that ultimately may have resulted in the NBA shifting its motivation and ultimately assuming the role of outsider (Biddle, 1986). The informant from NBA described their initial motivation for joining “... to share knowledge and exchange ... between alliance members...The original reason to involve the [associations] was to leverage...information out to many groups beyond the core.” In 2009, abruptly after new leadership took over,

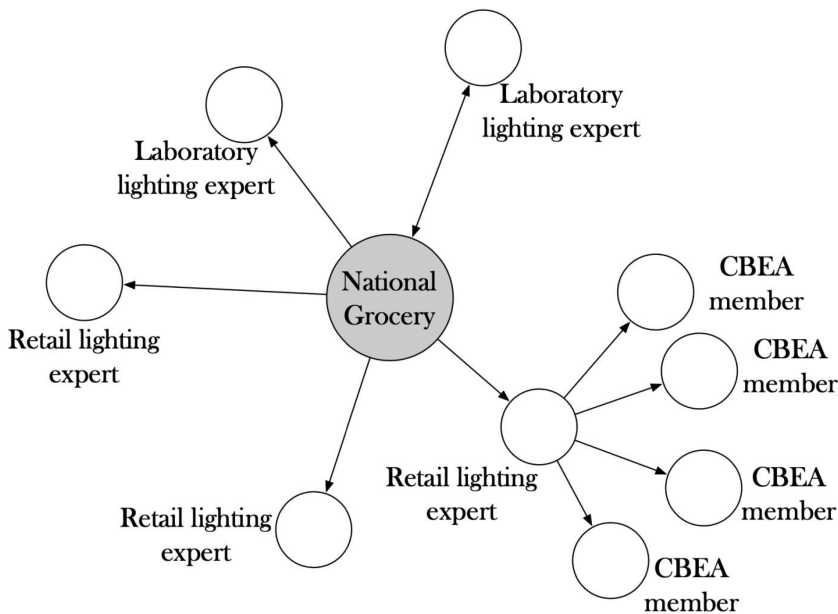


FIGURE 3 Depiction of all organizations tied through advising to National Grocery. National Grocery possessed five outgoing relationships (advice seeking) and only one incoming relationship (advice receiving)

the DOE “decreed” that representatives of the nongovernmental associations would no longer get to vote on steering committees. NBA’s informant articulated the implications for their role in the alliance, “... It was a terrible mistake...We thought that [NBA] was very important ... for the alliance...that seems to have been downplayed ... it’s not nearly as important.” NBA’s aspiration to serve in an integrator role now seemed to be in conflict with the role ascribed to them by the administrators of this network, the DOE. DOE seemingly wanted to assert sole ownership of the integrator roles in the alliance as the informant articulated here: “[DOE] has put up resources and has served as a coordinator to establish these relationships...The labs report to DOE and DOE manages...the alliances. We [DOE] have the relationship[s] ... which has driven the alliances.”

5.6 | Expert departed were not learning anything new

The departed had left the alliance. The two departed organizations had extensive resources and expertise, possessed little, if any, interest in access to any forms of knowledge from other organizations, and their representatives saw little value of the alliance for their organizations. For instance, an interviewee articulated their experience on the steering committee: “It’s hard to describe ... They made a 3-hour presentation to all the members ... It was an absurd use of my time.” Departed organizations did not participate in any activities but remained listed as members by others.

Organizations, such as Outdoor Gear (OG), had largely left the network, but others still ascribed a role to their organization exemplified what theorists refer to as role dissonance—wherein an actor’s perceived role is inconsistent with the role ascribed to it by others (Biddle & Thomas, 1966.) While network dynamics was not the focus of this study, the marginalized organizations identified here present

an interesting opportunity to hypothesize how an organization’s role may be correlated with network departure.

6 | CONCLUSIONS

The organizational level role approach allows managers to better understand their engagement within sustainability focused knowledge-sharing networks, make decisions about resources to be allocated, and take part in shaping alliances intent on diffusing sustainability knowledge. Through the alignment of objectives, resources, ties, and ultimately roles, participation in similar alliance network forms has the potential to yield internal legitimacy by providing knowledge to enable benchmarking, reduced prototyping costs through practice and technology sharing, leverage over suppliers through standards and specifications development, and more effective and efficient utilization of research. But managers must understand organizational roles and the inherent limitations of each role to achieve desired outcomes.

This study complements and extends the emerging research on roles (Peterman et al., 2014; Bertels et al., 2014; Hoffman, 2009), multisectoral roles in formulating and implementing environmental policy (Starik & Heuer, 2002), and work on the dynamics of alliance networks (Paquin & Howard-Grenville, 2013; Phelps, Heidl, & Wadhwa, 2012) by developing a framework for defining organizational roles and the implications each role may have on ability to gain and share the four forms of environmental knowledge identified in this alliance network. We define the concept of an organizational role using an analytic inductive approach to develop a framework that describes and predicts organizational roles based on an organization’s resource strengths (and deficiencies), motivations, and network ties. We presented a typology of six different organizational roles: integrator, director, sharer, user, outsider, and departed.

6.1 | Study limitations and suggestions for further research

The study revealed a number of new research opportunities. First, future research should compare different networks and different role types, possibly in different institutional contexts. This study examines an alliance network in one specific context—a membership-based and hierarchically governed sustainability network (see Gulati, Puranam, & Tushman, 2012). The diversity of public, private, and civil society actors likely led to more heterogeneity in roles across the CBEAs than in other more homogenous networks. The focus of the alliance, energy efficiency in buildings, was also not commonly seen as strongly related to competitive advantage, thus leading to more knowledge sharing than other possible networks. Further, given the relative nascence of this particular network, one would expect significant dynamism across the constellation of existing roles, especially after significant events change the network structure (see Ahuja, Soda, & Zaheer, 2012; Majchrzak, Järvenpää, & Bagherzadeh, 2015). While we looked at only one network, comparative network analysis might lend insight into the influence of network goals, management, and composition on alliance success. Additionally, this study focuses on knowledge-driven roles, but other roles could be identified and studied across different types of sustainability networks and at different phases of knowledge sharing (Hansen, Mors, & Løvås, 2005). Adopting the perspective of one or multiple actors would lead to an improved view of cognitive understandings of the whole network (Brands, 2013; Kilduff & Krackhardt, 1994; Lomi & Pattison, 2006).

Second, our study presents a relatively static view of organizational roles across the knowledge sharing network, neglecting the dynamic effects of, for instance, forced removal of a particular organization or the origins of voluntary departures. Longitudinal data would allow for empirical assessment of how roles change over time and at different stages of network development (e.g., Majchrzak et al., 2015; Paruchuri, 2010). Empirically, longitudinal network effects could be investigated through at least two pathways: (1) simulation and testing different configurations of organizational actors with varying attributes over time to determine role compositions that lead to more or less effective knowledge sharing in alliances and (2) comparison of different networks across varying geographical and institutional contexts, at multiple levels of analysis (Berends, van Burg, & van Raaij, 2011), or across networks (Lomi & Pattison, 2006; Majchrzak et al., 2015; Sytch, Tatarynowicz, & Gulati, 2012).

Third, our study neglects to answer the question of why and how certain organizations might come to be in seemingly disadvantaged situations. Our interviews reveal that organizational roles are not always uniformly perceived by all participant organizations across the network; theorists refer to this as role conflict (Biddle, 1986). The question then arises whether alliance networks can and should be steered towards a balanced role situation in a way to avoid these forms of role conflict (see Provan & Kenis, 2007; Provan & Lemaire, 2012). Ultimately, studying interorganizational roles in a network context will allow us to better understand how organizational actors can effectively compete, cooperate, and achieve sustainability goals.

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APPENDIX A.

TABLE A1 Summary of selected cases and organizational descriptions (also appears in Peterman et al., 2014)

Case set	Company alias	Organization description	Lead informant job function	Number of interviewees per case
Retail Energy Alliance				
	Big Box Retail	Diverse retail goods, food service retail goods, food sales retail goods	Senior Engineering Manager	2
	Outdoor Gear	Specialty retail goods and garment sales	Director Corporate Social Responsibility	1
	Clothing Stores	Department store retail goods and garment sales	Energy Management & Engineering Services Director	1
	Worldwide Retailers	Diverse retail goods and food sales retail	Engineering Supervisor	2
	Specialty Grocers	Food sales and service retail	Global Leader, Sustainable Engineering and Energy Management	2
	Global Hardware	Specialty retail goods	Director of Engineering and Energy Management	1
	Fast Food Global	Food service retail	Director of Global Engineering	1
	Warehouse Superstores	Diverse retail goods and food sales retail	Director of Energy and Sustainability	1
	National Grocery	Food sales retail	Lighting and Engineering Manager	1
Commercial Real Estate Energy Alliance				
	Major Media	Media operations, theme parks, resorts, hotels, offices, food service retail	Principal Technical Staff	3
	Valley Properties	Commercial office real estate	Vice President of Engineering Services	1
	Mall Properties	Specialty commercial real estate	Sustainability and Energy Manager	1
	A & B Properties	Commercial real estate	Director of Real Estate and Chair Energy and Environment Committee	2
	US General Services Administration (GSA)	Federal office space	Director of Research	2
	ABC Banks	Office buildings and financial retail	Energy Manager	1
Hospital Energy Alliance				
	Big City Clinics	Distributed health services facilities	Director of Facilities	1
	Historic Hospitals & Clinics	Distributed health services facilities	Strategic Resource Coordinator	1
	University Medical Center	Hospital campus	Vice President of Facilities	1
	Hospital Campus	Hospital campus	Director of Engineering and Facilities	1
Nongovernmental organization				
	Retail Association	Trade association	Vice President of Sustainability	1
	National Building Association (NBA)	International organization of professionals - standards writing, research, publishing, and continuing education	Technical and Policy Lead	1
Government laboratories and administrators				
	National Laboratory - P1	Research Laboratory - US DOE -funded	Technical Specialist	1
	National Laboratory - P2	Research Laboratory - US DOE -funded	Technical Specialist	1
	National Laboratory - L	Research Laboratory - US DOE -funded	Technical Specialist	2
	National Laboratory - N1	Research Laboratory - US DOE -funded	Technical Specialist	1
	National Laboratory - N2	Research Laboratory - US DOE -funded	Technical Specialist	1
	US Department of Energy (DOE1)	Government agency - Program administrators	Program Director	1
	US Department of Energy (DOE2)	Government agency - Program administrators	Program Director	2
		Total interviews		37
		Total cases		28