Building Constructive Innovation Networks: Role of Relationship Management

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Abstract: In response to the growing demands for innovation, networked arrangements that draw together and synthesize the knowledge resources of multiple organizations and sectors have come to the fore-front within the construction arena. Because they are based on a relational governance principal, these new arrangements require management strategies and techniques that may not be synonymous with conventional approaches. Drawing on the Cooperative Research Centre for Construction Innovation as an example of an interorganizational innovation network, this case study examines its formation and operation to determine the role that relational governance plays in these new arrangements and to provide insights into the relationship-based management strategies employed. The case study indicates that although a mix of governance modes supplements the relational approach, network management remains a critical, if often overlooked, function. Based on the findings, a preliminary relationship management framework is presented as well as some key lessons for those responsible for the architecture, operation, and administration of these innovation networks.

Interorganizational Innovation Networks in Construction

The building and construction sector is one of the five largest contributors to the Australian economy and is a key performance component in the economy of many other jurisdictions (Hampson and Manley 2001; Manseau and Shields 2005). However, the ongoing viability of this sector is increasingly reliant on its ability to foster and transfer innovated products and practices. The conventional process for facilitating innovation has centered on the establishment of specialized publicly funded research institutions, limited and contested higher education funding and internal industry research and development units (Manseau and Seadon 2001). Increasingly, however, these largely internally orientated and linear models have been found to be insufficient to meet the need for large-scale innovation such as is required to continue to drive the construction industry forward. In their stead, interorganizational and cross-sectoral networks, which bring together key industry stakeholders and facilitate the accelerated flows of information, resources and trust necessary to secure and diffuse innovation, have emerged as a key strategy within this and other arenas (Anderson and Manseau 1999; Miozzo and Dewick 2002;

Swan et al. 2003; Dewick and Miozzo 2004). Through the network relationships, participants are able to secure a stable flow of resources (Thorell 1986), take advantage of economic efficiencies (Jarillo 1988), and tap into their partners' opportunities (Inkpen 1996). However, it is the accelerated opportunities for information and knowledge sharing coupled with the capacity to synthesize and leverage these learnings into new and innovative outcomes that provides the greatest advantage within networks (Conway 1995; Powell et al. 1996; Huxham 1996).

Thus current innovation paradigms emphasize the need for multidisciplinary and interactive knowledge production between universities, research institutions, and relevant industries, and are described elsewhere as the "triple helix model" (Leydesdorff 2000) or the dynamic innovation model (Lundvall 1992; Manseau and Seadon 2001). The highly porous nature of the boundaries between these sectors allows for the enhanced transfer of information, knowledge, resources, and people, and results in the formation of a new innovation location or domain occurring at the point at which these three sectors overlap. The formation of this new innovation domain is depicted in Fig. 1.

The blending of organizations and sectors into networked organizational forms extends the previously dichotomous use of markets and hierarchies as principal organizing forms (Williamson 1975) and introduces a relational or network mode of operation (Powell 1990; Bureau of Industry Economics 1991) to industries such as construction. However, because networks function on a relational operating logic, they require governance and management considerations that challenge preexisting management strategies. In particular, as Gann and Salter (2000) and Ling (2003) have noted, the role of relational governance and its management are not particularly well understood with respect to the operation and durability of hybrid organizational types.

As network arrangements have become important strategic options, the ability to utilize relational governance modes and isolate management strategies for effective outcomes has become a key consideration for both practitioners and researchers.

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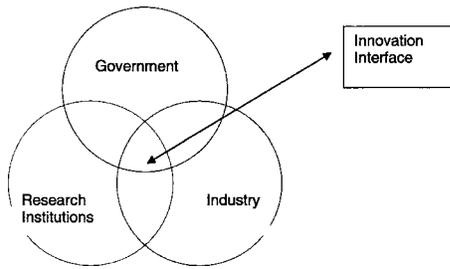
Fig. 1. Trisector innovation interface

Study Objectives

This case study informs this debate by interrogating the Cooperative Research Centre for Construction Innovation (CRC CI) to gain a more in-depth understanding of its governance arrangements and in particular its relational management strategies and actions. Because it brings together industry and government research users and university and national research providers in the property and construction arena under the one organizational ambit (Hampson et al. 2003), the CRC CI presents as a useful example of a collaborative research initiative. A further key feature of the CRC CI is that unlike many earlier and existing networked models, it extends beyond an emphasis on limited government sponsorship or formalized "hard dollar" contracts as central organizing principles (Cooper 1997; Seadon 1997; Gann 2000; Hampson and Manley 2001) to include a more deliberate long-term relational approach. The CRC CI is also distinguished by a longer-term funding commitment by the Australian national government, allowing for a greater stability and depth in these relationships. As such, the CRC CI aligns with the new innovation models as depicted by Winch (2005).

The CRC CI's apparent success in contributing toward increased innovation production and diffusion in the construction area over a relatively short period of operation is an additional rationale for its examination. Indeed, independent economic experts estimate that Construction Innovation's work will deliver in excess of $500 million toward Australia's Gross Domestic Product (GDP) over 15 years (ACIL Tasman 2005). Further, the results chronicled in its 2005 Annual Report indicate that, as well as meeting required academic deliverables, the project is providing tangible outcomes including software packages to evaluate noise management options and three-dimensional computer-aided design models that allow for direct assessment of the environmental impact of material selection options and automated estimating of material quantities and costs (CRC CI 2005). Importantly, industry partners are benefiting from the increased information engendered from the projects both in terms of new products and processes. Industry is benefiting from innovation templates for small and medium sized enterprises to improve their innovation performance and government is able to develop a more evidence-based policy. Research users and researchers alike are also benefiting from developing stronger networks throughout the industry—at both a personal and institutional level. A further indication of the success of the CRC CI is the expansion of the number of members and cash and in-kind investment in support of the second round bid for funding from 2007 (CRC CI 2005, 2006).

In order to build an analytical framework against which the operation of the CRC CI can be assessed, the next section sets out a typology of the main governance modes as well as their associated integration processes and management strategies. Following this, the research methodology for the case study is described, the findings highlighted and discussed and finally some key lessons for working in a networked model are distilled.

Examining Governance and Management Modes

The term governance deals with the processes and systems by which an organization or society make decisions about how it will operate. The broader public policy governance literature has identified three main modes or models of social integration: the hierarchy, the market, and social networks (Powell 1990; Thompson et al. 1991; Lowndes and Skelcher 1998). Each of these models represent alternative ways of organizing and is underpinned by a set of ideological assumptions and principles that guide their integrating mechanisms and optimal management approaches.

In the hierarchical model, "legitimate" authority provides the means of integrating and regulating the relationships between actors into a functional system of operation (Lowndes and Skelcher 1998; Considine and Lewis 1999). The strategic arrangements through which outcomes are realized center on procedures, rules, regulations, mandates legislation, and routines. Therefore traditional management is primarily vertically oriented and is based on the activities of planning (establishing organizational goals), organizing (structuring and designing the organization), and leading (directing and coordinating) to achieve goals (Agranoff and McGuire 2001a).

In contrast, the market mode of governance emphasizes private sector organizations operating through contractual transactions based on the concepts of demand and supply. For the market model the integrating mechanism is the formalized, mostly legal, contractual arrangements that use price signals to bring dispersed suppliers and purchasers together for short and highly specified exchanges (Thompson et al. 1991). Management in this context is through arms-length transactions using written contracts and formal agreements and is based on reliable performance specifications.

The network governance mode has a different logic of operation. It is based on a social or communal organizing principle and is underpinned by interpersonal relational aspects such as trust, reciprocity, and mutual benefit (Powell 1990; Kickert et al. 1997). Relationships, while valued as ends in and of themselves, are also leveraged to achieve synergistic outcomes that are not possible in single agency or committee operating modes or by contracts. Management within the network governance mode is therefore not top-down and does not center on the concept of a self-interest contract. Instead the idea of network management is very much focused on building relationships in which trust and reciprocity come to the fore (Agranoff and McGuire 2001a; Koppenjan and Klijn 2004; Keast et al. 2006). Drawing on the network and governance literature, Table 1 sets out the core relational aspects of each of these governance modes and their idealized associated integration mechanisms and management foci.

The benefit of this typology is twofold. First, by unpacking and specifying the core governance aspects and related integration methods and management strategies, it adds to the array of implementation tools available to construction managers. A second more immediate contribution of the framework is its provision of a heuristic device to guide the exploration of the case study.

Table 1. Governance Integration Relations, Mechanisms, and Management Schema

Governance mode	Hierarchy	Market	Networks
Integration relationship orientation	Authority relationships	Exchange relationships	Social/communal relationships
Key integration mechanisms	Centralized and legitimate authority, rules, regulations, procedures and legislation	Formalized, legal contractual arrangements, arms-length transactions, bargaining	Interpersonal trust, mutuality and reciprocity
Management focus	Administrative management	Contractual management	Relational management

Note: Adapted from Keast et al. (2005, 2006).

Research Methodology

To build the case study, a set of 11 semistructured interviews was conducted with identified key network members involved in the establishment and early operation of the cooperative endeavor. This "purposeful sample" (Patton 1990) of key informants was selected for both their early involvement in the establishment of the CRC CI initiative and ongoing contact, allowing for a historical account of the process of formation and early operation of the network. Each of the key informants occupied a senior executive position within a government department, contract organization, and financial institution or was an academic. All 11 identified key informants contacted agreed to participate in the interview process, with nine of the nineteen formative organizations represented in the study.

Questions focused on the establishment, expectations, relationships, and implementation process of the CRC CI during its establishment and early phase of operation. Although the interview was administered through an informal process, an interview schedule was used to ensure that all questions were completed and as a mechanism to control the level of interviewer-induced bias (Patton 1990). By tapping into the participants "lived experience" of the network, the relationships between actors and the processes undertaken to facilitate this way of working (Yin 2003), a clear picture of the network process could be developed (Marshall and Rossman 1989). Documentary evidence was utilized as an additional source of information as well as to provide confirmation of statements and direct alternative enquiries. The use of multiple data sources also allowed for triangulation across responses to occur, thus enhancing the validity of the results.

Having identified the research methodology, the following section provides an introduction to the case study organization and describes its governance and management processes.

The Case of the Cooperative Research Centre for Construction Innovation

The CRC CI was formally established in July 2001 to: "Enhance collaboration between researchers, government, and industry involved in the construction and property arena to deliver innovative outcomes required for growth and viability" (CRC CI 2003). Specifically, the aims of this initiative centers on delivering tools, technologies, and management strategies that will improve the long-term effectiveness, competitiveness, and dynamics of a viable construction industry (CRC CI 2003).

The project was made possible through a 7-year $14M grant through the Cooperative Research Centre Program initiated by the Australian government to foster and facilitate cross-sector research and development activities that have national economic and social importance (CRC CI 2003). This funding was coupled with $50 million cash and "in-kind" support from industry, research, and government partners. The CRC CI currently comprises 19 industry, government, and research partners occupying a complementary niche around the property and construction value chain, as well as a body of researchers across six institutions involved in and supporting the endeavor. In bringing together and molding this disparate group of construction stakeholders into a functioning network, it was envisaged that collective action toward innovative outcomes would transpire. The overall purpose of the CRC CI is articulated as: The formation of the CRC was driven by a mutual recognition of the need to *lift the game* and leverage on individual strengths through national and international collaboration. Participants around the value chain have joined together to strive to achieve this (Hampson et al. 2003).

In this way the CRC CI network model centers on the transformation from individual efforts or occasional project-based coalitions to a strategic interorganizational network focused on harnessing the capacities of all stakeholders toward innovative excellence, and leveraging from that to enhance and sustain the viability of the industry.

Governance and Management within the CRC CI

The interview process has revealed that considerable time and effort was directed to developing connections with potential partner organizations and establishing the level of rapport and mutuality necessary to build an interorganizational innovation network (Interviews April 16 and May 7, 2003). An appreciation of the important role of such interpersonal relationships to facilitate the creation of innovation within the CRC CI was evident in most responses (Interviews April 29 and May 28, 2003). Indeed, for a number of respondents there was an early and strong realization that to achieve the goals of the CRC CI, it was necessary to move beyond a competitive orientation and focus on building and nurturing more cooperative relationships (Interviews March 28, April 2 and 4, 2003).

There was also recognition that this process of relationship development did not happen on a greenfield site as former long-standing personal associations frequently existed between respondents (Interviews March 12, April 4 and 29, 2003). The following statement is indicative of the situation; "There were already relationships there, good personal links between us from past work that helped" (Interview April 16, 2003).

On securing the agreement or buy-in from participants, a more formalized contractual undertaking was sought. Thus, in addition to these hierarchical governance processes and related management strategies, the CRC CI also draws on the market mechanisms of contractual arrangements and agreements between participating members as a key integrating process. In these contracts, each of the member organizations undertook to make financial and for some also in-kind contributions to the project. However, it was interesting to note that several respondents commented on the need for both formalized and relational contracting as a preferred mode of transaction because it recognizes the in-

completeness of formalized contracts and the fact that they can be subject to unforeseen changes (Interviews April 4 and 16 and May 28, 2003).

As well as building networks and support coalitions and securing funding and action commitment through contracts, the CRC CI also made use of a formalized hierarchical structure of a governance board to bring together the 19 stakeholders and the various operational arms of the project, including research committees, and a research agenda covering three areas of focus to provide centralized direction to the work program. Such a structure allows for joint planning and decision making to transpire, both of which are considered key aspects of successful interorganizational operation (Brown 1984). Reflecting this complex and formalized structural arrangement, highly bureaucratic processes such as a schedule for reporting, regulation, and structured agendas are key instruments of linkage (CRC CI 2004). Providing a further level of integration and tasked with implementing the policy and action directions of the Governing Board is a Senior Management Team led by Construction Innovation's Chief Executive Officer. This centralized body acts as a supplementary hub linking the various elements of the CRC CI and, because of its hands-on role, also functions as an innovation broker.

Using the framework provided in Table 1 as a guide, it can be seen that with its application of a hierarchical structure and related operating format and market based contractual agreements, coupled with interpersonal relationships, the CRC CI draws on a mix of governance arrangements. Typically organizational arrangements that use the resources of a number of existing organizations and mix governance modes as a means to "join-up" previously separate entities are referred to as hybrid arrangements (Borys and Jemison 1989). Hybrid arrangements can exhibit a number of possible combinations and recombinations of contact, authority, and trust to form many new types of organizational entities ranging from strategic partnerships to multiorganizational arrangements constituted as corporate entities (Schaeffer and Loveridge 2002). A hybrid approach therefore has the ability to limit or balance out the negative effects of an over-reliance on one governance mode (Lowndes and Skelcher 1998; Menard 2002). For the CRC CI the benefit of a hybrid governance approach is that it supplements the fluidity of network relationships by stabilizing resource flows through and beyond relational agreements to more formalized contractual arrangements and centralizing decision making and action to provide directed action to secure optimal innovation outcomes.

However, the presence of the hierarchy and market modes of governance in forming and directing the operation of the CRC CI aside, as the following section demonstrates, there remains a strong reliance on relationships as an integrating, stabilizing, and motivating factor for collective action.

CRC CI Relationships and the New Management Imperative

The interview responses indicated that while network members understood that the CRC CI has an established and highly organized governance structure and official and conventional management process, they nevertheless saw themselves involved in a different way of working; one that relies on relationships and relationship building as a key endeavor (Interviews April 29 and May 28, 2003). That is, for most respondents there was a strong realization that to achieve the goals of the CRC CI members, it was necessary to go beyond limited authority and contractual

relational processes to establishing and nurturing enhanced interpersonal relationships between people and to a lesser extent between their parent companies. Commenting on the value of relationships in this mode of working, one respondent succinctly stated: "The people issue is more important" (Interview April 2, 2003).

Despite the realization of the importance of relationships in facilitating or lubricating the higher level of information and trust sharing required for innovation, members were cognizant that to achieve outcomes the relationship process had to be more directive or instrumental than "cups of tea" or "cupcake parties" (Interviews April 16 and May 7, 2003). As it was stated: "It doesn't happen simply by people talking about innovation . . . or sitting around . . . and dreaming about this stuff" (Interview April 16, 2003).

Indeed, the observation was frequently made that an overemphasis on process at the expense of direction and action would only result in 'talk fests' to the detriment of outcomes (Interviews April 2, 4 and 16, 2003). Clearly, it was understood and demanded that directed action to drive the relationships and leverage the interactions for outcomes was also required (Interview May 14, 2003). This emphasis on tangible outcomes was stressed in the statement: "You can't just go with soft 'bunny hugging.' You can't be satisfied with the warm inner glow. There have to be outcomes that make a difference" (Interview April 16, 2003).

This view is apparent in the following statement that acknowledged the need for "focused direction to get on with the job" (Interview April 4, 2003). This function has been defined elsewhere as network driving (Keast et al. 2004) and is concerned with the task of keeping the group together but moving toward agreed goals. Within the CRC CI the role of driving and managing the network relationships "to make sure something beyond talking happens" was seen largely as the responsibility of the Chief Executive Officer and the Senior Management Team (Interviews May 7 and 9, 2003). However, it was also understood that network members had a shared responsibility for the operation and management of the endeavor: "The CRC has got to take responsibility to coordinate and make it happen—but so too do industry and government" (Interview April 16, 2003).

Thus, although there was a strong understanding that the CRC CI was about relationships, this was coupled with an equally strong and pragmatic expectation that these relationships should be managed, massaged, and harnessed to ensure that participating bodies achieved individual and collective outcomes.

The next section compares the respondents' comments on relational or network management with the extant public sector literature on network management.

Network Management Strategies and Tasks

Four key network or relational management tasks have been identified within the literature: Activating, framing, mobilizing, and synthesizing (Kickert et al. 1997; Agranoff and McGuire 2001a,b). As the following will demonstrate, although in some ways overlapping, these represent an alternative way of managing and therefore require some very specific and deliberative strategies to put into effect new management principles and techniques.

Activating

Activation refers to the need to identify and select the appropriate actors and stakeholders as well as the ability to tap into their

skills, knowledge, and resources (Agranoff and McGuire 2001a). This is important because "resources like money, information, and expertise are the integrating mechanisms of networks." There was a strong awareness and deliberate strategy on the part of Construction Innovation personnel of the need to identify, attract, and secure "buy in" (Interview May 7, 2003) from participants to the network. For networks within the construction arena, the need to attract and secure relevant players and their resources has been identified as a key task and one which generally resides with the more influential or core network members (Walker and Hampson 2003a). This is evidenced in the following statement, which acknowledged that the involvement of industry and government was central to the formation of the network: "A key strategy was to get enthusiasm from industry and government agencies . . . so our main strategy was to put together an initial program that would excite industry partners and government departments to 'come on board'" (Interview April 16, 2003).

However, as well as focusing on bringing to the table the three big players (industry, government, and research institutions), the CRC CI "cast its net wider to secure a broad membership base" (Interview May 14, 2003). This rationale is explained: "You have to have the right collaborative partners—you have to have the right profile of people because innovation is not single faceted—it is very much multifaceted" (Interview April 4, 2003).

It was widely agreed that as well as the involvement of strategic or higher profile members, the inclusion of innovation "end users," often described by respondents as the "Builder with the 4 tonne 'ute' (or pick-up) and the cattle dog" (Interviews April 4, 16, and 29, 2003), was a central consideration.

At the other end of the scale, a number of respondents identified the strategic use of key or influential personnel as a mechanism to attract high-level industry support and representatives to the CRC CI (Interview April 2, 2003). On this it was stated: "A key task was getting a lead industry Chair—to attract other senior members from Industry to come and sit around the table" (Interview April 16, 2003). As well as providing legitimacy for the project, these higher-level members were also described as providing the "horsepower to get things moving" (Interview April 4, 2003).

Respondents also noted that because of the different skill sets and responsibility levels the CRC CI would necessarily be comprised of members from a number of different operational levels (Interview March 19, 2003). Through the activation process the CRC CI has come to have a broad-based, multilevel membership composition, which has contributed to its structural complexity. In this way, activation is about establishing the structure or shape of the network and creating a legitimate foundation for the network even before interactions take place (Mandell 2000).

Further, by consciously attempting to engage all relevant actors to an issue, the full complement of resources, skills, and knowledge is brought to the project and can be applied to improve decision making (Innes and Booher 1999), leverage of new resources (Lowndes and Skelcher 1998), and secure innovative ideas and solution through synergistic interactions (Huxham 1996; Mackintosh 1992; Powell et al. 1996). There was broad awareness of and expectation by respondents for synergies through interaction and prior relationships (Interviews April 4 and 16, 2003). An example of this is noted as: "A system can have a behavioral outcome, which is completely different from what you might expect from looking at the individual components although it is developing that synergy. All the individuals have their various inputs and fire it up and you will hopefully get some results coming out" (Interview April 2, 2003).

Similarly, respondents were aware of and looked to gain benefit from the potential to leverage off the network capital of the CRC CI and gain added advantages. "So there are great opportunities now that we have leveraged up to be of national and international significance" (Interview April 4, 2003).

The withdrawal of funding by an initial network participant required that some changes be made to the structure and operation of the network and necessitated a refocusing of remaining actors (Interview April 16, 2003). Although initially problematic, this situation provided the opportunity for adjustments to be made and reminded the remaining members of fluidity of network relationships. Overcoming this fluidity and the potential for networks to become static is a further important aspect of network management in this phase. Such "network tinkering" (Kickert et al. 1997) or deactivation is used when the network composition becomes stale or is not working and there is a need to input new resources or energy to bolster the dynamics of the interactions.

Drawing from the previous, it is possible to distill four core activation tasks: (1) the identification and selection of relevant network members; (2) gaining the buy in or agreement of key actors to devote necessary skills and resources to the cause; (3) establishing a structural arrangement that reflects the complexity of both the membership and the task to be achieved; and finally (4) adjusting and enhancing network dynamics through the strategic introduction of new members and/or the removal of nonproductive members.

Framing

Another network management aspect identified from the respondents' comments and consistent with the network management literature was that of *framing*. Framing is a subtle function that involves establishing and influencing the operating rules, values, and norms of the network as well as altering the perceptions of the members so that they can see that more is achieved by working together than singularly (Agranoff and McGuire 2001a). The sense of interdependency and the need for a collective approach is apparent in this statement: "Any one element of the construction industry cannot operate by itself—it has to be a team effort and that is the complexity of the area. Yes, it is a complex web, but I think that people have to realize the reality is that we are in a complex web and if you deny it nothing will ever get done" (Interview April 2, 2003).

With so many diverse members in a network, framing becomes necessary to get members to look at problems from another perspective or differently, to influence the rules of interaction and to recommend different decision-making mechanisms (Agranoff and McGuire 2001a). Within the CRC CI this was described as: "Trying to get people to work together, to seek other points of view—the industry perspectives, which are all different" (Interview April 2, 2003).

That is, in order for the network to be effective, members need to be able to understand and accept each other's point of view and in effect "step into each others' shoes" (Mandell 1994, 2000). In this way, within the CRC CI mutual learning and understanding become the lubricant for more collaborative actions. "And you have a shared understanding and commitment because you know these people both personally and professionally" (Interview April 16, 2003).

The same respondent implied that the existing relationship bonds allowed them to take a "leap of faith" with a high-risk strategy in a previously uncooperative environment. "I knew all the people involved and I saw it from the start and I thought that

it was worth giving it a go because we didn't have any other strategies—we were always struggling in construction" (Interview April 16, 2003).

These "pockets of trust" (Keast et al. 2004) smoothed over some of the riskier aspects of the CRC CI and paved the way for more collective and collaborative action.

In this way framing is used to support the activation stage but is also relevant as a management tool to refocus direction when the network operation is suboptimal. Central tasks at this stage focus on (1) establishing and influencing the operating rules, values, and norms of the network and, in effect, creating "new terms of engagement"; (2) altering member perceptions through the introduction of new information and ideas; or (3) understanding and examining the perspective of other members; and (4) gaining agreement to "work together."

Mobilizing

The CRC CI is about a different way of working that requires participants (and their parent organizations) to let go of their previous, wholly independent orientation and commit to a new collective entity. The process for bringing together these separate entities into a collective unit is described as mobilization (Oberscall 1973). Building a collective identity and shared goals involves convincing others that by working to a shared outcome they can also achieve individual objectives. The relational management emphasis is centered on aligning interests and building consensus (Walker and Hampson 2003b). Interview responses indicate that the CRC CI became mobilized around a need to shift from an independent to an interdependent approach to research and development through more cooperative arrangements (Interviews March 12 and April 16, 2003). The following statement by an industry partner encapsulates the realization of the need for all parties to work together to better achieve their individual and collective goals. "Collective commitment is seen as being the core catalysis for establishing the innovative brokerage function—you can't do it in isolation and you can't do it alone. Federal Government cannot legislate nor do it [innovation research] on its own and academia can't do it on its own. Bring all three parties together and you have created a powerhouse for change" (Interview April 29, 2003).

Within the project, at least initially, the task of bringing or mobilizing the members to a view of the strategic whole and committing to the network (Mandell 1988) was partly achieved through the establishment of a common vision or purpose. That is, there was concerted effort directed toward creating a sense of common ownership of the project by all partners (Interviews March 19 and April 2, 2003): "What we were trying to do was bring together a whole range of different people who had different ideas, different values, and different egos and agendas and bring them together under one dream" (Interview April 4, 2003).

For some respondents the task of molding these disparate positions into a mutual goal was to be achieved through the articulation of individual and mutual benefits (Interviews April 16 and May 14, 2003): "I think that it is about getting together and aligning yourself with a common view and being prepared—you need to be able to understand the value that you can add to the buyer or user of R&D and also on the other side explain to the researchers the need and benefits of working collaboratively in applied ways" (Interview April 4, 2003).

Mobilizing therefore involves forging coalitions and agreements on the scope of network operations: "The construction industry is very competitive and so it was a major barrier to bring

competitors around the table to be jointly involved in research and so we needed to clearly articulate what would be the benefits of doing pre-competitive research which each could then take and apply in their own environments" (Interview April 16, 2003).

It was, however, acknowledged that this task of securing a common view point was difficult (Interviews April 16 and May 14, 2003) because it sometimes involved 'blue sky ideas' often requiring some hard selling (Interview April 16, 2003).

With respect to the task of mobilizing for commitment and action, there was strong agreement by respondents on the important role of a centralized network coordinator to champion the project and draw in and connect members to the network, while at the same time drive the project to secure outcomes. On this role it was stated: "That energy pulled lots of people and ideas together" (Interview April 4, 2003). The value of a strong champion was also noted by a number of theorists including Tatum (1984) and Nam and Tatum (1997) as essential for innovation and innovative practices.

Along a similar line, Agranoff and McGuire (2001a) make the important point that network management also has to do with securing the commitment of network members' individual organizations to work through the network. A number of CRC CI respondents also identified the need to obtain the endorsement of the parent organization, for example it was stated: "We had to get senior management approval and support" (Interviews April 16 and May 14, 2003). It was also observed that this endorsement also afforded network actors the legitimacy to work in a different way and assisted in smoothing the course for funding (Interview April 4, 2003). According to Bryson (1995), the existence of such a higher-level sponsor helps to generate resources and provides formal authorization for the project, making it less susceptible to policy and political changes (Keast and Brown 2002). Thus, innovation development and innovative practices would seem to benefit from the dual support of both champions and sponsors.

Within the mobilizing stage of network management the work emphasis shifts to focus on the following five tasks: (1) the establishment of a common mission or vision; (2) securing member agreement in terms of the scale and scope of action; (3) creating coalitions and interest subgroups as an underlying support infrastructure; (4) supporting network champions in their endeavor to model behaviors and "sell" ideas and identifying sponsors that will provide legitimacy and line of credit; and finally (5) driving the relationships to achieve outcomes.

Synthesizing

As network management is essentially about molding a set of disparate agencies and people into a collective and functioning whole, a key task centers on dealing with the conflicts that members have both within the network and with each other, and also the conflicts that arise from the loyalties they feel to their individual organizations and those they may feel to the network. This relates to the fact that members of a network are also members of individual organizations and come with preconceived ideas, values, and commitments to their organization (Mandell 2000). Within the CRC CI there was some conflict of interest apparent between the network goals and the parent body of some network members (Interviews April 16 and 19, 2003). Refocusing on the imperative for the overall goal of cooperative research outcomes and reasserting the dual benefits of inclusion mostly overcame the potential for individual goals to split the network. "You have to have an imperative. There has got to be something in it for them [individual organizations]. Some need something that drives them

to innovate and that is the promise that they will get better widgets and better economy…and you have to focus on selling that individual and mutual benefit" (Interview March 19, 2003).

The need to acknowledge and work with tensions and in a constructive manner to facilitate creatively was identified by one respondent: "There are still tensions—but creative tensions. This is about changing paradigm stuff—about thinking outside of the box. Getting people to think that this is as much an output of the whole exercise as anything else" (Interview April 2, 2003).

Also identified as an important strategy for keeping members "on board" was a deliberative process of engagement for building and maintaining relationships (Interviews April 16 and May 7, 2003). This action was exemplified in the following: "Constantly going back to industry partners—checking that this is what they want—bringing them along, engaging with them" (Interview April 4, 2003).

For many respondents, the investment of energy and enthusiasm, particularly by the Chief Executive Officer and other core members, provided a stimulating environment and motivated people to stay with the program and contribute fully to the creative agenda (Interviews April 29 and May 14, 2003).

As well as refocusing incentives and building and maintaining relationships, other synthesizing functions undertaken included developing new rules for interactions, cultural adjustments, and changed the roles for members (Kickert et al. 1997; Agranoff and McGuire 2001a, b; Mandell 1990). Similarly for the CRC CI, changing the culture of members and their organizations from competitive to cooperative was considered an essential prerequisite for the program to work. "We cannot be complacent . . . the need to change attitudes and culture is just as important as technology. Attitude changes will lead to better outcomes and thus are necessary to go forward" (Interview April 2, 2003).

The following statement reinforced this view: "The biggest impact on management performance was not something that ran faster, but having a different culture" (Interview March 12, 2003).

Gann (2000) and Dulaimi et al. (2002) have also noted the important role that culture change plays in construction innovation and the need for policies and priorities that reflect this goal.

Finally, the need for enhanced, more effective, and cross-cutting communication among the members was identified as central to achieving synthesis within the CRC CI. Within networked forms, communication must be thick and multidirectional to enable all members to access and draw from the information flows (Ansell 2000). Discussing the construction industry specifically, Walker and Hampson (2003a) argue that effective communication is vital for building and sustaining the relationships necessary for construction innovation. The realization of the need for a comprehensive and shared communication channel to overcome information asymmetry is evident in the following: "There must be communication around the triangle of industry, government and research" (Interview April 16, 2003). Within the CRC CI this need for multiple communication channels was achieved through a comprehensive communication process that included internal mechanisms such as newsletters and email groups and external formalized processes including structured reporting, academic publications, and other media outlets as well as an underpinning Information and Communication Technology platform (CRC CI 2004).

The synthesizing phase creates the environment and conditions for favorable and productive interactions. The main management task revolves around sustaining the relationships by (1) checking levels of engagement and contribution; (2) monitoring that actions and behaviors reflect network principals; (3) establishing and enforcing a network culture as well as developing a communication system able to facilitate high levels of communication and information sharing; (4) removing obstacles and establishing processes to enable members to working through conflict; and finally (5) continually monitoring to ensure that the diverse needs and resources of members continue to be directed toward a common strategic purpose.

This section has shown that within the CRC CI considerable attention has been directed toward alternative management tasks based on relationship building, molding, and driving in order to achieve its goals of innovative outcomes. These actions fall within the broad parameters of network management strategies identified in the literature (Agranoff and McGuire 2001a,b; Kickert et al. 1997). Linking the findings to the actions prescribed by existing theories of network management, while insufficient to demonstrate a direct causal relationship, nevertheless demonstrates evidence of a relationship between the findings and theory and increases confidence in validity of the results (Connell and Kubisch 1998).

It would appear, however, that within the CRC CI this process of relationship management within has proceeded mostly on intuition and vision without the benefit of any guiding framework for action.

Drawing on the available network management literature and the insights distilled from the experiences of the CRC CI respondents, a preliminary relational or network management framework has been developed (see Table 2).

Although preliminary in its conceptualization, the framework offers network managers and administrators within the construction industry some direction on which to base their endeavors to effectively bring in a relational aspect to the management of networks that comprise different organizations and sectors.

Reflecting on Findings

This case study has demonstrated that although the CRC CI is a hybrid network arrangement drawing on a mix of three governance modes, the third pillar—relational governance—and its management was important in establishing the network and continues to be central in maintaining the ongoing commitment of members. The existence and perceived importance of relationships within the CRC CI for achieving a collective approach is consistent with the work of Lowndes and Skelcher (1998) who noted that: "A key to sustaining collaboration appears to involve the underlying presence of network mode of governance even when market and hierarchy predominate." In particular, the enhanced relationships established and maintained between members have acted as a conduit to bring people, resources, and ideas together to foster the synergistic processes necessary for innovation outcomes (Interviews April 2 and 4, 2003). On this it was stated: "It was a successful synergy of people and ideas that led to a realization that we were actually sitting at quite a substantial level nationally and we were promoting and publishing and being sought after internationally for the work that we were doing on this project and others" (Interview April 4, 2003).

Being cognizant of and strategically managing the relationships allowed the CRC CI to move beyond limited contractual and structured organizational arrangements to more beneficial but risky cooperative and collaborative endeavors. The relationships arising from previous contractual and alliance formation were also considered to provide 'fertile ground' for innovation

Table 2. Preliminary Relational Management Framework

Relational management roles and focus	Task components
Activating Forming membership and accessing resources	• Identify and select relevant network members • Access and gain agreement to devote skills, knowledge and resources to the network—the "buy in" • Establish appropriate structural arrangement • Introduce new actors and resources to renew interest and change nonperforming dynamics • Deactivate or disconnect noncontributing members
Framing Shifting orientation from single to collective	• Establish values, norms and rules—new terms of engagement • Introduce and champion new ideas • Encouraging members to view issues from another's perspective • Stressing the benefit of working together
Mobilizing Securing commitment to whole or collective identity	• Establish common vision, mission • Secure agreement on scale and scope of action • Forge coalitions and subgroups for specific actions • Drive action for outcomes • Identify and foster champions and sponsors
Synthesizing Building and maintaining relationships	• Check level of involvement and sense of engagement • Monitor relationships and activities • Leverage resources toward collaborative advantage and collective benefit • Establish network and innovation culture • Deal constructively with conflict • Build communication processes

development (Interviews April 4 and May 28, 2003). In this way, the emphasis on relationships and increased understanding and trust provided a way of limiting contractual disputes and reducing the undertone of competitiveness existing within such arrangements (Interview May 28, 2003). Further, although a highly complex organizational arrangement of often-disparate actors and of significant size and magnitude, the CRC CI has been in existence for more than 5 years. Given the generally short lifespans of collaborative arrangements (Limerick et al. 1998), it would appear that as well as helping to "smooth over" the dual competition-cooperation dilemma faced in hybrid arrangements, a strong relational aspect has contributed to the durability and sustainability of the CRC CI.

However, although clearly important to the successful operation of the CRC CI, it is apparent from the respondents' comments that the relationship orientation and its management coexist with and are supported by two other governance elements. The coexistence of this mix of governance and management strategies was described by one respondent as follows: "It seems to me that the CRC is a top-down and bottom-up structure" (Interview March 12, 2003). Indeed, it was apparent from the respondents' comments that at different times a particular governance mode and its associated management style were more dominant, with, for example, a more bureaucratic process emerging when the program needed direction for rebidding process (Interview March 12, 2003) or at the formation of the network when there was a strong emphasis on relationship building (Interviews April 2 and 4, 2003). This finding lends support to the proposition put forward by Lowndes and Skelcher (1998) and Sydow (2004) that, depending on the stage of development of a collaborative endeavor, different governance aspects, and therefore management strategies, will be more relevant. Clearly the task in this context is to be able to mix and match the governance modes (Rhodes 1997; Brown and Keast 2003) and related management strategies to ensure that they best reflect the context of the network and its stage of development. Further, as it was suggested by Keast et al.

(2006), given the mix of governance modes in place in hybrid arrangements there will also be a need for administrators to be able to move between management strategies and even to use them simultaneously.

In this way, by supplementing fluid network relationships with other governance modes the CRC CI was able to stabilize resource flows and provide the directed action necessary for innovation. Also the CRC CI has demonstrated the importance of actively and strategically 'managing' networks to ensure that the investment in relationship building is capitalized on and directed to innovation outcomes.

Lessons and Conclusions

Interorganizational networked based arrangements have emerged as new measures to facilitate innovation development and diffusion within the construction industry. Understanding the operation and nuances of network governance and the isolation and identification of network management strategies is now a core consideration. This case study has generated several insights into the governance and management of interorganizational innovation networks. First, it has demonstrated that although interorganizational innovation networks are based on an underpinning relationship principal, they can draw on a mix of governance arrangements to create the necessary context for these relationships to be leveraged into productive outcomes. Second, the case study provides support to other network governance research findings that the mix or importance of governance modes will shift according to the stage of development of the network and the nature of the tasks it is undertaking. Third, although relationships are an important aspect of networks, the case study has demonstrated that they must be strategically managed to secure optimal outcomes. Finally, by unpacking the network management strategies employed by the CRC CI, a level of congruence

was found with the broader network management literature and as a result a preliminary framework for network management has been presented.

To conclude, network-based arrangements have come to the fore as previously competitive organizations seek to work together and draw on each other's innovation capacities, share knowledge, and gain collaborative advantage. Although acknowledging the importance of conventional management strategies and techniques in the operation of hybrid arrangements, it is concluded that the high level of interpersonal interaction involved in these complex network arrangements also requires the application of specific network management processes to mold and adjust relationships for the collective action necessary for innovation development and technology transfer.

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