To Join or Not to Join: Individual and Sub-organizational Factors Affecting Industry Membership in University-based Cooperative Research Centers[1][2][3]

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ABSTRACT

Since the early 1980s the US government through federal legislation has worked to increase public-private partnerships to help drive industrial innovation and economic progress (National Science Board, 2006). Cooperative Research Centers (CRCs) are one such mechanism, enabling industrial organizations to collaborate with both universities and government agencies. These university-based CRCs operate as linkage mechanisms (Gray, 1998), bridging the culture gap between academia and the private sector. Understanding the motivations and processes through which these partnerships initiate and evolve is important to their continued success. From existing research we know what environmental and organizational factors signal an increased likelihood for partnerships to occur. However, beyond these initializing conditions little is known about how organizations discover potential partners and subsequently decide whether to pursue a formal partnership arrangement.

This current study applied a mixed methods approach to identify factors within organizations that could explain how industry-university partnerships happen. Two preliminary studies were conducted to explore pre-collaborative exchanges between university-based CRCs and their prospective member organizations. These first two stages of research revealed underlying communities of university researchers, industrial technologists, and government scientists. Within these communities reside networks of actors engaged in dynamic relationship exchanges that propagate formal partnership considerations. Further, semi-structured

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interviews with organization representatives brought to light a varied and often increasingly elaborate process regarding decisions to partner with university-based CRCs.

The final stage of research administered a structured survey to a sample of industrial and public organizations. A series of regression models identified the unique and relative effects of decision outcome predictors across several domains of analysis. I found support for network-based perspectives on the development of industry-university partnerships. However, the influence of network relationships rested primarily on the initiation of the partnering decision. Technical and non-technical characteristics of the CRC, as well as sub-organizational and individual variables, were found to be most predictive of actual decision outcomes.

KEYWORDS: I/U Collaboration, Decision-making, Predictive model, Networks, Strategic behavior, Transaction cost

INTRODUCTION

Industry not only serves as the primary funding source for the national innovation system, but also has been increasing its share of university funding over the past several decades. Industry-university cooperative research centers are one mechanism through which industry investments in academic research are made. Understanding what drives industry to engage in research joint ventures with universities can help university administrators and policy makers strengthen relationships with industry. However, much of the theoretical and empirical literature on research joint ventures has failed to account for individual and sub-organizational factors that may explain why an organization chooses to collaborate in the first place. The purpose of this study is to expand on what is already known about industry-university collaborations, by first exploring the role of individual and sub-organizational factors, and then quantifying their effect relative to industry-level and organization-level factors.

Theoretical literature

Transaction cost theory (Williamson, 1975) appears to have set a benchmark challenged by subsequent theories. Transaction cost places the pursuit of lower cost alternatives as a central motive for collaboration (Kogut, 1988; Olk & Earley, 1996). Organizational networks theory has introduced the role of trust and familiarity into the collaboration equation (e.g., Gulati & Gargiulo 1999; Uzzi, 1996). Authors like Ring and Van de Ven (1992, 1994) and Olk (1998) have recognized the absence of the individual in theories on joint ventures. In their work on network formation processes the authors effectively extended organizational networks thinking down to the individual level of analysis. Strategic behavior or strategic choice theories have argued that organizations are motivated by profit maximization rather than cost reduction. Still other theories have been more concerned with assets than with profits. For example, resource dependency has posited that organizations will collaborate based on a mutual and comparable need for the other's resources. I briefly review each of these theories below.

Transaction Cost

Kogut (1988) examined transaction cost theory in the context of Research Joint ventures (RJVs), which the author characterized as two firms pooling resources under a common legal organization. According to

Kogut, transaction cost theory deals with how a firm chooses to interact with its environment. Fundamentally, a firm will extend its boundary into the environment if to do so will help minimize costs. These costs include both production costs and transaction costs. Hagedoorn et al. (2000) suggested that production costs may vary from firm to firm, depending on propriety knowledge and operational capacities. Transaction costs may also vary across firms. Kogut defined transaction costs as "expenses incurred for writing and enforcing contracts, for haggling over terms and contingent claims, for deviating from optimal kinds of investments in order to increase dependences on a party or to stabilize a relationship, and for administering a transaction (p. 320)." Transaction costs can be high when contracts are incomplete. This is particularly the case when contracts involve intangible assets, like contracts for the generation of knowledge from research (Hagedoorn et al., 2000).

A firm may conduct its own research, contract with another institution for research, or engage in an RJV. For two firms to engage in an RJV at least one firm must perceive the costs of internal development, external contracts, or acquisition to exceed the cost of engaging in joint research (Kogut, 1988). Under these conditions, RJVs can reduce costs through shared investments. Critical to the RJV, however, is how uncertainty is resolved through mutual control and evaluation of performance. Transaction cost places significant emphasis on governance structures as a means of minimizing opportunism among parties. This reliance on governance structures depreciates the importance of trust and familiarity in partner selection, and this has become a main criticism among alternative thinkers (e.g., Granovetter, 1985; Uzzi, 1996).

Organizational Networks

Network theories of joint ventures seem to have emerged in response to the transaction cost literature. Granovetter (1985) described transaction costs theories as accepting an under-socialized view of human action; that is, organizational behavior is rational and utilitarian, unfettered by social relations or social structure. This new institutional economics, as Granovetter called it, is represented in the work of Williamson (e.g., Williamson, 1975). In contrast, Granovetter raised the question of why people prefer to collaborate with familiar parties rather than with strangers. If Williamson's new institutional economics holds up, then firms would rely entirely on institutional arrangements or a general morality as protection against opportunism, rather than on familiarity or past experience. For Granovetter social networks play a significant role in determining

exchanges among actors in a system. More recent authors have repeated this criticism of transaction cost theory under the organizational networks rubric (e.g., Uzzi, 1996; Gulati & Gargiulo, 1999).

Underlying organizational networks is the concept of embeddedness, or the idea that an organization's behavior is affected by its relationships in the network. Here, past and repeated transactions determine a firm's network position (Granovetter, 1985; Olk & Earley, 1996). Uzzi (1996) proposed a causal framework for embeddedness, based on his ethnographic and empirical work. For Uzzi, initial exchanges stem mainly from prior relationships between actors or via third party introductions. These first exchanges serve as grounds to demonstrate reciprocity and establish trust between actors. As trust builds, the parties begin to engage in what Uzzi called "thick information sharing," which engenders joint problem solving and collaboration. Similarly, Gulati and Gargiulo (1999) offered a taxonomy of embeddedness that includes elements of both relationship type and network position. For these authors, relationships among organizations in a network can be either relational or structural, with the former referring to direct ties and the latter to indirect ties. Relationships can also be positional. Here an organization may be centrally located with many ties in the network, or peripherally located with fewer ties.

Network Formation Processes

A body of literature parallel to organizational networks has attempted to explain the influence of individual-level networks on inter-firm collaborations. Geisler (1995) referred to these theories as interaction theories, while Dill (1990) described them as following a process perspective. Most subsequent authors in this literature have categorized this perspective under a network formation nomenclature (e.g., Doz, Olk, & Ring, 2000; Kreiner & Schultz, 1993; Olk & Earley, 1996; Ring & Van de Ven, 1994). These theories are closely linked with organizational networks in that both are grounded in social networks and emphasis the role of trust and familiarity as antecedent conditions to collaboration. Further, both frameworks take a critical stance against Williamson's new institutional economics (e.g., Uzzi, 1996; Ring & Van de Ven, 1992; Zajac & Olsen, 1993).

What makes network formation processes distinct from organization networks is the former's focus on individual actors. While organizational networks recognize networks at both the individual and organizational levels, much of the empirical work has focused on organization-level dyads (e.g., Gulati & Gargiulo, 1999;

Powell, Koput, & Smith-Doerr, 1996). In juxtaposition, researchers in the formation processes camp have proposed formation models at the individual level. For example, Kreiner and Schultz (1993) examined informal collaborations between universities and industry through a series of qualitative interviews. The authors' three-stage formation model includes the discovery of potential collaborations via informal encounters, exploration of opportunities through the sharing of information within an expanding network, and finally the crystallization of collaborative relationships.

Other models follow a similar, logical progression of network formation. Ring and Van de Ven (1994) described the formation process as moving from emergence, through development, and finally into evolution. The authors' development stage includes a sequence of processes involving the negotiation of terms, mutual commitments, and the execution of agreements. Olk and Earley (1996) offered a model that mirrors the emergence and development stages of Ring and Van de Ven (1994). Important to Olk and Earley and other formation processes thinkers (e.g., Ring and Van de Ven, 1992, 1994; Kreiner & Schultz, 1993; Zajac & Olsen, 1993) is the role of trust throughout the network formation. High levels of trust can minimize uncertainties and also motivate parties toward more informal negotiations and agreements. When trust is low members will be more likely to rely on formalized governance structures.

Strategic Behavior

While transaction cost explanations of RJV formation focus on a firm's drive to reduce its costs, strategic behavior theory holds that a firm's primary motivation is to improve its competitive position and maximize profits (Kogut, 1988; Olk & Earley, 1996). Further, strategic behavior theory argues that a firm will consider long-range outcomes, and as such may engage in more costly behaviors in the near-term if such behaviors will improve its competitive position in the longer-term. While under transaction cost theory a firm will select its partner based on the estimated cost of the arrangement, strategic behavior theory suggests a firm will select a partner based on the expected impact to its competitive position. Similarly, Hagedoorn et al. (2000) reviewed strategic management theory, which holds similar tenets as strategic behavior theory. The authors reviewed five variations of strategic management thinking; the commonality is that collaboration is based on improving a firm's competitive position.

Resource Dependency

According to this theory, firms collaborate in order to acquire resources necessary to achieve their goals. Olk & Earley (1996) referred to these theories under the power dependence moniker. The authors stated that organizations would enter a joint venture when two conditions are met: each has resources the other demands and organizations have a comparable level of demand for those resources. With regard to research collaborations Dill (1990) offered three levels of resource dependency. At the first level, a firm engages in a research contract for an identifiable service, while remaining generally independent from the service provider. The next level includes the sharing of resources under a legal contract toward accomplishing certain objectives. Here, Dill includes RJVs, consortia and industry-university collaborations. The final level is the merger or the legal joining of two firms into a single entity.

Empirical literature

The empirical literature covers a range of collaborative arrangements, from strategic alliances and industry-based consortia to industry-university cooperative research. Studies that directly assess differences between RJV members and non-members are limited, with most studies sampling from current members and exploring relationship processes (e.g., Doz, Olk, & Ring, 2000), relationship intensity (e.g., Santoro & Chakrabarti, 2002), or benefits realized by members (e.g., Lee, 2000). Unfortunately, several of these studies suffer from either design or analysis weaknesses. In this section I examine the empirical literature according to the type of collaborative arrangement studied. These include industry-based consortia, government-funded programs, and more specifically, university-based CRCs.

Consortia and Alliances Studies

The studies reviewed here examined consortia registered in accordance with government program stipulations. Doz, Olk, and Ring (2000) and Hayton, Sehili, and Scarpella (in press) identified consortia formed under the National Cooperative Research Act beginning in 1984. While Doz and colleagues used survey responses from consortia managers and member firm representatives, Hayton and colleagues analyzed existing panel data for consortia member and non-member firms, in order to identify conditions antecedent to consortia membership. One weakness of such data is whether the Registry is representative of industry consortia in

general, as registration was not a mandate on firms engaging in consortia activities. As such, the Hayton et al. database may have included firms participating in consortia but not identified as consortia members. Further, the database may have also contained firms registered as consortia that never engaged in consortia activities. For example, Doz et al. identified several registered consortia that were essentially two researchers from different firms operating under an informal agreement. Other firms registered for anti-trust protections, rather than for an explicit strategic initiative. Sakakibara (2002) conducted a similar panel data analysis in Japan, using a comparable approach as that applied by Hayton and colleagues. Together, these two studies are among the few that compared member firms against non-member firms.

Government Program Studies

RJVs stemming from government programs offer a closer approximation of the university-based CRC context, as these collaborations are more likely to involve a combination of industrial firms and universities. Studies of two different government programs are reviewed in this section. Quintas & Guy (1995) studied firms collaborating under the United Kingdom Alvey program, which was designed to address the region's declining market share in the information technology (IT) industry. The program was designed to spur pre-competitive R&D among IT firms, universities, and government facilities, and to establish technology communities among these institutions. The second study focused on the Advanced Technology Program (ATP) in the United States (Hall, Link, & Scott, 2001). The ATP was designed to improve the region's global competitive position through the development and application of generic technologies. Both these programs, Alvey and ATP, encouraged industry to work with universities, though not all participating firms did so. Still, these generally descriptive studies offer more explicit insights into decision processes and criteria applied by firms when choosing to collaborate.

Industry-University Studies

Several studies have been conducted regarding reasons why firms participate in industry-university collaborative arrangements, though few have been conducted with sufficient sample size and adequate statistical conclusion validity. Further, there is significant variation in the intensity and structure of university-industry collaborations under study. For example, Lee (2000) examined collaborations that mainly involved a single

faculty member working with a firm on a specific project. Santoro and Chakrabarti (2002) and Adams, Chiang, and Starkey (2001) conducted studies of collaborations that included both NSF-funded and non-NSF funded cooperative research, while Feller, Ailes and Roessner (2002) focused exclusively on the NSF-funded Engineering Research Centers (ERCs).

Significant differences were evident across these studies. The list of strategic reasons for collaborating with a university employed by Lee (2000) included eight factors. Feller et al. (2002) included 16 items, and Santoro and Chakrabarti (2001) included 7 items. Further, authors tended to entangle motivations for collaborating with barriers to deriving benefits. For example, Feller and colleagues, Hall et al. (2001), and Quintas & Guy (1995) recognized IP agreements as a barrier to effective collaborations, while Santoro and Chakrabarti (2001) include flexible IP arrangements as an antecedent to collaboration. When, to what extent, and with what kinds of organizations these factors influence decisions to collaborate with universities remains unknown.

Conclusions

The literature on collaboration, and in particular industry-university collaboration, has uncovered limited knowledge regarding factors within the organization that determine decision outcomes. Theoretical work has maintained a focus on the industry-level and organization-level, and has succeeded in gaining empirical support at these higher levels. The table below offers a summary of the factors found to influence RJVs at the organization-level and the industry-level.

Table 1: Summary of Organization-level and Industry-level Factors

Factor	**Definition**	**Influence on collaboration**	**Empirical support**	**Study focus**	**Associated theory**
Industry-Level					
R&D appropriability	Perceived effectiveness of patents to protect product/ process innovations	Low appropriability is linked to consortia membership	Sakakibara (2002); Hayton et al. (in press)	Consortia	Industrial organization models

Factor	Definition	Influence on collaboration	Empirical support	Study focus	Associated theory
Inter-dependencies	Shared needs, threats, or other dependencies among firms in the market	Perceived inter-dependencies linked to emergence of consortia	Doz et al. (2000)	Consortia	Resource dependency
Organization-level					
R&D intensity	R&D spending as a proportion of sales; Ratio of R&D funds to net sales	Higher R&D intensity is linked to consortia membership	Sakakibara (2002); Hayton et al. (in press)	Consortia	Strategic behavior
R&D capabilities	R&D intensity relative to the industry average	Higher capabilities linked to consortia membership	(Sakakibara, 2002)	Consortia	Organizational learning
Organization-level					
Firm age	Number of years in operation	More established firms linked to consortia membership	Sakakibara, (2002)	Consortia	Organization networks
Performance change	Whether a firm is experiencing or expecting a decline in performance	Declines in performance linked to consortia membership	Hayton et al. (in press)	Consortia	Strategic behavior
Triggering entity	Firms, agencies or individuals trigger the formation	Presence of a trigger linked to emergence of consortia	Doz et al. (2000); Quintas & Guy (1995)	Consortia	Network formation processes
Relational embeddedness	Direct link between firms—e.g., prior relationships	Increased likelihood of collaboration	Gulati & Gargiulo (1999); Powell et al. (1996); Uzzi (1996)	Strategic alliances	Organization networks, Network formation processes
Structural embeddedness	Indirect link between firms—e.g., third party	Increased likelihood of collaboration	Gulati & Gargiulo (1999); Powell et al. (1996); Uzzi (1996)	Strategic alliances	Organization networks, Network formation processes

In addition, empirical studies of government programs have identified possible sub-organizational factors that may influence decision to engage with universities. These factors are outlined in Table 2. Importantly, these

studies were not designed specifically to uncover variables that impact university collaborations; these findings should be viewed as tentative implications. To some extent, the qualitative work by Feller and colleagues (2002) provided supporting evidence regarding the influence of these factors, but more research is needed.

Table 2: Summary of Possible Sub-organizational Factors

Factor	**Definition**	**Influence on collaboration**	**Empirical support**	**Study focus**	**Associated theory**
Funding source	Source of R&D funds within the firm	Greater autonomy in R&D group can increase external collaboration	Quintas & Guy (1995)	Gov. programs	Organization learning, Network formation processes
Involvement in decision	Groups within the firm involved in collaboration decisions	Greater autonomy in R&D group can increase external collaboration	Quintas & Guy (1995)	Gov. programs	Organization learning, Network formation processes
IP agreements	Negotiation of IP agreements between parties	More flexible agreements can increase likelihood of collaboration	Quintas & Guy (1995); Hall et al. (2001)	Gov. programs	Organization learning, Network formation processes
Past experience with universities	Prior collaboration experience with a university	Prior experience can negatively affect future collaborations	Hall et al. (2001)	Gov. programs	Organizational networks. Organization learning

The studies focused on industry-university collaboration uncovered various aspects of the decision process and underlying motivations in the organization. First, the decision maker is somewhat elusive. Lee (2000) targeted technology managers while Adams and colleagues (2001) surveyed R&D lab directors. The qualitative interviews conducted by Feller et al. (2002) identified at least two ERC stakeholders in the firm: the primary contact with the ERC and a higher-level manager with approval authority. Second, both the Feller et al. study and the Santoro and Chakrabarti (2001) study highlighted the importance of a tangible outcomes to the organization, as well opportunities for knowledge transfer, access to center expertise, and the alignment of center research with the needs of the organization. Further, Santoro and Chakrabarti identified the importance of an organic and adaptable organization culture and the presence of a center champion within the organization to

industry participation in university-based CRCs. These results combined with findings from government program studies (e.g., Quintas & Guy, 1995) imply a multi-faceted decision process that possibly involves R&D staff and managers, operations or business staff, and legal staff for IP negotiations.

Overall, empirical investigations concerning motivations behind industry collaborations with universities have largely addressed organization-level, strategic concerns without consideration to decision-making processes that precede decisions to collaborate. While previous studies offer some insight into why organizations decide to collaborate with universities, it remains largely unknown from these studies how decisions are made, who gets involved, and what factors influence decision outcomes.

PRELIMINARY STUDIES

Two preliminary studies were conducted to explore different perspectives on early stages of industry-university interactions. The first study involved a web-based survey with CRC directors in the NSF-IUCRC program. The survey was designed to assess recruiting strategies employed by directors, as well as the outcomes attributable to those strategies. Five main topic areas were included in the survey form: center director characteristics, structural characteristics, center marketing tactics, perceived membership drivers, and recruitment outcomes. Results of the survey were leveraged in the design of the second study, a semi-structured interview with a sample of industry representatives involved in decision regarding IUCRC membership. The purpose of this subsequent study was to better understand the industry perspective on university collaboration, and the decision process followed by organizations considering membership in a university-based CRC. For a review of these preliminary studies, see Rivers (2009).

METHOD

Research Questions

The absence of empirical work on factors within organizations that affect decisions to collaborate with universities presents an opportunity to explore a range of variables and relationships. The preliminary interviews with organization representatives generated a host of propositions regarding the decision process and the factors that influence outcomes. Here I will focus on what appear to be the most predictive of actual decision outcomes. In general, this stage of the research will seek to quantify aspects of the decision process and to uncover the unique and relative effects of variables across multiple domains of analysis.

Research Design

This is a cross-sectional predictive study on organizations that recently made a decision regarding membership in a university-based CRC. The primary dependent variable is the organizations' decision to accept or decline membership. Data were gathered primarily through a self-administered web-based survey with organization contacts. Secondary data regarding CRC characteristics were pulled from CRC program archive databases housed at North Carolina State University's Innovation Studies Lab (e.g., Gray & Rivers, 2007a).

Population

The National Science Foundation (NSF) Industry-University Cooperative Research Center (IUCRC) program represents a segment of a much larger population of industry-university (IU) research transactions. Hall (2004) described four unique categories of industry support for university research. First, industry supports individual faculty researchers through grants or consulting arrangements. Such interactions are often informal. In the second category are formal, collaborative projects involving a university and one or more industrial firms. The ATP program studied by Hall et al. (2001) constitutes one example. The third category is large, university-based R&D labs not affiliated with any federal funding programs but involving multiple industry members. Hall referenced the Stanford Center for Integrated Sciences as an example. IUCRCs, ERCs, and other federally supported programs comprise the fourth category.

Sampling Frame

The sample for this study was drawn from the NSF IUCRC program. The IUCRC program has been an active and successful linking mechanism for industry and universities since the early 1980s. According to Gray (1998), by 1997 more than 80 universities were participating through 55 IUCRCs, working with 700 industry members. More recent numbers show little variation. Gray and McGowen (2008) reported 34 active centers and three newly formed centers, represented by a total of 84 universities. Further, the program boasts over 600 memberships from industry and government agencies, with NSF funding of roughly $6.7M and industrial funding of nearly $26M. Data from preceding years indicate stable industry and university involvement levels (e.g., Schneider, Rivers, & Gray, 2006; Gray & Rivers, 2007a).

Procedures

A two-stage sampling approach was followed in this study. First, IUCRC directors were approached for contact information on organizations recently recruited for membership in the IUCRC. In the second stage the organization contacts were invited to participate in an online survey.

Measures

The section describes the main outcome variable, as well as the different variable domains and associated predictors. Several item batteries were included in the questionnaire. Both confirmatory and exploratory factor analyses were conducted to gain parsimony in the data prior to analysis.

Membership Outcome. Respondents were asked: What did your organization decide regarding membership in the center? Response options were either "Decided NOT to join, or remain undecided" or "Decided to join the center." Twenty-nine participants reported that their organization decided not to join the IUCRC; 68 reported to have joined the IUCRC. This served as the main outcome in the analysis, and is labeled DV_dec.

Organizational Factors. The financial health of the organization and the number of employees served as organization-level variables. Participants were asked to rate the financial conditions in their organization at the time of the membership decision, as well as the number of employees within their organization. Following

Feller et al. (2002), "organization" was defined in the survey form as "a distinct operating entity with its own strategy, objectives and market competitors."

CRC Characteristics. Center characteristics are divided into two domains: objective and perceived. Objective characteristics variables were derived from secondary data sources and include such aspects of an IUCRC as maturity, structure, and size. Perceived characteristics include both technical and non-technical aspects of an IUCRC, for example, strategic fit to the organization, research expertise, networking opportunities.

Sub-organizational Factors. I considered sub-organizational measures to be those characterizing particular units or processes within a larger organizational entity. I categorized these measures into two types: process and context. The process measures centered on aspects of the decision-making routine, including the complexity of the process, the influence of the budget planning cycle, the number of individuals involved, the presence of a champion for (or opposition to) CRC membership, and whether the organization (rather than the CRC) prompted the membership decision. The context measures addressed elements of the environment in which the decision process unfolded. These included open innovation, the organization's absorptive capacity, whether the organization had a specific technical need to be addressed, and whether the organization was interested in applied, basic or development-oriented research from the CRC. These labels are preceded with "SC" to denote their sub-organizational context domain.

Individual Characteristics. Participants were asked to rate the extent of importance of various gatekeeper, liaison, and champion behaviors to the performance of their organization roles. In addition to these role behaviors, participants were asked for the following information: years in their current job; years in the organization; years in technology area; their management level; and their financial decision authority with regard to the membership decision.

Predictive Analyses

First, I ran separate logistic regression analyses on each variable domain to assess the amount of variance explained in the decision outcome, and to discover the most influential predictors within each domain.

All regression models were performed using SPSS 16.0 (SPSS, Inc). Table 3 summarizes results for each of the logistic regression analyses.

Table 3: Comparison of Logistic Regression Models Across Variable Domains

	Organization Decision[+]			
Domain	Model χ^2	*df*	R^2	Adj R^2
Organization	4.13	1	.04	.06
CRC-Objective	3.96	2	.04	.06
CRC-Perceived	47.27**	6	.39	.55
Sub-org Process	10.00*	4	.10	.14
Sub-org Context	13.66**	3	.13	.19
Individual	11.26**	3	.11	.16

[+] R^2 value based on Cox & Snell statistic, adjusted R^2 value based on NagelKerke statistic
** Significant at p < .01
* Significant at p < .05

Based on Table 3, the perceived CRC variable domain explained the most variation in the organizations' decision (R^2 = .39). Influential variables in this domain include strategic fit (CP_sfit, Exp(B) = 1.44), the membership fee (CP_fee, Exp(B) = 1.92), and the financial leverage (CP_levg, Exp(B) = 1.91). The sub-organizational context model explained 13% of variance in the outcome (R^2 = .13), led by two absorptive capacity indicators: staff expertise (SC_acexp, Exp(B) = 1.59) and interest in pursuing external sources (SC_acint, Exp(B) = 1.56). The individual level variables offered an R^2 = .11, with a strong negative influence exhibited by the internal liaison role (ID_rlia, Exp(B) = .72). Finally, the sub-organizational process domain explained 10% of variance in the organizations' decision (R^2 = .10), with a notable and negative influence stemming from the presence of opposition to CRC membership (SP_opp, Exp(B) = .34).

Since the regression models to this point did not combine predictors across multiple variable domains, I ran aggregate multivariable regressions to test for unique and combined effects. I conducted logistic regression with the eight predictors identified as significant in the domain-level logistic models. Model results are presented in Table 4 below. The full model explained 49% of variance in the organizations' decision (R^2 = .49, p < .01). Again, to test whether this significantly exceeded the variance explained by a single domain alone, I

ran hierarchical logistic regression to test for the significance of the incremental *R-squared* value. I first entered the perceived CRC predictors, since these again explained the most variance among the domain-specific models. This produced a significant model (R^2 = .37, p < .01). Next, I entered the remaining predictors from Table 4, producing a significant improvement in the *R-square* value (ΔR^2= .121, p < .01).

Table 4: Multivariable Logistic Regression for Decision on Retained Predictors

Domain	Variable	B	Std. Err.	Exp (B)	Wald	p-value
CRC-Perceived	CP_sfit	.261	.114	1.298	5.268	.022
CRC-Perceived	CP_fee	.752	.292	2.121	6.627	.010
CRC-Perceived	CP_levg	1.038	.442	2.824	5.523	.019
Sub-org Context	SC_acexp	.868	.372	2.382	5.434	.020
Sub-org Context	SC_acint	.357	.331	1.429	1.161	.281
Sub-org Process	SP_opp	-1.707	.856	0.181	3.975	.046
Individual	ID_rlia	-.639	.252	0.528	6.423	.011
Organization	ORG_finh	.403	.281	1.496	2.053	.152
	(Constant)	-10.349	3.351		9.539	.002
					Model χ^2 (df = 8)	65.41**
					Cox & Snell R^2	.490
					Nagelkerke Adj R^2	.696

** Significant at p < .01

Six of the eight variables remained significant predictors in the aggregate model, compared to the domain-specific model results. I examined the remaining two variables—the organizations' interest in pursuing external partners (SC_acint) and the financial health of the organization (ORG_finh)—for possible mediation effects. The SC_acint variable showed significant correlation with the perceived CRC variables: the strategic fit of the CRC (CP_sfit, r = .32, p < .01); the membership fee (CP_fee, r = .24, p < .05), and financial leverage (CP_levg, r = .20, p < .05). *Financial health* did not correlate significantly with any of the predictors. I recovered only *interest in external partners* for the path analysis.

Among the significant predictors in the logistic model, odds ratios were highest for two perceived CRC variables, financial leverage (CP_levg) and membership fee (CP_fee), and the sub-organizational context variable address staff expertise (SC_acexp). The odds of membership increased by 2.8x with a one-point increase in perceived financial leverage (Exp(B) = 2.824, p = .019) and 2.1x with a one-point increase in favorable ratings of the membership fee (Exp(B) = 2.121, p = .010). Similarly, the odds of membership increased by 2.4x with a one-point increase in ratings on staff expertise (Exp(B) = 2.382, p = .020). Two variables generated odds ratios less than 1.0. A positive membership decision is 47% less likely with a one-point increase in scores on the internal liaison scale (ID_rlia, Exp(B) = .528, p = .011), and 82% less likely when opposition to the CRC emerges during the decision process (SP_opp, Exp(B) = .181, p = .046).

DISCUSSION

I designed this study to explore decision making within organizations considering CRC membership. To my knowledge, this is the first study to take an in-depth look at CRC membership decision-making. Other studies have examined motivations and antecedent factors, but none have looked inside organizations to discover the multitude of actors and motivations behind these decisions. Three attributes of this study are worth emphasizing. First, I included a comparison group of non-member organizations. Other studies that examined specific joint ventures have typically included only member organizations and lacked a comparison group. Second, I targeted an actual decision outcome rather than intentions or expectations about CRC membership, thus avoiding indirect linkages between intention and behavior (Eagly & Chaiken, 1993). Finally, I incorporated variables from multiple domains, which allowed for the discovery of unique and relative effects. Much prior research had focused on a single domain or level of analysis, overlooking potential shared variance. This is a first study to explore complementary effects of variables across multiple domains.

The series of regression models uncovered important factors in the decision process within and across variable domains. I found none of the industry-level variables to be meaningful predictors of the organizations' decision. At the organization-level, only financial health demonstrated a significant level of influence in the decision outcome, though this variable's correlation with the organizations' decision suggested a small effect size, based on effect size ranges offered by Cohen (1992). Once placed in the aggregate multivariable model, financial health no longer held significant influence on the outcome.

In the CRC variable domain I found none of the objective measures (like CRC size or structure) to affect the outcomes. Conversely, perceived CRC variables explained more variance in the organizations' decision, when compared to other domain-specific models. Both sub-organizational context and process domains showed medium effect sizes on the organizations' decision. In particular, the absorptive capacity item—staff technical expertise to transfer CRC knowledge—and the presence of opposition each affected the organizations' decision, with the latter exerting negative influence. In addition, individual-level variables demonstrated a medium effect on the organizations' decision in the domain-specific model. Here, I found that internal liaison behaviors had a negative effect on the decision outcomes, and this effect remained in the

aggregate model. Effects on the organizations' decision from other individual-level variables were non-significant.

I built a causal model (not reported in this paper, See Rivers, 2009 for specific information) in an effort to manifest both direct and indirect effects on outcomes in the decision process. The sample size limited the number of parameter estimates and therefore the number of variables I could include. The final model incorporated 10 variables. All path coefficients were significant at $p < .10$, with several paths exhibiting high levels of significance and large effect sizes. Generally, the final model emphasizes that decision outcomes are affected by variables from multiple domains. Individual characteristics, perceived CRC attributes, and sub-organizational context variables provided meaningful contributions. Perhaps the most influential path is from the strategic fit of the CRC directly to the participants' recommendation and indirectly to the organizations' decision. Further, individual-level, internal liaison behaviors had a negative impact on the membership decision.

This dominant influence of CRC characteristics seems most closely in support of strategic behavior theories. Organizations will engage in joint venture if to do so will improve their competitive position in the market (Kogut, 1988). Further, significant correlations were identified between perceived strategic fit, CRC membership fee, and financial leverage associated with the membership fee. These latter factors suggest decision-making with an emphasis on cost, tempered with consideration to strategic pay-off. When perceived fit is high, study participants reported more favorable perceptions of the membership fee and associated financial leverage. The absence of influence from a prior relationship with CRC staff suggests a limited role of familiarity in decision outcomes; it might be argued that network relationship get the CRC in the door, but strategic fit with the organization and cost considerations drive the membership decision.

Limitations

Despite efforts to leverage existing relationships between CRC directors and organization contacts during the fielding process, I was unable to secure a balanced sample of CRC member and non-member organizations. The small sample size in general leaves the analysis susceptible to high standard errors and wide confidence intervals. This translates to lower statistical power, or a higher chance of committing Type II errors.

Future attempts on this research design should seek larger cell sizes; however, primary research with industry research practitioners can be challenging and resource intensive.

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