SOMEBEWHERE BETWEEN MARKETS AND HIERARCHIES: CONTROLLING INDUSTRY UNIVERSITY RELATIONSHIPS FOR SUCCESS

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ABSTRACT

Since industry-university (I/U) alliances are dynamic with uncertain outcomes, governance mechanisms other than internal hierarchies and external market contracts are needed to assure that the risks and rewards of these relationships are equitably shared. To provide insight into this under-researched area, this study examines the key control factors that facilitate learning and technological outcomes in both the initial and continuing stages of I/U relationships. Findings using structural equation modeling of survey questionnaire data from 189 industrial firm senior managers reveal that a combination of flexible university IP policies, industrial firm champions, trust, and effective communications provide the control framework that is often unavailable through either hierarchical or market governance structures.

INTRODUCTION

The competitive landscape for many firms continues to be re-invented due to rapid technological change, shorter product life cycles, and intense global competition (Ali, 1994; Bettis & Hitt, 1995). In order to successfully compete and survive in this changing competitive environment, firms must continually learn and advance new technologies.

Organizational learning, and the subsequent ability to advance new technologies can be accomplished both intra- and inter-organizationally. An extensive literature continues to grow on the advantages of inter-organizational collaboration (e.g., Hail, Link & Scott, 2003; Adams, Chiang & Starkey, 2001; Jarillo, 1988; Parkhe, 1993; Pisano, 1990; Shan, Walker & Kogut, 1994) since firms are finding it increasingly more difficult to rely solely on intra-organizational initiatives due to limited expertise and resources (Tether & Tajar, 2008; D’Este & Patel, 2007; Hamel & Prahalad, 1994). While much of the inter-organizational literature concentrates on alliances between two or more industrial firms, a growing trend toward industry-university (I/U) collaboration demands that more scholarly attention focus on I/U relationships (Harryson, Kliknaitė & Dudkowski, 2007, 2008; Betz, 1996; Cohen, Nelson & Walsh, 2002; Fritsch, 2003; George, Zahra & Wood, 2002; Johnson, Bianco, Gruca, Crawford & Whiteley, 2003; Quetglas & Grau, 2002; Adams, Chiang & Starkey, 2001; SRI International, 1997).

The dynamic nature of I/U alliances and the uncertainties of its outcomes contribute to making the internal mechanisms of a hierarchy or the explicit contracts of a market unreliable in providing adequate governance and control. Thus, I/U relationships often resemble an intermediate form of governance somewhere between the strict boundaries of hierarchies and external markets. Prior research has not investigated the specific governance mechanisms used to insure equity in these relationships that serve to
protect the interests of both parties (Gray, Linblan & Rudolph, 2001; Geisler, 1995). Moreover, few studies have explored the different developmental stages of I/U relationships and the specific factors facilitating each of these stages. This study addresses these needs in the literature and makes a contribution in two important ways. First, we focus on the understudied area of industry-university collaboration and closely examine two important stages of I/U relationships, i.e., the initial establishment stage and the continuing stage. Second, we explore the key antecedent governance factors that facilitate each of these two stages and investigate the possible linkage these key antecedent factors for each stage may have on learning and technological outcomes.

BACKGROUND AND RESEARCH CONSIDERATIONS

Industry-university relationships have a long history (Furman & MacGarvie, 2007). For example, the German pharmaceutical firm Bayer created relationships with universities as far back as the late 19th century (Bower, 1993). In the US, the National Research Council united scientists in the research-oriented universities with those in industry to assist the war effort during World War I (Reams, 1986). Today, industrial firms and universities work together for a number of reasons. For example, industrial firms gain access to highly trained students, professors, facilities, and new technologies (NSF, 1982a). Firms can also enhance their image and reputation when partnering with a prestigious academic institution (Fombrun, 1996). In contrast, universities primarily interact with industrial firms in order to obtain additional funds, particularly to support various research initiatives (NSB, 1996; NSF, 1982a). Research funding from industrial firms is especially appealing since it often involves less bureaucratic red tape than funds from federal or state agencies. Universities also work with firms to expose students and faculty members to practical problems, create employment and internship opportunities for university graduates and students, and to gain access to applied technological areas (Lam, 2007; Austen, 2003; NSB, 1996).

Beyond the above reasons for industrial firms and universities to interact, I/U collaboration can stimulate learning and help drive the advancement of new technologies. As an example, linkages between industry and academe have resulted in many technological advances in the area of microbiology (Pisano, 1990). Similarly, in the areas of pharmacology and chemistry pharmaceutical firms often rely upon university assisted basic research for the development of new drugs (van Rossum & Cabo, 1995). High tech sectors are not the only beneficiaries from I/U relationships. Chrysler Corporation has worked with several universities on a number of applied engineering research projects that resulted in significant knowledge and technology transfer useful in Chrysler’s manufacturing value chain (Frye, 1993). With an increased emphasis by industry on working with universities, a better understanding of what is important to industry in establishing and sustaining these relationships is now needed to advance the field further (Betz, 1996; Mowery & Shane, 2002).

We recognize that inter-organizational relationships follow developmental processes (Austen, 2003; Ring & Van de Ven, 1994; Van de Ven & Poole, 1995). Therefore in teasing out what’s important to industrial firms in establishing and sustaining I/U relationships, we investigate two distinct stages, i.e., the initial establishment stage and the continuing stage, and examine certain antecedent factors and the types of learning and technological outcomes generated in each of these two stages. In the following section, we present our theoretical framework and the specific hypotheses tested in this study.
THEORY DEVELOPMENT AND HYPOTHESES

Industry-university collaboration involves the commitment of considerable resources by both partners in order to create mutually beneficial outcomes that are equitably shared (Santoro, 2000). Given the uncertain nature of establishing and sustaining I/U relationships, neither the internal mechanisms of a hierarchy nor the explicit contracts of the market can be relied on to provide adequate governance and control. For example, the resources of the university are out of the hierarchical controls of their industrial partner, and similarly the firm’s resources are beyond the hierarchical control of their university partner. On the other hand, if contracts alone were adequate to handle the numerous uncertainties of partnering then a market arrangement would be sufficient; an industrial firm could simply hire a university to engage in a specific research or commercialization activity. Unfortunately, the entire array of possible input and output contingencies cannot be fully anticipated, explicated, and adequately written into a contract (Santoro & Betts, 2002). Therefore, neither a hierarchical or contract governance structure can effectively deal with the many nuances and subtleties I/U relationships. As a result, I/U relationships often rely on an intermediate form of governance, such as clan control (Ouchi, 1980), relational contracting (Bolton, Malmrose & Ouchi, 1994; Fritsch, 2003; Zaheer & Venkatraman, 1995), networks (Powell, 1990) and hybrid structures (Williamson, 1991).

Clan control holds part of the key particularly when the goals of the partners and the objectives of the relationship are congruent (Ouchi, 1980; Santoro & Chakrabarti, 1999). I/U relationships can also involve relational contracting when they are long-term relationships and assets specific to the relationship are committed by each partner (Fritsch, 2003). Most often, however I/U relationships resemble hybrid governance structures, in that there can be contracts mediated by elastic control mechanisms and there are certain adaptability characteristics and incentive structures that enable the relationship to take on an intermediate form falling somewhere between the internal control of a hierarchy and the external control of the market (Williamson, 1991).

I/U relationships are volitional, goal-directed efforts where each partner’s strategic choices help establish and maintain the partnership (Child, 1972; Santoro & Chakrabarti, 1999). Moreover, I/U relationships evolve over time (Santoro, 2000) and unfortunately little attention has been paid to the evolutionary processes of these relationships. Ring and Van de Ven (1994) proposed a multi-stage process for establishing and sustaining inter-organizational relationships where they identify ‘negotiations’ and ‘commitment’ stages in which expectations are explored and agreements reached, and an ‘executions’ stage in which partners carry out their commitments. Regarding governance, Ring and Van de Ven (1994) state that the negotiations and commitment stages establish “an initial structure of safeguards” and the executions stage is where “subsequent interactions reconstruct and embody new governance structures for the relationship” (p. 93). Following Ring and Van de Ven’s (1994) treatise we adopt a two-stage model for understanding key temporal aspects of I/U relationships. Our first stage combines Ring and Van de Ven’s (1994) negotiations and commitment stages into what we define as the initial stage of an I/U relationship. We follow their typology further by incorporating their execution stage into our model into what we define as the continuing stage of an I/U relationship.

Building on this two-stage model we argue that a combination of antecedent factors contribute to provide the necessary control in the initial and continuing stages of I/U partnerships that allow for mutually beneficial learning and technology outcomes. Learning and technological outcomes are important because they usually underlie the reason that industrial firms partner with universities and therefore they often serve
consummated once collaborative work commences, i.e., the continuing stage of the relationship, can prove contentious and debilitating to the relationship. The importance of flexible IPR, patent ownership, and licensing policies diminishes over time since once there is agreement of these policies the need to revisit and radically alter these policies is minimal (Santoro & Betts, 2002). Following these combined notions we propose the following:

**Hypothesis 1a:** Flexible university policies for intellectual property rights, patents and licenses will be more positively related to technology outcomes in the initial stage of I/U relationships than in the continuing stage of I/U relationships.

**Hypothesis 1b:** Flexible university policies for intellectual property rights, patents and licenses will be more positively related to learning outcomes in the initial stage of I/U relationships than in the continuing stage of I/U relationships.

The Role of I/U Champions

In establishing and sustaining I/U collaborations, sufficient time and effort must be expended in order to identify potential partners, develop an appropriate collaborative agenda, and ensure that results are indeed mutually beneficial solutions to targeted areas of opportunity (Plewa & Quester, 2008; Santoro & Chakrabarti, 1999). An empowered and influential individual, or champion, responsible for boundary spanning activities does much to insure these goals are attained.

The value of champions have been long been recognized, particularly in the area of industry-university collaborations. For example, studies by both Gerwin and colleagues (1992) and van Dierdonck, Debackere and Engelen (1990) found that champions are an important facilitating factor in I/U relationships because champions often provide needed control and governance. While the literature is pretty clear on the importance of champions, questions persist as to how champions go about accomplishing these activities. We follow work done by Ancona and Caldwell (1990) and believe that effective industry-university champions serve a number of diverse roles. First, champions must be the scouts who seek external information about potential liaisons. Second, champions must be ambassadors responsible for establishing and sustaining good relations. Third, champions must be sentries responsible for monitoring activities between the firm and the university. Fourth, champions must be guards who protect against any potential negative internal and external threats to the relationship.

Successful I/U relationships mean that universities must conduct research that industry really needs. In the same way, industry must become aware of, and utilize the kinds of research that universities conduct (Kotnour & Buckingham, 2001; Sparks, 1985). In bridging this gap, there must be frequent, ongoing, and personal interactions between university personnel and their industry partners. As scouts and ambassadors, I/U champions are the key figures that must develop good interpersonal relationships between the partnering organizations. Effective champions are also sentries and guards by providing necessary guidance and direction in all stages of the industry-university relationship (Ancona & Caldwell, 1990; Austen, 2003; Frye, 1993). In doing so, effective champions must be technologically knowledgeable, spontaneous in response to fluid market dynamics and protective of their organization’s needs and interests. They must also be
sensitive and delicate in their handling of the philosophical and cultural differences that usually exist between academe and industry (van Dierdonck, et al., 1990).

Ultimately, it is most often the case that the industrial firm determines its level of resource commitment and involvement in I/U relationships (Santoro & Chakrabarti, 1999). That may explain why Santoro and Chakrabarti (2002) found that champions at the industrial firm were more important to the intensity level of knowledge transfer, technology transfer, cooperative research, and research support I/U activities than were their university counter-parts, i.e., champions affiliated with the university. We follow Santoro and Chakrabarti’s (2002) findings; that industrial firm champions are more influential in I/U relationships than are champions affiliated with the university. However, we build upon and extend their notion in this research by arguing that I/U champions at the firm play a greater role in advancing learning and technological outcomes in both the initial and continuing stages of I/U relationships than their university counter-parts. More formally we therefore propose,

**Hypothesis 2a:** The presence of an I/U champion at the firm will be more positively related to the level of technology outcomes in both the initial and continuing stages of I/U relationships than the presence of an I/U champion at the university research center.

**Hypothesis 2b:** The presence of an I/U champion at the firm will be more positively related to the level of learning outcomes in both the initial and continuing stages of I/U relationships than the presence of an I/U champion at the university research center.

**Communication Effectiveness**

Effective communications are important to the governance of I/U relationships particularly communications related to the status of the relationship and to performance feedback since both these communications can enhance and improve subsequent relationship performance (Hequet, 1994; Husman, Lahiff & Penrose, 1988; Kotnour & Buckingham, 2001).

In the initial stage of I/U relationships, role expectations are just beginning to crystallize and interactions between participants are more of a formal nature (Ring & Van de Ven, 1994). Over time, as the relationship matures, participants in industry-university relationships learn more about each other and interactions become more personable. When interactions become more personable, communications become more effective and are of more use in governing the relationship (Kotnour & Buckingham, 2001). As such, communications may not be as effective in the initial stages of I/U relationships, but become more so in the continuing stage of the relationship. Besides leveraging interpersonal relationships to aide in governance, effective communications in the continuing stage of I/U relationships help the dissemination of information to the industrial partner, thereby enabling the firm to adapt and integrate learning as it occurs (Santoro & Saporito, 2003; Starbuck, 2001).

Since our focus of this study is on what is important to industrial firms in establishing and sustaining I/U relationships, effective communications refer to the transfer of information by the university research center to their industrial firm partners. Specifically of interest here is the effectiveness, or lack of, with which
the university center’s competence as well as the center’s motives and fairness in sharing their abilities (reverse score), and 3) the extent to which the firm perceived that the university center adhered to a set of principles that the firm found acceptable.

**Technology outcomes.**

Technology outcomes were measured by a four-item scale (alpha = .92) for each stage, i.e., initial stage and continuing stage. We asked respondents at the firm to approximate the technology output generated as a direct result of the I/U relationship. The four items used in this measure were the following: 1) the number of patents, 2) the number of patent applications, 3) the number of licenses, and 4) the number of non-patented and non-licensed products and processes. The number of non-patented and non-licensed products and processes (item 4) were combined into a single item since our exploratory interviews and previous research showed that singularly, low levels of these outcomes are generated in any one I/U relationship (NSB, 2000; NSB, 1996).

**Learning outcomes.**

Learning outcomes were measured by a three-item scale (alpha = .91) for each stage, i.e., initial stage and continuing stage. We asked the respondents to approximate the knowledge output generated as a direct result of the I/U relationship. The three items used for this measure were the following: 1) the number of research papers published, 2) the number of research papers presented at conferences, and 3) the number of master’s theses and doctoral dissertations generated as a direct result of their relationship with the university center.

**Structural Equations Analysis**

Structural equation modeling was used to estimate the strength of relationships between all variables examined in this study (Maruyama, 1998) where estimated measurement models were created to examine the initial and continuing stages of I/U relationship success as represented by the level of learning outcomes and technology outcomes. In doing so, we estimated the full structural equation models and tested for model equivalence. The equivalence of specific paths were tested and finally structural equation trimmed models were tested against the full models. We used Joreskog and Sorbom’s LISREL 8.11 structural equation modeling program with the input for the LISREL program being a 22 X 22 covariance matrix.

For each stage, i.e., initial and continuing stage, technology outcomes, learning outcomes, and trust were multiple indicator latent variables with 4, 3, and 3 indicators respectively. The remaining variables were single indicator latent variables for each stage. As such, the error variances were set to zero for these variables (Bollen, 1989) while the LISREL 8.11 program automatically sets the variance of these latent variables to 1 as a default. The error terms of the dependent variables (learning outcomes and technology outcomes) were allowed to correlate due to the probable presence of unmodeled common causes.
## RESULTS

### Descriptive Statistics and Measurement Model

Descriptive statistics for all indicator variables are displayed in Table 1. A two-group analysis procedure was used. In this method, parameter estimates for two groups, in this case the initial and the continuing stages of the I/U relationship, were estimated simultaneously with fit statistics reflecting the fit of both groups jointly. The factor loadings for our variables were estimated twice, first constrained to be equal in both initial and continuing relationship situations and then free to vary between the situations. All of the path coefficients in the free and constrained models were highly significant (p < 0.001). The difference in chi-squared between the constrained and free models was not significant (p > 0.05). This indicates that the constrained and free models are not different. Based on these results we are confident that we measured the same constructs in each of the models. From this point on in our analysis we used separate measurement models in order to estimate trimmed path models for each of the two situations, i.e., initial stage and continuing stage.
Table 2: Structural equation modeling Fit Statistics

<table>
<thead>
<tr>
<th>Model</th>
<th>$\chi^2$</th>
<th>RMSEA</th>
<th>GFI</th>
<th>CFI</th>
<th>IFI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measurement model</td>
<td>175.52 ***</td>
<td>.048</td>
<td>.92</td>
<td>.95</td>
<td>.95</td>
</tr>
<tr>
<td>Trimmed path models</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Initial relationship</td>
<td>52.07 *</td>
<td>.053</td>
<td>.95</td>
<td>.98</td>
<td>.98</td>
</tr>
<tr>
<td>Continuing relationship</td>
<td>63.33 *</td>
<td>.068</td>
<td>.94</td>
<td>.97</td>
<td>.97</td>
</tr>
</tbody>
</table>

* $p < 0.05$
*** $p < 0.001$

The fit statistics reported in Table 2 include the chi-square statistic, root mean square error of approximation (RMSEA), and three fit indexes: goodness of fit index (GFI; Joreskog & Sorbom, 1993), comparative fit index (CFI; Bentler, 1990) and incremental fit index (CFI; Bollen, 1989). The chi-square results for both the constrained and free models were significant suggesting that we use measures of fit other than the chi-squared statistic (Bollen, 1989; Joreskog & Sorbom, 1993). Values between .05 and .08 on the RMSEA indicate a good fit, and values below .05 indicate a very good fit (Browne & Cudeck, 1993). For the three fit indexes (GFI, CFI, IFI) values of above .90 indicate good fit. As table 2 shows, the RMSEA and fit indexes strongly suggest a good fit for both the measurement model and trimmed path models.

Tests of Hypotheses

Figure 1 shows the final trimmed structural path models for each time frame and displays the significant relationships in each of the models. The full measurement model originally contained a path for each hypothesis. For parsimony, as the path models were developed, insignificant relationships were eliminated from the models. In the final trimmed models, displayed in Figure 1, each path indicates where there is significant support for the corresponding hypothesis noted.

As figure 1 shows, we found support for hypotheses 1a and 1b. The inclusion of the paths between flexible intellectual property rights and both technology outcomes and learning outcomes in the initial stage of I/U relationships indicates that both hypotheses 1a and 1b were supported in the initial stage (path coefficients = 0.30 and 0.26 respectively, $p < 0.001$). In contrast, our results show that flexible policies for IPR, patents, and licensing are not significant in the continuing stage of I/U relationships. As such, the paths between flexible intellectual property rights and both technology outcomes and learning outcomes were trimmed from the model in the continuing stage of the relationship since these paths were not significant.

We found support for hypothesis 2a. That is, significant relationships exist between industrial firm I/U champions and technology outcomes in both the initial (path coefficient = 0.11, $p < 0.05$) and continuing (path coefficient = 0.16, $p < 0.01$) stages of I/U relationships while no significant relationships exist between university center I/U champions and technology outcomes. For parsimony, university center I/U champions were trimmed from each of these models since their relationship to technology outcomes and learning outcomes were not significant in either the initial stage or the continuing stage. Contrary to our a prior
notion, we did not find support for hypotheses 2b since no significant relationships were found between I/U champions at the firm and learning outcomes at the initial and continuing stages of I/U relationships.

**Figure 1 - Trimmed Structural Models for Each Time Frame with Path Coefficients**

- **Initial Stage of the I/U Relationship**
  - Flexible IPR Policies
  - Industry Champion
  - Communication Effectiveness
  - Trust

- **Continuing Stage of the I/U Relationship**
  - Flexible IPR Policies
  - Industry Champion
  - Communication Effectiveness
  - Trust

* p<0.05  
** p<0.01  
*** p<0.001
Hypotheses 3a and 3b were both supported; that effective communications by the university research center are more positively related to technology outcomes and learning outcomes in the continuing stage than in the initial stage of I/U relationships. Specifically, the paths between communications effectiveness and both technology outcomes and learning outcomes were trimmed from the model for the initial stage of I/U relationships, indicating no significant relationship. Consistent with hypotheses 3a and 3b, there were significant paths between communications effectiveness and both technology outcomes and learning outcomes (path coefficients = 0.46 and 0.39 respectively, p < 0.001) in the continuing stage of I/U relationships.

Hypothesis 4a was not supported because the paths between trust and technology outcomes were not significant in both the initial and continuing stages of I/U relationships. The paths between trust and technology outcomes were therefore trimmed from both the initial stage and continuing stage models as displayed in Figure 1. Hypothesis 4b was supported because the paths between trust and learning outcomes were positive and significant for both the initial and the continuing stages (path coefficient = 0.21 and 0.30 respectively, p < 0.01). Further comparative analysis of these two path coefficients revealed a significant difference between these two coefficients (Δ path coefficients = 0.09, p < 0.05) indicating that trust is more strongly related to learning outcomes in the continuing stage of I/U relationships than in the initial stage of I/U relationships.

DISCUSSION

Conclusions and Implications

The results of this study suggest that several factors combine to provide control and governance at different stages of industry-university relationships. With a complementary combination of these elements in place, industry-university relationships can be beneficial collaborative endeavors by stimulating learning and technological outcomes. The results also indicate that there are both similarities and differences in the factors that are associated with the initial stages of I/U relationships compared to the continuing stage of I/U relationships. The following discussion elaborates upon the specific factors that are important in the two different stages of I/U relationships and their role in the outcomes generated.

Factors associated with outcomes in specific stages of I/U relationships.

Two factors were found to be significantly linked with both learning outcomes and technology outcomes, but each of these factors were important only in either the initial stage or continuing stage of the I/U relationship but not both. Specifically, flexible intellectual property rights, patenting, and licensing policies was associated with both learning outcomes and technology outcomes in the initial stage while communications effectiveness was linked to both learning outcomes and technology outcomes in the continuing stage of an I/U relationship.

Our finding that flexible intellectual property rights, patenting, and licensing policies were linked to both learning and technology outcomes only in the initial stage suggests that firms and university research centers finalize those policies in the initial stage based on each organization’s needs (Santoro & Betts, 2002). It also implies that if a university research center’s policies on intellectual property rights, patenting, and
licensing are rigid and unresponsive to the industrial firm’s needs, these policies could create a serious impediment to the successful establishment of the I/U partnership.

Although our results show that flexible intellectual property rights policies are important for both learning outcomes and technological outcomes, we believe the reasons for their importance are different for each outcome. In the case of learning outcomes, industry is most concerned that the university research center respect the firm’s need to keep proprietary knowledge closely held through such things as copyrights and shared authorship. With regard to technology outcomes, a firm is able to maintain its competitive advantage only when patent and licensing policies facilitate the firm’s development and commercialization of first-mover technological advances.

Effective communications and learning outcomes and technology outcomes in the continuing stage of I/U relationships.

Our results support and are consistent with the work of other researchers suggesting that effective communications are important in sustaining inter-organizational relationships (e.g., Hequet, 1994; Husman, Lahiff & Penrose, 1988; Lind & Zmud, 1995). Our finding that effective communications were not linked to either learning outcomes or technology outcomes in the initial stage of I/U relationships but were in the continuing stage may indicate that effective communications are not easily achievable in collaborative ventures. Rather, effective communications may need to develop over time as interpersonal relationships across organizations mature (Ring & Van de Ven, 1994). We suspect that in the initial stage of I/U relationships, communications are dominated by more formal role interactions and as a result the effectiveness of the communications between partners is also harder to evaluate. As the relationship endures, formal role interactions are replaced with more interpersonal relationships and as these more personal communications intensify they become not only more effective but easier to evaluate. It is this combination of more personal interchanges and their evaluation that together help determine effective communications (Lind & Zmud, 1995). Additionally, a variation in the university research center’s ability to communicate effectively can be triggered by many factors; i.e., depending upon the personality, experience, communications skills, and/or prior relationships of the industrial firm representatives, the university research center director and his/her associates may be more effective in communicating with some firms than with others (Husman, Lahiff & Penrose, 1988). Thus, while we were interested in the firm’s perspective of how well the university research center communicated with them, the firm could very well be a key source for this effectiveness or ineffectiveness (Lind & Zmud, 1995).

Factors associated with a specific type of outcome.

Two factors were significantly linked with one of the two outcome variables in both the initial stage and the continuing stage of I/U relationships. The first factor was between industrial firm champions and technology outcomes; the second factor was between trust and learning outcomes.
Trust and learning outcomes.

Our results indicate that the firm’s trust in its university partner is important in both the initial and continuing stages of I/U relationships with respect to learning outcomes but not to technological outcomes. Having trust linked to learning outcomes but not to technology outcomes may indicate that trust reduces uncertainty about the actions of the other parties in the relationship and about the expected outcomes and is therefore an informal regulatory process that substitutes for formal control mechanisms (Das & Teng, 1998). When betrayed, the betrayed has been met with unpleasant and unexpected surprises regarding these expectations. A betrayal of trust could manifest itself in low levels of learning outcomes due to a lack of cooperation in sharing knowledge and/or through the inappropriate sharing of knowledge (Bhattacharya, Devinney & Pillutla, 1998). Moreover, since wide participation among participants is needed in creating learning (Tornatzky & Fleischer, 1990) sharing of ideas is a necessity. It is unlikely that significant learning outcomes developed through such widespread participation can be held by any one party which means that the question is not whether learning outcomes are shared, but rather whether or not the parties can be trusted to actively participate in the ongoing process. Finally, the benefits of learning in I/U relationships and the manifestation of its outcomes are largely intangible and often hard to distinguish. Since it is often difficult to determine who the appropriate beneficiaries are for inter-organizational learning, trust among alliance partners is important since the judgment for knowledge dissemination can be unclear and perplexing (McAllister, 1995).

To summarize, I/U relationships can be beneficial by producing both learning and technological outcomes. We argue in this paper that I/U relationships have an intermediate form of governance, somewhere between the hierarchical control of either organization in the partnership and market contracts. In order to obtain the maximum benefits from these dynamic relationships certain controls must be set in place. Through this study we’ve illuminated certain control factors that work in tandem to help govern and control I/U relationships and allow for the equitable distribution of risks and rewards based on two important stages of the relationship. Specifically, a combination of flexible intellectual property rights policies, a champion in the industrial firm, and a firm’s trust in its university partner can be those controls that facilitate success, as measured by learning and technological outcomes, in the initial stage of an I/U relationship. As an I/U relationship matures, i.e., the continuing stage, an industrial firm champion, the firm’s trust in its university partner, and effective communications become especially important.

Limitations and Suggestions for Future Research

While this study helps to deepen and broaden our knowledge of I/U relationships, this investigation has limitations. One limitation has to do with perspective. With a primary focus on the industrial firm, important factors for I/U relationships from the university research center’s perspective were not examined. Exploring such things as the existence or lack of effective leadership in the university research center or personality conflicts between the university research center director and industrial firm participants could also prove beneficial in understanding this aspect.

Second, we defined I/U relationship success by the creation of learning outcomes and technology outcomes within two distinct stages of the collaborative venture. Our snapshot in time of the initial and continuing stages is helpful but does leave many unanswered questions. First, there are a number of
alternative multi-stage models of inter-organizational collaboration (Ring & Van de Ven, 1994; Van de Ven & Poole, 1995) which cannot be differentiated with observations at only two points in time. Moreover, our reliance on learning outcomes and technology outcomes as measures of I/U relationship success may not be broad enough. Additional measures such as length of relationship and firm performance may offer additional insights.

Another consideration is that the industry-university technology relationships examined in our study were largely based in NSF supported technology research centers affiliated with US universities. Although this provided us with a diverse array of firms, relationships, and outcomes, this largely confined our study to US borders. A similar investigation examining I/U technology relationships in university technology research centers located in a variety of different countries will serve to extend and enhance these findings. In fact, there is new and growing literature that addresses I/U collaborations in other countries (Hanel & St Pierre, 2006). Some areas of the world investigated are Valencia, (Garcia-Aracil, 2008), Japan (Fukugama, 2005; DeBroux, 2008), Nigeria (Adeoti & Adeyi, 2005), Europe (Harryson, Kliknaite & von Zedwitz, 2008; Dooley & Kirk, 2007), the UK (D’Este & Patel, 2007), Canada (Heale, Shapiro & Egri, 2004) and China (Harryson, Kliknaite & von Zedwitz, 2008; Wang & Lu, 2007).

Finally, our results show that industrial firm champions are particularly important for influencing both learning and technological outcomes. Future research could consider exploring the exact role that champions play by examining the full range of activities in which they engage, the nature of champion goals and reward systems, and the affect of cultural dimensions on the their role and contributions.

REFERENCES


