# A Conceptual Framework of Knowledge Transfer Effectiveness Methodology through Collaborative Factors of Dyadic Partnerships in University-Industry Alliances

Patthareeya Lakpetch
School of Public Administration
National Institute of Development Administration

## Abstract

*There are numerous studies examining alliance network performance. Very few studies, however, have examined (1) the detailed collaborative activities in dyadic university-industry partnerships and (2) potential constructs for measuring knowledge transfer and commercialization in the R&D alliance between industrial firms and the university context. By combining inter-organizational relations (IORs), the knowledge-based view (KBV) and the resource-based view (RBV) of the firm, this paper focuses on the influence of partner complementarities, partner attributes, and the characteristics of the coordination and relationship quality between industrial companies and universities that may lead to the effectiveness of knowledge transfer. This paper proposes an integrated model for measuring knowledge transfer effectiveness in university-industry alliances. The so-called "RDCE" model is thereby*

*proposed as an integrated model for measuring this knowledge transfer effectiveness in terms of tacit and explicit knowledge transfer from four different dimensions; namely, research outputs through explicit knowledge transfer, development through tacit knowledge transfer, commercialization, and efficient coordination. The research hypotheses are discussed for the purpose of future empirical study.*

*Key words: Alliances, Knowledge Transfer, Partner Complementarities, Commercialization, Effectiveness*

## 1. Introduction

Nowadays, knowledge is widely recognized for its importance as a critical resource for the competitive advantage of firms (Doz, 1996; Teece, 1998). However, as the environment changes so rapidly, a firm's self-sufficiency in creating knowledge will bear tremendous risks and may not bring success. This has resulted in a surge in university-industry R&D alliances in which cooperation can lead to innovation through academic outputs, yielding more competitiveness for their alliance partners in terms of public interest and commercial purposes. Such alliances create synergies between resources and knowledge that enhance or reshape competition within the market. Indeed, in an education industry, university network collaboration is recognized as a critical form of learning alliance and an essential instrument for gaining speed and flexibility in knowledge transfer while reducing costs in R&D and operations (Harryson et al., 2008).

Over the last 10 years, the Thai government's policy has been geared toward a knowledge-based economy by instituting policies and regulations, setting up infrastructure, and reviewing government rules and

regulations in the education sector. In order to accomplish these goals, this collaborative plan has been implemented through encouraging the interactions of a university, government, and industry partner linkage as a means of supporting the growth of a mutually-supportive relationship in the local economy (Lungkana Worasinchai et al., 2008).

There are compelling reasons for industry and universities to work together. As mentioned by Lungkana Worasinchai et al., 2008, Thai universities are divided in to two types: public and private universities. Public universities get financial support from the government, while private universities do not. Private universities depend mainly on student tuition fees. Managing a private university in Thailand is a constant challenge; however, many public universities have changed to semi-autonomous universities, and for this reason they get less financial support from the government. Thai universities have to find new sources of income in order to survive and form a closer collaboration with the private sector to generate additional revenue by capitalizing on their intellectual asset (Kennedy, 1986). In addition, the Board of Higher Education of Thailand has decided to make quality assurance a priority for all universities in Thailand and has defined Key Performance Indicators (KPIs) to measure the quality of Thai universities. In 2005, it defined new main KPIs associated with the implementation of knowledge management (KM). Many Thai universities are implementing knowledge management, thus making them operate in an environment that is closer to the business world.

As a result, the universities' redirected mission and focus, which include developing and commercializing applied technologies, have opened the door for greater industry interaction. In terms of benefit yielded

to universities, during their contacts with industrial firms and other organizations, universities also gain advantages from exposure to more applications-oriented research from obtaining better insight into curricula development (Geisler & Rubenstein, 1989). Students and faculty members are likely to be exposed to practical problems that will give them access to applied technologies, as well as create employment opportunities after graduation (NSB, 1996). Additionally, this practice might also become a factor that will make industries realize that universities are becoming more open and flexible and that they might now be ready to engage in more complex and advanced collaboration and R&D projects. Thus, the academic output of universities can be also considered as good as that of private corporations, and they may begin to reorganize themselves as a research and educational leader, with international competitiveness through innovative ideas.

However, while university/industry partnerships are a growing trend, recent studies show that the number of university/industry technology relationships, the intensity of these relationships, and the number of new technologies generated from these relationships fall far short of their potential (Betz, 1996; NSB, 1996; SRI International, 1997). There are cultural and philosophical incompatibilities that continue to have negative effects on the successful building of university-industry alliances. These are manifested in a lack of common understanding of needs, time frames, and reward systems (Reams, 1986). From the perspective of the private sector, universities may seem to react too slowly to market demands. One reason can be explained through the nature of common academic outputs, especially, technology-based universities, which tend to

concentrate on pure research. Rather than applied ones, they often place little emphasis on commercializing new products because academics are evaluated and rewarded on the basis of articles in scholarly publications (Logar et al., 2001). As a matter of fact, academics may choose not to release a product until they are convinced that it is as close to perfect as possible. But in the time it takes to reach this level of perfection, the market may have changed. The other reason is that universities may also not have in place the infrastructure or the funding necessary to support the commercialization of new products. Given the multiple forms and different natures of university-industry alliances, there is also considerable ambiguity about the applicability and extension of the existing knowledge of conventional strategic alliances to the area of this type of alliance. Thus, universities must eventually develop a program that marries the private sector's need for new products with the university's (public sector) ability to develop concepts, ideas, and products to meet those needs.

Therefore, to understand the factors that affect the performance of knowledge transfer is critical, as it is one part of the key success of collaboration. The research offers insight from both university and companies perspectives. The former examines the determinant factors that can result in developing alliances with public and private firms to commercialize their research output. The latter offers insight into how public and private firms can align themselves with academic institution to enhance the effectiveness of knowledge transfer and to foster new product development. The results of applying this process offer private sector organizations a potentially lucrative way to develop new product ideas and academic institutions an opportunity to capitalize on new ideas

generated by those institution via knowledge transfer through the alliance. The evidence gained from the study will be beneficial to management for verifying the factors that enhance or weaken the knowledge transfer performance so that the company can gain the most advantages, improve the weak points and nurture long-term relationships. The awareness of the existence of these factors could enable all decision-makers involved in the project to adjust their decision alternatives. These decision makers could also set the well-elaborated goals and objectives, and develop more effective functions for achieving them, especially for knowledge- obtaining purposes.

## 2. Theoretical Frameworks and Conceptual Development

According to Santoro and Chakrabarti (1999), university-industry alliances are defined as cooperative, non-equity-based arrangements between industrial firms from both public and private sectors and universities, involving resource exchange and, resource sharing or co-development by contributing human and financial capital, and technology or specific assets, to the partnership in order to enhance product quality and standardization and thereby improve profitability. In order to understand this type of alliance context, three tentative conceptual frameworks were constructed by combining inter-organizational relations (IORs), the knowledge-based view (KBV), and the resource-based view (RBV) to explain the logic of university-industry alliances.

First of all, the resource-based views (RBV) seems particularly appropriate for examining strategic alliances and for developing a causal link in order to understand better the logical connections between resource

acquisition, resource integration, and alliance performance. This is the strategic view, which helps us to explore the link between the internal firm's resources, capabilities, and competitive advantage. Theoretically, the resource-based view is used to derive predictions on the influence of complementarities in resources and knowledge influencing the motivations of large corporations. The heterogeneity between organizations creates different mechanisms of combining resources (Penrose, 1959). Apart from the simple sharing of resources, alliances can facilitate the development of new "idiosyncratic resources" which are unique to the alliance and thus contribute to successful collaboration. Thus, the resource-based view has been used to explain the potential value of external resources and also the factors influencing the creation of inter-organizational relationships. Complementarities between two firms have been identified as a key factor in creating value through the combination of resources and thereby making one firm an attractive partner for another (Eisenhardt & Schoonhoven, 1996).

However, the weakness of the RBV is also clear because it has also been criticized for being excessively focused on internal resources, with the unit of analysis being a single firm, and neglecting the role of resources available through inter-organizational collaboration (Dyer & Singh, 1998: 660-679). This criticism has led to the development of the "relational view" of inter-organizational relations (IORs), focusing on the sources of competitive advantage residing in dyads or networks of firms (Dyer & Singh, 1998 :660-679). Existing research has also found relationship-based factors (trust, commitment, and bilateral information exchange based on social interaction) to be an important facilitator of

resource and knowledge exchange (Nahapeit & Ghosal, 1998: 242-266). As inter-organizational relations (IORs) have some disadvantages because of the inadequate arguments of the strategic view in terms of linking the firm with competitiveness, the synergy of these two theories are required to further explore the link between the firm's resources, capabilities, and its competitive advantage in network organizations (Barney, 1991: 99-120).

In addition, the knowledge-based view (KBV) has also been applied extensively in examining resource acquisition and exchange over organizational boundaries in terms of explicit and tacit knowledge transfer. Its assumption is that alliance partnerships can help create a sustainable competitive advantage through new resource combinations and knowledge networking. The accumulation of heterogeneous knowledge through learning constitutes a driving force in development and knowledge acquisition in enhancing the firm's ability and competitive advantages. However, despite the wide use of the knowledge-based view, it has also faced some criticism. One of the criticisms is that research on the knowledge-based view is highly abstract (Argote, 1999) and the concepts are difficult to measure. It is perhaps, because of the abstractness of the concepts and the difficulty of operationalizing them that research on the knowledge-based view has become highly fragmented. While there is agreement within the research on the knowledge-based view regarding the basic assumption that knowledge is the source of competitive advantage, there is less agreement on the terminology and levels of analysis employed. Because of this fragmented nature of the research, the knowledge-based view has not been seen as a coherent theory (Grant, 1996) but rather as an umbrella covering a variety of processes (Argote, 1999).

In sum, all three theories contribute to a more thorough understanding of the links between strategy and the mission of alliance activities in terms of resource acquisition and knowledge transfer. It is worth noticing here, however, that these different approaches contribute to different aspects of alliances, as no single theory is able to explain the alliance phenomenon. In the next sections, the author applies these three approaches to establishing a strong foundation for the analysis and discussion of the proposed hypotheses of the study.

## 3. Hypotheses of the Study

The conceptual schema of this study is presented in figure 1, indicating the relationships among determinant factors and the effectiveness of knowledge transfer. As the university-industry alliance is embedded in different forms of collaboration including cooperative education, including collaborative researches contributing to public interest, commercial purposes and personnel exchange, the so-called “RDCE” model is thereby proposed as an integrated model for measuring knowledge transfer effectiveness in terms of tacit and explicit knowledge transfer from four different dimensions; namely, research outputs through explicit knowledge transfer, development through tacit knowledge transfer, commercialization, and efficient coordination. The following eight key elements are included for consideration: strategic alignment, source attractiveness, staff’s learning attitudes and abilities, skills of management, structure characteristics, shared values, support systems and styles of relationship. These eight determinant factors are categorized into four independent variables: partner complementarities, partner attributes, coordinating factors, and relationship factors.

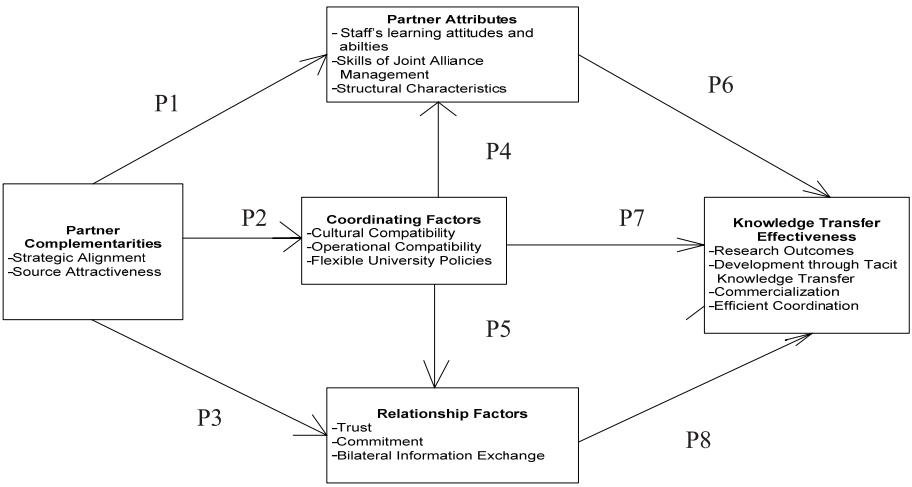


**Figure 1:** Conceptual Framework of the Study

## 4. Knowledge Transfer Effectiveness (RDCE Model)

Previous studies in this area suggest that tangible outcomes are an especially important measure of successful university-industry relationships, particularly explicit knowledge transfer consequences that can be measured through research outcomes through explicit knowledge, such as patents, licenses, publications and the joint use of either university or industrial firm facilities and equipment (e.g. Evans et al.1993).

As modified by the study of Santoro and Gopalakrishnan (2004: 614-625), there are two other quantitative approaches to evaluating the effectiveness of knowledge and technology transfer in the alliance. First of all, development through tacit knowledge transfer can occur through co-operative education programs and from the hiring of recent graduates. It can also be embodied in non-patented or non-licensed product and

process technologies. Co-operative education programs between universities, through the university research center and industry, are not only a way to share knowledge, but also serve to ensure that universities develop and deliver an appropriate curriculum for training students in state-of-the-art techniques. Co-operative education programs also provide on-the-job training experience in participating firms for graduate students. This knowledge sharing and subsequent training mean that graduates will easily adjust to the industry and be instrumental in solving a firm's immediate needs (Deutch, 1991: 55-65). Personnel exchanges between member organizations offer yet another way in which tacit knowledge is shared and acquired. Personnel exchanges between member organizations therefore provide a meaningful gauge for measuring the effectiveness of university-industry relationships. Thus, development in terms of curriculum development and professional development can be considered as tacit knowledge transfer whereby both industrial partners and the university exchange expertise and needs. Likewise, commercialization refers to the extent to which industrial firms and universities collaborate, participate, and are involved in the process of decision-making, developing, and commercializing the product or process from the projects. These purposes can be achieved through technology transfer and cooperation among the partners.

Additionally, as suggested by Rogers (1986: 169-181), efficiency in terms of comprehension, usefulness, goal attainment, speed, and economy can also be good indicators of knowledge transfer effectiveness in the university-industry context. According to the conceptualization of 'usefulness' of Choo (1998), the work of Lane and Lubatkin (1998:

461-77), and Lord and Ranft (2000: 573-89), among others, usefulness of transferred knowledge can be viewed as the extent to which such knowledge is relevant and salient to organizational success. Third, goal attainment can be measured as the extent to which knowledge has been transferred to a partner within an alliance. However, in order to make knowledge an organizational asset, a mechanism must be put in place to ensure that the knowledge diffuses from the individual level to the group level before it finally settles within the organizational memory as in the alliance context knowledge remains mostly in the heads of individuals that are seen as agents of the learning process. Following Zander and Kogut (1995: 76-92) and Zahra et al. (2000: 926), the speed of knowledge transfer signifies how rapidly (the recipient) acquires new insights and skills. Finally, based on the work of Szulanski (1995: 437-41) and Hansen et al. (2005: 776-93), the economy of knowledge transfer relates to the costs and resources associated with the knowledge transfer. There are reasons why it is important to consider the holistic dimensions of knowledge transfer together. First, a single dimension provides an incomplete picture of knowledge transfer. Knowledge transfer in the context of the university industry reflects different aspects of knowledge transfer success. As such, there is a need to understand how these four dimensions of knowledge transfer represented by research outputs, development, commercialization, and efficient cooperation can be optimized.

## 5. Research Hypotheses

From the proposed model, the relationship between variables is illustrated as a framework in this study through three causal relationships.

The first causal relationship examines the relationships between antecedent factors (partner complementarities) and the effectiveness of knowledge transfer concerning with the four dimensions of knowledge transfer (research outputs, development, commercialization, and excellent coordination) accordingly. The second causal relationship investigates the relationships between antecedent factors, and three mediating variables (partner attributes, coordinating factors and relationship capital). The third causal relationship examines the interactive influence among three mediating factors, and lastly, all these mediating variables are tested in the fourth causal relationship with the effectiveness of knowledge transfer between alliance partners.

### 5.1. Partner Complementarities as Antecedent Factors of Knowledge Transfer Effectiveness and Its Mediating Roles

Partner complementarities have been focused on as the most salient factor in alliance performance (Beamish, 1984; Blodgett, 1991: 63-78). Geringer (1991: 41-62) suggests that poor selection of alliance partners is among the most important reasons for alliance failures. Emden et al. ,(2005: 211-229) further state that in order to sustain the alliance partnership, the potential for creating synergistic value through co-development alliances hinges on three aspects; 1) selecting a partner with maximum potential to possess strategic alignment with the partner; and 2) selecting a partner with a maximum potential to sustain relational alignment with the partner; and 3) selecting a partner with maximum potential for creating resources and competencies (resources & knowledge complementarities). Thus, it is argued that a well-selected partner, with compatible strategic intent

and distinctly complementary and supplementary resources in terms of knowledge base, assets and skills, will make a valuable contribution to alliance performance (Geringer, 1991: 41-62).

First of all, the goals of an organization and the manner in which it seeks to achieve can lead to consequences regarding alliance participation (Saint-Onge, 1996: 10-14). Strategic alignment refers to the motivation and goals which are congruent among the alliance partners to pursue alliance formation and knowledge transfer. Strategic misalignment may occur in three circumstances: 1) norms, values, or procedural routines may not be congruent that is, partners do not speak the same language or do not share similar expectations and behaviors, thus impeding understanding and information flows; 2) potential partners are not willing to adapt as requirements change, and thus mutual and innovative ways to create synergistic value may never be found; and 3) the partners may be concerned only with short-term returns, in which case they are not be willing to make the necessary contributions for long-term outcomes. Thus, the two emergent subcategories in this view are: 1) motivation correspondence and 2) goal correspondence. Motivation correspondence refers to the extent to which the partners' perceived motives that are correspondent with one another (Smith & Barclay, 1997: 3-21). Correspondence of motivations signals whether partners have mutually beneficial intentions and non-competing goals. A key finding is that high goal correspondence enhances the consistency of expectations and assured mutual gains.

Apart from the strategic focus, Hill and Hellriegel (1994: 594-609) suggest that complementarities occur "only when the partners bring distinctive competencies that are different and non-overlapping".

Thus, being complementary provides opportunity for building on their existing knowledge stock and deepens the knowledge specialization of the partnership rather than broadening its knowledge scope (Grant, 1996: 109-122). On the other hand, Buckley et al., (2008: 1-12) have stated that supplementary knowledge accession reflects the difference in specialized knowledge between firms. From this perspective, "complementing" is opposed to "supplementing." The purpose of supplementary knowledge transfer is to widen the knowledge scope of the alliance. When partner firms each possess distinctive knowledge and have the ambition to learn, the knowledge transfer is supplementary in nature. The firms can extend their scope of specialization by acquiring supplementary knowledge from the focal unit, thereby broadening their range of specialization. Supplementary knowledge acquisition can help firms to be more adaptable to market changes.

Based on RBV literature, by pooling complementary and supplementary resources and capabilities, firms can initiate and perform competitively on projects that they could not have done alone (Harrigan, 1985). Dyer and Singh, (1998: 660-679) argue that the benefit of joint R&D is based on the pooling of supplementary and complementary resources provided by the different partners. While one partner may contribute certain critical resources, such as technological skills and assets, another partner may be helpful in providing financing, complementary technical know-how, or access to the large domestic or international markets for the product of the joint R&D effort. The contributions of each partner are determined by both the assets at its disposal and its comparative advantage in different inputs. Accordingly, it is suggested that the potential for partners to

synergistically leverage the pooled resources and capabilities in the market place would increase with resource and knowledge complementarities. In other words, when partners bring in unique and valuable strengths and resources, the learning aspects of the alliance, as well as the performance of the project for which the alliance has been created, are likely to be enhanced. Based on the literature review, it is suggested that there are three individual partner characteristics that matter most concerning ability to develop and sustain valuable resources in knowledge exchange: staff's learning attitudes and abilities, skills, and structural characteristics.

#### 5.1.1 The Relationship between Partner Complementarities and Partner Attributes

According to Mowery et al. (1996: 77-91), learning intent and absorptive capacity are necessary conditions for a firm's successful exploitation of knowledge outside its boundaries. A parallel line of research in the broader technology transfer literature suggests that possession of these abilities facilitates inward technology transfer (Aulakh et al., 1996: 1005-1032). When a recipient perceives that it can obtain complementary resources and knowledge from the alliance partners that can provide it with a sustainable competitive advantage, its motivation to learn increases. Likewise, when the partners possess the same strategic intent with goal congruence and motivation, firms are eager to learn more as this facilitates the understanding of the knowledge being transferred and enhances the rate at which such knowledge is transferred among partners. In sum, the strategic intent alignment and the complementary resources and knowledge possessed by the partners influence the recipient's desire to

learn, which, in turn fosters the effectiveness of knowledge transfer across organizations.

Cohen and Levintal (1990: 128-152) introduced the concept of learning intent and absorptive capacity, for instance, to label the ability of the firm's intention to evaluate, assimilate, and use outside knowledge for commercial ends. They introduced the absorptive capacity construct as "the firm's ability to identify, assimilate and exploit knowledge from the environment." Absorptive capacity affects the ability of partnered firms to learn, according to Lane and Lubatkin (1998: 461), who noted that "...the ability of a firm to learn from another firm is jointly determined by the relative characteristics of the two firms." Absorptive capacity also affects the ability of a firm to internalize knowledge obtained from its partner or generated in cooperation with the partner. Thus, absorptive capacity can be enhanced through the existence of a differential in the respective resource inputs of the allies that induces different learning rhythms (Kumar and Nti, 1998: 356-367).

In terms of joint management skills, university-industry IOR does not simply involve the execution of specific tasks, but normally requires extensive interaction and joint decision making and problem solving. For these reasons, the management of the interface function is critical. It has been emphasized that gate-keepers in both firms' and academic laboratories have to be considered as key elements of the collaboration. The role of boundary personnel and gatekeepers is crucial in facilitating the internal dissemination of knowledge gained in the collaboration. As a consequence, both parties should carefully design and implement the interface function in order to avoid information appropriation by key

individuals. Thus, management support in terms of competence can be positively related to resource and knowledge complementarities which contribute to knowledge transfer success (Bloedon & Stokes, 1991: 8-10).

Lambe et al. (2000: 141-158) also posit that an alliance competence can be gained from the partner's complementary resources because such human competence is a resource that exist prior to alliance formation. First, tacit knowledge and previous organizational experiences contribute to a focal partner's knowledge regarding how to successfully form and implement alliances (Simonin, 1997: Spekman et al., 1999: 147-172). Firms that have such experience imply a "pro-activeness," which provides focal partners with an information advantage and skill exchange to improve their ability to select, negotiate, and structure alliances (Day, 1995: 297-300; Spekman et al., 1999). At the heart of alliance success, managers, and top management teams play a critical role. They have the ability to inspire, influence, change, and influence the thinking, attitudes, and behavior of people (Bass & Stogdill, 1989). They are also technologically knowledgeable and spontaneous in responding to unpredictable conditions. Thus, a firm with skillful alliance management tends to transfer such experiences to their focal partners in terms of their capability to manage inter-firm cultural differences and trouble shooting (Sivadas & Dwyer, 2000: 31-49).

In terms of the structural characteristics, the differences between structures will be characterized according to specialization, hierarchy, and formal coordinating mechanisms and interaction patterns varying upon the degree of complexity, formalization and centralization (Robbins, 1990). Formalization refers to the degree to which jobs within the organization

are standardized (Robbins, 1990). Centralization refers to the degree to which decision-making is concentrated at a single point in the organization (Robbins, 1990). Complexity refers to the degree of differentiation that exists within an organization. Horizontal differentiation considers the degree of horizontal separation between units. Vertical differentiation refers to the depth of the organization's hierarchy. Spatial differentiation encompasses the degree to which the location of an organization's facilities and personnel are dispersed geographically. An increase in any one of these three factors will increase an organization's complexity. From the above discussion, it can be seen that enhances alliance coordination and information flow is likely to be less formalized, and less centralized and simple. Thus, any organization that possesses these three structural characteristics can be considered as a complementary and supplementary resource for the alliance partner that enhances the process of knowledge transfer. From the above argument, the following proposition is suggested.

Preposition 1: Partner complementarities in terms of strategic alignment and complementary resources will be positively associated with partner attributes.

### 5.1.2 The Relationship between Partner Complementarities and Coordinating Factors

Brockhoff et al. (1991) have pointed out that certain organizational processes are important for successful interfaces. The tight linkage between corporate cultures and organizational operational actions contributes to the compatibility between partners, and this practice is therefore important for building university-industry relationships. To a certain extent, adaptation

and flexibility in information and knowledge transfer, for example, becomes crucial in dissolving conflict and mutual adjustment. Thus, flexible university policies can reduce conflicts between industrial firms and universities in terms of the compromise and attenuation of publication and product launch in the market in relation to the commercialization process. The more the university and its industrial partners can adjust to the needs of each other, the greater the strategic and goal alignment between them will be. Thus, it is argued that less coordination between two parties may lead to counterproductive outcomes and reduce the potential of resource and knowledge utilization pooled in the alliance partnership. Therefore, to a certain extent, blending organizational cultures offers an attractive feature to join in the alliance (O'Reilly & Chatman, 1996: 492-509). Culture is likely to impact knowledge transfer within collaborative ventures because of contextual differences between the partners. It has also been established that people carry their corporate and ethnic backgrounds into their collaborative relationships (Taylor & Osland, 2003) and this may affect their mental models of what should count as knowledge. Knowledge itself has been broadly defined to include a flux mix of framed experiences, values, contextual information and expert insights. Thus, differences in beliefs, values and practices between the alliance partners could create barriers to knowledge transfer unless they are identified and harmonized (Davenport & Prusak, 1998). Harrigan (1988: 83-103) suggests that symmetrical partnerships tend to foster a cooperative culture and that alliance without cooperative cultures tend to fail.

Additionally, support systems such as operational compatibility help facilitate a sense of unity and congeniality in the relationship. This

would be especially pertinent in international alliances where cultural differences are likely to exist. The tight linkage can enhance the collaboration between alliance partners in arriving at mutual adjustment. Organization patterns must change to accommodate the blending of each member's talents. At the same time, members must dissolve conflicts, develop unified management processes by identifying key issues that might cause conflict, and come to an agreement as to what all members can commit to at the same decision point (Dyer & Singh, 1998). Flexible university policies can also reduce conflicts between industrial firms and universities in terms of publication and product launch in the market. Therefore, in order to ensure the best chance of success, companies should either seek partners that have complementary resources and knowledge, similar management philosophies, strategic alignment and operational compatibility, or have an alliance agreement that adequately addresses differences, and provides for their mutual adjustment and conflict resolution (Ernst & Stern, 1996). As a matter of facts, most of those that possess these advantages are likely to have shared values and support systems for alliance collaboration that contribute to the effectiveness of knowledge transfer. Therefore, the following hypothesis is proposed:

Preposition 2: Partner complementarities will be positively associated with coordinating factors in terms of cultural and operational compatibility, as well as flexible university policies.

#### 5.1.3 The Relationship between Partner Complementarities and Relationship Factors

Socio-psychological aspects, such as trust, mutual commitment,

and bilateral information exchange embodied in relationship capital, are important since they act as coordinating mechanisms and determine the quality of the relationship (Heide & John, 1988: 24-36; Morgan & Hunt, 1994: 20-38). Mohr and Spekman (1994: 135-152) have found that relationship factors are likely to be fostered when partners perceive a high level of resource complementarities. In relationships, partners need each other's resources and where reciprocal needs exist, partners are less likely to resort to opportunism. Further, resource-interdependent partners are more likely to be motivated to create relationship capital by engaging in trustworthiness, commitment, and participative lines of communication.

The willingness of alliance partners is vulnerable to the actions of another party based upon the qualitative characteristics of behavior inherent in the partners' strategic philosophies and cultures and the partner's specific operating behaviors and day-to-day performance (Whipple & Frankel, 2000). In the knowledge acquisition process, an atmosphere of trust should contribute to the free exchange of information between committed exchange partners since the decision makers do not feel that they have to protect themselves from the opportunistic behavior of others (Blau, 1964; Jarillo, 1988: 31-44). Without trust, information exchanged may be low in accuracy, comprehensiveness, and timeliness (Zand, 1979: 229-239) because the partners are unwilling to take the risks associated with sharing more valuable information (Hedlund, 1994: 73-90).

Next, the construct of commitment between partners has also received much attention in the organizational behavior literature as well as in the marketing channel literature (e.g. Mowday et al., 1979; Anderson & Narus, 1990; Kumar et al., 1995). Commitment is generally defined as an

implicit pledge of relational continuity between exchange partners through their willingness to adopt a long-term perspective to the relationship, such as commitment to making an effort to achieving all goals and objectives of the alliance (Morgan & Hunt, 1994: 20-38). This positive climate fosters greater dedication to the project. Thompson (1967) argues that the mutuality of commitment in situations of reciprocal interdependence reduces uncertainty for the parties, leading to the effectiveness of knowledge transfer.

Lastly, bilateral information exchange is conceptualized to include the formal and informal sharing of timely, adequate, critical, and proprietary information among alliance partners. In terms of bilateral information exchange, it refers to the communication between partners which can be defined as "the formal as well as informal sharing of meaningful and timely information between firms" (Anderson & Narus, 1990). It serves as an integrating device since it helps align partners' interests and values (Mohr et al., 1996: 314-328). That practice facilitates the realization of mutual benefits by allowing exchange of necessary information and by reducing misunderstandings and uncertainty (Dwyer et al., 1987: 11-27). Bilateral information exchange includes quality of information, the extent of information sharing and participation in goal setting and planning.

Quality of information is perceived as a key aspect of transmitting information in terms of the accuracy, timeliness, adequacy, and credibility of information exchanged (Daft & Lengel, 1986: 554-571). Several researchers have noted that the meaningful and timely exchange of information can result in a more trusting relationship between partners, thus helping

managers to realize mutual benefits by reducing misunderstandings (Dwyer et al., 1987; Anderson & Narus, 1990: 42-58; Mohr & Spekman, 1994: 135-152). The quality of the information shared has also been found to be a key issue within the context of inter-organizational relationships (Mohr & Spekman, 1994: 135-152; Olson & Singsuwan, 1997: 60-85) and has been found to be an important predictor of partnership success (Devlin & Bleakley, 1988: 18-25).

Information sharing refers to the extent to which information is communicated between partners (Badaracco, 1991: 10-16). Effective information sharing increases information value for people in the organization, leading to trusting and committed relationships (Anderson & Narus, 1990: 42-58; Anderson et al., 1992: 18-34). A high level of information sharing in terms of clearly-defined roles and information exchange has been found to be positively correlated with satisfaction within a partnership (Moncza et al., 1998). Information sharing is composed of those devices put in place during the negotiation of the alliance agreement in an effort to avoid self-interested behavior by either of the alliance partners.

Participation in planning and goal setting refers to the extent to which partners actively engage in planning and goal setting (Mohr & Spekman, 1994: 135-152). Anderson et al. (1987: 85-97) also suggest that decision-making and goal formulation are important aspects of participation that help alliances to succeed (Mohr & Spekman, 1994: 135-152; Olson & Singsuwan, 1997: 60-85; Moncza et al., 1998). Planning, commitment, and agreement are essential to the success of any relationship. The overall strategy for the alliance must be mutually developed. Key managing

individuals and areas of focus for the alliance must be identified. Information exchange is critical in any research activity and the structure and nature of interpersonal communication channels greatly influence its outcome.

From the above-mentioned perspectives, it is seen that relationship factors are likely to be fostered when partners perceive a high level of complementarities. The principal of reciprocity implies that action from others affect the relationship. Thus, in relationships, partners need each other's resources and where reciprocal needs exist, partners are less likely to resort to opportunism. Thus, the following hypothesis regarding structural characteristics is hereby proposed:

Preposition 3: Partner complementarities will be positively associated with relationship factors.

### 5.2. The Interactive Roles between Coordinating Factors, Partner Attributes, and Relationship Factors

#### 5.2.1 Relationship between Coordinating Factors and Partner Attributes

Zhara and George (2002:185-203) have argued that compatible coordination between partners can help manage an alliance in a consistent way and in a way that allows them to successfully combine and synthesize their learning attitudes and abilities, skills, and compatible organizational structures. Thus, a shared vision in terms of a firm's sense of operational mission, along with consistency of cultures, is an essential process for coordination mechanisms. If partners lack the understanding of each other's operating requirements or if they are unwilling to make concessions and meet on a middle ground for cooperation, misunderstandings will result

and a lack of support for the relationship will give rise to frustration and disillusionment with the partnership (Niederkofler, 1991: 237-257). Thus, it is proposed that coordinating factors in terms of cultural and operational compatibility and flexible policies can enhance motivation to learn among alliance partners, modify the structural arrangement, and alter rigidity in the structural characteristics so that collaboration is more inflexible and can fit better with the alliance partnership.

Preposition 4: The greater the extent to which alliance partners are well-coordinated in terms of cultural compatibility, operational compatibility, and flexible university policies, the greater the extent of partner attributes in terms of the absorptive capacity and learning intent of the partners, the skill of joint alliance management, and structural characteristics.

### 5.2.2 The Relationship between Coordination Factors and Relationship Factors

Morgan and Hunt, (1994: 20-38) have pointed out that compatible operational philosophies and compatible corporate cultures have an impact on the enhancement of trustworthiness between alliance partners. The more efficient the alliance is in transforming an input of cooperation into collaborative output, the higher the trust will be (Buckley & Casson, 1988:31-53). Furthermore, as Thompson (1967) argues, mutuality of commitment incurred in situations of reciprocal interdependence and coordinating activities reduces opportunistic tendencies and also provides a basis for joint decision making and risk sharing (Sarkar et al., 2001: 358-73). Gulati et al. (1994: 61-69) have also argued that bilateral information

exchanges encourage openness and move alliances from win-lose situations to win-win situations, thus leading to stable long-term relationships through aligning incentive structures and enhancing confidence in each other (Williamson, 1975). Accordingly, these arguments offer considerable support for the following hypothesis:

Preposition 5: The greater the extent to which alliance partners are well-coordinated in terms of cultural compatibility, operational compatibility, and flexible university policies, the greater the level of relationship factors in terms of trust, commitment, and bilateral information exchange.

### 5.3. The Relationship between Mediating Variables (Partner Attributes, Coordinating Factors, Relationship Factors) and Knowledge Transfer Effectiveness

#### 5.3.1 Relationship between Partner Attributes and Knowledge Transfer Effectiveness

Many scholars have confirmed that the staff's learning attitudes and abilities and the skill of management and structural characteristics positively influence the amount of transferred knowledge. For example, in the study of Gupta and Govindarajan (2000: 473-496), the findings reveal that lack of motivation in accepting knowledge caused by poor learning attitudes and ability leads to "stickiness" or difficulties in the transfer process (Szulanski, 1995: 27-43). Moreover, it can be argued that if a recipient organization is very motivated to acquire knowledge possessed by a foreign source, it will be better prepared psychologically to understand

the knowledge that is being transferred. Indeed, learning intent captures the degree of desire for internalizing a partner's skills and competencies (Simonin, 2004: 407-427). Covin and Levinthal (1990: 128-152) also further introduced the concept of absorptive capacity, which refers to a firm's abilities to internalize knowledge obtained from its alliance partner in order to help its innovative activities. In terms of management skills, Day (1995: 660-679) has also stated that they contribute to a firm's ability to create idiosyncratic resources that are not inimitable due to "causal ambiguity." This ambiguity is maintained because the essential skills and knowledge are embedded so deeply into the management themselves regarding the tacit knowledge about alliances, the culture, and the supporting innovation processes that they cannot be directly observed (Day, 1995: 660-679). Teece (1998: 285-305) has also argued that a preferred structural characteristic is likely to be used in certain conditions and environments in the organization. The design of a firm will contribute to its performance in a knowledge-sharing context. From the above discussion, the following hypothesis is proposed:

Preposition 6: Partner attributes consisting of staff's learning attitudes and abilities (learning intent, absorptive capacity), the skills of joint alliance management (joint management competence), and the structural characteristics (formalization, centralization, and complexity) are positively related to the perceived level of knowledge transfer effectiveness.

#### 5.3.2 Relationship between Coordination Factors and Knowledge Transfer Effectiveness

Parkhe (1991) has argued that diversity in cultural and procedural differences may be at the root of adversities and can negatively

affect the quality of partnership interactions. In order to have effective communication and exchange of knowledge, there has to be at least a minimum congruence between norms and procedures. Partners with compatible cultures are more likely to understand one another and to work toward common goals. Compatible cultures engender synchronization of expectations and behaviors. O'Reilly and Chatman (1996: 492-501) have further stated that organizational culture has an effect on the success of the alliance. At the same time, members must develop unified management processes by identifying key issues that might cause conflict and come to an agreement (Dyer & Singh, 1998: 660-679). In the case of university-industry alliances, there are some inevitable conflicts in their organizational settings. The industrial side shows certain rigidity in the decision and communication channel, and the university side often presents a traditional bureaucratic structure which generates barriers to a swift and ambiguous decision process (Gleister & Rubenstein, 1989: 47). Thus, flexible policies, regarding intellectual property, patent policies, and licensing agreements are a major facet in the area of the university-industry relationship. Both universities and industrial firms see these areas as potential ways to increase revenues, establish competitive advantage, and enhance their own recognition. Competition between universities and industrial partners over these rights is therefore a contentious topic (Phillip, 1991: 80-93). Many universities like to claim patent rights for any new inventions or technical discoveries developed through the use of university facilities and services (NSB, 1996). They also prefer not to grant exclusive licenses to their industrial partners, since exclusive licensing to one firm restricts the dissemination of knowledge to the general public.

As a result, industry often perceives universities as self-centered and inflexible compelling them to go elsewhere for more accommodating partners (Gerwin et al., 1992: 57-67). However, universities with successful track records in building industrial partnerships are much more obliging to industry's needs in that they balance the tensions between their primary goal of knowledge dissemination by withholding the dissemination of some information in order to provide the industrial firms with patent protection (Mansfield, 1991:1-21). Thus, the following hypothesis is proposed:

Preposition 7: The greater the degree of coordination factors, consisting of cultural and operational compatibility, as well as flexible university policies, the greater the perceived level of knowledge transfer effectiveness.

#### 5.3.3 Relationship between Relationship Factors and Knowledge Transfer Effectiveness

In the knowledge acquisition process, an atmosphere of trust should contribute to the free exchange of information between committed exchange partners since the decision makers do not feel that they have to protect themselves from others' opportunistic behavior (Blau, 1964; Jarillo, 1988: 31-44). Without trust, information exchange may be low in accuracy, comprehensiveness, and timeliness (Zand, 1979: 229-239). Additionally, commitment to a relationship has been also viewed in terms of the economic costs of maintaining the partnership, as well as the emotional ties to the relationship. Thompson (1967) argues that mutuality of commitment in situations of reciprocal interdependence reduces uncertainty for the parties, leading to the effectiveness of knowledge transfer. Communication also enables goal adjustment, task coordination, and inter-firm learning. Mohr

and Spekman (1994: 135-152) have stated that planning, commitment, and agreement are essential to the success of any relationship. Thus, based on the aforementioned argument, the following hypothesis is tested in this study:

Preposition 8: Relationship capital, consisting of trust, commitment, and bilateral information exchange among the university-industry alliance partners, is positively related to the perceived level of knowledge transfer effectiveness.

## 6. Conclusion

In today's highly competitive business environment, the collaborative R&D alliance partnership is currently considered as a win-win strategy to move Thai universities and the Thai industrial sector forward in terms of innovation and scientific breakthroughs in a knowledge-based economy. However, knowledge is the main source of innovation. As a matter of fact, the diffusion of knowledge needs to be captured and combined with other knowledge coming from different sources to foster innovation. Measuring the effectiveness of such processes as well as the proper knowledge transfer between the various stakeholders in university-industry alliance relations is crucial. The author has developed a framework for the RDCE model that is believed to include the factors necessary for measuring the effective collaboration between universities and industries.

Three theoretical perspectives, namely inter-organizational relations (IORs), the knowledge-based view (KBV), and the resource-based view (RBV) of the firm were used to explain this phenomenon. The 8 S-framework,

which includes strategic alignment, source attractiveness, staff's learning attitudes and abilities, skills of joint management, structural characteristics, shared values, support systems and styles of relationship in four groups of variables, namely partner complementarities, partner characteristics, coordination factors and relationship-based factors, were integrated to offer a holistic view of the effectiveness of knowledge transfer. The framework of this study could be further operationalized and empirically verified by researchers interested in this area of research. The contribution of the study offers a theoretical understanding of the university-industry alliance, which can be a starting point for conducting empirical studies in order to uncover the phenomena underlying strategic alliances in the R&D alliance context.

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