KNOWLEDGE TRANSFER EFFECTIVENESS OF UNIVERSITY-INDUSTRY ALLIANCES

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ABSTRACT

Title of Dissertation	Knowledge Transfer Effectiveness of University-Industry Alliances
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Drawing on inter-organizational relations (IORs), the knowledge-based view (KBV), and the resource-based view (RBV) perspectives, this paper explores the relationship between partner complementarities, partner attributes, coordinating factors and relationship factors, together with a broad conceptualization of knowledge transfer effectiveness, consisting of research outcomes, development through tacit knowledge transfer, commercialization, and efficient coordination (RDCE model) in the university-industry context.

The objectives of the study include: 1) to study the extent of knowledge transfer effectiveness between universities and industrial partners during 2007-2009; 2) to examine the determinants of the knowledge transfer effectiveness of university-industry alliance partners, and 3) to test whether antecedent factors affect the effectiveness of knowledge transfer among alliance partners differently, and if it does, whether it influences the effectiveness of knowledge transfer directly, indirectly or both. The proposed path analytic model was tested using structural equation modeling to evaluate theoretically specified constructs and to collect survey data in order to validate the measures and examine the proposed causal relationship models. Using survey data gathered from 240 alliance partnerships, the statistical results revealed that the proposed model has a significant mediating effect that contributes to knowledge transfer effectiveness. Based on the causal path model, partner attributes and relationship factors are the key enablers on knowledge transfer effectiveness. These findings, however, reveal that partner complementarities in terms of strategic and resource alignment between partners are only key antecedent factors and have

only an indirect effect contributing to knowledge transfer. This appears plausible since mere complementarities between partners may not lead to learning or knowledge transfer, which require a certain depth of partner interaction, specific attributes of partners, and relationship quality. These observations bring into question whether the network organization like alliance partnership can achieve the knowledge transfer effectiveness if it is a single coherent entity driven by a particular dominated partner. Instead, it suggests that alliances are socially embedded and therefore highly need to incorporate strategic orientation between university-industry alliance partners in terms of mutual dependence, management vision, governance mechanisms, institutional support, and network interface in order to enhance knowledge transfer, contain opportunism, and prevent defection from the university-industry alliances.

Taking into consideration both universities and industrial partner perspectives, the results also outline a successful method that has enhanced the effectiveness of knowledge transfer by driving R&D co-development alliance projects in terms of changing academic outputs to the private sector market place. In making this transition, a number of obstacles, as well as opportunities, were addressed. Still, by looking inward, the author suggests that there exists an excellent opportunity for universities to meet the private sector needs for new product development and knowledge exchange. In return, the university's outreach initiatives could develop unlimited opportunities for university stakeholders (faculty, students, alumni, etc.) to learn, prosper from, and advance their educational research mission by fostering active relationships via co-development alliances with the private sector.

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Patthareeya Lakpetch

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ABBREVIATION AND SYMBOLS

Abbreviations	Equivalence
AGFI	Adjust Goodness of Fit Index
CFI	Comparative Fit Index
CMIN/DF	Chi-square Statistic Comparing the Tested Model and the Independent Model with the Saturated Mode
DE	Direct Effect
df	Degree of Freedom
F	F-Distribution
GFI	Goodness of Fit Index
IE	Indirect Effect
IFI	Incremental Fit Index
n	Sample Size
NFI	Normal Fit Index
%	Percentage
P-value	Probability Value
r	Pearson Product Moment Correlation
R^2	Square Multiple Correlation
RMR	Root Mean Square Residual
RMSEA	Root Mean Square Error of Approximation
S.D.	Standard Deviation
S.E.	Standard Error
t	t-Distribution
TE	Total Effect
$\overline{X}$	Arithmetic Mean
x^2	Chi-Square Test

CHAPTER 1

INTRODUCTION

1.1 Background of the Study

Thailand is a developing country and as such it is encountering fierce competition due to globalization. The political plans outlined by the government stress the need for Thailand to balance its objectives to achieve sustainable happiness and its target of "the Sufficiency Economy Philosophy," which is sustainable but competitive. One of the focuses of the country is oriented not only toward improvement of the economic structures of trade, production, and tourism but also towards science and technology development (Lungkana Worasinchai et al., 2002).

To remain economically competitive, the industry of Thailand is committed to continuing to add value to manufacturing and services and increasing productivity and creativity as well as entrepreneurial development. The key factor of economic growth has been the availability of a highly-educated and productive workforce within a supportive environment that promotes innovation and enterprise. However, as shown in the research conducted by the Ministry of Science, the number of researchers in Thailand is very low in comparison with other countries in the region. Over the last 10 years, the government's policy has been geared toward a knowledge-based economy by creating a pro-business environment for entrepreneurship to sprout and flourish. This includes instituting policies and regulations, setting up infrastructure, reviewing government rules and regulations which may have become outmoded in today's business environment, enhancing intellectual property protection, improving business access to financing and training manpower and encouraging more creativity, innovation and entrepreneurship in the education sector. In order to accomplish these goals, this collaborative plan has been implemented through encouraging the interactions of university, government, and industry partners linkage as a means of

supporting the growth of a mutually-supportive relationship in the local economy (Lungkana Worasinchai et al., 2002: 289).

Through collaboration, the R&D alliance augments and extends firms' internal efforts to achieve strategic objectives, providing access to specialized knowledge that may be difficult if not impossible to bring into the firm (Bercovitz and Feldman, 2007: 932). Recent literature on "open innovation" has further emphasized the importance of inter-organizational relationships in the innovation process. Organizations increasingly rely on external sources of innovation via inter-organizational network relationships (Perkmann and Walsh, 2007: 259-280). According to Chesbrough (2003), "the role of internal R&D is to identify, understand, select from, and connect to the wealth of available external knowledge, and to fill in the missing pierces of knowledge that are not being externally developed." In this light, as Bercovitz and Feldman (2007: 930-948) argue, the "university-firm dyad" is a particularly unique mechanism for "cross-boundary learning" (Gibbons and Johnston, 1994: 230). Universities can be seen as strong actors in economic development through incubator facilities or as scientific/technological pools for industry. It appears that universities and research institutes and centers will have an important role to play in assisting the small and medium enterprises (SMEs) in their technology upgrading and in guiding them in developing their own research capability so that they can better meet future challenges. On the other hand, governments can facilitate the relationship between them by offering collaboration incentives and infrastructures.

Nohria and Garcia-Pont (1991: 105-124) have posited that through alliances, a firm can gain access to desired strategic capabilities through knowledge transfer by linking to a partner with complementary resources and knowledge, or by pooling its internal resources with a partner possessing similar capabilities. Harryson et al. (2008: 12-46) further add that 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 as an essential instrument to gain speed and flexibility in knowledge transfer while reducing costs in R&D and operation. Nowadays, there are different typologies of university-industry alliances such as cooperative education,

scholarly academic services and research consortia in the form of small and enterprises (SMEs), R&D grants for intellectual properties etc.

As illustrated in table 1.1, a collaborative R&D alliance partnership is currently considered as a win-win strategy to move Thai universities and Thai industrial sectors forward in terms of innovation and scientific breakthroughs in a knowledge-based economy. There are compelling reasons towards the cooperation: economical factors, social factors and political factors.

Politically, the government's policy has been geared toward a knowledge-based economy by encouraging the interactions of university, government, and industry partners' linkage. The collaboration is much easier as government provides facilities and subsidies for the collaboration between university and industrial partners by offering collaboration incentives and infrastructures such as research centers, or broker association such as Office of Small and Medium Enterprises Promotion (OSMEP), Thailand Research Fund (TRF) and Commission of Higher Education etc. to facilitate collaboration.

Apart from these reasons, 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 (KPI) such as numbers of academic outputs, Academic activities and so on to measure the quality of Thai universities. In 2005, it defined a new main KPI associated with the implementation of knowledge management (KM). Many Thai universities are implementing KM, thus making them operates in an environment that is closer to the business world. In addition, the implementation of autonomous system in the universities has driven Thai universities to find new sources of income to capitalize on their intellectual asset due to the increasing gap between public funding and research costs.

Likewise, the government also sets regulation on the industrial production in terms of corporate social responsibilities towards the manufacturing of environment friendly products, the management of toxic substances and the concerns of people's wellness. Therefore, the industrial sectors must pay more attention on their production to customize and to meet these government requirements. Thus, the co-development research has help accredit the quality of product as well as increase product image with the association with the well-known and prominent institutions.

Table 1.1 Driving Forces of University-Industry Alliance Collaboration between University and Industrial Partners

Organizations	Economical factors	Social Factors	Political Factors	Technological Factors
Universities	-Less financial support from the government. - Increase fixed costs but lower number of students -Lack of financial budget in pursuing research activities	-The decline of birthrate in Thailand that impacts the number of students applying to university	-The implementation of KPI (Key Performance Index) for evaluating the quality assurance of universities - Autonomous university will gain less financial support from the government	-Requirement for the new scientific breakthrough knowledge as the acceptable academic outputs
Industrial Partners	-Increasing Costs in R&D activities (preferably outsourcing methods), low investment in facilities, laboratories and equipments -Costly in headhunting the expert from other companies -Acquiring new product development and scientific breakthrough with certain budgets.	- The research output will be more application-oriented for the sake of public interest and commercial purposes to meet the needs of customer demand -Create of product image with the association with well-known institutions	-The government policy towards the knowledge-based economy. - Government Support in terms of incentives and Infrastructures collaboration through broker associations such as OSMEP, TRF - Government Regulation in terms of environmental aspects towards the manufacturing industry such as the promotion of environmental friendly products and prohibition on toxic substances	- Rapid technological change -Aggressive Competition in the industry -Energy Crisis - New trends of Science and Technology such as Nano, Bio-Technology

Source: The Author's Own Elaboration

In terms of social aspects, the growth of the population of Thailand and its social structure are also changing. The birthrate in Thailand, as in many other countries in the world, is decreasing, and this directly impacts the number of students applying to university (Lungkana Worasinchai et al., 2002: 293). The number of universities increasing and the number of students decreasing make education more and more competitive. Universities are still running with the same fixed costs, with less income, resulting in administrative disadvantages.

Economically, industrial firms are mainly concerned about the needs to reduce R&D costs and gain financial supports in terms of outsourcing with the agreement of university and sharing facilities and equipments, as well as innovating new product with certain costs. Additionally, due to global competition and rapid technological advances, this competitiveness in the market demands that firms to broaden their knowledge base through outsourcing and collaborating with university. By the same token, the education sector in Thailand is becoming competitive not only among Thai universities but also among foreign universities. Many universities, from different part of the world, are extending their overseas campuses and collaborating with Thai universities in different ways, such as exchange students and exchange faculty members. Therefore, the education cooperation among foreign universities and Thai universities is now competitively growing. As a matter of fact, universities have also modified their strategic focuses to become more involved in the development and commercialization of new technologies to survive. Consistent with this strategic orientation, universities and industrial sectors have become R&D alliance partners. Evidence of these changes can be seen in the gradual shift in university research outputs from scholarly research to non-academics such that patents, licenses and practical applications that are gaining more prominence in responding with the needs of focal industrial partners (Lungkana Worasinchai et al., 2002: 292).

In terms of benefit yielded for universities, during their contacts with industrial firms and other organizations, universities gain advantages from financial support for research activities and more exposure to applications oriented research for practical use rather than for the purpose of scholarly publication and obtain better insight into curricula development. 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.

On the other hand, an industrial partner can gain access to desired strategic capabilities through knowledge transfer by linking to a partner with complementary resources and knowledge, or by pooling its internal resources with a partner possessing similar capabilities such alliances create synergies between resources and knowledge that enhance or reshape competition within the market to gain speed and flexibility in knowledge transfer while reducing costs in R&D and operation. Additionally, alliance collaboration should reduce the investment for in R&D for industrial firms that emerge from the limited uses of research results. Also, benefits of collaboration to a firm include access to highly trained students, facilities, and faculty as well as an enhanced image when associated with a prominent institution. Figure 1.1 is summarized mutual benefits between universities and industrial partners through alliance collaboration.

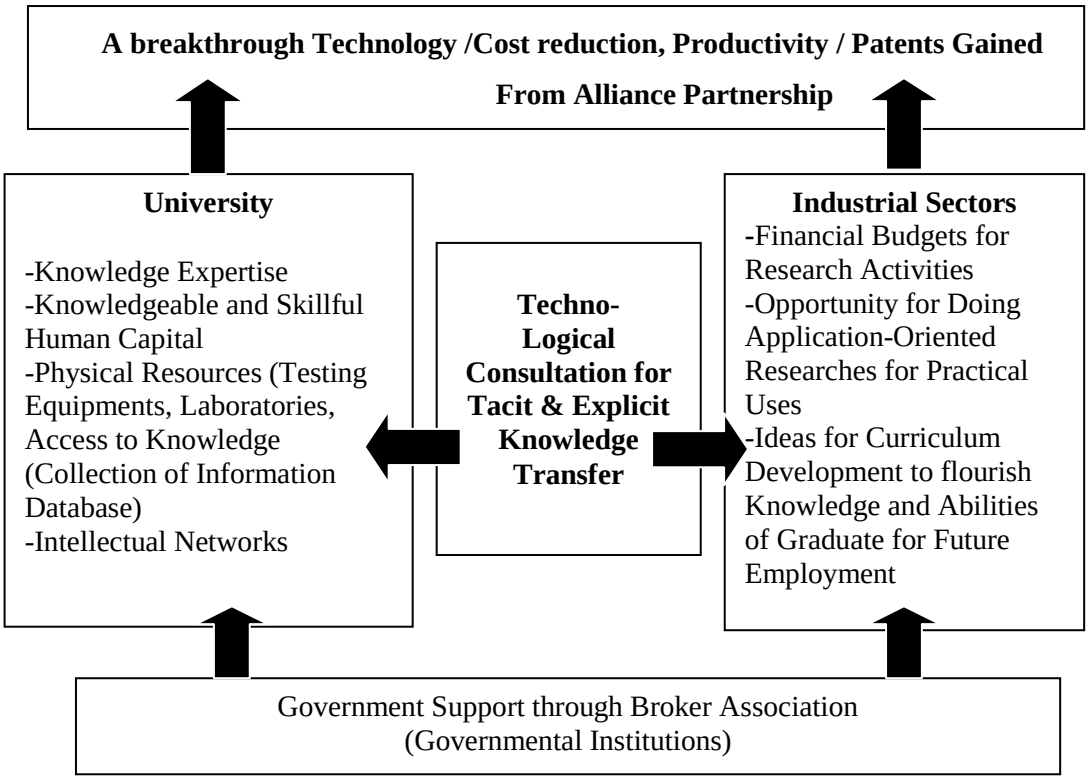


Figure 1.1 Mutual Benefits through Alliance Partnership

Source: The Author's Own Elaboration

1.2 Significance of the Study

Owing to the increasing importance of strategic alliances, the rate at which firms formally collaborate has increased dramatically in recent years (Gulati, 1995: 85-112; Glaister and Buckley, 1996: 301-332). However, collaborations often do not achieve their goals, and many fail. This leaves managers in a dilemma: they are eager to get the benefits from using these cooperative arrangements; however, they fear that what they get will be a nightmare instead of a fulfillment of their expectations (Lin and Chen, 2002: 139-166). Therefore, there is still considerable interest among managers and scholars in discovering a recipe for successful alliances (Harrigan, 1988: 83-103).

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). Therefore, institutions 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. Thus, to understand the factors that affect the performance of knowledge transfer is critical, as it is one part of the key success of collaboration.

Though there is a general abundance of theoretical and empirical literature dealing with cooperation with universities, research centers, and public research organizations (Mowery and Rosenberg, 1989; Ham and Mowery, 1998: 601-675; Rogers et al., 1998: 79-88), there are few studies based on such comprehensive data as that used in this paper or that look into the integrated four dimension of knowledge transfer effectiveness (research outcomes, development through tacit knowledge transfer, commercialization, and efficient corporation) that contribute to knowledge transfer performance.

Also, there is no clear idea of the factors that would contribute to the effectiveness of knowledge transfer between the alliance partners. Alliance managers and researchers have not paid much attention to how alliance partners develop their relationships after a strategic alliance is formed or how they effectively cooperate with contribute to the strategic alliance (Gulati et al., 1994: 61-69). The strategic alliance research has not fully provided insight into how strategic alliance partners develop their relationships through which each partner can enhance mutual understanding and cooperation and how the improved understanding and cooperation influence the pooling and capitalization of the knowledge contributed to the strategic alliance success by enhancing knowledge transfer performance (Yan and Gray, 1994: 1478-1517; Simonin, 1999: 463-490; Barringer and Harrison, 2000: 367-403). Given the multiple forms and different natures of university-industry alliances, there is also considerable ambiguity concerning the applicability and extension of our current knowledge on conventional strategic alliances to the area of this type of alliance.

In this study, the primary objective is to integrate the various perspectives on R&D alliances and to develop a framework for future investigation. The focus is on the transfer of alliance knowledge by alliance partner firms. Specifically, assuming an alliance partner has a learning objective, what factors are associated with the successful acquisition of alliance knowledge by an alliance partner? How does learning and knowledge transfer occur in the university-industry alliances? How can the effectiveness of knowledge transfer be enhanced? This paper focuses on attempting to understand the characteristics of the relationship between companies and universities that may lead to successful cooperation in terms of knowledge transfer. This empirical study is based on a sample of 350 alliance projects performed by partners from the public and private sectors that took part in some type of collaborative R&D projects between 2006 and 2008. The results indicate that cooperation with universities is a nation-wide phenomenon involving basic research, conducted under the sponsorship of different research support schemes promoted by private and governmental sectors.

Thus, the significance of the study hinges on its contribution. The research offers insight from both university and companies perspectives. The former examines the determinant factors that can result in developing alliances with the public and

private firms to commercialize their research output. The latter offer 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 of new product ideas and academic institutions an opportunity to capitalize on new ideas generated by those institution via the knowledge transfer through alliance.

1.3 Objectives of the Study

The research objectives are as follows:

1) To review the research on university-industry alliance partnership and theoretical approaches applicable to the analysis of knowledge transfer effectiveness among the alliance partners

2) To examine the factors determining the knowledge transfer by proposing an RDCE model as a new construct measurement, including research outcomes, development through tacit knowledge transfer, commercialization and efficient cooperation

3) To conceptualize the determinant factors, which play key roles in the university-industry alliance partnership and that lead to superior knowledge transfer effectiveness.

1.4 Scope of the Study

1) The relationships between industrial firms and the university are the focal point of the paper. The scope of this study concerns about the formalized alliance structure rather than informal relationships between industry and academe. The university-industry alliance is defined as an inter-firm cooperative arrangement for the attainment of some strategic objectives. In this definition, university-industry alliances are concerned solely with contractual agreements without equity sharing, such as licensing, marketing and distribution agreements, manufacturing agreements, R&D agreements, and technology agreements between the partners. The main focuses are

related to a range of activities, such as collaborative research and development, staff consultancy, seminars and specialist training courses, industrial attachment programs, technology licensing, commercialization, formation of SME spin-off companies (incubation centers), and venture development.

2) The frame of sample respondents contains the lists of Chiefs Executives of Boards (CEOs), middle line managers, alliance project managers, researchers, directors of joint research projects and administrators in charge of university network and university-industry alliance projects implemented together with the partners from both the private and public sectors during 2006-2008.

1.5 Contributions of the Study

The contributions of this research are at the theoretical and practical level.

1.5.1 Theoretical Contributions

At the theoretical level, there is growing evidence that previous studies on international alliances appear to focus on a variety of alliances such as international joint ventures, licensing, and other cooperation relationships between two or more potentially competitive firms in terms of technological transfer, with little attention to non-equity based alliances in university-industry alliances. Consequently, the determinants of a successful collaboration have been examined mostly from the multinational corporations' perspectives in terms of joining new product innovation programs with international joint ventures. As a result, those studies insufficiently explain the phenomena that have occurred in university network and university-industry alliances due to different environmental settings and corporate missions. Therefore, this study contributes to the enhancement of our understanding and develops a theory of international alliance by providing results from a wider scope of industries. This study's first contribution is to clearly define R&D alliances between university and industry alliances and to concentrate specifically on this type of collaboration. Several characteristics differentiate these types of alliances from other types of partnership. Integrated constructs were proposed to give holistic views of the university-industry alliance context.

Second, this study contributes to the theoretical development of an integrative model for measuring the effectiveness of knowledge transfer. Little has been done in the literature in investigating the combined effects of the four constructs, including partner complementarities, partner attributes, coordinating factors and relationship factors, on the effectiveness of knowledge transfer which can be measured through four dimensions of explicit and tacit knowledge transfer (research outcomes, development through tacit knowledge transfer, commercialization and efficient coordination). This study, based on extensive literature review, builds hypotheses between these constructs and the effectiveness of knowledge transfer.

The third contribution of this study is the derivation of empirical support for the model's prediction using data from actual partnerships. The empirical evidences of this study prove the relationships between these constructs and clarify the relative importance together with the interrelationships between partner characteristics and relational aspects in explaining the effectiveness of knowledge transfer. Much of the prior research has generally considered these two aspects separately to improve the effectiveness of knowledge transfer. Our findings, by examining the direct and indirect effects of partner characteristics on knowledge transfer, highlight the need to examine both simultaneously. Thus, the findings of this study fill the gap in the literature that is lack of examining these integrated determinants affecting the effectiveness of knowledge transfer.

1.5.2 Practical Contributions

At the practical level, this study also proposes a conceptual framework to examine the factors influencing the effectiveness of knowledge transfer within the university-industry alliance which can be broadly applied to other industries. The findings of this study present the factors that are most relevant to the case of the university. Eventually, the current study can be also used as a reference basis for comparative study in the same or related fields such as pharmaceutical and biotechnology, etc., in order to monitor the current performance among partners and find ways to improve cooperative weaknesses.

The evidence gained from the study will be beneficial to management for verifying the factors that enhance or weaken 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. They could also set well-elaborated goals and objectives, and develop more effective functions for achieving them (especially for knowledge obtaining purposes). In other words, this awareness would improve the alliance management capability of the organization. Consideration of these factors could affect interrelationship decisions and modify the partners' reciprocal behaviors to perform better and achieve knowledge-related purposes.

1.6 Definition of Terms

University-industry alliance refers to any form of cooperation between universities, research centers and industrial firms, in particular, those that involve production process know-how, and R&D process and technology, to achieve their strategic objectives and innovation by pooling their resources, knowledge and skills. Partners may or may not possess equity shares in the collaborated project. Alliance includes both formal and informal agreements, especially in the form of personnel exchanges, cooperative research projects and education as well as university-sponsored research project for commercial purposes.

Partner complementarity refers to the extent to which both partners have strategic alignment and source attractiveness in terms of supplementary and complementary resources and knowledge to complement each other and facilitate the partnership. Strategic alignment refers to the extent to which both partners can create synergistic value through co-development alliances and possess motivation and goal correspondence. Source attractiveness refers to the extent to which each partner brings in unique strengths and resources, including financial, technological, and physical resources, as well as organizational capabilities to the collaboration to extend the scope of knowledge specialization and increase new product development from the existing product range and to build on the existing knowledge stock and deepens the knowledge specialization of the partnership by enhancing the efficiency and economies of scale of the partnership rather than broadening its knowledge scope.

Partner attributes can be defined as the partner characteristics in terms of their learning attitudes and abilities, skill of management and structural characteristics. Staff's learning attitudes and abilities refers to the willingness of organization members to learn from externally acquired knowledge and their abilities to internalize knowledge obtained from its partner or to generate, and integrate explicit knowledge in cooperation with the partner. In terms of management skills refers to the extent of the ability with which alliance management can identify potential partners and maintain good relations between the two organizations by solving conflicts in the university-industry partnership. In the aspects of structural characteristics, these governance mechanisms refer to the characteristics of working procedures in the organizations which are different according to the degree to which jobs within the organization are standardized (formalization), centralized or are complex with high differentiation of working units.

Coordinating factors refer to the degree of cultural compatibility and shared value which are congruent in terms of organizational philosophies, norms, and value systems and the extent to which each partner has similar and consistent procedural capabilities on a day-to-day working basis and the context of a working relationship its policies to overcome operating misfit and compromise for existing organizational incompatibilities regarding intellectual property and publication of new research and products.

Relationship factors refer to the degree of trust, commitment and bilateral information sharing between partners. Trust refers to the extent to which each party has confidence and willingness to rely on their alliance partners based on the qualitative characteristics inherent in the partners' strategic philosophies and cultures, as well as their specific operating behaviors and day-to-day performance. In addition, commitment refers to the extent to which each partner intends to stay in the relationship and has the attitudes and willingness to make all effort on behalf of the alliance to create a positive environment that facilitates overcoming of barriers to meet alliance goals. In terms of bilateral information exchange, it refers to the extent to which information is communicated to engage all partners in planning and goal setting in terms of decision-making and goal formulation through partner interface mechanisms such as formal collaboration through communication channel, frequency

of communication with quality information sharing, including such aspects as the accuracy, timeliness, adequacy and credibility of information exchange.

The effectiveness of knowledge transfer represents the framework measurement of knowledge transfer outcomes in the university-industry alliances context which include research outputs and tangible consequences such as patents, licenses, publications, cooperative researches; development through tacit knowledge transfer through professional and skill development; commercialization through technology transfer activities through the degree of involvement in the process of decision-making, developing, and commercializing products from the projects; and efficient corporation in terms of mutual comprehension, usefulness, goal attainment, speed and economy.

1.7 Organization of the Study

The conceptual framework of this dissertation draws on the resource perspectives that lead to alliance formation and also its impact on the collaborative network and the effectiveness of knowledge transfer among university-industry alliance partners. This study is organized as follows:

Chapter 1 introduces the topic, its significance, the objectives, the scope of the study and a definition of terms; additionally, the organization and contribution of the study are also discussed.

Chapter 2 provides some brief details about the background of the strategic alliance and specifically about classification and other university-industry alliance concerns. Related literatures of theoretical frameworks such as inter-organizational relations (IORs), resource-based view (RBV), and knowledge-based view (KBV) are also introduced as grounded theories for investigating the knowledge transfer phenomena in the university-industry alliance context. The logical relationships between variables are explained. A conceptual model for analysis is proposed together with the derived hypotheses, research variables, operational definitions and structural equations.

Chapter 3 explains the methodology, which describes proposed research design, research instrument, the population of the study, units of analysis, data

collection procedures, the methods of the data analysis and the scale construction of variables and measurement, together with a reliability test.

Chapter 4 deals with the findings. The collection and analysis of the data to test the hypotheses suggested in chapter 3, together with descriptive statistics, are described

Chapter 5, the final chapter, contains the conclusion and a discussion of the results and provides some insights into the implications of the findings and suggestions for further research.

CHAPTER 2

LITERATURE REVIEW

This chapter is organized three parts. The first part presents the literature review on strategic alliance and an overview of know-based alliances, especially the origin of university-industry alliance together with prior studies related to these types of alliance and knowledge transfer performance. The second part includes the theoretical and empirical literature concerning the factors affecting the effectiveness of knowledge transfer in university-industry alliances. The last part presents the conceptual development and the logical relationships between variables, the framework, and the research hypotheses of the study.

2.1 Overview of the Strategic Alliance and Knowledge-Based Alliance (KBEs)

The cooperative agreements between two or more organizations for attaining mutually beneficial goals have come to be known as strategic alliances. According to Draulans et al. (2003: 155-66), co-operation between firms is a very old phenomenon. Businesses have entered into alliances for centuries. The first “alliance literature” is said to date back the 1960’s work of Warren (1967: 396-419) and Evans (1986: 26-49) on inter-organizational relationships. Since the early alliance literature, different forms of alliance have become more important for companies and management, and according to Duyster et al. (1999: 505-530), the number of non-equity agreements has grown from less than 10 percent of all alliances in 1970 to approximately 85 percent in the mid 90’s. This rapid growth has during the 1980’s and 1990’s resulted in a wealth of literature and consequently many different views and definitions of what an alliance actually is. Some of the more influential definitions are presented below.

2.1.1 Definition of Strategic Alliances

Strategic alliances are defined commonly in the literature as “any voluntarily initiated cooperative arrangements between firms involving exchange, sharing or co-development and it can include contributions by partners of capital, technology, or firm-specific assets” (Gulati, 1995: 85).

In addition, Mohr and Spekman (1994: 136) defined strategic alliance as the “purposive strategic relationship between independent firms that share compatible goals, strive for mutual benefits, and acknowledge a high level of mutual dependence.”

According to Contractor and Ra (2000: 271), an alliance is “any cooperative or joint action between two companies on a contractual and/or equity joint venture basis.”

Das and Teng (2000: 31) define strategic alliances as “voluntary cooperative inter-firm agreements aimed at achieving competitive advantage for the partners.”

Willcocks and Choi (1994) define strategic alliances as “inter-organizational relationships involving voluntary, collaborative efforts of two or more organizations to create and add to, if not maximize their joint value.”

According to Forrest (1989), “Strategic alliances are those collaborations between firms and other organizations, both short-term and long-terms, which can involve either partial or contractual ownership, and are developed for strategic reasons.”

As can be seen from these definitions, one common view of what an alliance is does not exist. Still, all of the definitions are describing some form of cooperation between organizational entities. Some definitions (Craven et al., 1993: 55-70) are stricter than others, while others emphasize the voluntary nature of the cooperation. Besides the definitions presented above, it has further been suggested that a key characteristic of an alliance is sharing resources (Hamel et al., 1989: 133-139). From this study’s point of view, however, the most important difference between the definitions is the use of the word “strategic.”

Varadarajan and Cunningham (1995: 284) define strategic alliance as the pooling of specific resources and skills by the cooperating organizations in order to achieve common goals, as well as goals specific to the individual partners. Strategic

alliances are relatively long-term collaborative arrangements, including R&D coalitions, marketing and distribution agreements, franchising, co-production agreements, licensing, consortiums, joint ventures and so on (Tsang, 1998: 346-357). Firms will be interested in cooperating when they need complementary resources from others to overcome limitations and to avail themselves of different opportunities. Alliances are formed for a variety of reasons, and these include entering new markets, reducing manufacturing costs, developing and diffusing new technologies rapidly (Walters et al., 1994: 5-10); getting access to new markets, and learning new management and partnering skills (Medcof, 1997: 718-732); and sharing risk and defending against competitors (Ellram, 1992: 1-25).

2.1.2 Types of Strategic Alliances

According to Narula and Hagedoorn (1999: 283), alliances can be categorized into two broad groups of agreements: equity-based and non-equity based alliances, based on their degree of inter-firm interdependency and internalization. Alliances range from relatively noncommittal types of short-term, project-based co-operation to more inclusive, long-term equity-based co-operation. At one extreme lie wholly-owned subsidiaries, representing complete interdependence between firms and full internalization. At the other extreme are free market transactions, where firms engage in arm's-length transactions while remaining completely independent of each other. Both equity and non-equity forms of alliances can be long-term relationships that provide individual firms with the means to broaden their scope and share risks without expansion.

Based on the explanation of Faulkner (1995), equity alliances include joint ventures, minority equity investments, and equity swaps. A joint venture, the most common form of equity alliance, implies the creation of a separate corporation, whose stock is shared by two or more partners, each expecting a proportional share of dividends as compensation. More specifically, a joint venture is defined as a co-operative business activity, formed by two or more separate firms for strategic purposes, which creates a legally independent business entity and allocates ownership, operational responsibilities, and financial risks and rewards to each partner while preserving each partner's separate identity or autonomy. The independent business

entity can either be newly-formed or the combination of pre-existing units and/or divisions of the partners. Even though the partners' stakes in the new business may vary, the partners are all considered owners or parents of the new entity. They normally provide finance and other resources, including personnel, until the venture is able to function on its own. Joint ventures generally aim at making the new company a self-standing entity with its own aims, employees, and resources.

Non-equity alliances include a host of inter-firm co-operative agreements such as R&D collaboration, co-production contracts, technology sharing, supply arrangements, marketing agreements, exploration consortia, etc. The non-equity alliance is often a preliminary step to creating a joint venture. It is therefore the most flexible and potentially the least committed form of alliance. Companies can form a non-equity co-operative contract on a minimal basis to see how the enterprise develops and allow it to deepen and broaden by introducing new projects over a period of time. As the collaboration requires no major initial commitment, it has no limitations. It is probably the most appropriate form of co-operation when the extent of the relationship is impossible to foresee at the outset, when the alliance is not bound by a specific business or set of assets, and when joint external commitment at a certain level is not specifically sought. The non-equity collaborative form may be most appropriate if the activity concerned is a core activity of the partners; if it is non-core, a joint venture may be more appropriate.

From the above explanation, strategic alliances can also be classified 1) according to their degree of control and commitment in a partnership, and 2) according to the level of expected technological and investment contributions. Strategic alliances can be viewed in three broad categories; namely; joint ventures, minority alliances (equity alliances), and contractual agreements (non-equity alliances).

Gulati and Singh (1998: 781-814) add that joint ventures are combinations of the economic interests of at least two separate companies in a distinct firm with profits and losses usually shared according to equity investments. Minority alliances involve a certain degree of investment made by a large company in a smaller firm. Finally, a contractual agreement refers to the cooperation between firms in transferring or interchanging each firm's resources to its partners with the least degree of control over

its partner's resources. Contractual alliances do not involve the sharing or exchange of equity, nor do they entail the creation of new organizational entities. Thus, the right to control the resources still belongs to each individual firm.

Contractual agreements can range from loose to tight agreements between the partners. The level of control and commitment, including technological contribution to the alliance, is lower in loose than that in tight contractual agreements. Loose contractual agreements include marketing/promotion agreements, distribution agreements, and service/consulting agreements, etc. On the other hand, tight contractual agreements include an agreement involving legal contracts that spell out mechanisms of coordination, delivery and termination classes. Typical examples of tighter contractual agreements include technology licensing, the agreement to share operations especially technological operations, and R&D agreements (Faulkner, 1995).

Das and Teng (2000: 31-61) further state that property-based resources and knowledge-based resources could determine structural preferences in terms of four major categories of alliances: equity joint ventures, minority equity alliances, bilateral contract-based alliances and unilateral contract-based alliances. Property-based resources, including financial capital, physical resources, human resources, etc., cannot be easily obtained because they are legally protected through property rights in such forms as patents, contracts and deeds of ownership (Miller and Shamsie, 1996: 519-543). Because other cannot take property-based resources away, alliance partners will not be overly concerned about unintended transfers of these resources. Knowledge-based resources refer to a firm's intangible know-how and skills. Knowledge-based resources, such as tacit know-how, skills, and technical and managerial systems, are not easily imitable because they are vague and ambiguous; thus, they are not protected by patents. Because others can get adequate access to knowledge-based resources, alliance partners will be concerned with losing their knowledge-based resources through an alliance (Hamel, 1991: 83-103 and Mowery et al., 1996: 77-91).

Das and Teng (2000: 34) synthesize a four-part alliance typology, which is similar to Gulati's typology (1996: 295): 1) joint ventures; 2) minority equity alliances; 3) bilateral contract-based alliances; and 4) unilateral contract-based

alliances. They argue that the type of resources is a key dimension in predicting the structural preferences in the prospective alliance, summarized in table 2.1 and table 2.2.

Table 2.1 Four Types of Alliances

	Type	Definition	Main Forms	Key features
Equity alliances	**Joint ventures**	It involves two or more legally distinct; each of which share in the decision making activities of jointly owned entity. (Gulati and Singh, 1998)	--	partner create a new entity Organization (Gulati and Singh, 1999); Longer duration and highly integrated. (Das and Teng, 2000)
	Minority Equity Alliances	One partner owning a minority stake in the other Partnering firm. (Zollo et al., 2002	---	Do not create a new entity; Longer duration; Less integrated than joint venture.
Non-equity alliances	**Bilateral contract-based Alliances**	The partners have sustained production of property rights. (Das and Teng, 2000)	Joint R&D, joint marketing and promotion and enhance supplier partnership (Das and Teng, 2000)	Partners put in resources and wok together constantly; incomplete and more open-ended contracts; tighter Integration. (Das and Teng, 2000)
	Unilateral Contract-based Alliances	A well defined transfer of property rights, such as the "technology for cash" exchange in licensing agreement. (Das and Teng, 2000)	Licensing, distribution agreements, and R&D contract (Das and Teng, 2000)	Individual firms carry out their obligations independently; complete and specific contracts; relatively low integration. (Das and Teng, 2000)

Source: Das and Teng, 2000: 34.

As shown in Table 2, type of alliances can be classified according to the firm's available resources.

Table 2.2 Resource Types and Firm's Structural Preferences

Firm (A)	Partner Firm (B)	
	Property-based resources	**Knowledge-based resources**
Property-based resources	Unilateral contract-based Alliances	Joint Ventures
Knowledge-based resources	Minority equity alliances	Bilateral contract-based Alliances

Source: Das and Teng, 2000: 34.

Lu (2000: 1-35) synthesized four reasons why firms prefer different structures of strategic alliance.

First, joint ventures enable a firm to better appropriate its partner's knowledge-based resources; thus they are preferable to the firm if knowledge-based resources are its partner's primary resource in the alliance. Furthermore, firms are also wary about losing their own knowledge-based resources because of the highly integrated organizational nature of operational characteristics of a joint venture. Thus, they will prefer joint ventures only if knowledge-based resources are not their primary resource types in the alliance. In other words, only when firms contribute mainly property-based resources, will they prefer a joint venture structure.

Second, firms will prefer minority equity alliances when they have primarily knowledge-based resources to contribute to the alliance and their partners have primarily property-based resources. The reasons are as follows:

1) Contract-based alliances will be less attractive because they do not offer sufficient safeguards against opportunistic behavior regarding knowledge-based resources;

2) Joint ventures will also not be preferred because they are altogether too much of one's own knowledge-based resources that the partner could potentially appropriate, making it too risky to form a joint venture.

Third, if both partners have substantial knowledge-based resources in an alliance, joint ventures that are highly integrated may be too risky a choice because a firm's tacit knowledge could be significantly appropriated by its partner firm. In such

situations, joint venture is likely to become a learning race (Hamel, 1991: 83-103). Scholars suggest that once learning has been accomplished, alliances are likely to be intentionally terminated (Inkpen and Beamish, 1997: 177-202). Hence, contract-based alliances will be preferred over joint ventures and minority equity alliances. Between the two types of contract-based alliances, the better choice is bilateral contract-based alliances, such as joint production, joint R&D, and joint marketing and promotion, because there are many more opportunities for learning from each other with these types of alliances than with unilateral contract-based alliances, such as licensing and subcontracting.

Fourth, unilateral contract-based alliance involves the comparatively light engagement of the partners. The transfer of tacit knowledge will be difficult "because knowledge that is being transferred is organizationally embedded" (Kogut, 1988: 319-32). Following this logic, unilateral contract-based alliances will be preferable when both partners intend to contribute primarily property-based resources to a prospective alliance. Since neither firm will be interested in secretly acquiring the other's tacit knowledge, there will be little need for a bilateral contract-based alliance. Unilateral contract-based alliances will provide the requisite clarity for exchange of property rights.

As mentioned above, strategic alliances encompass a wide range of inter-firm linkages, including joint ventures, minority equity investments, equity swaps, joint research and development, joint manufacturing and joint marketing. Strategic alliances which are not equity-based collaborations; they are often organized by informal norms and are not bound by the boundaries such as informal inter-organizational relationships across a wide range of activities. (Barringer and Harrison, 2000: 367-403). Nevertheless, mergers and acquisitions, overseas subsidiaries of multinational corporations, and franchising agreements are not classified as strategic alliances since they do not involve independent firms with separate goals or call for continuous contribution of participating firms, such as transfer of technology or skills between partners.

2.1.3 The Dynamic Processes of Alliance Collaboration

In order to understand an alliance, it is necessary to investigate why it has been formed or in other words, why the partners have felt the need to establish it. Hamel (1991: 83-103) points out that from a general view point, a collaboration may provide an opportunity for one partner to internalize the skills of the other, and thus improve its position both within and outside the alliance. The dynamic phenomena of the alliance collaboration can be explained through the concepts proposed by Hyder and Abraha (2006: 173-191), as follows:

1) Motives

The discussion starts with motives because without motives and a specific intention, no firms are likely to engage in collaboration with other firms. There must be some logic behind commitments and the sharing of assets. The motives explain why partners enter into an alliance, what benefit they derive from the alliance, and what interests they attach to the continuation of the relationship. Osland and Yaprak (1994: 52-66) argue that alliances are used in developing new technologies and transferring sensitive technologies. Culpan (1993) discusses three general motives of Western firms, i.e. minimizing transaction costs, acquiring needed resources, and gaining a competitive advantage from alliances. Fahy (2000: 94-104) have examined British firms' motives and their experiences with international venture partners in Hungary. Their result identifies two major motives in forming the collaborative ventures: market-seeking and resource-seeking motives. They found that foreign companies usually play an important role in creating new customers for existing products and services that have been missing in their markets.

2) Resources

Resources are linked with motives because partners make their important resources available to the alliance for the fulfillment of goals. Resources constitute the central issue in the resource-based view (Barney, 1986: 231-241) and also play an important role in industrial network theory (Johanson and Mattson, 1988: 1-18). It is worth arguing that an alliance needs not to be established if the required resources can be generated internally on acceptable terms and conditions. Complementarity of resources has been emphasized as a major prerequisite for successful operation in alliance literature (Varadarajan and Cunningham 1995: 282-

296; Tsang, 1998: 346-357). Thus, motives define what resources are required, and resources determine how the goals can be reached.

Many strategic alliance researchers see a close link between motives and resources, as most of the motives directly or indirectly lead to the access or accumulation of resources. For example, Tsang's (1998: 346-357) conceptual work discusses motives from a resource-based perspective: 1) creation of rents which can occur by the combination of complementary resources: 2) expansion of resource usage, e.g. an engaged technological resource can be exploited in a new strategic alliance; 3) diversification of resource usage, i.e. risks are shared with other partners, making resources free for other investments; 4) imitation of resources,-which offers chances for learning complex things, such as technology, market know-how, marketing procedure, etc. through collaborations; and 5) disposal of resources, i.e. shedding of non-core businesses through alliance formation.

3) Learning

Another important purpose of alliance formation is learning. Authors such as Hamel (1991: 83-103) and Tsang (1998: 346-357) have dealt with different aspects of learning in strategic alliances. By close collaboration, it is possible that partners seek knowledge from each other. Through the shared execution of the alliance task, mutual interdependence and problem solving, and observation of alliance activities and outcomes, firms can learn from their partners. Unlike other learning contexts, the formation of an alliance reduces the risk that the knowledge will dissipate quickly (Powell and Brantley, 1992: 365-394). Thus, alliances provide an opportunity for learning. Two or more organizations are brought together because of their different skills, knowledge, and strategic complementarity. The differences in partner skills and knowledge provide the catalyst for learning by the alliance partners. However, the degree of learning varies from partner to partner depending for the most part on the ambition, organizational size, complexity, and learning capacity of the partners. Learning is not possible unless the partners want to learn (Hamel et al., 1989: 133-139). The partners need to have a motive for learning. It is not enough therefore that there are resources such as technology, partner competence, local market know-how, etc. available for learning.

It is important; first of all, to point out that in this type of cooperation, one of the crucial features is the motivation to learn from one's partner, thus acquiring knowledge that in the majority of cases will complement one's own. The demand that a firm makes on universities is for two types of knowledge (Gonard, 1999: 143-152): basic and specific knowledge.

There is a demand for basic knowledge, generic information which universities and research centers are able to offer, and more specific knowledge, more directly focused on problem solving and product design and development. Although there is a growing demand for this latter type of knowledge (Gonard, 1999: 143-152), universities and research centers are not yet equipped to respond to this demand. In fact, as Mowery et al. (1996: 77-91) point out cooperation with universities in carrying out applied research work usually meets with less success. This tendency, however, appears to be about to change. The universities are altering their approach, and their mission, by carrying out more applied research, which is more closely geared to the needs of industry (OECD, 1998; Santoro and Chakrabarti, 1999: 225-244). The universities need funds to finance research, and, as state budgets continue to diminish, they have to turn to the business world. Nor must it be ignored that research partnerships sometimes evolve out of private initiative and therefore tend to undertake more applied research projects. Some public bodies and some more technologically oriented universities also carry out this less basic type of research (OECD, 1998).

Osland and Yaprak (1994: 52-66) state that firms can learn through at least four processes: experience, imitation, grafting, and synergism. Experience is the way of learning which takes place through experiment and trial and error. Imitation is an attempt to learn about the strategies, technologies, and functional activities of other firms and to internalize this second-hand experience (Osland and Yaprak, 1994: 52-66). There are two types of imitation, “open and secret imitation” that take place in a strategic alliance (Tsang, 1998: 346-357). In licensing, which is an open imitation, the licenser agrees to let the licensee learn and use the technology under specified conditions. For secret imitation, the owner of the resource has no intention of letting its partner imitate. According to Huber (1991: 88-115), grafting is a way to acquire knowledge through formal acquisition of another firm or by establishing alliance with another firm. Synergism occurs when firms collaborate to produce new knowledge.

The learning that takes place between the partners is usually asymmetrical because not all partners have the same ability and competence to learn (Hamel, 1991). It can be expected that the partners will seek different kinds of knowledge: the foreign partner for local know-how and the local partner for technical and marketing know-how.

4) Networks

Another motive that leads businesses in any country to cooperate with research centers is the fact that collaboration with universities provides access to international knowledge networks (Okubo and Sjoberg, 2000: 81-98). Networks can help firms expose themselves to new opportunities, obtain knowledge, learn from experiences, and benefit from the synergistic effect of pooled resources (Chetty and Blakenburg, 2000: 77-93). It is neither possible nor intended that alliance will work in isolation, but it is important that partners exchange resources among themselves and that the alliances establish useful contacts with other parties for their smooth operation. The idea of a network has become important because no firm is self-contained and therefore is involved in continuous exchange with its environment for survival. Cook (1977: 62-72) discusses the idea that social networks, which are built on social relationships. Social exchanges can develop into social bonds (Cunningham and Turnbull, 1982: 304-316) and these bonds can facilitate and promote various types of business exchanges.

Research centers are well-organized in international networks (OECD, 1998) and co-operation with them enables firms to gain access to these networks, make them known in other countries and thus achieve easier access to international markets. This means that, if the industry of a particular country has lost its capacity to compete with those of other countries, collaboration with its own universities will enable it to reclaim its position in the international market (Bonaccorsi and Piccaluga, 1994: 229-247; Jones-Evans et al., 1999; Okubo and Sjoberg, 2000: 81-98). Sakakibara (1997: 447-473) expresses a similar view when she says that this collaboration with research centers enables businesses to keep up to date regarding industrial standards and to access government information and find out what other firms in the sector are doing. Industrial marketing researchers have advanced the concept of industrial networks, which are viewed as sets of connected exchange relationships among actors who control industrial resources and activities (Johanson

and Mattson, 1988: 1-18). Depending on the objectives, the concept of the network is significant in this study from two dimensions. One is purely in the line of achieving the overall aim of the strategic alliance, and the other primarily concerns the fulfillment of individual goals by coming into contact with other parties.

5) Performance

Measurement of performance is important because partners have certain expectations, and because the outcome of an operation may require further adaptation, exercising more control, raising more funding, or extending further cooperation by the partners. In the literature, five criteria, i.e. profit, growth, adaptability, joint participation in activities, and survival, and are often mentioned in measuring alliance performance (Hyder, 1988). Profit means the amount of revenue from sales left after all costs and obligations are met. Growth is represented by an increase in such variables as total manpower, plant capacity, sales, profits, market shares, and number of innovations. Adaptation refers to the ability of a firm to change its standard operating procedure in response to environmental changes. The need for adaptation is great in alliances, as they involve parties with different cultures, backgrounds, and objectives. Joint participation means that each partner has to perform some organizational function in the alliances. Survival is the ability of a firm to exist without any basic change in structure or goals as set at the beginning. Hyder and Abraha (2006: 173-191) find all these criteria significant in studying alliances. Even successful network development by the alliances and the partners is seen as a sign of good performance because the right connections give a firm legitimacy and a solid position for further development of new business ideas and exploit further opportunities in the host and neighboring countries.

A network is also linked with motives. When motives are in its place and resources are secured either through partners or networking, learning can take place in the alliance. But what to learn is largely decided by outcome of the alliance. If motive is the starting point, then outcome, which we have called here performance, is the ultimate criterion of the alliance. But in fact, an existing alliance is a dynamic process that goes like a cycle. Performances is a measure of how network development has functioned, whether the right resources could be managed and used,

and finally what the partners have learned or are capable of learning in the future. Both performance and learning are shown in figure 2.1.

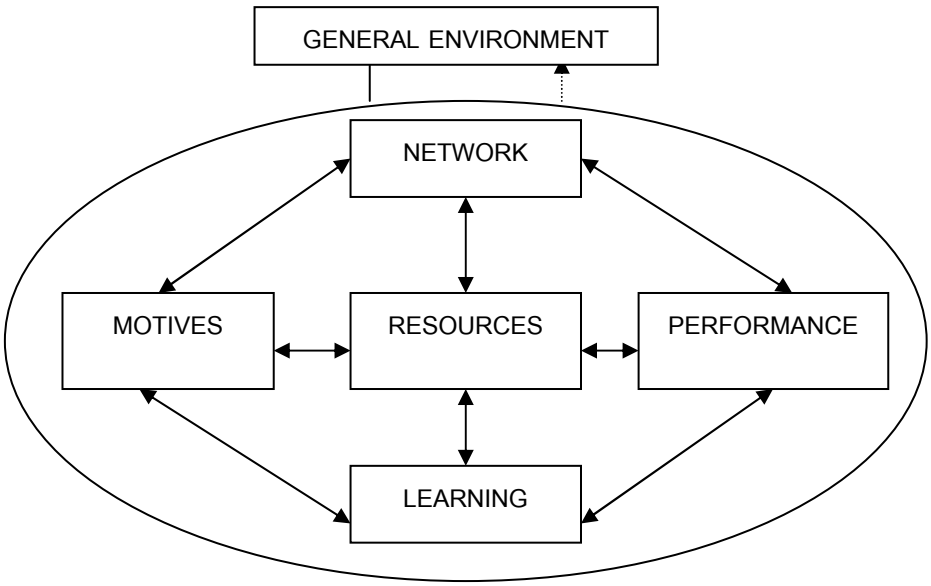


Figure 2.1 A Theoretical Framework for the Study of Strategic Alliances
Source: Hyder and Abraha, 2006: 184.

Moreover, the impact of the environment on such relationships will be important to such relationships. The general environment can offer both opportunities and constants. The alliance as a whole can therefore be affected by the general environment, which is included as a broader concept in the theoretical framework. Interrelationships of motives, network development, performance, and learning together with resources make up the core activity and can be considered as a dynamic process of an alliance.

2.1.4 Motivation for Knowledge-Based Alliances (KBEs)

As suggested by Grant and Baden-Fuller (2002: 61-84), the dominant motivation behind the formation of inter-organizational exchange is as follows:

1) Knowledge as a Resource

The first motivation is to gain access to valuable partner-held resources. Cook (1977: 64) defined a resource as “any valuable activity, service or commodity.” Knowledge is one such resource (Westney, 1988: 339-346; Inkpen and Dinur, 1998: 1-20). The central proposition is that knowledge-based enterprises (KBEs) are positively motivated to secure access to knowledge because knowledge is essential to them in their pursuit of competitive advantage (Grant, 1996: 109-122). This proposition is strongly rooted in resource dependency theory (Pfeffer and Salancik, 1978), which holds that firms manage their dependencies on the external environment by acquiring the needed resources that decrease their reliance on other organizations. For instance, if a firm is deficient in a particular knowledge domain, and possession of that knowledge is deemed essential to competitive advantage, then resource dependency theory holds that the firm will take purposive action to acquire that needed knowledge. Eisenhardt and Schoonhoven (1996: 31-59) have posited that a circumstance of mutual need would make formation of an alliance to exchange resources even more likely.

2) Knowledge Uses

Note that a firm seeks knowledge for multiple purposes. Inkpen and Dinur (1998: 1-20) stated that knowledge of use to a firm involved in one of the inter-firm relationships, a strategic alliance, could be one of the three types. First, firms are motivated to secure knowledge that could be used to design future inter-organizational relationships (Lyles and Salk, 1996: 877-903). Knowledge about the collaborative process develops over time and is known to affect the outcomes of collaborative exchanges (Powell et al., 1996: 116-145; Simonin, 1997: 463-490; Anand and Khanna, 2000: 295-315). Secondly, firms may seek partner knowledge without wishing to internalize it. At first, this may seem counterintuitive, given the strong need for KBEs to upgrade their stock of knowledge assets. However, as Hamel (1991: 83-103) has noted, if a firm's collaborative agreement with a partner is defined narrowly, the knowledge embodied in the specific outputs of that relationship may

have no residual value for either partner. Thirdly, a collaborative relation may generate knowledge that pertains to a focal partner's strategy, operations, and core product line in other words, knowledge about things that at first glance seem to be most useful for those that have the potential for generating revenues in competitive markets.

3) Generate New Knowledge

Firms are also motivated to collaborate to generate new knowledge. Such knowledge will contribute to the competitive advantage of each partner. Firms are known to be knowledge-integrating institutions (Grant, 1996: 109-122) in that they take action to “create conditions under which multiple individuals can integrate their specialist knowledge.” These actions may be taken within the firm or between firms engaged in collaborative advantage through the production of unique, socially complex, and causally ambiguous knowledge that is consistent with the resource-based view of the firm (Barney, 1991: 99-120). This view contends that the prime determinants of a firm’s competitive position are capabilities that are valuable, rare, inimitable, and not substitutable (e.g. Wernefelt, 1984: 171-180; Dierickx and Cool, 1989: 1504-1513). Conner and Prahalad (1996: 477-501) have proposed the idea that the essence of the resource-based view is the conceptualization of the firm in terms of its knowledge-assets. The generation of knowledge through the pooling of joint assets and know-how and expertise (Leonard-Barton, 1991: 111-125) can be seen as a race by allied partners against their rivals. Thus, actions taken by firms in certain settings can be interpreted as a combinative action intended to improve the competitiveness of both partners based on the accelerated development and repatriation of knowledge. An example of this phenomenon is an international joint venture formed to share resources with partners, including local knowledge and connections with decision-makers (Beamish and Banks, 1987: 1-16). Other scholars have noted that inter-organizational relationships serve to share the costs with others regarding "exploration and exploitation" (March, 1991: 71-87), not only to increase the productivity of existing capabilities, but also to discover new wealth creation (Powell et al., 1996: 116-145). In this sense, firm knowledge assets have no fixed value; they are differentially valuable depending on the degree of overlap with the knowledge assets.

4) Protecting Assets

KBEs also collaborate in order to preserve the intrinsic value of their existing knowledge assets. Nelson and Winter (1982) have stated that firms act to prevent the deterioration of their stock of knowledge by exploring new avenues for its use. One way to accomplish this aim is by joining forces with another firm that has different knowledge assets, a proposition that has been supported in the literature. Kogut (1988: 319-332) notes that collaborative relationships enable a firm to maintain the value of their own know-how while being simultaneously positioned to benefit from the know-how of partners. Further, Das and Teng (2000: 31-61) have indicated that while in a collaborative relationship, a firm relinquishes only temporarily the resources under its control, meaning they remain available for future internal deployment. The point here is that a company may choose to form an inter-organizational relationship as a way of upgrading a knowledge asset that otherwise might be eclipsed by exogenous changes in markets, the actions of competitors, or both.

5) Blocking Rivals

It has also been suggested that a focal firm may be motivated to engage in an inter-firm relationship to prevent the partner firm from forming an alliance with the focal firm's rival. Barringer and Harrison (2000: 367-403) have mentioned that by taking action to prevent a potentially harmful combination of valuable assets held by prospective partners, the focal firm can deescalate a competitive threat through the following actions: First, it must be able to estimate the chance that its rival will form a partnership with another firm. Secondly, in the context of knowledge, it must be able to assess the outcomes of knowledge combinations that could take place between those firms. While such an assessment may be possible if the prospective partners are both large, well-established firms with a well- defined technology base, it is not necessarily possible to assess outcome **ex ante** if one of the prospective partners is new, small, and has an unknown or undefined technology base. Thirdly, it must be able to assess fully the threatening possibility available to it and find out what is needed instead of blocking its rivals.

2.1.5 Changing the University Mission and Its Linkage to Industry as Alliance Partner

Inter-organizational initiatives such as strategic alliances and joint ventures are powerful alternatives to organizations undertaking projects because they enable organizations to share risks, build on jointly shared capabilities, and create synergies for better competitiveness. Of particular interest in this study are inter-organizational initiatives between industrial firms and universities. This kind of alliance allows for the sharing of personnel, technologies, and knowledge (Betz, 1996). As a result, university-industry alliances create sophisticated knowledge pools along with highly trained people that can help propel knowledge creation and the development and commercialization of valuable new technologies (Betz, 1996).

Traditionally, the primary functions of a university have included the triad of teaching, research, and service (Phillips, 1991: 80-93). These functions have historically been tightly coupled with the research component, driving the advancement of basic knowledge for integration into the overall learning experience (Reams, 1986). Accordingly, the university's generation and diffusion of knowledge as its key mission have provided the necessary foundation for the effective training of future academic, government, and industry professionals. However, the research conducted in universities has been largely based upon the personal interests, skills and expertise of its resident faculty. Moreover, the faculty's research agenda is often highly influenced by the academic calendar, the availability of graduate assistants, and their own current teaching schedules. With respect to publications, faculties view them as the critical output of their research-placed in scholarly journals by academics. The generation and diffusion of knowledge therefore was reserved to scholars. As such, university reward systems are severely implemented toward satisfying the academic community. Van Dierdonek et al. (1990: 551-566) have mentioned that the traditional university embodies a myriad of loosely connected autonomous professionals intent on satisfying one another and not sensitive to those outside the academic community.

With respect to those outside the academic community, industrial firms are concerned with employing knowledge to solve immediate problems in order to maximize earnings and stockholder wealth (Berman, 1990). This disparity in focus

between universities and industry has made for an obstacle for university/industry collaboration. An industry's focus is much more problem-centered in concentrating on critical situations requiring immediate attention (Sparks, 1985: 19-21). Being problem- centered, firms actively seek input from constituents outside the organization, e.g. customers or suppliers (Von Hipple, 1986). Industrial firms normally maintain or acquire specific competencies as they are needed, and they expect tangible results within a much shorter time horizon.

While differences in cultures, philosophies, and research objectives still exist, the gap between industry and academe is abating. With the substantial decrease in federal and state support for research, universities have begun to rely more heavily on industrial funding. Research-oriented universities have therefore modified their focus, strategies, and structures to encourage and facilitate effective liaisons with industry. Now, research is often measured by patents, licenses and new applications and processes for industry, such that the diffusion of knowledge to non-scholars is becoming increasingly important.

2.1.6 Industry's and University's Concerns in Building a University-Industry Alliance

Santaro and Chakrabarti (1999: 244) have stated that in building university/ industry relationships, industry's needs embody the overarching areas of technology development, managing the risk of development, creating a forum for networking, human capital development, and access to facilities and expertise. Industry also has a number of concerns related to each of these needs. Table 2.3 provides a summary of these needs and concerns.

Table 2.3 Industry's and University's Concerns in Building University-Industry Alliance

Categories of Industry Needs	Specific Aspects of Needs	Critical Industry Concerns
Technology Development	(a) Research (b) Development (c) Commercialization	(a) Access to multiple sources of research ideas (b) Cost-effective means to develop technologies (c) Reducing development cycle time (d) Developing new applications and product enhancements (e) Improving and enhancing process technologies (f) Building competence in non-core Technologies
Managing the Risk of Development	(a) Risks of pre-competitive research (b) Flexible technical agenda (c) Improving likelihood of success	(a) Matching technological trajectory and market needs (b) Defining proper technical boundaries (c) Reducing the risk of obsolescence (d) Maintaining options to various approaches (e) Minimizing suck costs
Forum of Networking	(a) Formalized structure (b) Defined mission (c) Critical mass of major organizations	(a) Symmetry in information exchange (b) Reasonable time commitment (c) Value of the relationship (d) Effect on corporate image
Human Capital Development	(a) Training new Employees (new graduates) (b) Continuing professional education (c) Curriculum Development	(a) Recruiting new employees with proper skills (b) Creating training opportunities for potential employees (c) Fit between university curricula and market needs (d) Continuous upgrading of skills
Access to Expertise and Facilities	(a) Build and strengthen skills and knowledge (b) Use of university facilities	(a) Complementing and supplementing existing resources (b) Cost-effectiveness (c) Capacity to absorb skills and knowledge (d) Transferring both explicit and tacit Knowledge

Source: Santoro and Chakrabarti, 1999: 237.

1) Technology Development

Technology development includes the activities of research, development, and commercialization. Here, industry has a number of concerns related to its ability to advance new technologies. Having multiple and diverse sources of research ideas, a cost-effective means of development and commercialization, and the ability to meet cycle-time requirements are necessary. Additionally, industry is concerned with developing new applications and product enhancements, and with improving and enhancing process technologies in non-core technologies through outsourcing.

2) Managing the risk of development

Managing the risk of development embodies the risks associated with competitive research, creating a flexible technical agenda, and improving the likelihood of success. Specific industry concerns entail ensuring a match between the technological boundaries/specifications, and reducing the risk of obsolescence through unforeseen development of competing technologies. Here, opening windows of opportunity depends upon the firm's skillful evaluation of options and proper positioning, which can drastically reduce uncertainty in entering a specific technological domain (Hamilton, 1985). Hamilton's (1985: 195-262) work with both emerging and established firms in the area of biotechnology supports this notion. Industry must also maintain its options for multiple technical approaches and minimize sunk costs to manage properly the risk of development.

3) Forum of Networking

Creating a forum for networking means that there is a formalized structure, a defined mission, and a critical mass of major organizations. Some of industry's key concerns include symmetry in information exchange, reasonable time commitments, value from the relationships and the effect on the corporate image.

4) Human Capital Development

Human capital development involves the training of new employees (specifically recent university graduates), continuing professional education and input into university curriculum development. In building relationships with the university, industry is concerned with recruiting new employees with the proper skills, creating

training opportunities for potential employees, ensuring a fit between the university's curriculum and market needs, and upgrading skills.

Thus, the partnerships set up between businesses and universities and research centers is that the businesses involve the need of businesses to have suitably specialized staff as well as a minimum internal structure to enable them to use the basic knowledge generated by these cooperative partnerships, and also to transfer it to the rest of the organization (Bailetti and Callahan, 1992: 145-156; Cyert and Goodman, 1997: 45-57).

Cyert and Goodman (1997: 45-57), in particular, place special emphasis on the fact that in order to give full potential to the learning process in the organizations involved, and to offset any problems within the partnership, it is advisable to form work teams made up of staff from the firm and from the research center, and to create ties between these people inside the firms and the centers so that they can achieve a better understanding with the organization with which they are cooperating and therefore reduce cultural differences. Santoro and Chakrabarti (1999: 225-244), in the same vein, make specific reference to “champions,” and Bonaccorsi and Piccaluga (1994: 229-247) speak in terms of “gatekeepers,” In all cases, these figures refer to people whose job it is to promote the idea or project, liaise between individuals and organizations, transfer information in the appropriate context, coordinate activities, and sustain the quality of the relationship between the company and the research center.

5) Access to Expertise and Facilities

Access to expertise and facilities relates to the firm's ability to build and strengthen skills and knowledge needed to advance new technologies as well as having access to external facilities. Critical industry concerns comprise complementing and supplementing existing resources cost effectively, having the appropriate absorptive capacity, and transferring both explicit and tacit knowledge.

One reason that causes firms to cooperate with research centers is to obtain the funds with which to conduct research. This is the view of various authors (Geisler and Rubenstein, 1989: 43-62; Bonaccorsi and Piccaluga, 1994: 229-247). In order to secure financing, cooperation with universities and research centers is very

often undertaken under the auspices of certain national or international research promoting programs, such as government-sponsored projects.

Santaro and Chakrabarti (1999: 255-244) have further stated that successful collaboration requires that there be a fit between the university's changing mission and industry's critical needs. Table 4 indicates that a number of critical industries needs/concerns can be addressed and are consistent with the changing mission of the university.

Table 2.4 The Fit of Industry's Needs and the Changing Mission of the University: The Contemporary University's Mission

Category of Industry's Needs	**Research**	**Teaching**	**Publication**	**Development and Commercialization of Applied Technologies**
Technology Development	+	+	-	+
Managing the Risk of Development	+			+
Forum for Networking	+	+	?	+
Human Capital Development	+	+	+	+
Access to Expertise and Facilities	+			+

Source: Santoro and Chakrabarti, 1999: 235.

Note: **"+"** indicates a positive fit; **"-** "indicates a negative fit; "?" indicates a questionable fit

Table 2.4 reveals that many of industry’s needs are a positive fit with the mission of contemporary universities. Specifically, a university appears well-matched to the needs of each industry by assisting with technological development, managing the risk of development, providing a forum for networking, assisting in human capital development, and furnishing expertise and facilities. With respect to university teaching, this has a positive fit with industry's need for technological development. University publications appear to have a negative fit with industry's development technology. While the contemporary university has become more sensitive to industry's needs, academic freedom still exists, which means that prompt publication of research is still valued. When this research is a result of joint university/industry initiatives, it can possibly jeopardize the firm's ability as a first mover (Reams, 1986). Scholarly publications also have a questionable fit with a forum for networking. Santoro and Chakrabarti (1999: 225-244) concluded that “while visibility gained through published research results can attract prestigious newcomers to an existing forum, the fear of premature dissemination of knowledge can make existing and potential members leery. On the plus side, human capital is a positive fit, since the literature can be used for ongoing and new employee training. Finally, the university's development and commercialization of applied technologies are a positive fit with each of industry's needs, since this activity is directly targeted toward advancing new technologies. Thus, a meeting of the minds between industry and academe is beginning to take shape where there is a general positive fit between industry's needs and the contemporary university's changing mission.”

2.1.7 Mutual Benefit between Academia and Industrial Partners

The effectiveness of knowledge transfer among partners can be expressed by the mutual benefit between university and industry through the synergy RDCE model. Meanwhile, the effort to align university-industry needs is very important. By doing so, then the student can match his or her competencies with what the industry expects. This attempt is to align classroom teachings with the trends and current market needs of industry. As shown in figure 2, we clearly see that with lucid understanding of industry needs, the faculty can create an industry-driven course. With a pool of subject

matter experts of professors and lecturers, the university will provide the professional education. They could also assist in conducting industry-related research.

The central idea of the model is that first, the university will provide the professional education and industry-based research. The industry will benefit from this activity by having customized study program and a competent prospective workforce. Market demand specification and financial funding are to be provided by the industry. On the other hand, the industry will help to enhance and develop the curriculum by certifying the study program. The loop of two arrows as illustrated in figure 2.2 depicts continuous processes. Firms support industry professionals and practitioners could help the students to better understand the current challenges to the industry. Once in a while, lecture classes could also be held on-site with the cooperating industrial partners.

Actually, in return, the industry side could also benefit from this practice. They will have a more competent future workforce that will graduate from this customized program. This type of program is tailored to industry needs. To achieve this intention the university has to ensure that the most up to date technology in the industry is accessible to both the students and faculty. Through this smart affiliation, the university will gain significant professional practice and monetary resources. The university could provide effective and professional-level services of the professors and researcher, leading to the effectiveness of knowledge and personnel exchange with the alliance partners (Pimentel et al., 2006).

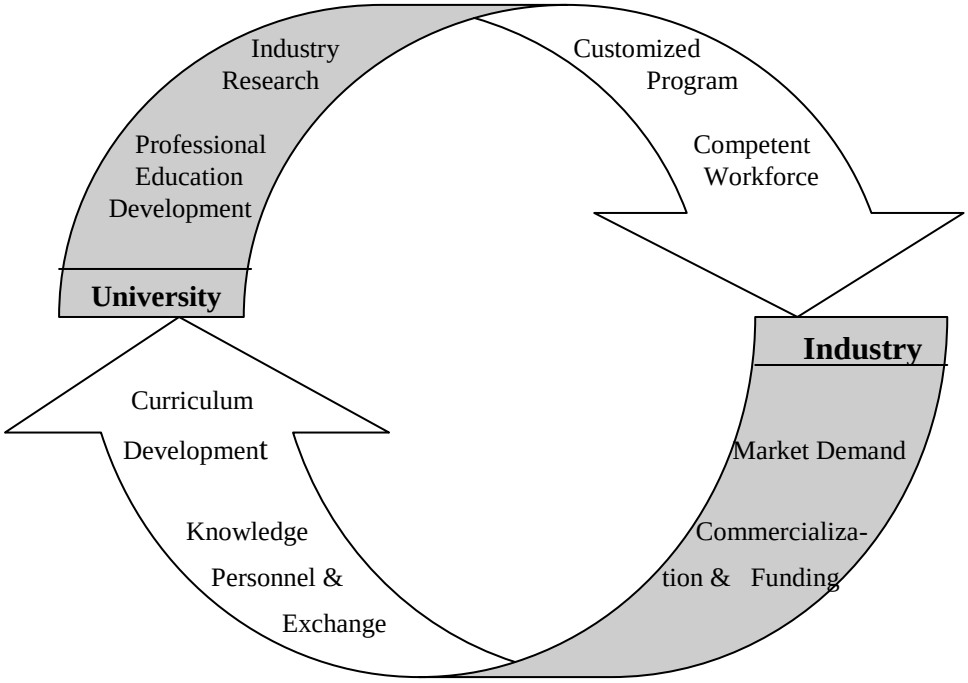


Figure 2.2 Academia-Industry Synergy RDCE Model
Source: Santoro and Chakrabarti, 1999: 237.

2.1.8 The Classification of University-Industry Relations

As shown in table 2.5, Bonaccorsi and Piccaluga (1994: 229-247) suggest six groups of university-industry relationships, based on the forms that are generally cited in the scientific and practitioner literature (Rothwell, 1983: 5-25; Geisler and Rubenstein, 1989: 43-62; Bloedon and Stokes, 1991). The main criteria for classification are based on organizational resource deployment, in terms of the personnel, equipment, and financial resources that the two parties are willing to commit to the relation.

1) Organizational Resource Involvement from the University

First of all, organizational resource involvement on the part of the university is nil if the firm's contact is with an academic as an individual and without any agreement being signed with the university; beyond that case, university resource involvement grows from B to F, reaching a maximum when the whole university is

involved in creating specific structures which have the objective among others to collaborate with firms.

2) Length of the Agreement

The length of the agreement between universities and firms can vary from short (but renewable) in the case of personal formal relationships, to long, in the case of the constitution of specific structures or in the case of formal non-targeted agreements. In the case of relationships between universities and industries organized by third parties, the length of the agreement is very short, unless a more stable relation comes out of this episodic type of contact.

3) Degree of Formalization

The formalization of the agreement is low or completely absent in the case of personal informal relationships; in the case of relations through third parties the formalization can either exist or not exist; in all other cases the relations are formalized. This is very important because it is sometimes argued that increasing formalization and monitoring in an IOR can lead to conflict among participants who are struggling to maintain their organizational autonomy in the face of growing interdependence.

Table 2.5 A Typology of University-Industry in Inter-Organizational Relationships

Classifications	Description	Examples of Relationship
A. Personal Informal Relationships	Exchange between the firm and an individual inside the university, without any formal agreement involving the university itself. Typical examples are consultancy contracts with professors or information exchange meetings organized in an informal way. Also, firms may benefit from relations with other firms founded by researchers who worked or still work in the university.	-Individual consultancy (paid for or free); -Informal exchange forums and workshops; -Academic spin-offs; -Research publications
B. Personal Formal Relationships	Collaborations involving personal relations as in the previous case-but with formalized agreements between the university and the firm.	-Scholarships and postgraduate linkages -Student interns and sandwich courses; -Sabbatical periods for professors; -Exchange of personnel
C. Third Parties	Relations which are developed through intermediary associations-some of which run by the university, some completely external to it, and some others in an intermediate position-which facilitate the transfer of knowledge from university laboratories to firms. At the same time, these institutions may function as indicators of market needs for those researchers who wish to know more about them.	-Liaison offices; -Industrial associations (functioning as brokers); -Applied research institutes; -General assistance units; -Institutional consultancy (university companies)
D. Formal Targeted Agreements	Relations which involve a formalization of the agreements and the definition of specific objectives since the beginning of the collaboration; examples of the objectives are prototype development, testing, on the -job training for students	-Contract research; -Training of employees; -Cooperative research projects (including direct cooperation between academic and industrial scientists on projects of mutual interest usually regarding basic and nonproprietary research; no money changes hands and each sector pays salaries of its own scientists; temporary transfers of personnel for conduct of research may be required) -Joint research program such as industrial support of portion of university research projects.
E. Formal Non-targeted Agreements	Relations which involve a formalization of the agreement as in the previous case; however in this category the relations have broader, often long-term and strategic objectives	-Broad agreements; -Industrially sponsored R&D in university departments -Research grants and donations, general or directed to specific departments.
F. Creation of Focused Structures	Research initiatives which are carried out together by university and industry in specific permanent structures created among others for that purpose	-Association contracts; -University-industry research consortia; -University-industry cooperative research centers; -Innovation/incubation centers; research , science and technology parks; -mergers.

Source: Bonaccorsi and Piccaluga, 1994: 233.

Apart from the above-mentioned criteria, on the other hand, Santoro and Chakrabarti (1999: 225-244) have proposed that industrial firms building industry-University (I/U) relationships with university research centers are clustered into three distinct strategic groups. The strategic groups consist of collegial players, aggressive players, and targeted players.

Collegial players are more concerned with using I/U relationships to exchange technical information, particularly from their peer group. This group of firms believes that I/U relationships make them privy to the latest developments in pre-competitive research, thus enabling them to influence its direction and application. Finally, collegial players rely heavily on both research support and targeted financial contributions.

Aggressive players account for the largest percentage of firms and have the highest-intensity university-industry relationships. These firms also generate the highest number of tangible outcomes from their university-industry relationships. This group is an equal mix of large and small firms, and their strategic time horizon generally integrates both long and short-term perspectives. The aggressive player's major focus is on advancing new technologies, both core and non-core, for their business. Firms in this group use university-industry technology relationships in large part to build and strengthen their skills and knowledge base, while gaining access to university facilities. As such, aggressive players have explicit and measurable return on investment (ROI) expectations for their university-industry technology relationships, which are more precise and demanding than their collegial player counterparts.

Targeted players have moderately intense technology relationships and generate a moderate level of tangible outcomes from their university-industry relationships. The targeted player's major focus is on advancing new core technologies. That is, collaborative projects with university research centers are specially established in order to address immediate issues related to the firm's primary business. To focus on these immediate issues, the use of supplementary consulting arrangements is widespread among targeted players. Resource dependence is a key motivator to targeted players so that they can build and strengthen skills and knowledge and gain access to university facilities. Finally, these firms have very

aggressive short-term ROI expectations and their resource input to the university center tends to be at low levels.

Table 2.6 provides information on the intersection of the firm's collaborative strategies with university-industry relationship effectiveness dimensions. This intersection shows the importance for a firm to have a clearly defined collaborative strategy. Moreover, the various effectiveness dimensions should not be seen as an all-encompassing rubric. Rather, firms have different motivations for building relationships with university research centers. The firm's strategic objectives for university-industry relationships are a key instrument in determining the effectiveness of these relationships.

Table 2.6 Intersection of the Industrial Firm's Collaborative Strategies and University-Industry Relationship Effectiveness

Dimensions of I/U Relationship Effectiveness	Collegial Players	Aggressive Players	Targeted Players
Resource Input	High	Med.	Low
Participation in the Relationship Process	Low	High	Med.
Explicit Knowledge Transfer	Low	High	Med.
Tacit Knowledge Transfer from Research Center	Med.	High	Med.
Tacit Knowledge Transfer from Peer Group	High	Low	Low

Source: Santoro and Chakrabarti, 1999: 230.

2.1.9 The Prior Studies of Strategic Alliance, University-Industry Alliance and Knowledge Transfer Performance

The issues of knowledge creation, knowledge transfer and learning between alliance partners have attracted researchers and have been examined several times in academic research and management consulting applied studies. Hence, not only has the frequency of these types of research increased but also the importance of such knowledge-related issues in strategic alliance literature has increased accordingly. Nielson (2005: 301-322) has classified the research literature of knowledge-related issues in strategic alliances as shown in Table 2.7.

Table 2.7 Prior Studies Regarding to Knowledge Transfer among Alliance Partners

Key topics	Main focus	Researches
1. Knowledge as a Source of Competitive Advantage	The role of effective management of inter-firm knowledge	Anand and Khanna, 2000; Grant and Baden-Fuller, 2002
2. Knowledge (Complementary) as Conducive to Alliance	The motives and partner selection	Beamish, 1984; Geringer, 1988
3. Knowledge Creation	How to learn from the partner by gaining access to skills/resources that the focal firm does not possess. Central issue is transfer of complementary knowledge and the mechanisms by which knowledge is transferred, including barriers to , such as ambiguity and protectiveness.	Harrigan, 1985; Zander and Kogut, 1995; Grant, 1996; Mowery et al., 1996; Simonin, 1999; Kale et al., 2000
3. Knowledge Absorption	The capacity internalizes the knowledge transferred to it. Absorptive capacity is positively related to learning and is considered primary origin of knowledge stickiness.	Cohen and Levinthal, 1990; Szulanki, 1995; Lyes and Salk, 1996
4. Collaborative Knowledge	Developing skills and know-how useful in future alliances. Knowledge about collaboration per se determines alliance outcome.	Powell et al., 1996; Simonin, 1997; Gulati, 1998; Gupta and Govindarajan, 2000
6. Knowledge as Determinant of Alliance Evolution	How knowledge obtained via alliance can be central to evolution to the alliance.	Doz and Prahalad, 1998

Source: Khamseh and Jolly, 2008: 40.

In this study, the author attempts to study holistically complementary knowledge as conductive to an alliance in terms of motives and partner selection. As the partner attributes play critical for the alliance to work, it is suggested that knowledge transfer within the alliance will increase as the level of search for the right partner increases (Kale et al., 2000: 217-227). The antecedent factors enhancing alliance performance are associated with the selection of appropriate partners since choosing partners who possess necessary resources and with whom strategic and economic incentives can be aligned is a critical determinant of partnering performance (Heide and John, 1988: 24-36).

Thus, partner attributes such as absorptive capacity, joint management competence, cultural compatibility, and structure characteristics can affect the effectiveness of the knowledge transfer within the university-industry alliance networks (Sherwood and Covin, 2008: 162-179). Also, the role of the effective management of inter-firm knowledge in terms of the coordination that develops skill and know-how usefully in the collaborative alliance, as well as relational factors, is considered as the determinant of knowledge transfer effectiveness among the partner alliance**.**

2.2 Theoretical Frameworks

This section aims at building a theoretical base for the study by introducing different aspect of theories and how they link to alliances. However, it does not intend to be a full review of all organization theories and strategic management. Rather, it briefly presents influential schools in strategic management and organization theory which are interesting from an alliance perspective. Child and Faulkner (1998) point out that “one looks in vain for a unified theory or approach to provide the basis for understanding cooperative strategy.” Thus, this chapter aims to provide a holistic view of the theoretical foundations of strategic alliance. The emphasis is on discussing inter-organizational relationships (IORs), the knowledge-based view (KBV) and the resource-based view (RBV).

2.2.1 Inter-Organizational Relations (IORs)

Inter-organizational relations (IORs) have been studied by many scholars in terms of the factors influencing organizations to join inter-organizational relationships (Galaskiewicz, 1985: 281-304; Oliver, 1990: 241-265; Powell et al., 1996: 116-145 and Gulati, 1998: 397-420).

Oliver (1990: 241) defines an inter-organizational relationship as "an enduring transaction flow and linkage that occurs among or between an organization and one or more organizations in the environment." Galaskiewicz (1985: 281-304) identified three arenas of inter-organizational relations: resource procurement and allocation, political advocacy, and legitimation. Resource procurement, allocation, and legitimation arenas involve resource dependency issues in their explanatory framework. For example, the resource procurement and allocation perspective points out that an organization can be influenced to enter inter-organizational relationships by the organizations that control resources. The legitimacy arena looks at organizational efforts to identify with a highly legitimate community, and societal legitimacy involves resource dependency issues as members, of an alliance may exert power in the form of legitimacy arguments to persuade others to join the alliance.

In order to procure the resources it needs and to cope with environmental uncertainty, organizations participate in IORs in different forms. Oliver identified six types of inter-organizational relationships: trade associations, voluntary agency federations, joint ventures, joint programs, corporate-financial interlocks, and agency-sponsor linkages. Alliances mostly resemble joint ventures and these can be considered as one form of IORs. Oliver (1990: 241-265) also posited six contingencies prompting organizations to establish an inter-organizational relationship. These contingencies include necessity, asymmetry of information sharing, reciprocity, efficiency, stability, and legitimacy.

Due to necessity**,** an organization needs to establish a relationship with other organizations in order to gain the resources and knowledge that it does not have. This occurrence may be triggered by asymmetry of information sharing, which refers to a gap between the amount of information different organizations have, making at least one of them want to interact to bridge that gap through technology transfer and coordination. In order to acquire technological know-how, many organizations enter

alliances with great anticipation about learning from their partners, whether as the primary goal or as a derivative of other objectives, such as creating new products and technologies or penetrating into new markets. Organizational learning occurs when a firm acquires, assimilates, and applies new information, knowledge, and skills that enhance its long-run performance and competitive advantage. Strategic alliances can operate as institutionalized channels for transferring and creating new organizational capacities. Learning may occur either through exploitation, as one organization acquires another's know-how, or through common experience, as partners learn synergically while implementing a collaborative agreement (Tsang, 1998: 346-357).

Also, the reciprocal interdependence among the partners is a crucial element. Reciprocity is employed in order to meet a common goal. While the nature of a strategic alliance requires reciprocal interdependence in order to decrease the competitive consequences of cooperative endeavors through partner interaction, partnerships can also hinder efficient production, restrict market access, and reduce economic competition. In accordance with Ohmae (1997) explanation of the necessity of alliances in a global economy, the factors of attributes are the unification of customers' needs and preferences. As customers are receiving more information and are making more informed decisions, they want the best quality products for the lowest possible prices, however, Ohmae (1997) also points out that it is impossible for a company to meet value-based customers' needs alone. No company can master all aspects of the technology needed to ensure success. Even if a company has superior technology, they won't be able to keep it to themselves for long. So, in order to build an enduring competitive advantage, companies need to acquire and maintain their resources. Not only technology, but also the immense fixed costs involved in competing in a global arena need to be shared. This is where strategic alliances come in as a tool to increase capabilities and amplify contributions to fixed costs.

Moreover, the firms are likely to form an alliance to improve their internal input/output ratio and increase partner firms' efficiency or productivity (Harrigan, 1985) through economies of scale and scope based on joint operation and activities (Contractor and Lorange, 1988: 3-20), sharing costs in performing specific activities, cooperative specialization, and access to greater resources and capabilities (Arora and Gambardella, 1990: 361-379). With respect to profitability, the alliance literature

suggests that the profitability of the alliances involve both benefits and costs (Peterson and Shimada, 1978: 803-815). It further indicates that alliance benefits are generally greater than alliance costs associated with transaction and coordination. There are two major benefits from alliance formation (Harrigan, 1985), which are likely to increase partner firms' profitability. First, partner firms tend to increase operation efficiency or productivity through cost sharing, economies of scale and scope through joint activities, and greater access to resources and capabilities (Harrigan, 1988). This improved productivity in turn is expected to increase profitability of partner firms, since productivity gains are likely to be related to reduced costs and/or increased revenues due to increased outputs (Oum and Yu, 1999: 9-42). Second, partner firms can strengthen their competitive position vis-à-vis their rivals through appropriate strategic behavior, including pricing (Eisenhardt and Schoonhoven, 1996: 31-59). Improvement through an alliance would allow firms to price their products/services competitively without sacrificing their profit margin. On the other hand, enhanced market power following an alliance would make it possible for the firms to implicitly fix the price of their products and services. This enhanced competitive position will eventually be reflected in partner firms' improved profitability.

Moreover, the needs of stability occur when organizations are in a turbulent and complex environment and use alliance cooperation as a strategy to forecast and absorb uncertainty. The popularity of strategic alliances occurs as a mechanism for limiting environmental uncertainty by the parties of the alliance through shared risks and cost savings. According to Harrigan, (1988: 83-103), two sources of environmental uncertainty are demand uncertainty and competitive uncertainty. Demand uncertainty arises from the unpredictability of consumer purchasing behavior. Strategic alliances are formed in order for the partners to gain access to the resources and capabilities required to cope with that uncertainty.

On the other hand, competitive uncertainty is caused by competitive interdependence, where the actions of one firm have a direct and significant effect upon the market positions of others in the industry, often causing reactionary moves in kind (Hay and Morris, 1979). Competitive uncertainty pushes firms to enter into alliances to limit competitive interdependence by limiting the number of competitors.

In terms of legitimacy, firms are likely to enter relationships that appear to agree with the prevailing norms. Oliver (1990: 241-265) also proposed that legitimacy is another condition that urges a company to form an inter-organizational relationship. A firm joins in the alliance in order to survive through congruence with its institutionalized environment determined by taken-for-granted rules and norms, which are socially legitimated. The phenomenon of alliance can also be explained by institutional theory. Institutional isomorphism theorists suggest that the choice of organizational form in an industry is due to firms exhibiting a "bandwagon effect" or imitating what other firms are doing in the industry (Dimaggio and Powell, 1983: 147-60). As organization's choice is constrained by multiple external pressures (Oliver, 1990: 241-265) and organizations tend to conform to the norms and expectations of their institutional environments in order to survive (Meyer and Rowan, 1977: 340-363; Scott and Meyer, 1992). Organizations feel threatened by the prospect of being selected out by the customer and they decide to be isomorphic with other successful organizations (Hannan, 1977: 149-164).

Monczka et al. (1998: 533-578) also states that IORs vary in their structure, ranging from simple transactions through formal alliances. An IOR means the ties, linkages, and exchange that occur among or between organizations (Galaskiewicz, 1985: 281-304). Hence, an organization in an IOR is viewed as an entity embedded within a larger system and it has a network of relationships.

2.2.2 Knowledge-Based View (KBV)

The knowledge-based view has emerged from the resource-based view of the firm. Distinguishing knowledge from other types of resources, this view of strategy considers knowledge as the strategically most significant resource of the firm (Grant, 1996). Its proponents argue that heterogeneous knowledge bases and capabilities among firms are the main determinants of sustained competitive advantage and superior corporate performance (Kogut and Zander, 1992: 383-397; DeCarolis and Deeds, 1999: 953-968). The knowledge-based view of the firm depicts firms as repositories of knowledge and competencies (Kogut and Zander, 1992: 383-397; Spender, 1996: 45-62). According to this view, the "organizational advantage" (Ghosal and Moran, 1996: 13-47) of firms over markets arises from their superior

capability in creating and transferring knowledge. Knowledge creation and innovation result from new combinations of knowledge and other sources (Cohen and Levinthal, 1990: 128-152; Kogut and Zander, 1992: 383-397). The accumulation of knowledge through learning constitutes a driving force in the development and growth of young firms (Penrose, 1959; Spender, 1996: 45-62) because knowledge acquisition opens new "productive opportunities" (Penrose, 1959) and enhances the firm's ability to exploit these opportunities.

Although a variety of definitions of organizational learning have been proposed, a common notion for various definitions is that learning involves acquisition and exploration of new knowledge by the organization (Kumar and Nti, 1998: 356-367). Huber (1991: 89) states that "an organization learns if any of its units acquires knowledge that it recognizes as potentially useful to the organization." Similarly, Argote (1999) has depicted organizational learning as a process consisting of knowledge acquisition, retention and transfer. Relationships with other organizations are therefore an important source of new information for organizations (Argote, 1999). Indeed, numerous studies have identified learning and knowledge acquisitions as important motivations for entering inter-organizational relationships (Hamel et al., 1989: 133-139; Badaracco, 1991: 10-16).

The factors influencing transfer of knowledge over organizational boundaries are important for the present study. The knowledge-based view argues that tacit knowledge (Polanyi, 1968) is most valuable for organizations because it is difficult to transfer and thus can give a sustainable competitive advantage. Tacit knowledge is linked to individuals and is very difficult to articulate. Polanyi (1961) defined tacit knowledge as to "know more than we can tell," and views this knowledge as largely inarticulable. According to Polanyi (1961, 1968), tacit knowledge is primarily seen through an individual's actions rather than through specific explanations of what that individual knows. The knowledge-based view argues that because tacit knowledge is difficult to imitate and relatively immobile, it can constitute the basis of sustained competitive advantage (Grant, 1996: 109-122; DeCarolis and Deeds, 1999: 953-968). A stream of research building on the knowledge-based view has shown that strong ties and collaboration are positively related to the transfer of knowledge over organizational boundaries (Bresman et al., 1999: 439-462).

Absorptive capacity is also an important concept for inter-organizational learning and thus for the present study (Cohen and Levinthal, 1990: 128-152). Absorptive capacity was first defined by Cohen and Levinthal (1990: 130) as the firm's "ability to recognize the value of new external information, assimilate it, and apply it to commercial ends." They argued that inter-organizational learning is most effective when there is sufficient similarity in the basic knowledge of the firms (enabling effective communication) but simultaneously sufficient diversity in the special knowledge (non-redundancy makes knowledge valuable).

Despite the relative newness of the knowledge-based view as a theoretical perspective, it has already been applied in a large number of empirical studies. While a large share of the empirical research applying the knowledge-based view focuses on the characteristics of different types of knowledge and the use of knowledge within firms, the most relevant stream of research for the present study focuses on the role of inter-organizational relationships in knowledge acquisition and learning.

The characteristics of the knowledge influencing the transfer of knowledge over organizational boundaries have also received empirical attention. For instance, Inkpen and Dinur (1998: 1-20) reported that in their longitudinal analysis of five international joint ventures in the automotive industry, knowledge transfer was negatively related to the tacitness of knowledge and the organizational level at which the transfer took place.

However, although tacit and ambiguous knowledge have been shown to be more difficult to transfer over organizational boundaries, empirical research has identified social capital and frequent communications as factors facilitating knowledge transfer. For instance, Simonin (1999: 463-490) found that collaborative know-how from past alliances was positively related to transfer of ambiguous knowledge. Additionally, Kale et al. (2000: 217-227) found in their research on alliances of 278 U.S. companies that relational capital was positively related to learning from the alliance partner. Examining knowledge acquisition in key customer relationships of 180 technology-based new firms, Yli-Renko et al. (2001: 587-613) found that social capital embedded in the key customer relationship greatly facilitated knowledge acquisition from key customers.

Besides social capital and frequent communication, absorptive capacity has been shown to be among the most important roles of absorptive capacity. Lane and Lubatkin (1998: 461-477) analyzed 69 R&D alliances between pharmaceutical and biotech companies and found that learning tacit and embedded knowledge required absorptive capacity on the part of the recipient firm. They found that similarity of the basic knowledge between the alliance partners was positively correlated and similarity of the special knowledge was negatively correlated with learning from the alliance partners.

Learning through inter-organizational relationships has been shown to be important for the performance of technology-based new firms. For instance, the research conducted by Powell et al., (1996: 116-145) examining panel data on alliances of dedicated biotechnology firms, demonstrated that when the knowledge base of an industry is complex, expanding, and widely dispersed, the locus of innovation will be found in networks of learning rather than in individual firms. They found that in those situations, building external collaborations was central to updating the knowledge base of the firm and R & D collaboration.

2.2.2.1 The Importance of Knowledge and its Role in Alliance Collaboration

At the basic level, organizational knowledge can be defined as the capacity for action. In contrast to information, knowledge is difficult to codify, and difficult to transfer, as it is embedded in business routines and processes. The firm's knowledge base includes its technological competence as well as knowledge about customer needs and supplier capabilities (Teece, 1998: 285-305). These competencies are reflected in both individual skills and the collective knowledge of organizational communities. The essence of the firm is its ability to create, transfer, assemble, integrate, and exploit knowledge assets, a process that has come to be known as knowledge management. Knowledge management involves various processes, such as the sharing of individual knowledge and its evolution to a collective state, the embedding of new knowledge in products and services, and the transfer of knowledge across the organization. The ultimate objective of knowledge management is the creation of new knowledge and innovation that can be deployed in the marketplace as the foundation for competitive advantage.

Many writers have examined how collaboration leads to some form of organizational learning (e.g. Kogut, 1988: 319-332). In some cases, researchers discuss such learning in terms of knowledge sharing and transfer (e.g. Mowery et al., 1996: 77-91; Kale et al., 2000: 217-227 and Grant and Baden- Fuller, 2002: 61-84). In some cases, collaboration helps organizations "to better utilize strategic alliances as vehicles for learning new technologies and skills from their alliance partners" (Lei et al., 1997: 207). In this case, learning in collaboration is about learning from a partner, and the collaboration has served its purpose once the necessary organizational knowledge has been successfully transferred.

But while collaboration can facilitate the transfer of existing knowledge from one organization to another, it can also create new knowledge that neither of the collaborators previously possessed (e.g. Mowery et al., 1996: 77-91; Gulati, 1998: 397-420). The importance of knowledge creation has, in particular, been noted by researchers who have studied innovation in inter-firm alliances from a social constructivist perspective (Powell et al., 1996: 116-145). This stream of literature grows out of a theoretical perspective that sees knowledge as a property of communities of practice (Brown and Daguid, 2001: 40-57) or networks of collaborating organizations (Powell and Brantley, 1992: 365-394), rather than as a resource that can be generated and possessed by individuals.

In other words, networks of collaborating organizations are an important source of knowledge creation. Moreover, knowledge is not simply a resource that can be transferred from organization to organization; rather, new knowledge grows out of the sort of ongoing social interaction that occurs in ongoing collaborations. Following the work of Powell et al. (1996: 116-145), from the perspective of the knowledge creation view, the more collaborative ties an organization has, and the greater the diversity of its partners, the more likely it will be successful at generating new knowledge (Powell et al., 1996: 116-145 and Simonin, 1997: 463-490). Collaboration thus emerges from a series of ongoing, informal, and unplanned relationships (Von Hippel, 1986). This approach challenges some of the strategic work that emphasizes the importance of a formal agreement with clearly identified goals, highly rational partner selection criteria, specified controls for

monitoring performance, and a clear understanding of the termination arrangements (Powell et al., 1996: 116-145).

The importance of knowledge in strategic alliances for firms is to identify, transfer, and internalize external knowledge. Kogut' s review of the literature addressing joint ventures found that the firms' main motivation for entering into collaborative agreements was to transfer organizational knowledge (Kogut, 1988: 319-332). Berg and Friedman (1981: 293-298), in a study of joint ventures showed that in many cases, joint ventures did not in fact enhance the market power of the parent firm, but rather functioned as a means of knowledge acquisition. Knowledge is one of the most important elements of core competence, and firms try to transfer and absorb it in each interaction with their environment. Firms' partners in their cooperative actions are one of the main environmental or external sources of knowledge.

An underlying assumption is that learning and the application of knowledge-based resources are at the heart of competitive advantage and firm success (Teece, 1998: 285-305). Given this view, an important question is how firms augment their range of knowledge-based resources in a changing competitive environment. Specifically, how do firms transfer and acquire new knowledge from outside their boundaries? There are three basic alternatives for knowledge acquisition and transfer: internalization within the firm, market contracts, and relational contracts (Liebeskind et al., 1996: 428-443). Market-based transfers can be an efficient means of transferring knowledge embodied in a product (Demsetz, 1991: 147-160) but relatively inefficient when the knowledge is complex and difficult to codify. Relational contracts include both inter-firm networks and individual strategic alliances.

Inkpen (2000: 1019-1043) states that a series of knowledge management processes begins with the formation of an alliance and the creation of alliance knowledge, knowledge acquisition, and knowledge application by the alliance partners, as shown in figure 2.3.

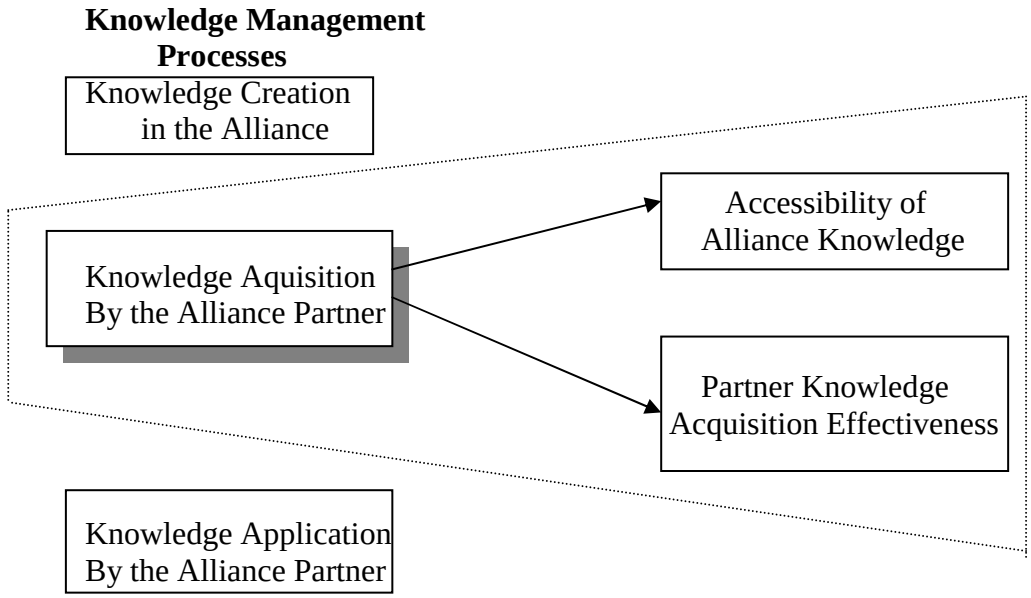


Figure 2.3 Conceptual Orientation for Knowledge Acquisition in the Alliances
Source: Inkpen, 2000: 1024.

2.2.2.2 Network and Knowledge Management

In order to be able to conceptualize a framework for knowledge networking, this study will first provide a theoretical foundation for networks, and secondly explain the interdependence between networks and knowledge management.

1) Theoretical Foundation on Networks

The term "networks" can be interpreted as those between individuals, groups, or organizations, as well as between collectives of organizations. In all these cases, the "network" construct demands that description and analysis does not concentrate only on a section of the relationship existing between the network participants and network relationships, but also comprehends the network in its entirety. According to a frequently quoted definition, a social network can be seen as: “a specific set of linkages among a defined set of actors, with the additional property that the characteristics of these linkages as a whole may be used to interpret the social behavior of the actors involved” (Mitchell, 1969: 2).

Consequently, the term "network" designates a social relationship between actors. The actors in a social network can be persons, groups, but

also collectives of organizations, communities or even societies (Lincoln, 1982: 255-294).The relationships evolving between actors can be categorized according to contents (e.g. products or services, information, emotion), form (e.g. duration and closeness of the relationship), and intensity (e.g. communication frequency). Typically, network relationships are characterized by a multiple mixture concerning form and content, i.e. the relationships between actors are of various forms, which may consist of diverse contents to be exchanged. The form and intensity of the relationships establishes the network structure (Burt, 1979: 415-435). Besides formalized networks, the literature stresses the importance of informal networks as the result of and prerequisite for decision-making processes in organizations (Morgan, 1986: 173-184), the importance of the interconnection of organization-wide action (Probst, 1987), and the influence of managers' position in the internal network on their cognition and information-processing (Walker et al., 1997:109-125). Krebs and Rock (1994) have stated that networks are structural as well as cultural. The relationships between the actors are founded upon personnel-organizational or technical organizational interconnections on a long-term basis. The relationships between network members can be understood as deriving from their autonomy and interdependence, the coexistence of co-operation and competition, as well as reciprocity and stability. Networks may also result on the one hand from internalization, that is to say, an intensification of cooperation, or externalization in the form of a limited functional outsourcing achieved by loosening hierarchical co-ordination mechanisms. With regard to different functional areas, both types, which entail more than just a modification of division of labor, can be pursued in parallel within an enterprise. Moreover, internalization and externalization can occur horizontally, i.e. on the same level, but also vertically with regard to actors on different levels of the value chain, e.g. suppliers or customers.

2) Integrating Networks and Knowledge Management Perspectives

Knowledge is increasingly recognized by modern organizations as their most important source of lasting competitive advantage. However, the key to obtaining long-term competitive advantage is not to be found in the administration of existing knowledge, but in the ability constantly to generate new knowledge, and to

move on to new products and services (Von Krogh et al., 1994: 53-71). Rather than viewing firms as devices for processing information, making decisions, and solving problems, one should realize that they are based increasingly on knowledge seeking and knowledge-creation.

In order to conceptualize the integration of networks and knowledge management, there are two main aspects. First, knowledge management should comprise a holistic view of knowledge, that is to say, the integration of explicit and tacit knowledge. Furthermore, knowledge management should take a holistic view of where or rather how knowledge is being created and transferred. Knowledge is often thought of as an objective commodity, which is transferable independently of person and context. On the basis of this mental model, people often try to solve problems by improving the information flow with intensive use of modern technologies. The potential of innovative technologies for the mastery and distribution of explicit knowledge, i.e., knowledge which is pinned down verbally in writing or electronically and can therefore be communicated and distributed, is undisputed. However, what is required is an integrated approach, which includes both explicit and tacit knowledge. Since tacit knowledge is deeply rooted in personal experiences, subjective insights, values and feelings, it can hardly be completely communicated and shared. Tacit knowledge can be conceptualized as possessing a technical and cognitive dimension. Whereas the technical dimension contains informal, personal abilities and skills, often designated as "know-how," the cognitive dimension includes our mental model influenced by our beliefs, values, and convictions (Nonaka and Takeuchi, 1995). For this reason, a network must be built up in which the knowledge and experience of employees are available (Seufert and Seufert, 1998: 77-84).

However, although working, learning, and innovation complement each other, they are nowadays still strictly separated in many firms as a result of their disparate mental models (Brown and Daguid, 2001: 40-57). Working is traditionally seen as the production and delivery of products or services. Formal operation instructions and workflow are designed to execute this as efficiently as possible (Hammer and Champy, 1993). As attention is focused upon the efficiency with which the task is carried out, this field is frequently resistant to modifications. Most studies have pointed out that learning is regarded explicitly as the absorption of

new knowledge, whereas this potential is in fact used most inadequately to increase the firm's ability to innovate. The underlying pattern of the learning process is often responsible for this. On the other hand, these processes simply focus on individual employees' acquisition of knowledge instead of inducing them to learn how to learn and how to inter-link areas of knowledge (Seufert and Seufert, 1998: 77-84). Finally, innovation is often associated with revolutionary proposals developed, for example in the research laboratory or other specialized departments. This form of innovation admittedly constitutes an important part of change in general, but is just one extreme within a continuum of innovations. They can also take the form of mere renewals and improvements in daily business, e.g. process improvements.

Seufert and Seufert (1999) state that focusing on explicit knowledge only, as well as taking a too narrow view of work, learning, and innovation areas involve the danger of erecting barriers of various kinds, functional and hierarchical, for instance, barriers to customers, suppliers, and co-operation partners, or mental barriers which impede the generation, transfer, and application of new knowledge. These not only hinder the short-term flow of knowledge but in the long-term prove detrimental to a company's innovation and learning ability. Based on integrated knowledge management, networking knowledge may deliver a conceptual framework for rethinking a knowledge-management model. In this case, knowledge barriers should be overcome by the “network,” and knowledge gaps should be cross-linked in order to stimulate the evolution, dissemination, and application of knowledge. The integration of networking into knowledge management yields great benefits. The openness and richness of networks are believed to foster a fertile environment for the creation of entirely new knowledge, while also accelerating the innovation rate. Powell et al. (1996: 116-45) demonstrated a ladder effect, in which firms with experienced partners competed more effectively in high speed learning races. Rather than trying to monopolize the returns from innovative activity and forming exclusive partnerships with only a narrow selection of organizations, successful firms positioned themselves as the hubs at the center of overlapping networks, stimulating rewarding research collaborations among the various partner organizations.

In sum, regardless of whether networking is driven by gaining access to new knowledge, or by creating and transferring knowledge, connectivity to a network and competence at managing networks have become key drivers of a new business logic. A framework for knowledge networking could be helpful in order to give it structure and reveal interdependence.

3) A Framework of Knowledge Networking

In the following, the author first gives a definition of what can be called knowledge networking, and will secondly describe its framework. The term "knowledge networking" is used to signify a number of people, resources, or relationships among them, who are assembled in order to accumulate and use knowledge primarily by means of knowledge creation and transfer processes for the purpose of creating value. Concerning the development of knowledge networks, A distinction has been made between emergent and intentional ones. Intentional knowledge networks are seen as networks that are built up from scratch, whereas emergent knowledge networks already exist but have to be cultivated in order to become high performing. In this way, a network may evolve whose participants share a common language, and a common set of values and objectives. This social network is backed up and transformed by information and communication technology. As this network of knowledge-resources is continuously being augmented by knowledge gained from learning situations, a knowledge network should be regarded as a dynamic structure rather than as a static institution.

The framework of knowledge networks comprises the following components: actors, individuals, groups, organizations, relationships between actors, which can be categorized by form, content, and intensity; resources which may be used by actors within their relationships, and institutional properties, including structural and cultural dimensions, such as control mechanisms, standard operating procedures, norms and rules, communication patterns, etc. These components can be perceived from either a static or a dynamic point of view. From a micro perspective, Seufert and Seufert (1999: 77-84) conceptualize knowledge networks on the following three building blocks, as shown in figure 2.4.

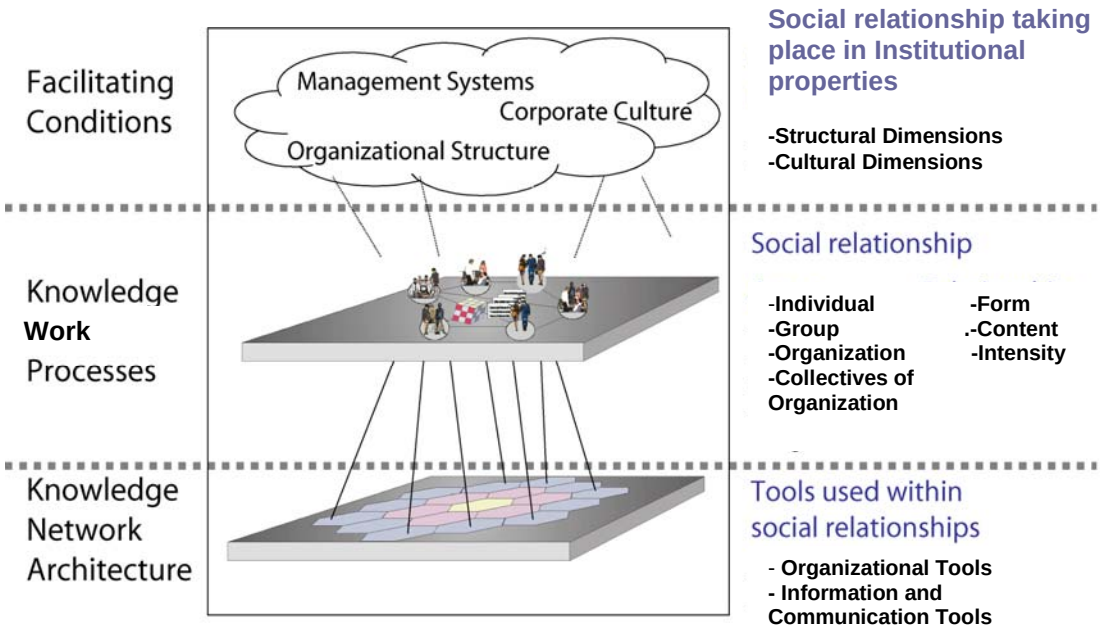


Figure 2.4 Framework Knowledge Networks: A Micro Perspective
Source: Seufert and Seufert, 1998: 80.

First of all, facilitating conditions comprise the network's internal structural and cultural dimensions in which knowledge work processes take place. Therefore, they define the enabling or inhabiting environment for knowledge creation and transfer. The organizational structure, management systems or network culture may be termed "categories to be taken into account. Care, for instance, as conceptualized by Von Krogh et al. (1994: 53-71) is a part of the network structure, crucial for knowledge creation. According to whether there is a high- or low-care environment, knowledge creation and transfer processes will differ considerably. Care involves helping behavior among people, lenience in judgment of new ideas and an active attitude toward understanding others.

Additionally, knowledge work processes comprise social interactions and communication processes on an individual and group level, which can advance knowledge evolution to an organizational and inter-organizational level. Following Nonaka (1994: 14-37), these processes can be conceptualized as a

knowledge spiral of dynamic transformation process between explicit and tacit knowledge.

Socialization comprises the exchange of tacit knowledge between individuals in order to convey personal knowledge and experience. Joint experience results in newly-shared, implicit knowledge, such as common values or technical skills. In practice, this could mean, for instance, gaining intuitive and personal knowledge through physical proximity and attaining direct communication with customers or a supplier.

Externalization describes transformation processes. On the one hand, this means and the conversion of implicit into explicit knowledge, and on the other, the exchange of knowledge between individuals and a group. Since implicit knowledge is difficult to express, the conversion process is often supported by the use of metaphors, analogies, language rich in imaginary, or stories as well as visualization aids, such as models, diagrams or prototypes (Nonaka and Konno, 1998: 40-55). In order to stage a constructive discussion and reach creative conclusions, a deductive or inductive mode of argumentation is also very important. The transformation of explicit knowledge into more complex and more systematized explicit knowledge represents a combination of processes (Nonaka, 1994: 14-37). It is necessary to combine different fields of explicit knowledge with each other and to make new knowledge available on an organization-wide basis. The systematization and refinement increases the practical value of existing knowledge and increases its transferability to all organizational units.

Internalization comprises the conversion of organization-wide, explicit knowledge into the implicit knowledge of the individual. This requires that individual be able to recognize personally relevant knowledge within the organization. Continuous learning and the gathering of one's own experience through "learning-by-doing" may support employees in these internalization processes. In this way capabilities and skills ("know-how"), as well as firm visions and guidelines, may be internalized and therefore shared throughout the entire company. This tacit knowledge and the experience gained on an individual level can be shared again through socialization-processes between individuals, so that the knowledge spiral may be set in motion once more. When cultivating the relationships that are the basis for these

processes of knowledge work, we will take into account the transformational effects that information and communication technology can have for the form and intensity of communication, cooperation, and coordination within Nonaka's four knowledge spiral process categories. Knowledge network architecture comprises the tool set used within social relationships. These tools include organizational tools, e.g., roles like the knowledge activists (Von Krogh et al., 1994: 53-71), as well as information and communication tools. Following the definition of a network provided earlier, knowledge networks maybe understood as social networks between knowledge actors in order to allow the creation and transfer of knowledge on an individual, group, organizational, and inter-hierarchical level. From the point of view of the dynamic knowledge management model, Seufert and Seufert (1998: 77-84) consider the following aspects to be of great importance.

First of all, the Interconnection of the different levels and areas of knowledge resulted from networking previous knowledge with new knowledge enables networking between individual knowledge types (explicit and implicit), networking between different levels (e.g. individual, group, organization), and areas of knowledge (e.g. customer knowledge, R & D knowledge).

Secondly, the interconnection of knowledge processes and knowledge network architecture can occur at different real places (e.g. in the office, with the customer), virtual places (e.g. distributed team rooms), or mental (e.g. common values, ideas, ideal) "places" (Von Krogh et al., 1994: 53-71). They can establish themselves in the form of formal or informal networks. Since knowledge occurs more and more in different time zones and different physical places, knowledge of the potential and capability to use modern information and communication technologies seems to be a critical success factor. In addition to these formal networks, informal networks or relationships are a crucial component for the knowledge ecology (Krackhardt and Hansen, 1997: 37-49).

Lastly, the interconnection of knowledge processes and facilitating conditions enables develop optimal knowledge creation/transfer, processes, and facilitating conditions to be cross-linked with each other. On the one hand, these processes are to be synchronized with the environment and the corporate culture within which they occur. On the other hand, the companies should actively

develop and maintain facilitating conditions in order to allow and support efficient and effective knowledge creation and transfer.

Although Seufert and Seufert (1998: 77-84) look upon knowledge networks as a separate layer rather than as a new kind of organizational unit, they do finally have to take into account from the macro-perspective interdependencies between the knowledge network, itself and the surrounding organization unit. In order to develop high-performance knowledge network they have to be synchronized by facilitating conditions, which they divide into structural (e.g. organizational structure, management systems) and cultural (e.g. corporate culture, organizational behavior) dimensions. However, they hypothesize a positive relation between knowledge networks and organizational development. Adapting from Gidden (1991: 201-221) and Orlikowski (1992: 398-427), they conceptualize the interplay between structure and action for knowledge networks and the organizational unit from a dynamic point of view, as illustrated and explained in figure 2.5 and table. As a consequence of knowledge networking, firms will have the opportunity to develop themselves into truly networked organizations.

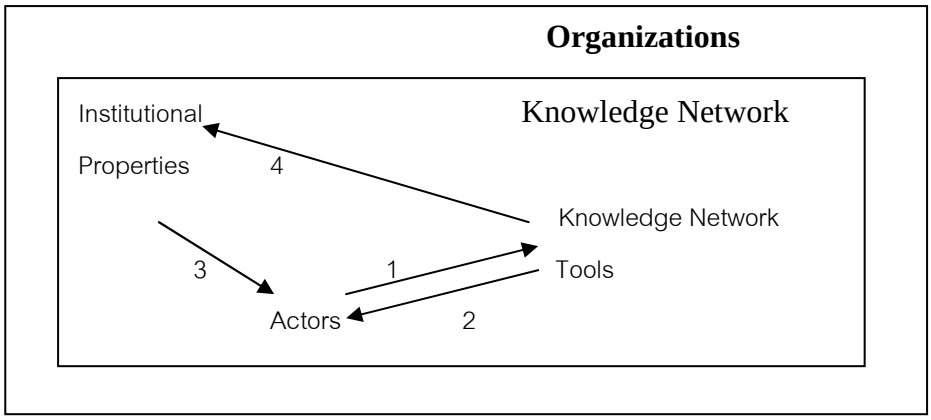


Figure 2.5 Development of Knowledge Networks: A Macro Perspective

Source: Seufert and Seufert, 1998: 79.

As shown in figure 2.5, it can be summarized the frameworks in a macro perspective as follows:

Table 2.8 Explanation of Framework Knowledge Networks- A Macro Perspective

Arrows	Type of Influence	Nature of Influence
1	Knowledge Network tools as a product of human action	Knowledge Network tools is an outcome of human interaction and communication processes.
2	Knowledge Network tools as a medium of human action	Knowledge Network tools facilitates and constrains human action.
3	Facilitating Conditions of Interaction with Knowledge Network tools	Institution Properties influence human in their interaction with knowledge network tools e.g. management systems, culture.
4	Institutional Consequences of Interaction with Knowledge Network tools	Interaction with Knowledge Network tools influences the institutional properties of the knowledge network through reinforcing or transforming structures of domination and legitimization. Since the institutional properties of the knowledge network and the surrounding organization are interconnected and have to synchronize, changes inside the knowledge networks may affect the organization in its totality.

Source: Seufert and Seufert, 1998: 79.

2.2.3 Resource-Based View (RBV)

The Resource-Based View (RBV) challenges the view of business strategy as managers seeking the best "fit" between the firm and its environment by emphasizing the overriding importance of factors internal to the firm (Barney, 1991: 99-120). While much of the research on the environmental model of competitive advantage focuses on studying the environmental conditions that favor high levels of firm performance (Porter, 1980), the resource-based view focuses on the firm's internal resources. Much of the research on the environmental model of competitive advantage has placed little emphasis on a firm's competitive position (Porter, 1980).

Accordingly, the resource-based view is selected as a basic perspective, which will be used as study guide to develop the casual link in order to understand the logical connection between resource integration and performance through the strategic implication process. In this aspect, the resource-based view examines competitive potential based on internal firm resources rather than on the basis of a firm's products (Wernefelt, 1984: 171-180). Resources have been considered that they are as an important source of competitive advantage because a firm has implemented strategy by exploiting internal strengths through its resources (Barney, 1991: 99-120). In the other words, the resource-based view focuses on value maximization of partner firms through pooling and utilizing valuable resources (Das and Teng, 2000: 31-61).

Resource-based theories of strategic management have extended the arguments brought forward in resource dependence theory. Resource dependence arguments are essentially reactive. Resource-based theories of strategic management add a proactive dimension to firm behavior. Eisenhardt and Schoonhoven (1996: 31-59) argue that firms enter into alliances for two reasons. First, firms enter into alliances if they are in a vulnerable strategic position and need resources from the alliance. Second, firms enter into alliances to capitalize on their assets. Firms enter into strategic alliances because they try to generate value through potential synergies (Madhok, 1995: 57-64). Small firm and large firm alliances have been explained by synergy arguments. Rothwell (1983: 5-25) argues that small firms have advantages in terms of innovative activities. Large firms have resource-based advantages. Thus, alliances might give small firms access to complementary assets that are often necessary to commercialize innovations (Teece, 1986: 285-305).

In the resource-based view of strategic management, the fundamental argument for alliance formation is that firms try to create an appropriate value in inter-firm relationships by leveraging the superior resources they possess with complementary resources (Stein, 1997: 267-284). Deeds and Hill (1991: 41-55) argue that strategic alliances give fast access to complementary assets rather than building these assets internally. Building asset internally is often too time-consuming and might forestall timing based advantages.

Sapienza et al. (1997) argue that the motivation of a firm to leverage their internal resource pool in external relationships will be a function of the characteristics of the internal resources. Specifically, they argue that the more imitable the core resources of the firm are, the lower its motivation to enter into alliances. Theoretically, the central premise of RBV is to find out the answer to questions concerning why firms are different and how firms achieve and sustain competitive advantage (Hoskisson et al., 1999: 417-456). These questions are answered by RBV's assumptions:

1) "Firms within an industry (or group) may be heterogeneous with respect to the strategic resources they control;"

2) "These resources may not be perfectly mobile across firms, and thus heterogeneity can be long lasting" (Barney, 1991: 99).

Therefore, examining the role of firm resources in creating competitive advantage is a core substance of RBV (Barney, 1991: 99-120). According to the resource-based view (RBV), firms can form IORs with other organizations based on the notion that the resources and capabilities controlled by a firm are the determinants of its subsequent performance and enable certain forms to outperform others (Barney, 1991: 99-120). Originally, the RBV primarily focused on the quality of internal resources of a firm and their effects on firm performance. However, more recently, the RBV shifted its focus to include external resource bases as well, by including a firm's IORs as a resource (Dyer and Singh, 1998: 660-679; Lavie, 2006: 638-658). This notion is based on the argument that by combining resources, firms can collaboratively perform activities that neither of them could perform alone, and thereby overcoming resource-based constraints on performance (Dyer et al., 2001: 37-43).

However, not all firms are able to combine resources with other firms efficiently (Dyer et al., 2001: 37-43). Thus, this problem poses the idea that a lack of control over external resources induces firms to engage in IORs. In order to engage in such IORs, firms require a strong internal knowledge base themselves, i.e. a resource complementarity argument (Dyer and Singh, 1998: 660-679). Furthermore, the more unique and difficult to imitate the resource possessed by a firm (i.e. the stronger its internal knowledge base), the greater the opportunities to exploit resource complementarity, and the larger the potential value of IORs (Barney, 1986: 231-241). Barney (1991: 99-120) also provides us a summary of the conditions of potential firm resources which are considered as sources of sustained competitive advantage (see figure 2.6).

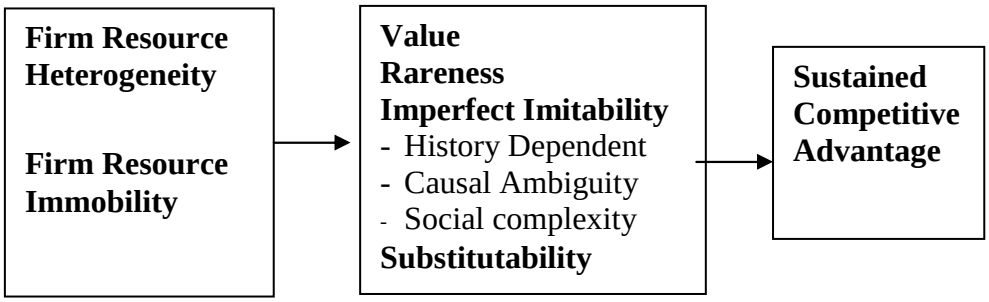


Figure 2.6 The Relationship between Resource Heterogeneity and Immobility, Value, Rareness, Imperfect Imitability, Substitutability and Sustained Competitive Advantage

Source: Barney, 1991: 102.

This model suggests that sources of sustained competitive advantage are particular firm resources that are valuable, rare, imperfectly imitable, and non-substitutable. The first two characteristics, valuable and rare are important conditions for creating a competitive advantage. However, such valuable and unique resources and capabilities are able to create only a temporary competitive edge because whenever the firm's competitors possess these resources and capabilities, the firm's competitive advantage will be eroded. Thus, two other characteristics of resource and

capabilities, costly to imitate and non-tradable, come to play a key role to protect the erosion of the firm's competitive advantage.

Additionally, resource and capabilities must be costly to imitate and non-tradable; otherwise the firm cannot maintain its competitive advantage. The more resources and capabilities that are difficult to imitate and non-tradable, the more it is likely that the firm can create a sustainable competitive advantage. Resources and capabilities are difficult to imitate and non-tradable only if they are a combination of both tangible and intangible assets (Barney, 1991: 99-120). There are several reasons why skills may be difficult to imitate and non-tradable. First of all, capabilities may be developed as a result of the firm's history or path dependence and therefore related to more specific and irreversible choices, which are invisible and difficult to understand for outsiders. Finally, capabilities are often the result of the complicated social interactions, embedded in the organization and not visible and or tangible for people outside the organization.

Trust between alliance partners is an example of invisible assets, which can not be traded or easily replicated or substituted by competitors. Trust is defined as the expectation that trading partners to an exchange will not act in an opportunistic manner even if there are short-term incentives to do so (Chiles and McMackin, 1996: 73-99). Trust is also earned over time, evolving slowly as a result of a successful history of performance between the partners (Liedtka, 1996: 20-37). RBV research shows that collaboration founded on trust enables firms to accumulate valuable, unique, costly to imitate, and non-tradable resources and capabilities (Dyer and Singh, 1998: 660-679; Barney, 1991: 99-120). Resources and capabilities that are valuable, unique, costly to imitate, and non-tradable are called sustainable resources and capabilities, which are viewed as either strategic assets (Amit and Schoemarker, 1993) or core competencies (Prahalad and Hamel, 1992: 79-91).

However, not all firm resources hold the potential for sustained competitive advantages. The contribution of this theory is that it develops the idea that "a firm's competitive position is defined by a bundle of unique resources and relationship" (Rumelt, 1984: 556-570). A resource-based view seems particularly appropriate for examining strategic alliances because firms essentially use alliances to gain access to

other firms' valuable resources. Thus, firm resources provide a relevant basis for studying alliances (Das and Teng, 2000: 31-61).

Resources and competencies include intellectual property, such as patents and brands, product development capabilities, and the ability to manage relationships with suppliers and customers, leading to the ideas of product/service heterogeneity arising from resource heterogeneity. When the firm resources are heterogeneous and immobile, different firms have access to different resource bundles and combine resources with varying degrees of effectiveness; thus, profitability of firms within an industry will vary widely.

Additionally, Das and Teng (2000: 31-61) further add that the resource-based view is used to indicate the conditions under which alliances will be likely to occur. These conditions have mainly to acquire and maintain all needed resources as well as reduce environmental uncertainty through resources interdependence with other business partners. The term resource broadly denotes both tangible assets as well as intangible capabilities, such as knowledge, skills, and other attributes of a firm. Kogut' s (1988: 319-332) organizational learning model, which is a part of the broad resource-based view, offers a refined view of alliance formation based on firm resources such as knowledge and technology. According to them, there are two possible reasons why firms forge alliances either to acquire the other's organizational know-how or to maintain one's own know-how while benefiting from another's resources.

Firms may use alliances or mergers and acquisition (M & A) to obtain resources possessed by other firms that are valuable and essential to achieving competitive advantage. While both alliances and M & A can accomplish the objective of obtaining a selected firm's resources, the resource-based view suggests conditions that favor alliances over M & A when not all the resources possessed by the target firm are valuable to the acquiring firm. Thus, the distinct advantage of strategic alliances is to have access to precisely those resources that are needed, with minimum superfluity (Das and Teng, 2000: 31-59). In support of this view, Hennart and Reddy (1977: 1-12) found that firms prefer acquisitions "when the desired assets are 'digestible.'

Whereas the motive for obtaining resources is to reach others' resources, the motive of "retaining resources" is to keep one's own valuable resources securely in the firm. Kogut (1988: 319-332) suggests that a firm may wish to maintain certain resources but lack the setup to make use of them. For example, sometimes there may be an excess of research personnel, without sufficient meaningful work at hand. Rather than laying these individuals off, firms outsource them by seeking projects that can be carried out in conjunction with the resources of other firms, such as financial and physical resources. To that end, strategic alliances may help retain those resources that are currently under-utilized internally. Nelson and Winter (1982) maintain that, in order to prevent their know-how from decaying, firms sometimes need to engage in alliances in order to avail themselves of opportunities to keep using these capability or remembering by doing. In this case, the choice between alliances and M & A is about period only (alliances). The possible advantage of strategic alliances over M & A is that the firm only temporarily relinquishes its resources, which remain available for future internal deployment.

In sum, according to Das and Teng (2000: 99-120), the overall rationale for entering into a strategic alliance appears fairly simple. It is to aggregate, share, or exchange valuable resources with other firms when these resources cannot be efficiently obtained through market exchanges or merger/acquisitions. It is about creating the most value out of one's existing resources by combining these with others' resources, provided that this combination results in optimal returns.

Furthermore, Eisenhardt and Schoonhoven (1996: 31-59) also combine social, strategic, and resource-based view to explain when firms ally. Their main finding is that alliances form in two situations: 1) when firms are in vulnerable strategic positions or 2) when firms are in strong social positions. Therefore, the underlying logic of alliance formation is strategic needs and social opportunities. Vulnerable strategic positions occur when firms are in difficult market situations or undertaking expensive or risky strategies. In such a situation, an alliance can provide critical resources, both concrete ones such as specific skills and financial resources, as well as more abstract ones such as legitimacy and market power that improve strategic position.

In contrast, if the market is munificent or the firm is pursuing a strategy for which it has extensive resource capabilities, there is much less incentive to cooperate. Firms are more likely to continue alone. Strong social positions in alliance formation depend on social advantages, such as the personal relationships, status, and reputation of firms and key individuals within the firm. Strong social positions lead to alliance formation because high status and reputation signal the quality of the firm and attract partners who want to associate with high-status others. In addition, it is also because extensive personal relationships create an awareness of opportunities for alliance as well as knowledge and trust among potential partners.

In the next section, a comparison among the aforementioned theoretical approaches, namely inter-organizational relations (IORs), the knowledge-based view, and the resource-based view of the firm (RBV), will be further made.

2.3 Comparison among Three Approaches for the Analysis of Knowledge-Based Alliances

As presented in table 2.8, the present study develops a multi-theoretical framework of the mechanisms of value creation in alliance partnership and of the key factors influencing those mechanisms. The integrative use of three theories in building the models is justified by several studies to understand the complexity of inter-organizational relationships (Osborn and Hagedoorn, 1997: 261-278).

In the present study, the knowledge-based view, in terms of knowledge management perspectives, has been applied extensively in research examining knowledge transfer over organizational boundaries (Lane and Lubatkin, 1998). The resource-based view is used to derive predictions concerning the influence of complementarities in resources and knowledge influencing the motivations of large corporations to deepen the relationship beyond a pure financial relationship. The resource-based view has been used to explain the potential value of external resources and also the factors influencing creation of inter-organizational relationships. Complementarities between two firms has been identified as a key factor in creating value through a combination of resources and thereby making one firm an attractive partner for another (Eisenhardt and Schoonhoven,1996: 31-59). While resource-based

view recognizes the importance of partner complementarities and resource exchange among the partner, inter-organizational relations (IORs) help to understand the factors facilitating the transfer of knowledge and opportunities for collaboration over organizational boundaries (Nahapeit and Ghosal, 1998: 242-266). Extant research has found social capital (trust, commitment and bilateral information exchange based on social interaction) to be an important facilitator of resource and knowledge exchange (Nahapeit and Ghosal, 1998: 242-266).

Table 2.9 Summary of Inter-Organizational Relations, the Knowledge-Based View and Resource-Based View

Theory	Key Concepts	Key Assumptions	Key Propositions	Link to Alliance
Inter-Organization Relations (IOR)	Concentration of embeddedness in a network of social Relationships	-Deliberate construction of social relationships to achieve benefits	-Gaining benefits from relationships	-Predictions as to the role of relational factors facilitating resource & knowledge acquisition and transfer among the partners in the strategic alliance partnership
Knowledge-based View (KBV)		-Capability to acquire, assimilate, and diffuse knowledge	-A means to acquire or gain access to external resources	-Predictions as to the importance of knowledge acquisition for value creation. -Building sustainable competitive advantage through new resource combinations and knowledge networking
Resource-Based View (RBV)	-Focus on internal resources in terms of internal strengths and weaknesses -Survival by competitive Advantages -Organizations must manage strategic resources in terms of identification, develop-ment, and deployment in order to sustain their competitive advantages.	-Firms within an industry may be heterogeneous with respect to the strategic resources they control. These resources may not be perfectly mobile across firms. -Competitive advantage depends upon possession of a bundle of unique, rare, non-substitutable and inimitable resources; exploiting such resources fully and building company resource base are important.	-Building sustainable competitive advantage through new resource combinations -The symmetry in the exchange of resources is important. Possibility of synergistic development of idiosyncratic resource" is unique to the alliance. -Organizations must examine the role of idiosyncratic and immobile firm resources in creating competitive advantages.	-Predictions as to the role of inter-organizational resource combinations for value creation; the role of complementarities in value creating resource combinations -Strategic alliances can be used to complement possessed resources or to acquire resources that are lacking; resource pooling is important to increase the internal competence, resources and capabilities.

Source: The author's Own Elaboration

First of all, this study has employed the idea of inter-organizational relations (IORs) to explain the motive of an organization to join in strategic alliance activities. And then, knowledge-based view is implemented to develop hypotheses on the importance of knowledge acquisition for value creation and to determine the factors affecting the knowledge acquisition. Lastly, the resource-based view is also used to evaluate the alliance outcomes.

All three approaches assume that international alliances have the characteristics of bounded rationality. In the resource-based view, bounded rationality emphasizes the need to look for complementary knowledge and assets in the areas where the firms lack competence. One way that the firm can deal with it is to find such complementary knowledge and assets outside the firm's boundary, implying that cooperation with external partners will happen. However, cooperation with external partners cannot take place if trust and social relationships between the firms and external partners in inter-organizational relationships have not been established.

The resource-based perspective suggests that the firm is a collection of heterogeneous resources (tangible and intangible assets that are semi-permanently tied to the company). Sustained resource heterogeneity is a potential source of competitive advantage (Das and Teng, 2000: 31-61). The resource-based alliance argument mentions that firms use alliances to locate the optimal resource configuration in which the value of their resources is maximized relative to other possible combinations (Das and Teng, 2000: 31-61). Thus, alliances are used to develop a collection of value-creating resources, which are often complementary ones that a firm cannot create independently. According to this view, Peteraf (1993: 173-191) has posited that the RBV is used to derive predictions on the influence of complementarities in resources influencing the motivations of a firm to deepen the relationship beyond pure financial relationship because complementarities between firms have created value through combination of resources and thereby making one firm an attractive partner for another. In this sense, the resource-based view is a proactive approach in terms of resource acquisition (Pfeffer and Salancik, 1978).

However, the weakness of the RBV is also clear because it is an inside-out approach that overlooks the factors taking place outside the firm. The resource-based view has led to limited understanding of the boundaries of the theory (Preim and Butler, 2001: 22-40). The resource-based view argues that resources may be valuable, but does not answer when, where, and or how they can be useful (Miller and Shamsie, 1996: 519-543 and Preim and Butler, 2001: 32-40). Only recently has research focused on the contingencies influencing the value of resources (Miller and Shamsie, 1996: 519-543 and Preim and Bultler, 2001: 32-40). The resource-based view 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 and Singh, 1998: 660-679).

This criticism has led to the development of the "relational view" in inter-organizational relations (IORs), focusing on the sources of competitive advantage residing in dyads or network of firms (Dyer and Singh, 1998: 660-679). Although some of the previous studies on the resource-based view focused on the internal resources possessed or directly controlled by the firm, later research has increasingly recognized the role of inter-organizational relationships in building bundles of resources that are valuable, rare, non-imitable and difficult to substitute (Das and Teng, 1998: 21-42).

Inter-organizational relations (IORs) focus on social relations between parties in order to get complementary resources and capabilities for the firm to improve its competitive advantage. The IORs can help strengthening this weakness by pointing out that the interactions with many external partners exist not only to ensure their survival (Galaskiewicz, 1985: 281-304), but also to create a common increase of value to benefit each other in the future. Trust between the partners comes to play a key role in this approach, whereas opportunism, which seems to be an inverse function of trust, is not a major concern. However, the weakness of this theory is that it does not provide a strategic view to link the firm with the competitive edge. Thus, there is room for RBV to suitably fill the gap. RBV can help us to further explore the link between the firm’s resources and capabilities and competitive advantage (Barney, 1991: 99-120).

Thus, with a combination of the resource-based view and inter-organizational relations (IORs), researchers are able to analyze a firm's competitive performance from internal and external perspectives. The effectiveness of the alliance relationship could be evaluated in terms of resources, which lead to the internal organization perspective. The resource-based view (RBV) proposed the concept of matching a firm's internal strengths and weaknesses with its external opportunities and threats (Barney, 1991: 99-120). In other words, RBV combines the internal analysis of resources within a firm with the external analysis of the industry and the competitive environment (Collis and Montgomery, 1998: 3-30).

In addition, in this study, the knowledge-based view is also used to explain the phenomena of knowledge transfer among partners which is thereby extended from the breadth of the resource-based view. 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); the concepts are difficult to measure and learning is often treated as a "black box." Perhaps because of the abstractness of the concepts and difficulty of operationalizing them, research on the knowledge-based view has become highly fragmented. While there is agreement within the research on the knowledge-based view on the basic assumption that knowledge is the source of competitive advantage, there is less agreement on the terminology and levels of analysis. Because of this fragmented nature of the research, the knowledge-based view has not been seen as a coherent theory (Grant, 1996: 61-84) 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 mission of alliance activities. These strategy theories are later drawn together into an integrated alliance framework. This framework will then be used to study the determinants affecting the alliance formation and the performance of alliance collaboration. It is, however, worth noticing here that the different approaches contribute to different aspects of alliances, as no single theory is able to explain the alliance phenomena.

The next sections will apply these three approaches to establishing a strong foundation to analyze how partner complementarity, partner attributes, coordinating factors and relationship factors contribute to alliance performance in terms of knowledge transfer, followed with the discussion of the proposed model of the study.

2.4 Model Development and Hypotheses

This dissertation is based on a variety of theories and models postulated by scholars from different fields to form a new model, which suits the context of the study (See figure 2.7). The author proposes different aspects of 8 S-framework in four groups of determinant factors; namely, partner complementarity (strategic alignment, source attractiveness), partner attributes (staff's learning attitudes and abilities, skills of joint alliance management, structural characteristics), coordinating factors (shared values, support systems) and relationship capital (styles of relationship), as indicators to investigate the impact of the effectiveness of knowledge transfer.

Drawing on both organizational theory and strategic alliance literature, a new construct for testing the effectiveness of knowledge transfer between university-industry alliance partners falls into four categories of variables, called the RDCE model (research outputs, development through tacit knowledge transfer, commercialization, and efficient coordination). From the proposed model, as shown in figure 2.7, it can be summarized that the effectiveness of knowledge transfer is the ultimate criterion variable in the model, and its determinant factors include four variables, called "partner complementarity," "partner attributes," "coordinating factors," and "relationship capital." The midrange variables are reflected by 1) partner attributes consisting of staff's learning attitudes and abilities (learning intent and absorptive capacity), skills of alliance management (joint management competence), and structural characteristics (formalization, centralization and complexity); 2) coordinating factors (shared values and support systems); and 3) relationship capital (styles of relationship consisting of trust, commitment, and bilateral information exchange) respectively. Finally, partner complementarity, consisting of strategic alignment and source attractiveness, are regarded as preceding factors of alliance in

the model, which are logically modeled as antecedents of the effectiveness of knowledge transfer among the alliance partners.

The proposed research model in this study is a four causal relationship model (See figure 2.7). The first causal relationship examines the relationships between antecedent factors, which consist of strategic alignment and source attractiveness and the effectiveness of knowledge transfer concerning 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, called 1) "partner attributes," which are composed of three interrelated facets: staff's learning attitudes and abilities (learning intent, absorptive capacity), skills of alliance management (joint management competence), structural characteristics; 2) coordinating factors, which consist of shared values (cultural compatibility), support systems (operational compatibility, flexible university policies); and 3) relationship capital which are represented by the style of the relationship (trust, commitment, and bilateral information exchange). In the third causal relationship, all these mediating variables are tested in terms of their inter-related relations and finally, in the fourth causal relationship, all of these three mediating variables are examined with the effectiveness of knowledge transfer among the alliance partners.

According to the proposed model, the author offers a framework to understand 1) the antecedent factors that facilitate knowledge transfer within the university-industry alliance; and 2) how these proposed 8 S-framework determinant factors influence the effectiveness of knowledge transfer among the university-industry alliance partners. The purpose of the study is to test whether antecedent factors affect the effectiveness of knowledge transfer among alliance partners, and if they do, whether they influence the effectiveness of knowledge transfer directly, indirectly, or both?

The purpose of this chapter is twofold. First is provided a theoretical explanation based on inter-organizational relations (IORs), the knowledge-based view, and the resource-based view (RBV) to elaborate the relationship between variables in the proposed model. Combining these three theories, the author argues that partner complementarity factors, partner attributes, coordinating factors, and

relationship factors can be considered as the prerequisite for the effectiveness of knowledge transfer in the university-industry alliance. Second is to demonstrate the operational definitions of key study constructs. Thereafter, the variables employed in the study, together with the related hypotheses setting, are demonstrated in terms of their relation.

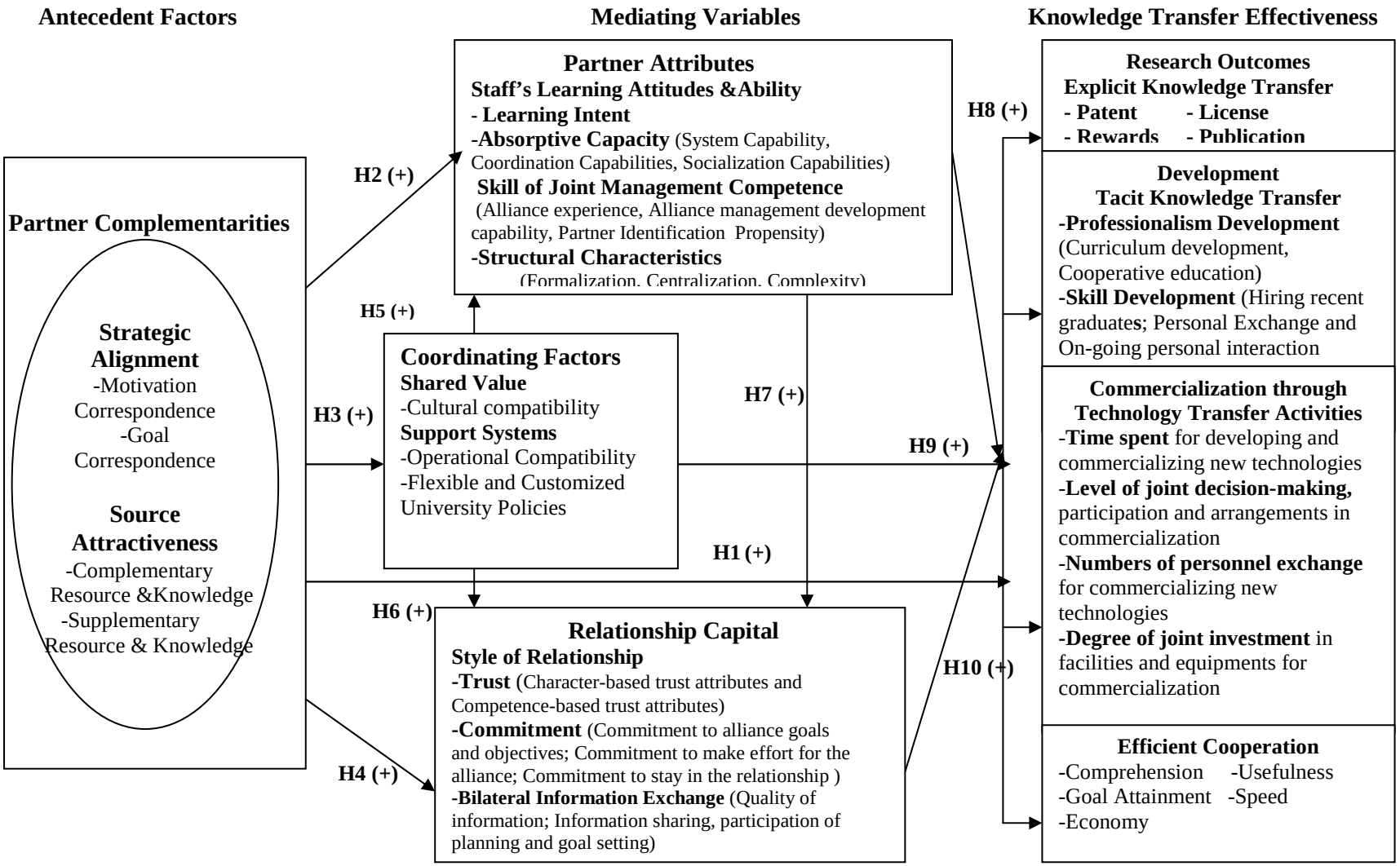


Figure 2.7 The Theoretical Framework of the Study

Table 2.10 and 2.11 summarize a list of the literature reviewed in this study that focuses on the antecedent factors that influence on the effectiveness of the university-industry alliance. The following section provides further explanation of the constructs and hypotheses that are posited in the proposed model. The domain of the effectiveness of knowledge transfer and these all antecedent factors were specified and a sample of items was generated for each construct (Churchill, 1979: 64-73).

Table 2.10 Summary of the Dependent Variables Measuring the Effectiveness of Knowledge Transfer in the University-Industry Alliance and Related Literature Review

Dependent Variables	Related Literatures
Effectiveness of Knowledge Transfer (RDCE Model)	
Research Outcomes through Explicit Knowledge Transfer	Geisler and Rubenstein, 1989; Irvine and Michaels, 1989; Zegveld, 1989; Bloedon and Stokes, 1991; Seufert and Seufert, 1998
Development through Tacit Knowledge Transfer	Polanyi, 1968; Deutch, 1991; Evans et al., 1993; Nonaka and Takeuchi, 1995; Santoro and Chakrabarti, 1999; Simonin, 1999
Commercialization through Technology Transfer Activities	Santoro and Chakrabarti, 1999; Santoro and Gopalakrishnan, 2000
Efficient Coordination	Zander and Kogut, 1995; Lane and Lubatkin, 1998; Simonin, 1999; Zahra and George, 2002; Hansen et al., 2005

Table 2.11 Summary of Antecedent and Mediating Factors that Influence the Effectiveness of Knowledge Transfer in the University-Industry Alliance and Related Literature Review

Antecedent/ Mediating Factors (8 S-frameworks)	Related Literatures
	Partner Complementarities
Strategic Alignment	**Goals/ Motivation Correspondence** Doz and Hamel, 1989; Hamel, 1991; Saint-Onge, 1996; Smith and Barclay, 1997; Saez et al., 2002
Source Attractiveness	**Supplementary Resource and Knowledge** Wernefelt, 1984; Harrigan, 1985; Dierickx and Cool, 1989; Barney, 1991; Bleeke and Ernst, 1991; Aulakh et al., 1996 **Complementary Resource and Knowledge** Harrigan, 1985; Brockhoff et al., 1991; Nielson, 2005
	Partner Attributes
Staff 's Learning Attitudes and Ability	**Learning Intent** Hamel et al., 1989; Hamel, 1991; Bonthous, 1996; Levithas et al.., 1997; Doz and Prahalad, 1998 **Absorptive Capacity** Cohen and Levinthal, 1990; Kogut and Zander, 1992; Grant, 1996; Liebeskind et al., 1996; Dyer and Singh , 1998; Lane and Lubatkin, 1998; Van den Bosch et al., 1999**;** Barringer and Harrison, 2000
Skills	**Joint Management Competence** Parke, 1993; Willkof et al., 1995; Smith and Barclay, 1997**;** Das and Teng, 2000
Structure	**Structural Characteristics** Chandler, 1962; Hall, 1977; Killing, 1983; Schaan, 1983; Beamish, 1984; Fredrickson, 1986; Perlmutter and Heenan, 1986; Geringer and Hebert, 1989; Bleeke and Ernst, 1991; Bidault and Cummings, 1994; Moenaert et al., 1994
	Coordinating Factors
Shared Value	**Cultural Compatibility** Weick, 1979; Deal and Kennedy, 1982; Gregory, 1983; Smircich, 1983; Denison, 1990; Schein, 1990
Support Systems	**Operational Compatibility** Onida and Malerba, 1988; Geisler and Rubenstein, 1989; Oliver, 1990; Robbins, 1990; Bonaccorsi and Piccaluga, 1994; Madhok, 1995; Sarkar et al., 1997; Das and Teng, 1998; Koza and Lewin, 1998; Madhok and Tallman, 1998 **Flexible University Policies** Burns and Stalker, 1961; Lewis, 1990; Niederkofler, 1991; Santoro and Chakkrabrati, 1999

Table 2.11 (Continued)

Antecedent/ Mediating Factors (8 S-frameworks)	Related Literatures
	Relationship Capital
Style of Relationship	**Trust** Buckley and Casson, 1988; Anderson et al., 1989; Moorman et al., 1992; Parke, 1993; Morgan and Hunt, 1994; Kumar et al., 1995; Madhok, 1995; Aulakh et al., 1996; Das and Teng, 1998; Monczka et al., 1998; Young-Ybarra and Wiersema, 1999 **Commitment** Anderson et al., 1987; Dwyer et al., 1987; Moorman et al., 1992; Gulati et al., 1994; Morgan and Hunt, 1994; Madhok, 1995 **Bilateral Information Exchange** Dwyer et al., 1987; Anderson and Narus, 1990; Mohr and Nevin, 1990; Mohr and Spekman, 1994; Mohr et al., 1996

Source: Summarized from the Proposed Model Suggested by the Author

2.5 Variables and Operational Definition

The conceptualization of this study can be explained in terms of the research variables, the study's model, hypotheses, and structural equations as follows:

2.5.1 Independent Variables (Antecedents Factors of the Effectiveness of Knowledge Transfer of the University-Industry Alliance)

The focus in this study concentrates on what is important to industrial firms and the university in building effective university-industry alliance relationships. A number of factors that are especially important and proposed to evaluate the effectiveness of knowledge transfer among the alliance partners are as follows; partner complementarity; partner attributes; and relational alignment and relationship capital between the firm and university. Adapted from the study of Gopalakrishnan and Santoro,2004, in this study, the author suggests the 8 S- framework to measure the effectiveness of knowledge transfer by illuminating the following eight key elements for consideration: strategic alignment, source attractiveness, staff' s learning

attitudes and abilities, skills of management, structure, shared values, support systems, and styles of relationship. Strategic alignment refers to the motivation and goals which are congruent among the alliance partners to pursue the alliance formation and knowledge transfer. Staff's learning attitudes and abilities refer to the organization's intent to learn and assimilate the knowledge. Skills refer to the joint management experience and competence. Structure refers to the industrial firm's organizational structure. Shared values are the foundations around which the business is built as represented by the firm's culture. Support systems are represented by the operational compatibility among the partners and flexible university policies for intellectual property, patent ownership, and licensing. All of the aforementioned variables will be further explained in terms of their important definitions and the linkage between these variables and knowledge transfer activities in the alliance context discussed in the study.

Glaister and Buckley (1996: 301-332) stated that the sustainability and viability of an alliance is, to a great extent, determined by the partner chosen. Similarly, Devlin and Bleakley (1988: 18-25) pointed out that although some failures may be attributed to changes in business conditions, a number are triggered by inappropriate partner selection. Although two studies in the literature recognized the importance of partner selection (Saez et al., 2002: 321-345), none has addressed this issue extensively. High risks accompany the high potential benefits in co-development alliances (Littler et al., 1995: 16-33), but reducing risks while maximizing benefits may be a function of partner choice. Choosing the right partner also may reduce the clash between the logic of alliances and the logic of new product development. Thus, the potential partners that had technical resources were distinct yet complemented one another for the opportunity foreseen. Partners would be able to exploit or to create opportunities only by integrating their complementary skills and resources. Also, in order to develop the initial alliance projects, strategic alignment in terms of goal congruence and motivation correspondence as well as source attractiveness concerning the complementary and supplementary resources and knowledge can be considered as prerequisites for alliance formation.

1) Strategic Intent Alignment

Strategic intent is defined as the goals of an organization and the manner in which it seeks to achieve as a consequence of alliance participation (Saint-Onge, 1996: 10-14). 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.

If partner's goals are not complementary, knowledge development may be difficult. In such cases, managers may have to devote more resources to reducing strains inherent in the alliance, and less time developing valuable knowledge from the alliance. 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 in correspondence with one another (Smith and Barclay, 1997: 3-21). Correspondence of motivations signals whether partners have mutually beneficial intentions and determines the likelihood that the partners will engage in opportunistic behaviors.

Goal Correspondence occurs when the prospective partners have non-competing goals. A key finding is that high goal correspondence enhanced the consistency of expectations and assured mutual gains. Goal correspondence does not necessarily mean that partners have exactly the same goals, as long as they are not conflicting and can be achieved through a common benefit.

2) Source Attractiveness

The organizations that possess attractive resource and knowledge will be more appealing to recipients than those who do not possess such resources. DeCarolis and Deeds (1999: 953-968) indicates that stocks of resources and knowledge have a positive impact on firm performance. Success overtime, in turn, makes a source more attractive to a recipient. Second, if a firm possess knowledge and resource that has the

potential of creating competitive advantage, the firm is more likely to be better linked to other firms located in that environment.

First of all, complementary resource and knowledge can be explained according to Chi's definition (1994: 271), “complementarities exist between two sets of resources when a joint use of them can potentially yield a higher total return than the sum of the returns that can be earned if each set of resources are used independently of the other.” In line with this definition is the capability heterogeneity (versus homogeneity) amongst firms defined by Sakakibara (1997: 143-164) as “the breadth of diversity of technological capabilities that firms possess,". In the case of complementary resources and knowledge, the new stock of knowledge in the focal unit encompasses similar specialized knowledge of the partners. The word “complementary” is used to reflect the similarity of knowledge between the firms. However, this does not indicate an extensive overlap. Rather, it can be knowledge that is different but related to the same product or service. Thus, being complementary provides an opportunity to build on their existing knowledge stock and deepens the knowledge specialization of the partnership, rather than broadening its knowledge scope. Complementary knowledge accession can enhance the efficiency and economies of scale of the partnership and reduce uncertainty, as it provides a critical mass of knowledge.

When the partners acquire complementary knowledge from the focal unit, they can increase their knowledge concentration and deepen their field of specialization, because the knowledge that the firm acquires complements the knowledge about their current core competences. This can lead to higher efficiency (Grant, 1996: 109-122). However, greater specialization can reduce the adaptability of the firm concerned (Porter, 1980). In complementary knowledge acquisition, is likely to be transferred relatively easily because the partner firms possess similar specialized knowledge which facilitates the process of assimilation by the learning organization. This reduces the costs involved in knowledge transfer.

Resources are defined as “assets, capabilities, organizational processes, firm attributes and information, etc., controlled by a firm that enable the firm to conceive of and implement strategies that improve the efficiency and effectiveness” (Daft and Lengel, 1986: 554). And all resources can be classified into three

categories: financial, technological, and physical resources, as well as organizational capabilities. Financial resources mean the availability of capital (Das and Teng, 2000: 31-61). Physical resources include the plant, equipment, raw materials, production capacity, distribution channel, geographic location, and its access to raw materials and so on (Grant, 1996: 109-122; Williamson, 1975). Organizational capabilities refer to resources that are not factor inputs. They are complex combinations of assets, people, and processes that an organization employs for transforming inputs into outputs, such as formal structure, formal and informal planning, controlling, and coordinating systems, as well as informal relations among groups within the organization and between a firm and those in its environment (Barney, 1991: 99-120; Collis and Montgomery, 1998: 3-30).

As noted by John et al. (1996: 981-1004), resource complementarities can be defined as both uniqueness and symmetry. On the one hand, complementarity determines the mix of unique and valuable resources available for achieving strategic objectives (Killing, 1983), thus enhancing the competitive viability of the alliance. On the other hand, complementarity implies strategic symmetry, wherein a balanced share of unique strengths creates partner interdependence (Harrigan, 1985). Resource complementarity can be conceptualized as the extent to which each partner brings in unique strengths and resources of value to the collaborations (John et al., 1996: 981-1004). Complementarities in an alliance suggest that each firm contributes unique strengths and resources valued by the partners (Dymsza, 1988: 403-424). Complementarities also refer to the interdependence between partners (Harrigan, 1985). Beamish (1984) categorized partner contributions or needs into five groups; items, such as capital and technology, which are capitalized; human resources, including top managers and low-cost labor; market access; government and political influence; and knowledge. Several authors have suggested that partners should be complementary in the products, geographic presence, or functional skills that they bring to the venture (Harrigan, 1985; Bleeke and Ernst, 1991: 127-135).

Following the resource-based view, resource and knowledge complementarity is also crucial to collaborative success (Harrigan, 1985; Bleeke and Ernst, 1991: 127-135). While resources and capabilities are pooled, the actualization of this collaborative potential is generated through the dynamic process of interaction

and integration of the partners' resource bases and the effectiveness with which the partners succeed in moving away from a market-based exchange toward a mutually-oriented cooperative relationship (Koza and Lewin, 1998). Thus, the resources contributed by alliance partners can be combined in valuable ways. Failure by partners to ensure the complementary of resources prior to forming an alliance can have undesirable consequences.

Thus, the firm's bundle of heterogeneous resources is crucial for advancing new technologies and for sustaining competitive advantage (Wernefelt, 1984: 171-180; Barney, 1991: 99-120). However, organizations are limited in the amount of skills and knowledge they can develop and maintain (Hamel et al., 1989: 133-139). Thus, unless the organization has the complete array of resources to pursue new technological opportunities, help from an external source is necessary. Access to resources is an important reason for technology-based firms to engage in inter-organizational relationships with other organizations (De Meyer, 1999: 323-328). Resources acquired through inter-organizational relationships may include simple resources, e.g. financial, which are often sought from the alliance. Resources obtained through inter-organizational relationships can also include access to distribution channels (Sterns, 1996), production facilities, or something else that is needed to create, produce, or distribute the products competitively.

In terms of knowledge perspectives, most traditional literature is preoccupied with knowledge complementarity as the skills and resources that the other partner needs but does not have. As argued by Harrigan (1985), strategic alliances are more likely to succeed when partners possess complementary assets and thus a firm will seek the knowledge it considers lacking but that is vital for the fulfillment of its strategic objectives. Brockhoff et al. (1991: 219-229) identified the synergies resulting from the exchange of complementary know-how. Thus, complementary know-how in their opinion is a main trigger for alliances, particularly in R&D. One traditional view is that in seeking and applying the relevant knowledge, a firm will also need to possess a knowledge base in the same or similar area, because only such similarity will allow for an understanding of the complexities of the new knowledge as well as of its applicability to the firm's unique circumstances. Nielson (2005: 301-322) argued that the complementarity of knowledge refers to the

development and distribution of synergies of knowledge and to the matching of knowledge resources pooled within strategic alliances. But the similarity of knowledge bases of the partner firms refers to their strength in absorbing and interpreting transferred knowledge.

Moreover, Grant (1996: 109-122) has argued that knowledge is considered as the strategically most significant resource of the firm that influences the new product development. Heterogeneous knowledge bases and capabilities among firms are the main determinants of sustained competitive advantage and superior corporate performance (Kogut and Zander, 1992: 383-397). The knowledge-based view of the firm depicts firms as repositories of knowledge and competencies (Spender, 1996: 45-62). According to this view, the "organizational advantage" of firms over markets arises from their superior capability in creating and transferring knowledge (Ghosal and Moran, 1996: 13-47). Knowledge creation and innovation result from new combinations of knowledge and other resources (Cohen and Levinthal, 1990: 128-152). The accumulation of knowledge through learning constitutes a driving force in the development and growth of young firms (Penrose, 1959) because knowledge acquisition opens new "productive opportunities" and enhances the firm's ability to exploit these opportunities (Penrose, 1959). Thus, access to complementary, technical information from the corporation may generate major savings in cost and, critically, time. It may also represent a material reduction in both market and technology uncertainties given the superior intelligence resources of the corporation.

Although a variety of definitions of organizational learning have been proposed, a common notion for various definitions is that learning involves acquisition and exploration of new knowledge by the organization (Kumar and Nti, 1998: 356-367). In this study, the author follows Huber (1991: 89), who assumed that "an organization learns if any of its units acquires knowledge that it recognizes as potentially useful to the organization." Similarly, Argote (1999) has depicted organizational learning as a process consisting of knowledge acquisition, retention, and transfer. Relationships with other organizations are therefore an important source of new information for organizations (Argote, 1999). Indeed, numerous studies have

identified learning and knowledge acquisition as important motivations for entering inter-organizational relationships (Badaracco, 1991: 10-16).

As a result, access to knowledge is an important motivation for technology-based firms to enter into relationships with external parties (Powell et al., 1996: 116-145). Technology-based firms need external knowledge to focus their scare resources to the most effective use and to develop their competencies and organizations. Firms must be endowed with assets that partners value and are fit for use (Das and Teng, 2000: 31-61). The basis for any exchange is reciprocity, so in a collaborative arrangement involving two firms, both companies must possess such assets (Eisenhardt and Schoonhoven, 1996: 31-59). Firms lacking assets will not be desirable alliance partners, as linkage-formation opportunities are known to be related to the possession of resources (Ahuja, 2000: 317-343). While this point at first seems to be self-evident, on closer inspection the importance of asset possession becomes more critical. All firms have assets of some type. Those assets that are valued most by partners will be those that are difficult to trade in markets, are rooted in developmental process that are causally ambiguous, and have the potential either on their own or in combination to yield competitive advantage (e.g. Dierickx and Cool, 1989: 1504-1513; Barney, 1991: 99-120).

The factors influencing the transfer of knowledge over organizational boundaries are important for the present study. The knowledge-based view argues that tacit knowledge (Polanyi, 1961) is most valuable for organizations because it is difficult to transfer and thus can offer a sustainable competitive advantage. Tacit knowledge is linked to individuals and is very difficult to articulate. According to Polanyi (1968), tacit knowledge is primarily seen through an individual's actions rather than through specific explanations of what that individual knows. The knowledge-based view argues that because tacit knowledge is difficult to imitate and relatively immobile, it can constitute the basis of sustained competitive advantage (DeCarolis and Deeds, 1999: 953-968; Grant, 1996: 109-122). A stream of research building on the knowledge-based view has shown that strong ties and collaboration are positively related to the transfer of knowledge over organizational boundaries (Bresman et al., 1999: 439-462).

In the relationships between technology-based firms and universities, the universities often possess complementary knowledge that the firms might be able to access through the relationship, including breakthrough innovation, research and development, and input products and services at lower cost. On the other hand, the universities also must rely on the financial support and research input from the firms. These resource-combining relationships can be placed in two groups: 1) access to resources related to production and 2) access to resources related to distribution. These categories are will in line with other divisions of resource-combining relationships, such as division of strategic alliances into upstream and downstream alliances (Deeds and Hill, 1991: 41-55). Technology-based firms could build their competitive advantage not only on the basis of the resources they control themselves, but additionally on the basis of resources available through relationships with universities.

In the case of the university-industry alliance, resource complementarity entails monetary and equipment donations to the university by members of the corporate community to support various research activities. These monetary and equipment contributions can be in the form of endowment trust funds, which are extremely valuable to the university since it has flexibility in its usage, for example, upgrading laboratories, providing fellowships to graduate students, or providing seed money for promising new projects (Reams, 1986). In the past, with less pressure on the firm to obtain a return on investment, industry was freer to contribute large amounts of unrestricted funds and equipment. Lately, as pressures have intensified, industrial firms have opted for more targeted financial contributions, which are tied to specific research projects. Here, there is an expectation for return on investment within a reasonable timeframe (Fortune, 1996: 80F-80J). While clearly the recent trend is more toward targeted financial contributions, both continue to be important measures of effective university-industry relationships. If partner selection is haphazardly done, the partner selected might not possess the complementary resources required by the partners.

Secondly, resource and knowledge have been defined by many scholars. The differences between “complementary” and “supplementary” are as follows. Teece (1986: 285), who was amongst the first authors to introduce the concept of

"complementary assets," refers to assets of a different nature. In line with this traditional view, Hill and Hellriegel (1994: 594) suggest that complementarity occurs “only when the partners bring distinctive competencies that are different and non-overlapping.” From this perspective, “complementing” is opposed to “supplementing.” A similar distinction is made by Das and Teng (2000: 31-61) when they refer to partners' resource alignment, i.e. the pattern whereby allies' resources are matched and integrated in the cooperation: similar resources create a supplementary pattern and dissimilar resources induce a complementary pattern.

Buckley et al. (2008) have stated that supplementary knowledge accession reflects the difference in specialized knowledge between firms. 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 knowledge acquisition 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. Caution should be exercised, however, because supplementary knowledge acquisition can present the risk of diluting the firm’s specialization and losing core competence. The fact that the firms do not possess similar specialized knowledge means that the recipient will find it difficult to assimilate the transferred knowledge due to barriers to knowledge transfer. Thus, supplementary knowledge acquisition is likely to be a slower process and more costly than complementary knowledge acquisition. Constraints on knowledge transfer exist not only in the form of limits to absorptive capacity on the part of the recipient firm, but also in the capacity of the transferor to express the knowledge (Buckley et al., 2008: 1-12). Table 2.11 summarizes the operational definition of partner complementarities (antecedent factors) as follows:

Table 2.12 The Operational Definition of Partner Complementarities

PARTNER COMPLEMENTARITIES	PROPERTY	OPERATIONAL DEFINITION
Strategic Alignment	Motivation Correspondence	The extent to which the partners' perceived motives are in correspondence with one another.
	Goal Correspondence	The extent to which partners have consistency in expectations and assured mutual gains.
Source Attractiveness	Complementary resource and knowledge	The extent to which the acquired resources and knowledge from the focal alliance partners can increase knowledge concentration and deepen the existing field of specialization and current core competences.
	Supplementary resource and knowledge	The extent to which an organization can widen its scope of specialization by acquiring resource and knowledge from the focal partners, thereby broadening its range of specialization.

2.5.2 Mediating Variables of the Effectiveness of Knowledge Transfer: Partner Attributes, Coordination Factors and Relationship Factors

2.5.2.1 Partner Attribute: Staff's Learning Attitudes and Abilities (Learning Intent & Absorptive Capacity)

Levithas et al. (1997: 20-27) have stated that intelligent professionals should scrutinize their firm's preparation for collaboration. They must not only acquire externally generated knowledge, but also facilitate internal assimilation (i.e., by organization members) of that knowledge (Bonthous, 1996: 344-359). Accordingly, intent to learn can begin at the top of the organization's hierarchy (Hamel et al., 1989: 133-139). Executives can create reward mechanisms that provide effective incentives to those with direct alliance involvement to learn. Furthermore, they must communicate to those individuals a partner's strengths and weaknesses so that these individuals will understand how alliance learning will benefit their firm (Hamel et al., 1989: 133-139). Levithas et al. (1997: 20-27) further added that a partner's activities before commencement of the alliance should include the

consideration of collaboration whether it provides a firm with an opportunity to learn (either through the firm's increased knowledge of its own resources or by the understanding of a partner's resources), and motivation for learning by convincing others to acknowledge the value of learning from that particular partner. Levithas et al. (1997: 20-27) has stated that possessing the intent to learn does not guarantee a firm's ability to learn. Rather, firms must develop this ability over time (Lei et al., 1996: 203-225). Developing a culture that rewards critical and innovative thinking can foster such learning abilities. Or as Bonthous (1996: 355) suggests, employee must learn to set learning goals, internalize patterns develop their own conceptual understanding and judgment, synthesize, and think critically and strategically.

Furthermore, managers can increase the firm's ability to learn by developing its absorptive capacity. Cohen and Levinthal (1990: 128) have defined absorptive capacity as "a firm's ability to recognize the value of external knowledge, assimilate it, and apply it to commercial ends." Van den Bosch et al. (1999) suggested it entailed the evaluation, acquisition integration, and commercial utilization of knowledge obtained from sources exogenous to the firm. Absorptive capacity meets Barney's (1991) tests of value, rarity, inimitability, and non-substitutability. As Cohen and Levinthal (1990: 128-152) have argued, absorptive capacity is the product of decisions that are both historical and path dependent in nature. That said, the absorptive capacity of a firm can be augmented through activity (Barringer and Harrison, 2000: 367-403). Absorptive capacity also affects the ability of partnered firms to learn, according to Lane and Lubatkin (1998: 461-477), who noted that the ability of a firm to learn from another firm is jointly determined by the relative characteristics of the two firm's structure and compensation practices, since they formed an integral part of the partners' knowledge processing systems, which played a key role in establishing the extent of their respective absorptive capacity.

In terms of absorptive capacity, it affects the ability of a firm to internalize knowledge obtained from its partner or generated, in cooperation with the partner. Grant (1996: 109-122) has identified three factors that affect knowledge absorption capability: efficiency of integration (the extent to which the specialist knowledge held by individual organizational members is utilized); scope of integration (the breath of specialized knowledge required from firm members); and flexibility of integration

(the degree to which a capability can access additional knowledge and reconfigure existing knowledge). Dyer and Singh (1998: 660-679) have identified the absorptive capacity of knowledge-based enterprises more narrowly. They have noted that effective learning firms are those that have developed the ability to recognize and assimilate valuable knowledge from a particular alliance partner. This ability was seen to be a function of overlapping knowledge bases and interaction routines that maximized the frequency and intensity of contact. While theoretically powerful, the concept of absorptive capacity has seldom been empirically tested. Liebeskind et al. (1996: 428-443), for example, conducted a study of social networks between two biotechnology firms and universities, and demonstrated the importance of a firm's ability to internalize and use the knowledge that it imported. Their assumption was that alliances serve as a boundary-spanning network to identify and secure knowledge assets, and the study concluded that absorptive capacity increased the operating flexibility of the participating organizations. The key idea here is the absorptive capacity of firms, which can be represented by combinative capability. In an alliance context, combinative capability refers to the ability of an exchange pair of knowledge-based enterprises to extend, apply, interpret, and repatriate knowledge, with a view to the generation of new knowledge.

In this study, the author adapted the absorptive capacity construct from Kogut and Zander’s 1992 study. They defined combinative capability as the ability of a firm to synthesize and apply current and acquired knowledge to generate new applications from an extension of their existing knowledge base. This reflects an important tenet of the resource-based view of the firm, which considers competitive advantage to be the outcome of the act of using rather than possessing resources (e.g. Teece, 1998: 285-305) and then extends the concept of combinative capability by partitioning it into three constituent elements, as proposed by Van den Bosch et al. (1999: 551-568) as follows. One element was called systems capabilities, and this comprised the firm's conceptual infrastructure for integrating explicit knowledge. It was asserted that the existence of a well-defined infrastructure aided knowledge absorption, but at the expense of flexibility and scope. The second element was called co-ordination capabilities, and was proposed to enhance knowledge absorption through the structuring of relations between members of a group. Elements of

implementation included training and job rotation, the use of “natural” liaison devices, and active participation in the process of knowledge creation. While not efficient, this element was posited to have a high potential for expanding the scope and potential of knowledge combination activities. The final element was called socialization capabilities. The authors defined this as the ability of the firm to produce a shared ideology that offered firm members an attractive identity and a consistent, shared interpretative view.

2.5.2.2 Partner Attribute: Skills of Alliance Management (Alliance Experience, Alliance Development Capacity and Partner Identification Propensity)

In the perspectives of the skills of alliance management, many alliance researchers have suggested that “effective institutional rules or social controls for facilitating agreements” would improve alliance success (Dyer and Singh, 1998: 673). As Zirger and Maidique (1990: 867-883), relying on leadership theory, point out, favorable top management support can be the impetus for overcoming implicit barriers between functions, providing the requisite organizational resources and sparking a spirit of commitment. Several researchers have suggested a strong relationship between managerial style and business unit performance (Slater, 1989). Moreover, many scholars confirm that managers' abilities impact the performance of knowledge transfer within the organizations (Smith et al., 1984: 756-776; Slater, 1989). Lambe et al. (2002: 212-225) conceptualize alliance competence as an organizational ability for finding, developing, and managing alliances. This conceptualization is consistent with the definition of competence because an alliance competence is an organizational ability that helps a firm deploy inter-firm entities in a way that helps the firm compete in its marketplace. Management competence is comprised of three facets: alliance experience, alliance manager development capability and partner identification propensity.

Alliance Experience with alliances is a resource that can be leveraged across an organization because it contributes to knowledge about how to manage and use alliances (Simonin, 1997: 463-490). Thus, alliance experience facilitates an alliance competence. Day (1995: 660-679) has noted that such experience contributes to the quality of a firm’s “alliance management” by, among other things, improving

their abilities with respect to “selecting and negotiating with potential partners” and “planning the mechanics of the alliance so that roles and responsibilities are clear cut”. Although books and training programs exist, much of the knowledge about finding, developing, and managing alliances is “tacit” (Polanyi, 1968), and firms must learn by doing (Day, 1995: 660-679; Spekman et al., 1999: 747-772 and Anand and Khanna, 2000: 295-315). Indeed, an alliance competence is such a hands-on learning experience that firms should expect some of their initial attempts at alliances to fail and this will comprise part of the learning experience (Spekman et al., 1999: 747-772). Sherwood and Covin (2008: 162-179) have further suggested that a knowledge-seeking firm’s prior experience with the technology to be transferred and with the use of external sourcing arrangements in general, can be expected to impact that firm’s success at acquiring external knowledge from the partner. Regarding technology familiarity, firms with experience in each other’s technology are expected to more readily recognize and understand one another’s knowledge (Lane and Lubatkin, 1998: 461-477). This, too, is consistent with the absorptive capacity concept (Cohen and Levinthal, 1990: 128-152). If a firm has prior experience with its partner’s technology, it will better understand the assumptions that shape the partner’s knowledge pertaining to that technology. Moreover, technology familiarity enables acquirers of technology to understand the extent and significance of what has and has not been codified by the partner. Such an understanding will affect how the knowledge-seeking firm perceives that it must structure its relationship with the current holders of the technology in order to acquire the desired technology. Regarding alliance experience, firms with prior experience in alliances will likely understand the collaborative possibilities as well as how to successfully engage in them and what to avoid (Kale et al., 2000: 217-227). Organizations learn through various processes, including their experiences (Huber, 1991: 88-115). An extensive history of alliance experiences can contribute to the accumulation of relevant knowledge regarding the appropriate management of alliances. With a high overall level of alliance experience, partners will better understand how to create conditions at the interface that allows for legitimate access to their counterpart’s knowledge successes, and failures of the past will be reflected in current alliance-related knowledge of the partner firms. Such broad-based alliance knowledge should improve

the ultimate performance of individual alliance initiatives. Consistent with this point, Zollo et al. (2002: 701-713) have observed that the literature pertaining to the learning curve concept (e.g. Epple et al., 1991: 58-70) and the behavioral theory of organizations (e.g. Nelson and Winter, 1982) "suggests a positive relationship between a firm's general alliance experience and the performance implications of the focal agreement." Finally, alliance management development capability can be explained as firms that have the ability to develop capable alliance managers. According to Day (1995: 660-679) and Spekman et al. (1999:747-772), these managers then enable firms to plan and navigate the mechanics of an alliance so that roles and responsibilities are clearly articulated and agreed upon. In addition, these managers have the ability to review continually the fit of the alliance to the changing environment to make modifications as necessary. As Simonin (1997: 463) has stated, "The lower than average failure rate of joint ventures in the oil industry can be linked to the fact that managers have learned the essentials of collaboration." As a result, the author argues that firms with competent alliance managers will negotiate, structure, and run alliances in ways that allow such firms to: 1) secure attractive alliance partners, 2) minimize the chances of such alliance mismanagement as poor conflict resolution, and 3) work with their partner firms to successfully combine and synthesize their complementary resources over time into idiosyncratic resources that lead to competitive advantage. Partner identification propensity can be explained as firms that have an alliance competence systematically and proactively to scan for and identify potential partners that have the complementary resources needed to "develop a relationship portfolio to complement existing competencies " (Hunt, 1990: 3). Firms that can identify such partners not only enhance their ability to compete but also improve their chances of alliance success (Simonin, 1997: 463-490; Dyer and Singh, 1998: 660-679; Lambe et al., 2000: 141-158; Sivadas and Dwyer, 2000: 31-49). In have suggested that firms that scan for promising partners may also often achieve an alliance "first mover" advantage that allows them to gain access to and preempt competition from scarce resources offered by potential alliance partners. Day (1995: 662) has argued that "a firm that is adapted at identifying, consummating, and managing strategic alliances probably has a first mover advantage in bringing the best candidates into a relationship."

2.5.2.3 Partner Attributes: Structural Characteristics (Formalization, Centralization and Complexity)

Chandler (1962) states that structure concerns the organizational design of lines of authority and communication flows and it is believed to affect the behavior of organization members (Hall, 1977). Three structural variables, formalization, centralization, and complexity, which have been commonly used to analyze the structure of an organization, are considered (Fredrickson, 1986: 280-297). First of all, formalization refers to the degree to which jobs within the organization are standardized. If a job is highly formalized, the job incumbent has a minimum amount of discretion over what is to be done, when it is to be done, and how he or she should do it. Formalization would be measured by determining if the organization has a policies-and-procedures manual, assessing the number and specificity of its regulations, reviewing job descriptions to determine the extent of elaborateness and detail, and looking at other similar official documents of the organization.

Secondly, centralization is defined as the degree to which the formal authority to make discretionary choices is concentrated in an individual, unit, or level, thus permitting employee's minimum input into their work. It can be measured by the degree of control mechanisms. Control is a critical issue for the successful management and performance of international strategic alliances (Geringer and Hebert, 1989: 235-254). However, there is a great deal of uncertainty surrounding the meaning of control. There are few definitions of the concept and there are many inconsistencies in its operational definitions. Geringer and Hebert (1989: 235-254) defined control as the process by which one partner influences, to varying degrees, the behavior and output of the other partner, through the use of power, authority, and a wide range of bureaucratic, cultural, and informal mechanisms. They identified three dimensions of control in international joint ventures: focus, extent, and mechanisms. The focus of control exercised over a joint venture refers to the scope of activities over which a parent seeks to exercise, or not exercise, control (Geringer, 1991: 41-62).The extent of control is the degree to which the parents exercise control. The mechanisms of control refer to the means by which control is exercised. Geringer and Hebert (1989: 235-254) propose that all three dimensions of control (focus of control, extent of control, and mechanism of control) need to be examined together to get a

better understanding of communication distortion, the more difficult is to coordinate the decisions of managerial personnel, and the more difficult it is for top management to oversee the actions of operatives. Robbin (1990) has stated that the organizations can be tall, with many layers of hierarchy, or flat, with few levels. The determining factor is the span of control, which is defined by the number of subordinates that a manager can direct effectively. If this span is wide, managers will have a number of subordinates reporting to them. If it is narrow, managers will have few underlining. Spatial differentiation refers to the degree to which the location of an organization's offices, plants, and personnel are dispersed geographically. Spatial differentiation can be thought of as an extended dimension to horizontal and vertical differentiation. That is, it is possible to separate tasks and power centers geographically. This separation includes dispersion by both number and distance (Robbin, 1990).

2.5.3 Coordinating Factors (Shared Value and Support System)

The second set of mediating factors is classified as coordinating factors because they are derived from the interaction and relations between the alliance partners. Blakenburg et al. (1999: 467-486) stated that the co-ordination of activities between the alliance partners has also been found to lead to interdependence. Two of such factors that have been identified are: shared values (cultural compatibility) and support systems (operational compatibility and flexible university policies).

Coordination refers to the extent to which different "units" function according to the requirements of other units and the overall system. Coordination within the strategic alliance literature has been described as the extent to which two companies are integrated within a relationship (Salmond and Spekman, 1986: 162-166). The notion of recognized interdependence flows directly from the definition of an alliance. Partners cannot act alone and require the cooperation and collaborative efforts of others to achieve the goals and exchange the specialization of works. Without such recognition, partners would engage in opportunistic behavior and would attempt to further their own agenda without consideration of their partners (Spekman et al., 1999: 747-772). In their study, Mohr and Spekman (1994: 135-152) found coordination to be a good predictor of success. Olson and Singsuwan (1997: 60-85)

also supported this argument about the importance of coordination in their studies. In case of the university-industry alliance, participation in the relationship process includes the firm's involvement, interaction and level of decision-making with university personnel and other peer institutions in the university research center. Participation can be through institutional agreements, joint ventures, informal interactions, and technology transfer activities (NSF, 1997). Institutional agreements such as individual investigator contact research, grants to individual professors, and graduate fellowship support are specific ways of formalizing university-industry research endeavors. By far, individual investigator contract research is the most frequently used technique (NSB, 1996). Individual investigator contract research usually involves one university faculty member working with a single firm on a specific research project and is generally for the purpose of addressing an immediate industry problem. However, this type of arrangement can be the impetus for longer-term commitments in the future.

Group arrangements include special purpose affiliate programs and research consortia. These emphasize contact between the member organizations and the university's faculty, staff, and students. Industrial organizations often affiliate with a university in order to gain easy access to the current student body and to its alumni. A third way is through the creation of joint ventures. Informal interactions are more **ad hoc** and often occur as informal, spur of the moment conversations or through the co-authoring of research papers. Participation in the relationship process can extend to more one-on-one interactions through formal consulting arrangements between university personnel and industrial firm members (Santoro and Chakrabarti, 1999: 225-244). In order to enhance cooperation, the alliance partners should possess shared values and support systems, as follows:

2.5.3.1 Cultural Compatibility

Cultural Compatibility refers to a complex construct consisting of many concepts, most notable among them, shared values (Barney, 1986: 231-241) and shared meaning (Deal and Kennedy, 1982). Culture is important since it influences the actions of organizational members by imposing a repertoire of habits and values (Gordon and Ditomaso, 1992: 783-798). According to Peters and Waterman (1982), shared values embody the broad notions of direction that top managers want to infuse

into the organization. As such, organizational culture represents the third “S” in the 8-S framework, i.e., shared values.

Smircich (1983: 339-358) suggests that from a functionalist perspective, organizational culture is an organizational variable; culture is inherent to every organization. Denison and Mishara (1995: 204-223) elaborate this idea further by identifying four cultural traits: involvement, adaptability, consistency, and a sense of mission. Involvement refers to organizational members’ sense of ownership, responsibility, and commitment to the organization’s growth and survival. Burns and Stalker's (1961) notion suggests an organization's shared beliefs about values and goals substituting for fixed and rigid command and control systems. Involvement and adaptability combine to indicate organizational flexibility, openness, and responsiveness, while consistency and a sense of mission combine to indicate shared meaning, direction, and vision.

Culture is the collection of cognitions, expectations, mindsets, norms, and values within an organization (O’ Reilly et al. 1991: 487-516). Culture is a determinant of how organizations make decisions, and it shapes collective behaviors. Findings show that when the partners have compatible cultures, conflicts are overcome relatively easily. Parke (1991: 579-602) has argued that cultural and procedural differences may be 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 in norms and procedures, that is, in the way of doing things. 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. However, organizational culture is a complex construct. An organization's culture provides a social process mechanism which galvanizes its members with values, beliefs, basic assumptions and shared meaning, creating common behaviors, actions, and directed activities (Deal and Kennedy, 1982; Denison, 1990; Schein, 1990) where strong cultures indicate widely held and shared values and beliefs among organizational members (Weick, 1979). The functionalist perspective views culture as an organizational variable; something an organization has (Smircich, 1983: 389-358). This functionalist perspective helps clarify culture's role in driving organizational

initiatives and activities (Smircich, 1983: 339-358), since it insists that organizations are social instruments for task accomplishment with culture providing the overarching collective order (Gregory, 1983: 359-376). Cultural compatibility can be measured by the management team culture through their perception of behavioral and operating norms clustered in four sub-scales: 1) Task support (norms having to do with information sharing, helping other groups, and concern about efficiency); 2) Task innovation (norms for being creative, being rewarded for creativity, and doing new things); 3) Social relationships (norms for socializing with one's work group and mixing friendships with business); 4) Personal freedom (norms for self-expression, exercising discretion, and pleasing oneself).

Corporate culture can be viewed as an organization specific system of widely-shared assumptions and values that give rise to typical behavior patterns (Gordon and Ditomaso, 1992: 783-792). It is also possible that different units within a company may develop subcultures different from the dominant culture (Martin and Siehl, 1983). Each organization has to align between culture and management. To achieve the goal of improving quality and efficiency, one may need to increase autonomy. Autonomy is involved with positive political skills and compassion in service of a vision, articulated as the consequence of entrepreneurial spirit (Block, 1991). This aforementioned study purports to investigate the link between organizational and individual variables in terms of culture and its relations to work values of people in the alliance collaboration. Although these cultural differences can be conflicting at times, if handled correctly, all parties in the alliance can learn from one another and adopt the best practices from different cultures.

2.5.3.2 Support Systems (Operational Compatibility and Flexible University Policies

Geringer (1988) differentiates compatibility (when one partner's skills and resources match those of its ally) from complementarity (when one partner has the skills and resources that the other partner needs but does not have). Additionally, the effect of partner compatibility on creating value through alliances has been also noted (Madhok, 1995: 57-74). Compatibility, or the congruence in organizational capabilities between alliance partners, influences the extent to which partners are able to realize the synergistic potential of an alliance (Madhok and Tallman, 1998: 326-

339). Operational compatibility addresses the extent of congruence in the partners' procedural capabilities. Operational compatibility relates to status similarity on capability and procedural issues in the context of a working relationship. Operational compatibility enables members not to compete too much in the same market. It is crucial that members are able to balance cooperation with competition. The partners should have similar management philosophies. Compatibility of partner competencies is measured by the extent of synergy in the objectives and capabilities of the partners.

In terms of flexible university policies, some researchers have emphasized the importance of the ability to make adjustments in the development of strategic alliances (e.g. Lewis, 1990). Niederkofler (1991: 237-257) has argued that making adjustments to overcome operating misfit and re-establish strategic fit is a key factor in the success of strategic alliances. From the view point of organizational learning, in order to absorb the knowledge from the partners smoothly, existing organizational incompatibilities must be compensated. Otherwise, the inherent procedural, structural, and cultural differences between organizations become insurmountable obstacles to successful cooperation. 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). Unlike arm-length transactions, in which initial commitments govern, alliances require ongoing mutual adjustments. In order to ensure an effective match, forming an alliance should include adjusting both organizations to the new priorities (Lewis, 1990).

Inter-organization theory suggests that conflict is inherent in any relation and is managed but not suppressed through ongoing interaction (Oliver, 1990: 241-265). Indeed, IORs are set up for the purpose of managing the coexistence of conflict and cooperation. Conflicts can arise between university and industry because of differences in the objectives and differences in operational standards (Onida and Malerba, 1988; Bonaccorsi and Piccaluga, 1994: 229-247). Conflicts can be solved through compromise, exercised power, attenuation, and delay. In this study, the author argues that in university-industry relations, both parties hold a strong but heterogeneous basis of power: universities hold strong expert power, while companies

may have a combination of reward and expert power. There is little role for solving conflicts by means of the exercise of power by one party over the other. Therefore, it is expected that effective conflict resolution procedures are based on attenuation, compromise, and delay. However, it must be remembered that in most cases, the industrial side shows certain rigidity in decision and communication channels, and the university side often presents an amorphous structure which generates barriers to a swift and an ambiguous decision process (Geisler and Rubenstein, 1989).

Flexible policies for intellectual property rights, patent rights, patent licenses, intellectual property, patent policies, and licensing agreements are a major facet in the area of university-industry relationships (Reams, 1986). 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 industry over these rights is therefore a contentious topic (Phillips, 1991: 80-93). Many universities like to claim patent rights for any new inventions or technological discoveries developed through the use of university facilities or 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 else where for more accommodating partners (Gerwin et al., 1992: 57-67).

While academics are generally in favor of close collaboration, they live with deep tension that is caused by two powerfully competing realties: the instrumental needs for industry funding and the intrinsic needs to preserve intellectual freedom. However, universities with successful track records in building industrial partnerships are much more obliging to industry's needs. The successful centers do such things as delay the publication of research results, allow the industrial inventors to receive royalties, and offer exclusive licensing rights to the sponsoring industrial firm (Bower, 1993: 114-123). Successful universities are often willing to provide exclusive licensing rights if it is the only feasible way to commercialize a particular invention (Reams, 1986). Thus, a successful university balances the tensions between its primary goal of knowledge dissemination by withholding or delaying the

dissemination of some information in order to provide the industrial firm with patent protection (Mansfield, 1991: 1-12).

2.5.3.3 Relational Capital (Trust, Commitment and Bilateral Information Exchange)

Relational capital manifests itself as the styles of relationship between alliance partners through the effective bilateral information exchange (communication), commitment, as well as trust building. Without trust, there can be little sharing of information, only minimal regard for system requirements and low goal attainment. Relationship capital is the ability of interacting units, both internal and inter-organizational firms, to adjust mutually. Relationship capital is thus a relationship property, in which none of these factors should be considered independently and that investigates the effectiveness of knowledge transfer between alliance partners.

A growing body of relationship marketing literature has concluded similarly. Researchers have questioned the dominant paradigm of the discrete transaction and have posited that inter-firm changes take place in a context of continuity, where relational constructs such as trust, commitment and bilateral information exchange are key factors (Heide and John, 1992: 32-44 and Morgan and Hunt, 1994: 20-38). Consistent with this literature, three-related variables, trust, commitments, and bilateral information exchange, are combined to develop construct, called “relationship factors.” It is believed that relationship factors mediate the relationship between partner complementarity, coordination factors, and knowledge transfer effectiveness.

1) Trust

Trust is defined as the confidence and willingness of the firm to rely on an exchange partner that has ability and motivation to produce positive outcomes for the organization (Moorman et al., 1992:20-38). Trust is conveyed through faith, reliance, belief, or confidence among alliance partners and is viewed as a willingness to forego opportunistic behavior (Nooteboom, 1996: 985-1010). In inter-organizational relationship research, trust is simply one’s belief that one’s alliance partner will act in a consistent manner and do what he/she says and he/she will do. It is this sense of performance in accordance with “intentions and

expectations that hold in check one's fear of self-serving behavior on the part of the other members of the alliance (Nooteboom, 1996: 985-1010). This study examines the idea of trust established by the prior studies of Gabarro (1987) and Whipple and Frankel (2000: 21-28 quoted in Peerawut Chookhiatti, 2005). These scholars have found a high degree of two trust attributes: character-based trust attributes and confidence-based trust attributes, in previous studies of inter-organizational relationships. The reason for viewing trust from two distinct attributes is twofold. First, there is a difference between trusting what a firm says it believes and trusting what a firm actually does. Second, although character-based issues may be the glue binding trading partners together, competent-based trust is critical to successful long-term relationships.

Character-based trust is defined in this study as "the confidence and willingness to rely on exchange partners based on qualitative characteristics of behavior inherent in partners' strategic philosophies and cultures" (Whipple and Frankel, 2000: 21-28). The nine-item measure of trust builds on Mohr and Spekman' s (1994: 135-152) and Morgan and Hunt's (1994: 20-38) work but includes the aspects of partners' capabilities and reliability. The study of Gabarro (1987) and Whipple and Frankel (2000: 21-28) exhibits five sources of character-based trust. First, integrity is referred to as the level of honesty and principles of partner firms. Second, identification of motives is referred to as true strategic intentions of partner firms. Third, consistency of behavior is referred to as the reliability and predictability of the partner firm's actions in different situations. Fourth, openness is referred to as willingness of partner firms to be honest about problems. Last, discreteness is referred to as the willingness of partner firms to maintain confidentiality of strategic plans and key information.

Competence-based trust is defined as the confidence and willingness to rely on exchange partners based on partners specific operating behaviors and day-to-day performance (Whipple and Frankel, 2000: 21-28). Competence-based trust is concerned with behavior of both the partner firms at corporate level and at the key personnel level. The studies of Gabarro (1987) and Whipple and Frankel (2000: 21-28) show that there are four sources of competence-based trust. First, specific competence is referred to as specialized operational

knowledge and skills. Second, interpersonal competence is referred to as an individual's ability to effectively perform his or her responsibilities and work well with others. Third, competent in business sense is referred to as a broad experience base beyond a specific area of expertise. Last, judgment is referred to as "decision-making ability.

2) Commitment

Next, commitment refers to the trading partners' willingness to exert effort (Porter et al., 1974: 603-609). A high commitment level enables both parties to achieve individual and joint goals without raising the specter of opportunistic behavior (Cunningham and Turnbell, 1982: 304-316). Because more committed partners will exert effort and balance short-term problems with long-term goal achievement, higher levels of commitment are expected to be associated with partnership success (Angle and Perry, 1981: 1-14). Commitment suggests a future orientation in which partners attempt to build a relationship that can weather unanticipated problems (Mohr and Spekman, 1994: 135-152).

In this study, commitment was operationalized using Porter et al.'s (1974: 603-609) organizational commitment questionnaire, which measured the extent to which each party identifies with the goals and objectives of the alliance, the extent to which a partner is willing to exert effort on behalf of the alliance, and the extent to which it intends to stay in the relationship. These items have been widely used in studies of organizational behavior (e.g. Mowday et al., 1979: 224-247).

3) Bilateral Information Exchange

Lastly, bilateral information exchange is conceptualized to include the formal and informal sharing of timely, adequate, critical, and proprietary information among alliance partners. The measurement of this construct has been modified from the prior studies of Heide and John, 1988: 24-36. The communication measure is a seventeen-item, five-point Likert type scale that reflects communication quality (timeliness and adequacy of information) and information sharing (willingness to exchange critical proprietary information). Also, participation in planning and goal setting refers to the extent to which partners actively engage in planning and goal setting. It is measured by defined the roles and responsibilities that one partner must engage in competing the alliance task. Each construct is discussed below.

Information quality is perceived as a key aspect of transmitting information and includes such aspects as the accuracy, timeliness, adequacy, and credibility of information exchanged (Daft and Lengel, 1986: 554-571; Huber, 1991: 88-115). 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: 11-27; Anderson and Narus, 1990: 42-58; Mohr and 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 and Spekman, 1994: 135-152; Olson and Singsuwan, 1997: 60-85; Monczka et al., 1998: 533-578) and has been found to be an important predictor of partnership success (Devlin and Bleakley, 1988: 18-25).

Information sharing is presented in every part of, and created by, every activity of an alliance (Yoshino and Rangan, 1995) and refers to the extent to which information is communicated between partners (Bonaccorsi and Piccaluga, 1994: 229-247). Effective information sharing increases information value for people in the organization, is associated with trusting and committed relationships (Anderson et al., 1987: 85-97; Anderson and Narus, 1990: 42-58), and reduces the potential for conflict within collaborative relationships (Salmond and Spekman, 1986: 162-166). 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 (Monczka et al., 1998: 533-578). Information sharing are 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. By making the relationship contractually explicitly, clear and mutual, expectation is stipulated before the alliance begins and clear boundaries of behavior are pre-specified (Parke, 1993: 794-829). In order to ensure an equitable and relatively unambiguous relationship, the “rules of the game” need to be spelled out clearly and explicitly (Shenkar and Zeira, 1992: 55-75). When goals and expectations are clear to the partners, transaction costs are reduced and outcomes are more likely to be favorable (Kogut, 1988: 319-302).

Kathawala and Elmutti (2001: 205-217) suggest that in forming a strategic alliance, clearly define roles and interdependency is crucial. The question must be asked: “How integrated will the alliance be with the parent organizations?” Some alliances are highly integrated with one or more of the parent organizations and share such resources as manufacturing facilities, management staff, and support functions like payroll, purchasing, and research and development. Conversely, others may be autonomous and independent from their parent organizations. Whatever the relationship between the two partners, the merging of separate corporate cultures in which the parent firms may have different, even ultimately conflicting, strategic intents can be difficult and anything but smooth. It is extremely important that alliances be aligned with the company strategy. Top management must articulate a clear link between where it expects the industry’s future profit pools will be, how to capture a larger share of those, and where, if at all, alliances fit in that plan (Ernst and Stern, 1996). A set of common values and shared norms should be clearly communicated in order to enhance the abilities of the parties to work cooperatively.

Sherwood and Covin (2008: 162-179) have stated that the information sharing can be more effective through the partner interface mechanism of technology experts’ communication, reflected in meetings between partners’ technology experts, site visits by these experts to their partner’s facilities, and the use of technology-mediated (e.g. e-mail and telephone) communication between the partners’ technology experts. This partner interface mechanism constitutes a specific communications channel at the partner interface. It is explored because both theory and research suggest that technological information exchange at the individual level can be key to technology transfer success in university-industry alliances (Cockburn and Henderson, 1998: 157-182, Cohen et al., 2002: 1-23). The basic argument is that interaction among the partners’ technology experts forges “connectedness” between the partner organizations, thus strengthening the knowledge interface and facilitating knowledge transfer.

Consistent with the situated learning theory, the creation of inter-organizational teams tasked with overseeing the technology transfer process and the structuring of frequent interactions among the partner organizations’ technology experts are the means by which a social context can be created that is conducive to

technological knowledge acquisition success. Moreover, these two partner interface mechanisms reflect both formal and informal communication channels, the combination of which has been shown to facilitate information flow, which in turn provides enhanced access for the knowledge-seeking firm (Gupta and Govindarajan, 2000: 473-496).

Communication between alliance partners is challenging under the best of circumstances. These challenges may include breakdowns in communication, miscommunication, and variation in the perceived quality of the communication. Regarding this last point, based on their cultural norms and past experiences, alliance partners can have very different perceptions and expectations concerning what constitutes sufficiently clear, timely, or otherwise adequate communications (Das and Teng, 1998: 21-42). The presence of a multiple and complementary communication channel and processes that closely link the alliance partners create an organizational knowledge interface at which information should flow freely between the partners, thereby minimizing the severity of communication problems. Such an interface can enable the alliance partners to “overcome different frames of reference” (Daft and Lengel, 1986: 560), which is particularly important when the knowledge to be transferred is uncodified, highly personal, or rooted in an individual’s actions and involvement within a specific context (Nonaka, 1994: 14-37).

Participation in planning and goal setting refers to the extent to which partners actively engage in planning and goal setting (Mohr and Spekman, 1994: 135-152). When one partner's actions influence the ability of the other to compete, the need for participation becomes necessary to define roles and responsibilities (Anderson et al., 1987: 85-97). Anderson et al. (1987: 85-97) also suggest that decision-making and goal formulation are important aspects of participation that help alliances to succeed. Participation in planning and goal setting has been found to be a key predictor of success in dealer-supplier relationships (Mohr and Spekman, 1994: 135-152; Olson and Singsuwan, 1997: 60-85). 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.

The steps to successful joint planning are summarized in figure 2.8, which reads from the bottom-up.

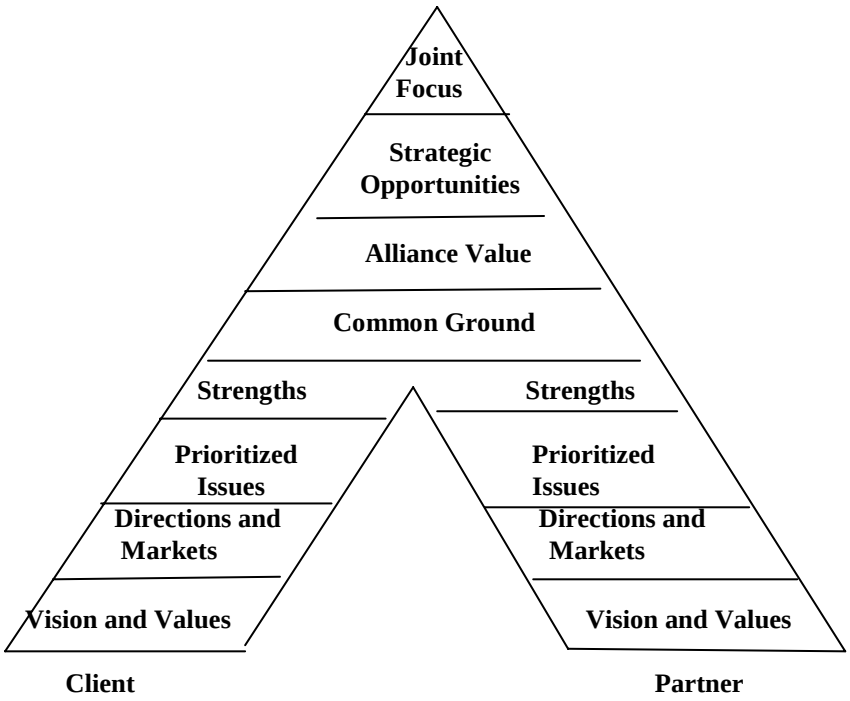


Figure 2.8 The Through Planning Process among Alliance Partners

Source: Alliance and Management International, Ltd., 1999.

The first step is to gain a clear understanding of the vision and values of each company. The next step is to gain agreement on the market conditions in the region of the world that the joint venture will be operating in. The next step is to clearly state the issues, strengths, and concerns of each organization. These initial steps allow the participants to bridge preliminary gaps of understanding at the onset of the process. During these initial fact finding meetings, the partners can learn a great deal about their potential partners.

The next step is to identify areas of common ground. Here is where commonality in the strategic direction among the partners can be identified. Next, the partners need to define the internal and external value of the alliance. They will also need to agree on the strategic opportunities to mutually pursue. The final

step in this planning process is to create a tactical plan to address the strategic targets (Alliance Management International Ltd., 1999). Then, through planning is one of the key ingredients in the successful formation of strategic alliances (Kathawala and Elmutti, 2001: 205-217) and in this study we will now test to see if the same holds true for university-industry alliances. Table 2.13-2.15 summarizes the operational definition of mediating variables (partner attributes, coordinating factors and relationship factors) as follows:

Table 2.13 The Operational Definition of Partner Attributes

PARTNER ATTRIBUTES	PROPERTY	OPERATIONAL DEFINITION
STAFF'S LEARNING ATTITUDES AND ABILITIES 1) LEARNING INTENT		The extent to which the organization's members have an intent not only to acquire externally generated knowledge, but also to facilitate internal assimilation of that knowledge.
2) ABSORPTIVE CAPACITY	System Capability	Absorptive capacity refers to the extent of firm's ability to internalize knowledge obtained from its partner or to generate and integrate explicit knowledge in cooperation with the partner, which stands for efficiency of integration (the extent to which firm can synthesize and apply current and acquired knowledge to generate new applications from an extension of their existing knowledge base; scope of integration (the breath of specialized knowledge required from firm members); and flexibility of integration (the degree to which a capability can access additional knowledge and reconfigure existing knowledge).
	Co-ordination Capability	The extent to which the firm can enhance knowledge absorption through the structuring of relations between members of a group. Elements of implementation include training and job rotation, the use of 'natural' liaison devices, and active participation in the process of knowledge creation.
	Socialization Capability	The extent to which the firm can produce a shared ideology that offers firm members an attractive identity and a consistent, shared interpretative view.

Table 2.13 (Continued)

PARTNER ATTRIBUTES	PROPERTY	OPERATIONAL DEFINITION
SKILLS 3) JOINT MANAGEMENT COMPETENCE	Alliance Experience	The extent of the ability to which management can select and negotiate with potential partners and plan the mechanics of the alliance with clear cut roles and responsibility from their prior experience with technology being transferred from alliance.
	Alliance Management Develop Capability	The extent of the ability to which management can maintain good relations between the two organizations as well as clarify the responsibilities and contribution of the project monitor, facilitate ongoing activities and protect against any potential internal and external threats by solving the conflict in the university-industry partnership
	Partner Identification Propensity	The extent of the ability to which management can identify potential partners that have the complementary resources that are needed to develop a relationship portfolio or 'mix' that complements existing competencies and enables them to occupy positions of competitive advantage.
STRUCTURE 4) STRUCTURAL CHARACTERISTICS	Formalization	Formalization refers to the degree to which jobs within the organization are standardized. If a job is highly formalized, the job incumbent has a minimum amount of discretion over what is to be done, when it is to be done, and how he or she should do it.
	Centralization	The extent of control mechanism to which the formal authority to make discretionary choices is concentrated in an individual, unit, or level, thus permitting employee's minimum input into their work. Three dimensions of control are focus, extent, and mechanisms, which refer to the scope of activities over which a parent seeks to exercise, or not exercise, control; the degree to which the parents exercise control. The mechanisms of control refer to the means by which control is exercised.
	Complexity	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 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 those three factors will increase an organization's complexity.

Table 2.14 The Operational Definition of Coordination Factors

COORDINATION FACTORS	OPERATIONAL DEFINITION
SHARED VALUED 1) CULTURAL COMPATIBILITES	Cultural compatibility refers to the congruence in organizational philosophies and goals which are related to organizational norms and value systems in terms of task support, task innovation, social relationships, and personal freedom.
SUPPORT SYSTEMS 2) OPERATIONAL COMPATIBILITIES	The extent to which each partner has similar competencies and consistent procedural capabilities on a day-to-day working basis and in the context of a working relationship.
3) FLEXIBLE UNIVERSITIES POLICIES	The extent of mutual adjustments and solution of universities to overcome operating misfit and re-establish strategic fit to enhance organizational learning and to absorb the knowledge from the partners smoothly, as well as compensate for the existing organizational incompatibilities through compromise, exercised power, and delay regarding intellectual property and publication of new research and products.

Table 2.15 Summary of Three Properties of Relationship Factors that Impact on the Effectiveness of Knowledge Transfer and the Operational Definition

RELATIONSHIP CAPITAL	PROPERTY	OPERATIONAL DEFINITION
STYLE OF RELATIONSHIP	Character-Based Trust	The extent to which each party has confidence and willingness to rely on his or her alliance partners based on qualitative characteristics inherent in partners' strategic philosophies and cultures.
1.TRUST	Competence-Based Trust	The extent to which each party has confidence and willingness to rely on his or her alliance partners based on partners' specific operating behaviors and day-to-day performance.
	Commitment to Meet Goals and Objectives of the Alliance	The extent of the beliefs and attitudes of the partners with which he or she can create a positive environment that facilitates the overcoming of barriers to meet with the goals and objectives of the alliance.
2 COMMITMENT	Commitment to Make Effort to the Alliance	The extent to which a partner is willing to exert effort on behalf of the alliance.
	Commitment to Stay in the Relationship	The extent to which each partner intends to stay in the relationship.
	Information Quality	The extent to which quality of the information, including such aspects as the accuracy, timeliness, adequacy, and credibility of information exchanged, is shared between partners.
3. BILATERAL INFORMATION EXCHANGE	Information Sharing	The extent to which information, is communicated between partners in terms of clearly defined roles and information exchange through partner interface mechanisms, such as formal collaboration through communication channels, and frequency of communication.
	Participation in Planning and Goal Setting	The extent to which partners actively engage in planning and goal setting in terms of decision-making and goal formulation.

2.5.4 Dependent Variables: the Effectiveness of Knowledge Transfer in University-Industry Relationships

The concept of knowledge transfer effectiveness raises important theoretical questions. Inter-organizational theory posits that IORs are instrumental for the achievement of given organizational goals. More generally, it is normally assumed that performance can be defined with respect to the relationship between goals and ends, either in technical or in economic terms, generated through interaction and new knowledge opportunities. The term "knowledge transfer" has been used in the literature to designate "successful" knowledge transfer wherein the transfer "results in the receiving unit accumulating or assimilating new knowledge" (Bresman et al., 1999: 444). Most studies have conceptualized and measured knowledge transfer as the extent of knowledge transferred (e.g. Bresman et al., 1999: 439-462; Agrawal and Henderson, 2002: 44-60). Some authors have, however, either directly or indirectly suggested that there are different dimensions to the knowledge transfer process. Szulanski (1995: 27-43), for example, identifies three dimensions, namely, timing, budget, and recipient satisfaction, in assessing "stickiness" in knowledge transfer. Similarly Zahra et al. (2000: 925-950) studied technological learning using three dimensions, namely, breadth (amount), depth (understanding), and speed (pace). Still, others have focused on the rate of knowledge transfer (e.g. Zander and Kogut, 1995: 76-92), or on how transferred knowledge has helped the recipient organization (e.g. Lane and Lubatkin, 1998: 461-477). In addition, Reagans and McEvily (2003: 509) have acknowledged that knowledge transfer represents a cost "in terms of time and effort." Hansen et al. (2005: 770-793) used transfer cost as one of the outcomes in their study of knowledge sharing in organizations.

In this study, the author characterizes the measurement of knowledge transfer effectiveness variable as explicit knowledge transfer, tacit knowledge transfer, commercialization, and excellent cooperation. As modified by the study of Santoro and Chakrabarti (1999: 225-244), there are four quantitative approaches (RDCE model) to evaluating the effectiveness of knowledge transfer in the alliance as explicit knowledge transfer represented by research outputs through explicit knowledge transfer , development through tacit knowledge transfer from university and industrial partners, commercialization through technology transfer activities and excellent

cooperation (comprehension, usefulness, goal attainment, speed and economy). Thus, several variables and operationalizations can be identified under each of these dimensions.

The effectiveness of knowledge transfer among partners can be expressed by the mutual benefit between university and industry. Meanwhile, the effort to align university-industry needs is very important. By doing so, the student can match his or her competencies with what the industry expects. This attempt is to align classroom teachings with the trends and current market needs of industry. As shown in figure 8, with clear understanding of the industry needs, the faculty can create industry-driven courses in which expert professors and lecturers at universities will be able to provide professional education and conduct industry-related research.

The central idea of the model is that first, the university will provide the professional education and industry-based research. The industry will benefit from this activity by having customized study programs and a competent prospective workforce. Market demand specification and financial funding are to be provided by the industry. On the other hand, the industry will help to enhance and develop the curriculum by certifying the study program. While firms get support from industry professionals, practitioners could help the students to better understand the current challenges to the industry. Once in a while, lecture classes could also be held on-site with the cooperating industrial partner.

Actually, in return, the industry side could also benefit from this practice. They will have more competent future workforces that will graduate from this customized program. This type of program is tailored based on industry needs. In order to achieve this intention, the university has to ensure that the most up to date technology that is being used in the industry should be accessible to both the students and faculty staff. Through this smart affiliation, the university will gain significant professional practice and monetary resources. The university could provide effective and professional-level services of the professors and researchers (Pimentel et al., 2006).

As a matter of facts, the effectiveness of the knowledge transfer in the university-industry alliance can be achieved through the mutual benefit of both parties. As the main purposes of strategic alliance between universities and industrial

firms in collaborating R & D are to develop innovation through academic outputs for commercial purposes, this study is thereby trying to measure all dimensions concerning the relationship (RDCE model) such as research outputs through explicit knowledge transfer, development from alliance partnership through tacit knowledge transfer, commercialization achievement through technology transfer activities, and excellent cooperation performance.

1) Research Outcomes through Explicit Knowledge

Explicit knowledge is knowledge that is codified and transferable in a formal, systematic language (Polanyi, 1961: 458-470). It is knowledge that can be found in contracts, manuals, databases, licenses, or embedded in products. Tacit knowledge is that knowledge made up of knowledge that has a personal quality, making it difficult to formalize and communicate. On the other hand, tacit knowledge is embodied in individuals, such as employees with expertise and know-how resulting from years of on-the-job experience, as well as in organizations, such as that with an established brand name, shared routines, and company culture (Khamseh and Jolly, 2008: 37-50). Bonaccorsi and Piccaluga, (1994: 229-247) have stated that explicit and tacit knowledge transfer capitalizes on university-industry relationship activities in order to integrate university-based research to propel applied initiatives for the development and commercialization of new technologies. Tangible outcomes are an especially important measure of successful university-industry relationships, particularly since they can be used to determine the firm's return on investment. Previous studies in this area suggest that explicit knowledge transfer consequences can be measured through patents, licenses, publications, and the joint use of either university or industrial firm facilities and equipment (e.g. Evans et al., 1993: 622-651).

Tangible outcomes are an especially important measure of successful university-industry relationships, particularly since they can be used to determine the firm's return on investment. Previous studies in this area suggest that explicit knowledge transfer consequences can be measured through patents, licenses, publications and the joint use of either university or industrial firm facilities and equipment (e.g. Evans et al., 1993: 622-651). .A three-item scale for measuring the

subjective approaches and a four-item scale for measuring the outcomes of explicit knowledge transfer are implemented

2) Development through Tacit Knowledge Transfer

Tacit knowledge transfer from the university can be represented by personal quality, making it difficult to formalize and communicate. On the other hand, tacit knowledge is embodied in individuals, such as employees with expertise and know-how resulting from years of on-the-job experience, as well as in organizations, such as that with an established brand name, shared routines, and company culture (Khamseh and Jolly, 2008: 37-50). 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 immerse themselves in the industry's situation 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 professionalism development can be considered as tacit knowledge transfer through which both industrial partners and universities mutually exchange their expertise and needs.

3) Commercialization

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 products from the projects in terms of time spent, number of involved personnel, degree of joint investment and decision-

making. These purposes can be achieved through technology transfer and cooperation among the partners.

4) Efficient Coordination

Additionally, efficiency in terms of comprehension, usefulness, goal attainment, speed, and economy can be also good indicators of the knowledge transfer effectiveness in the university-industry context. According to the conceptualization of 'usefulness' by Choo (1998), and the work of Lane and Lubatkin (1998: 461-477), 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 into place that ensures that the knowledge is diffused from individual level to the group level before it finally settles within the organizational memory, as in alliance context where knowledge remains mostly in the heads of individuals are seen as agents of the learning process. Following Zander and Kogut (1995: 79) and Zahra and George (2002: 187), 'speed of knowledge transfer' signifies "how rapidly (the recipient) acquires new insights and skills." Finally, based on the work of Szulanski (1995: 27-43) and Hansen et al. (2005: 770-793), 'economy of knowledge transfer' relates to the costs and resources associated with knowledge transfer.

The reasons why it is important to consider the holistic dimensions of knowledge transfer altogether are as follows: First, a single dimension provides an incomplete picture of knowledge transfer. The knowledge transfer in the context of university-industry alliance 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.

The effectiveness of knowledge transfer among partners can be expressed by the mutual benefit between university and industry. The central idea of the model is that first, the university will provide professional education and industry-based research. The industry will benefit from this activity by having customized study programs and a competent prospective workforce. Market demand specification

and financial funding are to be provided by the industry. On the other hand, the industry will help to enhance and develop the curriculum by certifying the study program. Firms supported by industry professionals and practitioners could help the students to better understand the current challenges to the industry. Once in a while, lecture classes could also be held on-site with the cooperating industrial partner.

Actually, in return, the industry side could also benefit from this practice. They will have a more competent future workforce that will be graduated from this customized program. This type of program is tailored-based on industry needs. In order to achieve this intention, the university has to ensure that the most up-to-date technology that is being used in the industry is accessible to both students and faculty. Through this “smart” affiliation, the university will gain significant professional practice and monetary resources. The university could provide effective and professional-level services of the professors and researchers (Pimentel et al., 2006: 21-24). Table 2.16 provides a summary of four properties of knowledge transfer effectiveness and its operational definition.

Based on the proposed model, as illustrated in figure 2.7, an explanation of relationships among variables, as specified in the review of literature, is also briefly illustrated in figure 2.9, located on the following page. The research hypotheses and structural equations are derived respectively.

Table 2.16 Summary of Four Properties of Knowledge Transfer Effectiveness

KNOWLEDGE TRANSFER EFFECTIVENESS	PROPERTY	OPERATIONAL DEFINITION
The Effectiveness of Knowledge Transfer (RDCE Model)	**Research Outputs through Explicit Knowledge Transfer**	The extent to which each alliance partner generates, absorbs and applies knowledge and transfers the relevant explicit knowledge within the organizational boundaries through tangible consequences that can be measured through patents, licenses, publications, and cooperative research, etc.
	Development through Tacit Knowledge Transfer	The extent to which each alliance partner generates, absorbs and applies the tacit knowledge and transfers the relevant technical know-how within the organization's boundaries through non-patented or non-licensed product and process, technologies, such as co-operative education programs, and from the hiring recent graduates and through curriculum co-development, and professionalism co-development.
	Commercialization through Technology Transfer Activities	The extent to which industrial firms and universities collaborate, participate, and are involved in the process of decision-making, developing, and commercializing products or processes from the projects.
	Efficient Coordination	The extent to which alliance partners can achieve excellent performance in collaborating in terms of mutual comprehension, usefulness of the alliance project, goal attainment, speed and economy.

2.6 Research Hypotheses

2.6.1 The Relationship between Partner Complementarities (Strategic Alignment, Source attractiveness) and the Effectiveness of Knowledge Transfer

Partner complementarities have been focused on as the most salient for alliance performance (Beamish, 1984 and Geringer, 1991: 41-62). Geringer (1991: 41-62) suggests that poor selection of alliance partners is among the most important reasons for alliance failures. The specific partner chosen can influence the overall mix of available skills and resources, the operating policies and procedures, and the short- and long-term viability of an alliance. Emden et al. (2005: 211-229) further state that to sustain the alliance partnership, the potential for creating synergistic value through co-development alliances hinges on three aspects; 1) selecting a partner that is strategically aligned; 2) selecting a partner that is relationally aligned; and 3) selecting a partner that create resources and competences (resources & knowledge complementarity). 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 valuable contribution to bring to an alliance performance (Geringer, 1991: 41-62).

2.6.1.1 Strategic Alignment and the Effectiveness of Knowledge Transfer

First of all, the goals of an organization and the manner in which it seeks to achieve can lead to a consequence of alliance participation (Saint-Onge, 1996: 10-14). Strategic alignment refers to the motivations and goals which are congruent among alliance partners to pursue the 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 or 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.

1) Motivation Correspondence refers to the extent to which the partners' perceived motives that are in correspondence with one another (Smith and Barclay, 1997: 3-21). Correspondence of motivations signals whether partners have mutually beneficial intentions and determines the likelihood that the partners will engage in opportunistic behaviors.

2) Goal Correspondence refers to the extent to which the prospective partners have non-competing goals. A key finding is that high goal correspondence enhances the consistency of expectations and assured mutual gains. Goal correspondence does not necessarily mean that partners have exactly the same goals as long as they are not conflicting and can be achieved through a common benefit.

Thus, if partner's goals and motivation are not complementary and aligned, knowledge development may be difficult. In such cases, managers may have to devote more resources to reduce the strains inherent in the alliance, and less time developing valuable knowledge from the alliance. Thus, the greater strategic intent is aligned between the partners, the more effective knowledge transfer will be enhanced. The following hypotheses are hereby proposed.

2.6.1.2 Source Attractiveness (Complementary and Supplementary Resource and Knowledge) and the Effectiveness of Knowledge Transfer

The organizations that possess attractive resources and knowledge will be more appealing to recipients than those that do not possess such resources. DeCarolis and Deeds (1999: 953-968) indicate that stocks of resources and knowledge have a positive impact on firm performance. If a firm possesses knowledge and resources that have the potential of creating competitive advantage, the firm is more likely to be better linked to other firms located in that environment. However, there are two types of resources gained in the alliance partnership. Two explanations of the word "complementary" and "supplementary" resources and knowledge are added by scholars. Hill and Hellriegel (1994: 594-609) suggest that complementarity occurs "only when the partners bring distinctive competencies that

are different and non-overlapping." Thus, being complementary provides an opportunity to build 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.

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 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 resource and knowledge complementarity. In other words, when partners bring in unique and valuable strengths and resources, both 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. When there is more complementarity between resources and knowledge pooled by partners, knowledge transfer is more effective through university-industry alliances. Thus, the proposed hypotheses are as follows.

H_1: Partner complementarities between university-industry alliance partners will be positively associated with the perceived level of the effectiveness of knowledge transfer.

2.6.2 The Relationship between Antecedent and Mediating Factors

2.6.2.1 The Relationship between Partner Complementarities (Strategic Alignment and Source Attractiveness) and Partner Attributes

The notion of close relationships between individual members of a partnership has been explored by a number of researchers (Yoshino and Rangan, 1995). Within the strategic alliance literature partnership, attributes of the partners have been considered as the determinants of the complementary and supplementary resource for one another (Sherwood and Covin, 2008: 162-179). Based on the literature review, it is suggested that there are three individual partner characteristics that matter most in terms of the ability to develop and sustain valuable resources in knowledge exchange: staff's learning attitudes and abilities, skills, and structural characteristics.

1) Partner Complementarities and Staff's Learning Attitudes and Abilities. 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, if 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 organization.

Cohen and Levinthal (1990: 128-152) introduced the concept of absorptive capacity to label the ability of the firm 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: 464), who noted "…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, the absorptive capacity can be considered as the complementary and supplementary resources and knowledge from the partner. The existence of a differential in the respective absorption capacities of the allies induces different learning rhythms (Kumar and Nti, 1998: 356-367). These variations explain, to a great extent, the interactions between partners in the alliance. Thus, the greater absorptive capacity in learning of the partner is positively related to the perceived level of partner complementarity, which leads to more effective knowledge transfer.

2) Partner Complementarities and the Skills of Joint Alliance Management

A 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 (Bloedon and Stokes, 1991: 8-10). The role of boundary personnel and gatekeepers is crucial in facilitating the internal dissemination of knowledge gained in the collaboration (Aldrich and Auster, 1986). 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 complementarity, which contribute to the knowledge transfer success.

Lambe et al. (2000: 141-158) also have posited that an alliance competence can be considered as complementary resources because such a competence is a resource that exist prior to the alliance and that helps firms to identify and secure partner firms that have complementary resources on four grounds. First, organizational experience with alliances contributes to a firm's knowledge and skills of how successfully to form and implement alliances (Simonin, 1997: 463-490; Spekman et al., 1999: 747-772). Firms that have such experience will improve their

ability to select, negotiate, and structure alliances so that they can secure alliance partners that have complementary resources (Day, 1995: 660-679; Spekman et al., 1999: 747-772). Second, because an alliance competence implies that a firm produces capable alliance managers, it facilitates the ability of such firms to select and secure alliance partners that have complementary resources because alliance mangers are often involved in the initial negotiation and structuring of alliances (Spekman et al., 1999). Third, an alliance competence should have a positive effect on complementary and supplementary resources because it enhances that ability of firms with such a competence to identify a potential alliance partners with complementary resources and aligned strategic intent (Simonin, 1997: 463-490; Dyer and Singh, 1998: 660-679; Spekman et al., 1999: 747-772 and Sivadas and Dwyer, 2000: 31-49). Fourth, the partner identification propensity facet of alliance competence implies a "proactiveness," which provides firms with an information advantage that helps them gain access to complementary resources in situations where there is a scarcity of potential alliance partners who offer complementary and supplementary resources (Sarkar et al., 2001: 358-373).

3) Partner Complementarities and Structural Characteristics

The differences between structures will be characterized according to specialization, hierarchy, the formal coordinating mechanisms and interaction patterns varying upon the degree of complexity, formalization, and the centralization (Robbin, 1990). Formalization refers to the degree to which jobs within the organization are standardized (Robbin, 1990). Centralization refers to the degree to which decision-making is concentrated at a single point in the organization (Robbin, 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 hierarchy. Spatial differentiation encompasses the degree to which the location of an organization's facilities and personnel is dispersed geographically. An increase in any one of those three factors will increase an organization's complexity.

From the above discussion, it can be seen that the facilitating structure that enhances alliance coordination and information flow is likely to be less formalized, less centralized, and simple. Thus, any organization which 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.

H_2: Partner complementarities will be positively associated with partner attributes in terms staff's learning abilities, skills of joint alliance management and structural characteristics.

2.6.2.2 The Relationship between Partner Complementarities and Coordination Factors (Shared Values and Support Systems)

Evan's (1986: 26-49) hypothesis suggests that in a dyadic relationship, the degree of similarity is positively associated with favorable relationship outcomes. Shared values serve as a basis for social relationships, which lie at the heart of the social interaction processes. Booth (1995) has stated that most companies prefer to form partnerships with those whose management philosophies, strategies, and ideas are most similar to their own. Indeed, differences in corporate partners' personalities, like differences in spousal personalities, can often lead to tragic results. The role a partner plays in the alliance is critical for the alliance to work.

Brockhoff et al. (1991: 219-229) have pointed out that certain organizational processes are important for successful interfaces. The tight linkage between organic cultures and organizational actions contribute to operational compatibility between partners and this practice is therefore important for building university-industry relationships since industry/university relationships involve inter-organizational interfaces for the successful transfer of information and knowledge between organizations. A cultural mismatch between the two organizations, i.e. the universities and firm, may pose a severe constraint in this exchange. Since universities and industrial firms can differ culturally (Reams, 1986), a match between organic cultures is necessary, especially adaptation and flexibility in the transfer of information and knowledge in order to dissolve the conflict and mutual adjustment. Moreover, shared visions in terms of a firm's sense of mission along with consistency of action are essential processes for facilitating the coordination mechanisms. Therefore, to a certain extent, blending organizational cultures offers an attractive alternative to join in the alliance (O'Reilly III and 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 and 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 and Prusak, 1998). Harrigan (1988: 83-103) suggests that symmetrical partnerships tend to foster a cooperative culture and that alliances without cooperative cultures tend to fail.

Additionally, support system such as operational compatibility helps facilitating a sense of unity and congeniality in the relationship. This would be especially pertinent in international alliances where cultural differences are likely to exist. It can enhance the collaboration between alliance partners in arriving at mutual adjustment. Organizational patterns must change in order to accommodate the blending of each member's talents. At the same time, members must dissolve the conflict, 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 and Singh, 1998: 660-679). 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 who do have complementary resources and knowledge, similar management philosophies, strategic alignment, and operational compatibility, or have an alliance agreement that adequately addresses the differences, and provides for their mutual adjustment and conflict resolution (Ernst and Stern, 1996). As a matter of facts, most of those who possess these advantages are likely to have shared values and support systems for an alliance collaboration that contributes to the effectiveness of knowledge transfer.

H_3: Partner complementarities will be positively associated with coordinating factors in terms of cultural and operational compatibility as well as flexible university policies.

2.6.2.3 Relationship between and Partner Complementarities and Relationship Capital (Trust, Commitment and Bilateral Information Exchange)

Besides the direct impact of partner complementarity factors (strategic alignment and source attractiveness) on the effectiveness of knowledge transfer in alliance partnership, there is evidence that partner complementarity indirectly affects performance through certain mediating behavioral variables. Researchers have argued and found empirical support for 1) the effect of relationship-capital variables on alliance outcomes (e.g. Bradach and Eccles, 1989: 99-118; Aulakh et al., 1996: 1005-1032) and 2) links between partner characteristics and relationship capital (Morgan and Hunt, 1994: 20-38). The socio-psychological aspects embodied in relationship capital are important since they act as coordinating mechanisms and determine the quality of the relationship in the collaboration. In fact, it has been suggested that inter-firm cooperation can lead to competitive advantage only when firms transcend transaction-based exchange and develop long-term relationships (Dyer and Singh, 1998: 660-679). Three key aspects of relationship capital, namely trust, mutual commitment, and bilateral information exchange, can be highlighted as factors that differentiate relationship-based practices from arm's length exchange (Heide and John, 1988: 24-36; Morgan and Hunt, 1994: 20-38).

Trust is defined as the willingness of a party to be vulnerable to the actions of another party based upon the expectation that the other will perform a particular action important to the trust or, irrespective of the ability to monitor or to control that other party (Mayer et al., 1995: 709-734). It is a multi-dimensional construct, involving both cognition, individual beliefs about peer reliability, competence, honesty, and reputation and affect, grounded in reciprocated interpersonal care and concern (McAllister, 1995: 24-59).

Thus, trust is an important ingredient in successful inter-organizational relationships, especially so when transferring knowledge (Yli-Renko et al., 2001: 587-613). Trust between organizations refers to the extent to which members within an organization hold beliefs about a partner's goodwill toward them and the existence of relational bonds between them (Dyer and Singh, 1998: 660-679). When a firm believes that an exchange partner is genuinely interested in its welfare, the firm will

have greater confidence that the exchange partner (e.g. a university in this case) will put forth its best efforts in working with them (Das and Teng, 1998: 21-42).There are several reasons to support this view. First, the firm's perception of their partner's relational bonds with and goodwill toward the university partner leads to cooperation rather than skepticism. Consequently, the firm devotes more of its energies to task-related initiatives rather than worrying about their partner's possible opportunism (Das and Teng, 1998: 491-512). Second, with relational trust a sense of obligation and intimacy gives rise to psychological contacts, shared beliefs, and greater identification between the parties (Das and Teng, 1998: 491-512). In other words, with trust the firm has confident expectations about entering into a vulnerable situation because shared values between the parties motivate the university to fulfill obligations and act in a beneficial fashion towards the industrial firm. Such confidence lessens a firm's fears about knowledge misappropriation, thereby making them more willing to work closely with their university partner in order to transfer knowledge. Additionally, when there is high trust, the firm is more likely to believe that the knowledge is accurate, important, and relevant (McEvily et al., 2003: 91-103). This allows the firm to economize on sorting through the knowledge for relevance or verifying the accuracy of the shared knowledge (McEvily et al., 2003: 91-103). Thus, the firm can focus on utilizing and building upon the knowledge and sharing this new knowledge with their university partner.

In addition, reciprocal commitment is also another critical element of relationship capital (Madhok, 1995: 57-74). These continuity expectations influence partners to make relationship-specific investments that, on the one hand, demonstrate their reliability and commitment to their exchange partner, and on the other, enhance the competitiveness of the alliance (Anderson et al., 1987: 85-97). Consistent with the literature, it is believed that it is not the act of commitment alone but also rather the structure of commitment that fashions relationship quality (Anderson and Narus, 1990: 42-58), thus contributing to effective knowledge transfer among the alliance partners.

In terms of bilateral information exchange, this 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 and

Narus, 1990: 42-58). Communication enables goal adjustment, task coordination, and inter-firm learning. Open communications in an alliance context implies a greater depth and intensity of information exchange and the ability of key information to cross-permeable organizational boundaries in numerous places. In addition, information flows tend to follow the informal set of ties that emerge during the evolution of the alliance and are not limited to the formal hierarchy and reporting system that exist within each of the partner firms (Spekman et al., 1999: 747-772). Mohr and Spekman (1994: 135-152) find that successful partnerships exhibited better communication quality and information sharing. From the above-mentioned perspectives, relationship factors are likely to be fostered when partners perceive a high level of complementarity. Thus, in relationships here partners need each other's resources and where reciprocal needs exist, partners are less likely to resort to opportunism. Resource interdependence is likely to result in reciprocity and thus reduce incentives for opportunistic behavior, as both partners perceive value in their relationship (Morgan and Hunt, 1994: 20-38 and Stump and Heide, 1996: 431-441). Resource interdependent partners are more likely to be motivated to create relationship capital by engaging in trustworthy acts that increase their vulnerability to each other, signaling their expectations of continuity and solidarity to the relationship by committing relationship-specific resources and maintaining open and participative lines of communication. From the above discussion, the following hypotheses regarding to structural characteristics are hereby proposed.

H_4: Partner complementarities will be positively associated with relationship factors in terms of trust, commitment and bilateral information exchange.

2.6.3 The Mutual Relationship between Mediating Variables (between Coordinating Factors, and Partner Attributes, Coordinating Factors and Relationship Factors, and between Partner Attributes and Relationship Factors)

Researchers have argued and have found empirical support for the mutual relation between mediating variables, especially the effect of coordinating factors on partner attributes and relationship factors (e.g. Bradach and Eccles, 1989: 97-118;

Morgan and Hunt, 1994: 20-38; Aulakh et al., 1996: 1005-1032 and Stump and Heide, 1996: 431-441). Three key aspects of partner attributes are the staff's learning abilities and attitudes (absorptive capacity, learning intent), and the skills of joint alliance management and structural characteristics. It has been proposed that these factors are positively related to coordinating factors (cultural and operational compatibility and flexible university), as well as relationship factors (trust, commitment, and bilateral information exchange) as follows:

2.6.3.1 Coordinating Factors and Partner Attributes

1) Coordination Factors and Absorptive Capacity/Learning Intent of the Alliance Partners

Absorptive capacity and learning intent are key elements of the knowledge management process. They are function of education level and the permeability of the people in place, the technological level of development and, already existing knowledge bases, as well as the resources available to the firm (capital, infrastructures, equipment, etc.). Differential absorption capacities induce different learning rates (Kumar and Nti, 1998: 356-367). In order to capture knowledge from an alliance, firms need to capture knowledge from an alliance, and firms need absorptive capacity and learning intent (Parise and Henderson, 2001: 908-924), which in turn will lead to a better alliance selection (George et al., 2000: 577-609). Zahra and George (2002:190) have stated that technological sourcing with alliances helps the firms' experience in dealing with external technology stakeholders, and it has been suggested that firms will be used to accepting and assimilating new knowledge from the partners that are well coordinated.

2) Coordination Factors and Joint Management Competence

Coordinating factors should positively affect joint management alliance competence because they help firms to manage an alliance in a way that allows them to successfully combine and synthesize their skills and knowledge resources over time in order to overcome coordination barriers through mutual adjustment, operational compatibility and conflict resolution (Hunt, 1990: 1-15). In terms of resource-advantage theory, an alliance competence is an organizational ability that facilitates the combining "of tangible and intangible basic or complementary resources" possessed by the alliance partners to create idiosyncratic

resources that may be used to "efficiently/effectively produce valued market offerings" (Hunt, 1990: 5). Also, Day (1995: 670) has suggested that alliance competence contributes to a firm's ability to create idiosyncratic resources that cannot be matched by competition because of "causal ambiguity." This ambiguity, which contributes to the inimitability of the idiosyncratic resources, is maintained because "the essential skills and knowledge are embedded so deeply into the people, the tacit knowledge about alliances, the culture and the supporting processes that they cannot be directly observed."

3) Coordination Factors and Structural Characteristics

Since universities and industrial firms can differ culturally (Reams, 1986), a match between corporate cultures is necessary, especially adaptation and flexibility of the transfer of information and knowledge in order to dissolve conflict and mutual adjustment. Moreover, a shared vision in terms of a firm's sense of mission, along with consistency of action, is an essential process for coordination mechanisms.

Additionally, some researchers have emphasized the importance of the ability to make adjustments in the development of strategic alliances (e.g. Lewis, 1990). Niederkofler (1991: 237-257) has argued that making adjustments to overcome operating misfit and to re-establish strategic fit is a key factor in the success of strategic alliances. From the viewpoint of organizational learning, in order to absorb knowledge from partners smoothly, existing organizational incompatibilities must be compensated for; otherwise, the inherent procedural, structural, and cultural differences between organizations become insurmountable obstacles to successful cooperation. 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 modify the structural arrangement and alter the rigidity in the structural characteristics to be more flexible to fit well with the alliance partnership.

H_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 extent of partner attributes in terms of absorptive capacity and learning intent of the partners, the skill of joint alliance management, and structural characteristics.

2.6.3.2 Coordination Factors and Relationship Factors

1) Coordinating Factors and Trust

Within the strategic alliance literature, transaction cost theory suggests that the presence of trust is a critical factor in the relational governance of the partnership because of problems of incompatible co-ordination and mutual dependency and conflict (Anderson et al., 1987: 85-97 and Morgan and Hunt, 1994: 20-38). When the partners do have a similar operational philosophy and compatible corporate cultures, mutual adjustment among them can be enhanced. Additionally, a cooperative working relationship between the alliance partner firms contributes to trustworthiness. The more efficient the alliance is in transforming an input of cooperation into collaborative output, the higher the trust will be (Buckley and Casson, 1988: 31-53) and in this way the effectiveness of the alliance is enhanced. On the other hand, a foundation of trust, in turn, although time consuming and expensive to create, can contribute to the sustained continuation of cooperative relationships (Madhok, 1995: 57-74).

2) Coordination Factors and Commitment

Furthermore, as Thompson (1967) argues, mutuality of commitment in situations of reciprocal interdependence reduces uncertainty for the parties. It provides a basis for joint decision making and, trust, and bridles opportunistic tendencies (Sarkar et al., 2001: 358-373). Risk sharing is also a primary bonding tool in a partnership. This is known as effective commitment and will be the focus of commitment in this study. Gulati et al. (1994: 61-69) argue that bilateral commitment of resources moves alliances from win-lose situations to win-win situations, thus suggesting that reciprocal commitment is likely to enhance partners' perceptions of how successful the relationship has been. Reciprocal commitment of inputs leads to stable long-term relationships through aligning incentive structures and enhancing confidence in each other (Williamson, 1975). By reducing the threat of

opportunistic behavior and increasing the cost of dissolution, commitments by both parties act as powerful signals of coordinating quality.

Hermen (2001) has also stated that in the alliance partnership, coordination and commitment are essential for a sustainable and successful alliance. Coordination ensures the smooth working relationship needed to meet the objectives of the alliance. However, opportunism and competition can be described as one alliance partner pursuing its own interest at the expense of others. Coordination is the pursuit of mutual interests and common benefits in the alliance. A lack of understanding of partners' operations, culture, strategic intent and ideology can lead to resistance and conflict and the commitment of the alliance partners. The following assumption is proposed to be tested:

3) Coordination Factors Bilateral Information Exchange

It has been noted that healthy inter-firm collaborations are characterized by open communication, accessibility, availability, information flows, and a sense of participation and involvement in the relationship (Mohr and Nevin, 1990: 36-57; Mohr et al., 1996: 314-328). These attributes create transparency in the relationship and facilitate mutual adjustment in order to solve conflicts that occur, among the partners. Furthermore, communication facilitates the realization of mutual benefits by allowing exchange of necessary information and by reducing misunderstandings and uncertainty in compatible operations (Dwyer et al., 1987: 11-27 and Mohr and Nevin, 1990: 36-57). In the alliance partnership, if the partners are well coordinated based on the same operational procedures and corporate culture, mutual disclosure among them seems to increase. This transparency helps to ensure a norm of information exchange (Heide and John, 1988: 24-36) and helps volitional compliance between partners. This practice highlights shared interests and common goals (Mohr et al., 1996: 314-328) and thus positively affects collaboration performance in terms of knowledge transfer effectiveness (Badaracco, 1991: 10-16). Information asymmetry and participatory imbalance create an environment prone to opportunism and power imbalances, whereas shared power and participative decision-making are characteristics of successful alliances (Bucklin and Sengupta, 1993: 32-46). In other words, participative and frequent exchange of information and maintaining open-door policies, with each other results from a willingness of the

partners to create transparency that creates a congruent working atmosphere and enhance coordinating mechanisms in the relationship.

Accordingly, these arguments offer considerable support for the following hypotheses:

H_6: The greater the extent to which alliance partner 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.

2.6.3.3 Partner Attributes and Relationship Factors

1) Absorptive Capacity and Relationship Factors

According to Mowery et al. (1996: 77-91), absorptive capacity results from a prolonged process of investment and knowledge accumulation within the firm, and its development is path-dependent. Therefore, the persistent development within the firm of the ability to absorb knowledge is a necessary condition 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 relevant technical skills facilitates inward technology transfer (Agmon and Von Glinow, 1991). Gambardella (1992: 391-407) has argued that higher levels of absorptive capacity would improve a firm's ability to exploit sources of technical knowledge outside its boundaries. Also, absorptive capacity and learning intent can create trust which reflects the belief that a partner's word or promise is reliable and that a partner will fulfill his or her obligations in the relationship. Consistent with this literature, mutual trust in a partnership is conceptualized in terms of the degree of confidence shared by the partners regarding each other's integrity (Aulakh et al., 1996: 1005-1032).

2) Skills of Joint Alliance Management and Relationship Factors

At the heart of alliances' successes, managers and top management teams play a critical role. They have the ability to inspire, influence, change, and conduct the thinking, attitudes, and behavior of people (Likert, 1951; Bass and Stogdill, 1989). As leaders, these individuals persuade others to accomplish

objectives shared by the leader and group (Gardner, 1990) and are determinant of the organization's performance (Finkelstein and Hambrick, 1990: 369-406).

In successful university-industry, alliance managers know the importance of skillful boundary management (Evans et al., 1993: 622-651). They are also technologically knowledgeable and spontaneous in responding to unpredictable conditions. They have a strong sense of drive, and are politically astute (Chakrabarti, 1974: 58-62). Successful management is also persistent, persuasive and innovative (Howell and Higgins, 1990: 317-341). In each organization, culture is an all encompassing term but has been defined to include the shared beliefs, values, and practices of a group of people, and these may vary among cultural communities (Taylor and Osland, 2003). The literature on culture views this heterogeneity as problematic in alliance relationships (Child and Faulkner, 1998). 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 and Osland, 2003) and this may affect their mental models of what should count as knowledge. Knowledge itself has been broadly defined to include a mix of framed experiences, values, contextual information, and expert insights. Thus, differences in beliefs, values and practices between alliance partners could create barriers to knowledge transfer unless they are identified and harmonized (Davenport and Prusak, 1998). Harrigan (1988: 83-103) suggests that symmetrical partnerships tend to foster a cooperative culture and that alliances without cooperative cultures tend to fail. Thus, a firm with an alliance competence will have difficulty working with an alliance partner that cannot manage inter-firm cultural differences, has trouble coordinating activities with another firm, does not share control, does not easily share information, and fails (Sivadas and Dwyer, 2000: 31-49).

As a matter of fact, management serves to influence others in its respective organizations, intensifies existing university-industry technology relationships by being gate keepers that continually seek external information that may affect the relationships, and maintains good relations between the two organizations as well as monitors and facilitates ongoing activities. Management also functions as a guard that protects against any potential internal and external threats to

the university-industry partnership (Ancona and Caldwell, 1990: 25-29). Spekman et al. (1999: 747-772) has stated that as a key promoter and influencer, management competence is therefore crucial for effective university-industry relationships and for building successful university-industry alliances in terms of the effectiveness of knowledge transfer.

3) Structural Characteristics and Relationship Factors

Brockhoff et al. (1991: 219-229) have pointed out that certain organizational processes are important for successful interfaces. The design of a firm will contribute to its performance in a knowledge-sharing context. Teece (1998: 285-305) suggests that successful firms that were dependent on the exchange and management of knowledge reflected several characteristics that unsuccessful firms did not. The tight linkage between corporate culture and organizational actions contributes to trust and commitment between partners and this practice is therefore important for building university-industry relationships since these relationships involve inter-organizational interfaces for the successful transfer of information and knowledge between organizations. Inconsistent working structures between the two organizations, i.e. the universities and firms, may pose a severe constraint in this exchange of knowledge and information.

O'Reilly III and Chatman (1996: 492-499) have stated that organizational structure has an effect on the success of an alliance. It provides a sense of control, for it unifies in which organizational members process information and react to the environment, which facilitates the achievement of a higher level of behavioral predictability (Trice and Beyer, 1993). Because people are guided by their shared values and norms, they voluntarily behave in a manner that is desired by other organizational members as well. Compared to hierarchical organizations, in strategic alliances the managing of organizational culture presents both a daunting challenge and a potential opportunity (Sarkar et al., 1995: 20-29).

A similar form of acculturation stress is likely to occur in strategic alliances. This issue may become especially serious for alliances in which one partner plays a dominant role. Whereas in a merger/acquisition it is acceptable for one organizational culture to prevail, in alliances this is rarely so, for partners in alliances are still independent firms so that both are concerned about losing their own

organizational identity in the strategic alliance. Thus, the challenge is to synchronize the operational alliance activities, while largely preserving the separate corporate cultures. Furthermore, there are certain organizational cultures that are inherently discordant, such as the rigid or formalized form of large organizations and the flexible or simple styles of small firms. Despite these difficulties, managing culture is critical, particularly owing to a lack of alternative effective control mechanisms in alliances. Although goal setting and structural specifications are useful, the degree of goal incongruence and task complexity may well require a higher level of control and centralization in alliances.

Therefore, to a certain extent, blending structural characteristics between partners becomes a critical element to joining in the alliance (O'Reilly III and Chatman, 1996: 429-490). Following this line of reasoning, the following hypothesis is proposed:

H_7: The greater the level of partner attributes in terms of absorptive capacity and learning intent of the partners, the skill of the joint alliance management, and structural characteristics, the greater the extent of relationship quality in terms of trust, commitment, and bilateral information exchange.

2.6.4 The Relationship between Mediating Variables (Partner Attributes) and the Effectiveness of Knowledge Transfer

2.6.4.1 Staff' s Learning Attitudes and Abilities and the Effectiveness of Knowledge Transfer

1) Learning Intent and the Effectiveness of Knowledge Transfer

According to Mowery et al. (1996: 77-91), learning intent refers to the motivation or intention that a potential recipient has to learn. The knowledge transfer literature indicates that learning intent represents a major factor in enhancing or jeopardizing desired knowledge transfers. For example, it has been argued that while learning motivation positively influences the amount of transferred knowledge (Gupta and Govindarajan, 2000: 473-496), lack of motivation in accepting knowledge 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: 409).

Nordtvedt et al. (2008) have argued the motivation of the recipient related to international knowledge transfer is positively associated with the speed of the knowledge transfer across borders. As Bierly and Chakrabarti (1996: 125) put it, "in general, firms want to maximize learning speed so that they can utilize first-in advantages," wherein they found that competition encourages firms to speed up the process of internal transfer of capabilities. In fact, an important decision facing managers in firms seeking to receive knowledge involves determining how important the knowledge is from their viewpoint and how rapidly they need to acquire and assimilate such knowledge. If a recipient firm is highly motivated to acquire knowledge, its openness to receive such knowledge allows for more effective transfer.

2) Absorptive Capacity and the Effectiveness of Knowledge Transfer

While learning intent can be defined as the motivation and intention to learn, absorptive capacity refers to the ability to assimilate and replicate new knowledge gained from external sources (Cohen and Levinthal, 1990: 128-152). The key idea here is absorptive capacity of firms which can be represented by combinative capability. In an alliance context, combinative capability refers to the ability of an exchange pair of knowledge-based enterprises to extend, apply, interpret, and repatriate knowledge through the process of synthesizing and applying current and acquired knowledge to generate new applications from an extension of their existing knowledge base (Teece, 1998: 285-305). As proposed by Van den Bosch et al. (1999: 551-568), there are three constituent elements of absorptive capacity, as follows:

One element is called systems capabilities, and is comprised of the firm's conceptual infrastructure for integrating explicit knowledge. It was asserted by Teece (1998: 285-305) that the existence of a well-defined infrastructure aided knowledge absorption, but at the expense of flexibility and scope. The second

element is called co-ordination capabilities, and was proposed to enhance knowledge absorption through the structuring of relations between members of a group. Elements of implementation included training and job rotation, the use of “natural” liaison devices, and active participation in the process of knowledge creation. While not efficient, this element was posited to have a high potential for expanding the scope and potential of knowledge combination activities. The final element is called socialization capabilities. The authors defined this as the ability of the firm to produce a shared ideology that offered firm members an attractive identity and a consistent, shared interpretative view.

Gambardella (1992: 391-407) has argued that higher levels of absorptive capacity would improve a firm’s ability to exploit sources of technical knowledge outside its boundaries. Firms with a high level of absorptive capacity are likely to have a better understanding of the new knowledge and to harness new knowledge from other firms to help their innovative activities (Tsai, 2001: 996-1004). Without such capacity, firms are hardly able to learn or transfer knowledge from outside. In the other words, firms can assimilate new knowledge more effectively if they possess a high level of absorptive capacity.

2.6.4.2 The Skills of Alliance Management

Lambe et al. (2002: 141-158) conceptualize alliance competence as an organizational ability for finding, developing, and managing alliances. This conceptualization is consistent with the definition of competence because an alliance competence is an organizational ability that helps a firm deploy inter-firm entities in a way that helps the firm compete in its marketplace. Management competence is comprised of three facets: alliance experience, alliance manager development capability and partner identification propensity.

Alliance Experience is related to a knowledge-seeking firm’s prior experience with the technology to be transferred and with the use of external sourcing arrangements, as suggested by Sherwood and Covin (2008). In general, it can be expected to impact that the firm’s success at acquiring external knowledge from the partner. Regarding technology familiarity, firms with experience in each other’s technology are expected to more readily recognize and understand one another’s knowledge (Lane and Lubatkin, 1998: 461-477). This, too, is consistent with the

absorptive capacity concept (Cohen and Levinthal, 1990: 128-152). If a firm has prior experience with its partner's technology, it will better understand the assumptions that shape the partner's knowledge pertaining to that technology.

Alliance Management Development Capabilities refer to the ability to develop capable alliance managers, as proposed by Day (1995) and Spekman et al. (1999). These managers then enable firms to plan and navigate the mechanics of an alliance so that roles and responsibilities are clearly articulated and agreed upon. In addition, these managers have the ability to review continually the fit of the alliance to the changing environment to make modifications as necessary. As a result, the author argues that firms with competent alliance managers will negotiate, structure, and run alliances in ways that allow such firms to 1) secure attractive alliance partners, 2) minimize the chances of such alliance mismanagement as poor conflict resolution, and 3) work with their partner firms to successfully combine and synthesize their complementary resources over time into idiosyncratic resources that lead to competitive advantage.

In terms of joint management competence in the organization, the literature on management of innovation emphasizes the importance of top management competence to innovative projects, in fact of project uncertainty and organizational conflict. From the point of view of firms, if only low level researchers are involved in the collaboration, the lack of more relevant 'sponsors' may negatively influence the inter-organizational relations (IORs); from the point of view of universities, major initiatives such as university companies and innovation centers cannot occur without top-management competence (Rothwell, 1991: 22-27). For example, the competent management who proactively scan for, and identify, promising alliance partners gain access to scarce complementary resources because they often have better and earlier information than competition about potential alliance partners. The information advantage generated by his/her competence and skills may translate into a kind of first-mover resource advantage for the firms because it gains access to the best resources and/or preempts competition form the only complementary resources (Day, 1995: 297-300; Varadarajan and Cunningham, 1995: 282-296; Dyer and Singh, 1998; 660-679). Such a first mover resource advantage makes it difficult for competition to imitate the competitive advantage

potential of the distinct partner resources pooled in the alliance and, thus, contributes to the degree to which such resources are complementary (or, again, the degree to which the resources pooled in the alliance enhance the ability of the firms to achieve their business goals).

Partner Identification Propensity is related to the ability to systematically and proactively scan for and identify potential partners that have the complementary resources that are needed to "develop a relationship portfolio or 'mix' that complements existing competencies and enables them to occupy positions of competitive advantage" (Hunt, 1990: 1-15). A firm that can identify such partners not only enhances its ability to compete but also improve its chances of alliance success (Dyer and Singh, 1998: 660-679).

For these reasons, Devlin and Bleakley (1988: 18-25) have posited that the management of the interface function is critical. It has been emphasized that project managers can act as gate-keepers in both firms and academic laboratories, which to be have considered key elements of 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 its competence can be positively related to the effectiveness of knowledge transfer.

2.6.4.3 Structural Characteristics and the Effectiveness of Knowledge Transfer

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. Teece (1998: 285-305) held that successful firms that were dependent on the exchange and management of knowledge reflected several characteristics that unsuccessful firms did not. Successful firms had an entrepreneurial orientation, with a strong bias toward action, and they exhibited dynamic capabilities, especially in the areas of flexibility and responsiveness to market opportunities (Teece, 1998: 285-305). These firms had flexible boundaries and preferred to organize through outsource arrangements and alliances. Decision-making was non-bureaucratic and aligned as much as possible to delivering opportunistic responses to temporary opportunities, while their shallow hierarchies enabled rapid

decision making and internal knowledge sharing. Finally, they were distinguished by organic cultures that rewarded innovation and entrepreneurship. The preferred structural characteristics of alliance partnership can be briefly described as follows (Robbin, 1990).

According to Robbin (1990), coordination between operating units mainly relies on formalization. The standardization of work processes helps the employee to have low discretion over what is to be done, when it is to be done, and how it should be done. High formalization will also help fine tune the members to the unique culture of the particular organization. For the most part, unskilled jobs are highly differentiated both horizontally and vertically. Formalization will help promote coordination among the lower-level employees with common understanding and a standardized set of repetitive activities and procedures. Therefore, the organization's productivity in terms of goods and service quality can achieve consistency, uniformity, and standardization. Regarding high formalization, low discretion, and explicit rules ensure that every task is performed in a consistent manner, thus resulting in a standardized output. The standardization of work processes, in which working procedures are clearly specified, helps to ensure coordinated effort among partners.

Bidault and Cummings, (1994: 33-45) also stated that the use of explicit rules in the relationship has been identified, as an impediment to the spontaneity and flexibility needed for internal innovation It has been claimed that between firms, formalization tends to enhance effectiveness and cooperation because the benefits that accrue from regulating employee's behavior. Standardizing behavior reduces variability, promote coordination by generating common understanding and standardized set of repetitive activities and procedures. The greater the formalization, the less discretion required from a job incumbent (Robbin, 1990).

In terms of centralization, as stated by Robbin (1990), in professional bureaucracies, a hierarchy of authority may exist but it is often bypassed or ignored in the interests of finding persons with the expertise needed to solve a particular problem. Decision-making authority is decentralized. Professionals possess skills that the organization needs. Therefore, they have autonomy to apply expertise through decentralized decision making. Low centralization allows professionals to have autonomy, which is necessary to accomplish specialized tasks so that the jobs are

effectively performed. Autonomy allows the professionals to perfect their skills. They repeat the same complex programs time after time and try to reduce the uncertainty until they get them just about perfect (Mintzberg, 1987: 66-75). Its flexible structure encourages rapid response and the ability to arrange and rearrange resources to meet changing needs that best serve to the innovation. This structure encourages self –directed teams and the professional expertise of employees. The most significant advantage is that it delivers dramatic improvements with speed and efficiency. Rapid response time and quicker decisions becomes then an advantage for the firm in the marketplace.

Also, centralization focusing on the concentration of decision-making authority typically impairs effectiveness, because it increases perceptions of bureaucratic structuring, which decreases the favor of participants' attitudes toward the project and results in increased opportunism. Moenaert et al. (1994: 360-377) argue that although centralization adds a comprehensive perspective to decisions and can provide significant efficiencies, it creates a non-participatory environment that reduces communication among participants, commitment, and involvement with projects and is associated negatively with innovation success.

On the other hand, complexity in organization structure which is represented by dispersed location and tall structures provide closer supervision and tighter "boss-oriented" controls, coordination and communication. The management becomes complicated because the increased number of layers through which directives must go. Flat structures have a shorter and simpler communication chain, less opportunity for supervision since each manager has more people reporting to him or her and reduced promotion opportunities as a result of fewer levels of management. It has been claimed that the larger the organization, the less effective the flat organizations. Increased size brings with it complexity and more demands on every manager's time. Tall structure, with their narrow spans, reduces the manager's day-to-day supervisory responsibilities and give more time for involvement with the manager's own boss. From the perspectives of complexity, an organization in which a simple organizational structure or high horizontal differentiation is achieved, the organizations can respond rapidly to changing conditions at the point at which the

change or innovation is taking place. Decentralization facilitates speedy action because it avoids the need to process the information through the vertical hierarchy.

From the above discussion, although evidence from the organization theory literature suggests a relationship between formalization, centralization, and complexity and the effectiveness of knowledge transfer, there are very few studies that link these organizational issues with the phenomena in the university-industry alliance context. This research will, therefore, go some way towards filling this gap. It is assumed that the knowledge transfer in R&D alliances is more effective when the structural characteristics in the alliance partnership are likely to: 1) be less formalized in their activities and relationships; 2) be less centralized in their approach to managing activities and relationships; and 3) have simpler levels of organizational arrangements. Following this line of reasoning, the following hypotheses are proposed:

H_8: Partner attributes consisting of staff's learning attitudes and abilities (learning intent, absorptive capacity), skills in joint alliance management (joint management competence,) and structural characteristics (formalization, centralization and complexity) are positively related to knowledge transfer effectiveness.

2.6.5 The Relationship between Mediating Variables (Coordination Factors) and the Effectiveness of Knowledge Transfer

The second set of mediating factors is classified as coordinating factors because they are derived from the interaction and relations between the alliance partners. Blakenburg et al. (1999: 467-486) have stated that the co-ordination of activities between alliance partners has also been found to lead to interdependence. Two of such factors that have been identified are shared values and support systems. Coordination refers to the extent to which different "units" function according to the requirements of other units and the overall system. Coordination within the strategic alliance literature has been described as the extent to which two companies are integrated within a relationship (Salmond and Spekman, 1986: 162-166).

2.6.5.1 Shared Values (Cultural Compatibility) and the Effectiveness of Knowledge Transfer

Culture is the collection of cognitions, expectations, mindsets, norms, and values within an organization (O' Reilly III et al., 1991: 487-516). Culture is a determinant of how organizations make decisions, and it shapes collective behaviors. Findings show that when the partners have compatible cultures, conflicts are overcome relatively easily. In order to have effective communication and exchange of knowledge, there has to be at least a minimum congruence in norms and procedures; that is, in the way of doing things. 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.

However, an organizational culture is a complex construct providing a social process mechanism, which galvanizes its members with values, beliefs, basic assumptions, and shared meaning (Deal and Kennedy, 1982; Denison, 1990; Schein, 1990). The functionalist perspective views culture as a catalyst in driving organizational initiatives and activities (Smircich, 1983: 339-358). Cultural compatibility can be measured by management team culture through their perception of behavioral and operating norms clustered in four sub-scales: 1) task support (norms having to do with information sharing, helping other groups, and concern about efficiency); 2) task innovation (norms for being creative, being rewarded for creativity, and doing new things); 3) social relationships (norms for socializing with one's work group and mixing friendships with business); and 4) personal freedom (norms for self-expression, exercising discretion, and pleasing oneself).

In terms of shared values or cultural compatibility, international strategic alliances are characterized by the presence of at least two cultures that interact and build interdependency (Cartwright and Cooper, 1993: 57-70). The synthesis of deep components of the original culture attitudes, values, and mores includes sharing meanings and actions between communicators and values communality over differences (Shuter, 1983: 429-436), therefore becoming more inclusive than the original cultures (Kumar et al., 1993: 1633-1651). Depending on the distinction mentioned in the literature, a knowledge transfer process may refer to the transfer of tacit knowledge, to the transfer of explicit knowledge or to both. Since

individualism and collectivism influence the way people think, interpret, and make use of knowledge, it seems reasonable to suppose that the moderating effect of the cultural dimensions on the type of knowledge may be transferred in a cross-border strategic alliance (Canestrino, 2004). According to the research conducted by Bhagat et al. (2002: 204-221), organizations located in individualistic cultures are better able to transfer and absorb explicit knowledge than the tacit knowledge. In contrast, organizations located in collectivist cultures are better able to transfer and absorb knowledge that is more tacit. The transfer of tacit knowledge is typical of those collectivist cultures, like the Japanese, where people usually learn from each other, according to a sort of “collectively tuning" (Canestrino, 2004). O’Reilly III and Chatman (1996: 492-499) have further stated that organizational culture has an effect on the success of the alliance. It provides a sense of control, for it unifies the way organizational members’ process information and react to the environment, which facilitates the achievement of a higher level of behavioral predictability (Trice and Beyer, 1993). Because people are guided by their shared values and norms, they voluntarily behave in a manner that is desired by other organizational members as well.

2.6.5.2 Support Systems and the Effectiveness of Knowledge Transfer

1) Operational Compatibility and the Effectiveness of Knowledge Transfer

Geringer (1988) differentiates compatibility (when one partner's skills and resources match those of its ally) from complementarity (when one partner has the skills and resources that the other partner needs but does not have). Additionally, the effect of partner compatibility on creating value through alliances has been also noted (Madhok, 1995: 57-74). Compatibility, or the congruence in organizational capabilities between alliance partners, influences the extent to which partners are able to realize the synergistic potential of an alliance (Madhok and Tallman, 1998: 326-339). Operational compatibility relates to status similarity on capability and procedural issues in the context of a working relationship. It is crucial that members be able to balance cooperation with competition. The partners should have similar management philosophies. Compatibility of partner competencies was measured by the extent of synergy in the objectives and capabilities of the partners. In

terms of operational compatibility, similarity of management philosophies, for example, can also enhance the collaboration between alliance partners in arriving at a single agreement. Organization patterns must change to accommodate the blending of each member's talents. At the same time, members must 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 and Singh, 1998: 660- 679).

On the other hand, incompatibility among partners may lead to a counterproductive working relationship. Social incompatibility may lead to an inability on the part of the partners to develop a harmonious relationship and thus negatively influence collaborative effectiveness (Sarkar et al., 1997: 255-285). Therefore, there appears to be theoretical and empirical support behind the idea that organizational compatibility in various domains has a positive effect on knowledge transfer performance. In order to ensure the best chance of knowledge transfer effectiveness, companies should either seek partners that do have compatible operations that adequately address the differences, or provide for their conflict resolution (Ernst and Stern, 1996).

2) Flexible University Policies and the Effectiveness of Knowledge Transfer

Conflicts can be solved through compromise, exercised power, attenuation, and delay. In this study, the author argues that in university-industry relations both parties hold strong but heterogeneous bases of power: universities hold strong expert power, while companies may have a combination of reward and expert power. There is little role for solving conflicts by means of the exercise of power by one party over the other. Therefore, it is expected that effective conflict resolution procedures are based on attenuation, compromise, and delay. However, it must be remembered that in most cases, the industrial side shows a certain rigidity in the decision and communication channels, and the university side often presents an amorphous structure which generates barriers to a swift and ambiguous decision process (Geisler and Rubenstein, 1989: 43-62). Thus, flexible policies for intellectual property rights, patent rights, patent licenses, intellectual property, patent policies, and licensing agreements are a major facet in the area of university-industry relationships

(Reams, 1986). 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 industry over these rights is therefore a contentious topic (Phillips, 1991: 80-93). Many universities like to claim patent rights for any new inventions or technological discoveries developed through the use of university facilities or 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 else where for more accommodating partners (Gerwin et al., 1992: 57-67).

As a matter of facts, while academics are generally in favor of close collaboration, they live with deep tension that is caused by two powerfully competing realities: the instrumental need for industry funding and the intrinsic need to preserve intellectual freedom. However, universities with successful track records in building industrial partnerships are much more obliging to industry's needs. The successful centers do such things as delay the publication of research results, allow the industrial inventors to receive royalties, and offer exclusive licensing rights to the sponsoring industrial firms (Bower, 1993: 114-123). Successful universities are often willing to provide exclusive licensing rights if it is the only feasible way to commercialize a particular invention (Reams, 1986). Thus, a successful university balances the tensions between its primary goal of knowledge dissemination by withholding or delaying the dissemination of some information in order to provide the industrial firm with patent protection (Mansfield, 1991: 1-21).

To sum up, effective university-industry relationships leading to knowledge transfer performance require that the university be able to mutually adjust to the needs of the industrial partners and it must be flexible. To demonstrate their flexibility and encourage industrial partnerships, universities must provide industries with meaningful incentives related to the development and commercialization of new technologies. The more the university and their industrial partners can mutually adjust to the needs of each other, the greater the effectiveness of knowledge transfer will be. Flexible policies for industrial partners are illustrated with a delay in publishing academic outputs and with the highest priority in registering patents and licenses for

commercial purposes (Bower, 1993: 114-123). Thus, the following hypotheses are hereby proposed.

H_9: The greater the degree of coordination factors consisting of cultural and operating compatibility as well as flexible university policies, the greater the perceived level of the effectiveness of knowledge transfer.

2.6.6 The Relationship between Mediating Variables (Relationship Capital) and the Effectiveness of Knowledge Transfer

2.6.6.1 Trust and the Effectiveness of Knowledge Transfer

When the industrial firm perceives the university as being trustworthy, the firm is more willing to share its knowledge and technology requirements with it. This in turn enables the university to work with more specific knowledge and technology guidelines. This is a critical first step, since a firm that is more trusting is more likely to build continuous, ongoing interaction that can facilitate even more effective knowledge transfer in the future. Subsequently, when members from both organizations interact more often, the added exposure to new knowledge reduces uncertainty, allowing for greater absorption and assimilation. 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 others' opportunistic behavior (Jarillo, 1988: 31-44). Without trust, the 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).

2.6.6.2 Commitment and the Effectiveness of Knowledge Transfer

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: 224-247; Anderson and Narus, 1990: 42-58 and Kumar et al., 1995: 348-356). 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 the commitment to all goals and objectives of the alliance (Morgan and Hunt, 1994: 20-38). Commitment to a

relationship has been viewed in terms of the economic costs of maintaining the partnership as well as the emotional ties to the relationship (Anderson et al., 1987: 85-97 and Morgan and Hunt, 1994: 20-38).

Cooper and Kleinschmidt (1995: 374-391) also identify both top management commitment and support as critical to alliance success. Kuczmarski (1988: 1633-1651) argues that top management commitment can create a positive environment that facilitates the overcoming of barriers to the collaboration success among alliance partners. This positive climate fosters greater dedication for the project. Top management can create such a climate by clarifying the responsibilities and contribution of the parties involved in the alliance, because this is at the heart of the exchange process. Dyer and Singh (1998: 660-679) further confirmed that the commitment of the senior management of all companies involved in a strategic alliance is a key factor in the alliance's ultimate success. Indeed, for alliances to be truly "strategic" they must have a significant impact on the companies' overall strategic plans; and must therefore be formulated, implemented, managed, and monitored with the full commitment of senior management. Without senior management's commitment, alliances will not receive the resources they need. (Lorange and Roos, 1991: 10-17)

Thus, if senior management is not committed to alliances, adequate managerial resources, in addition to capital, production, marketing and labor resources may not be assigned in order for alliances to accomplish their objectives in solving the conflict, and incompatible operation as well as adjusting mutually. Senior management's commitment to alliances is important not only to ensure the alliances receive the necessary resources, but also to facilitate in coordination with the partners in the compatible ways by convincing others throughout the organization of the importance of the alliance.

2.6.6.3 Bilateral Information Exchange and the Effectiveness of Knowledge

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, this 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 and Narus, 1990: 42-58). 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). Communication enables goal adjustment, task coordination, and inter-firm learning. Open communications in an alliance context imply a greater depth and intensity of information exchange and the ability of key information to cross-permeable organizational boundaries in numerous places. In addition, information flows tend to follow the informal set of ties that emerge during the evolution of the alliance and are not limited to the formal hierarchy or reporting system that exists within each of the partner firms (Spekman et al., 1999: 747-772). Mohr and Spekman (1994: 135-152) find that successful partnerships exhibited better communication quality and information sharing.

Additionally, communication between alliance partners is challenging under the best of circumstances. These challenges may include breakdowns in communication, miscommunication, and variation in the perceived quality of the communication. Regarding this last point, based on their cultural norms and past experiences, alliance partners can have very different perceptions and expectations concerning what constitutes sufficiently clear, timely, or otherwise adequate communications (Das and Teng, 1998: 21-42). The presence of multiple and complementary communication channels and processes that closely link the alliance partners create an organizational knowledge interface through which information should flow freely between the partners, thereby minimizing the severity of communication problems. Such an interface can enable the alliance partners to "overcome different frames of reference" (Daft and Lengel, 1986: 554-571), which is particularly important when the knowledge to be transferred is uncodified, highly personal, or rooted in an individual's actions and involvement within a specific context (Nonaka, 1994: 14-37). Each construct is discussed below.

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 and 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: 11-27; Anderson and Narus, 1990: 62-74 and Mohr and 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 and Spekman, 1994: 135-152 and Olson and Singsuwan, 1997: 60-85) and has been found to be an important predictor of partnership success (Devlin and 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 and 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 (Monczka et al., 1998: 533-578). Information sharing consists 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. By making the relationship contractually explicitly, clear and mutual, expectation is stipulated before the alliance begins and clear boundaries of behavior are pre-specified (Parke, 1993: 794-829). In order to assure an equitable and relatively unambiguous relationship, the "rules of the game" need to be spelled out clearly and explicitly. (Shenkar and Zeira, 1992: 55-75) When goals and expectations are clear to the partners, transaction costs are reduced and outcomes are more likely to be favorable (Kogut, 1988: 319-332).

Sherwood and Covin (2008) have stated that the information sharing can be more effective through the partner interface mechanism of technology experts' communication reflected in meetings between partners' technology experts, site visits by these experts to their partner's facilities, and the use of technology-mediated (e.g. E-mail and telephone) communication between the partners' technology experts. This partner interface mechanism constitutes a specific communications channel at the partner interface. It is explored because both theory and research suggest that technological information exchange at the individual level can be the key to

technology transfer success in university-industry alliances (Cockburn and Henderson, 1998: 157-182). The basic argument is that interaction among the partners' technology experts forge "connectedness" between the partner organizations, thus strengthening the knowledge interface and facilitating knowledge transfer. Consistent with learning theory, the creation of inter-organizational teams tasked with overseeing the technology transfer process and the structuring of frequent interactions among the partner organizations' technology experts are a means by which a social context can be created that is conducive to technological knowledge acquisition success. Moreover, these two partner interface mechanisms reflect both formal and informal communication channels, the combination of which has been shown to facilitate information flow, which in turn provides enhanced access for the knowledge-seeking firm (Gupta and Govindarajan, 2000: 473-496).

Participation in planning and goal setting refers to the extent to which partners actively engage in planning and goal setting (Mohr and 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. Participation in planning and goal setting has been found to be a key predictor of success in dealer-supplier relationships (Mohr and Spekman, 1994: 135-152; Olson and Singsuwan, 1997: 60-85 and Monczka et al., 1998: 533-578). 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.

The intensity and frequency of communication between individuals in the partner organizations are defined on a continuum of situations (Gibson and Smilor, 1991: 287-312). The hypothesis here is that the intensity/frequency of communication is positively related to the perceived positive outcome of the relation. A feedback effect is also expected: in fact, performance will increase if the intensity and frequency of communication grows, but also, the partners will be willing to communicate more after some preliminary goals have been successfully achieved. The feed-back effect will strengthen if several research collaborations are

successively established between the same research teams. With respect to effective university-industry relationships, the transfer of information initiated by either the university or the industrial firm to its partner is important. Effective communication must include ongoing dialogue and feedback regarding the relationship's activities and results. Thus, from the argument above, the following three propositions relating to communications will be tested in this study.

H_{10}: Relationship capital, consisting of trust, commitment, and bilateral information exchange among the university-industry alliance partners, will be positively associated with the perceived level of the effectiveness of knowledge transfer.

From the above discussion, the hypotheses of the study can be summarized in table 2.17 together the final model of the study as shown in figure 2.9.

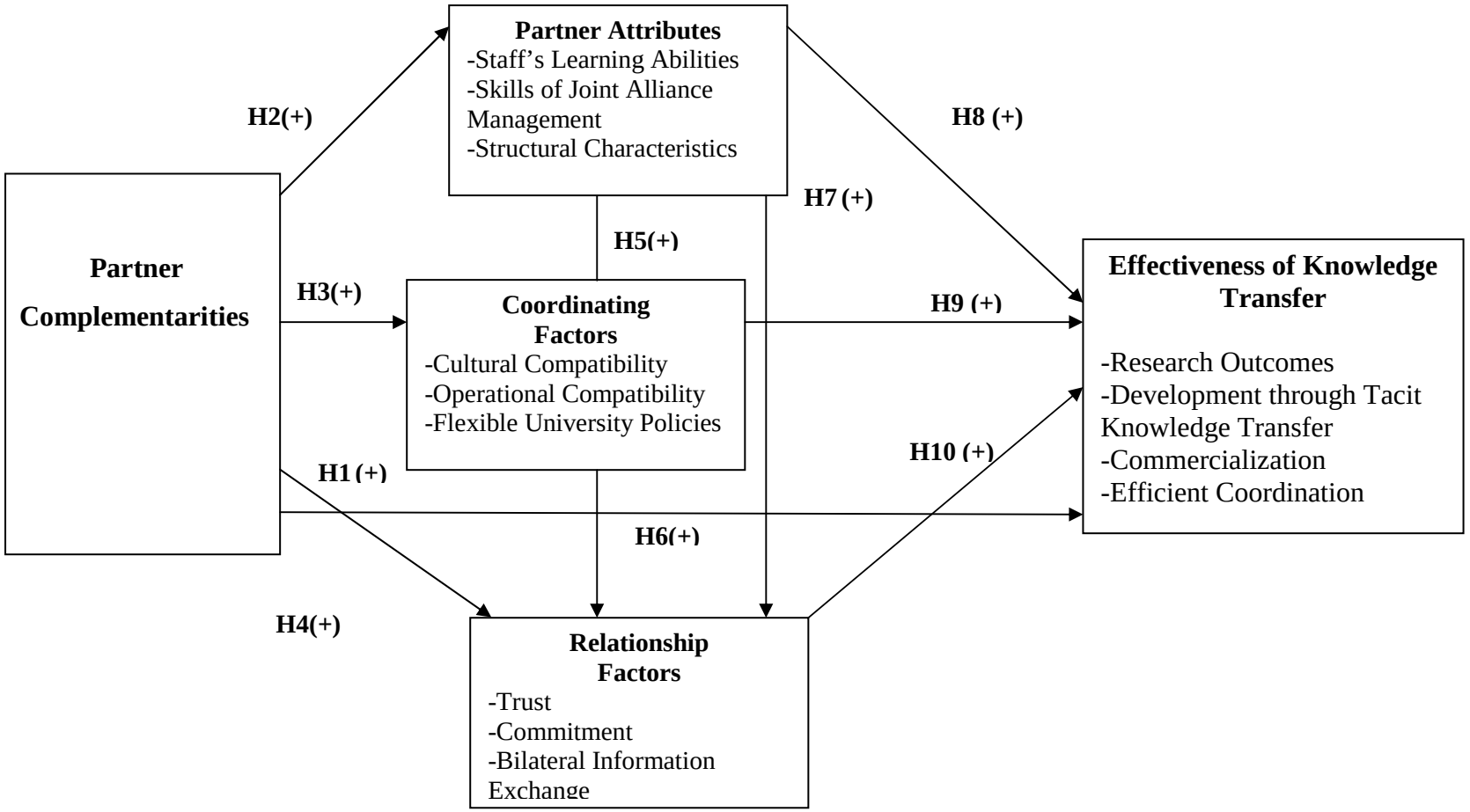


Figure 2.9 The Proposed Model of the Study

Table 2.17 Summary of Hypotheses

HYPOTHESES	STATEMENT
1	Partner complementarities will be positively associated with the perceived level of the effectiveness of knowledge transfer.
2	Partner complementarities will be positively associated with the partner attributes in terms of staff's learning abilities, skills of joint alliance management and structural characteristics.
3	Partner complementarities will be positively associated with coordinating factors in terms of cultural and operational compatibility as well as flexible university policies.
4	Partner complementarities will be positively associated with relationship factors in terms of trust, commitment and bilateral information exchange.
5	Coordinating factors consisting of cultural and operational compatibility and flexible university policies will be positively associated with the partner attributes in terms of staff's learning abilities, skills of joint alliance management and structural characteristics.
6	Coordinating factors consisting of cultural and operational compatibility and flexible university policies will be positively associated with the relationship factors in terms of trust, commitment and bilateral information exchange.
7	Partner attributes in terms of staff's learning abilities, skills of joint alliance management and structural characteristics will be positively associated with the relationship factors in terms of trust, commitment and bilateral information exchange.
8	Partner Attributes in terms of staff's learning attitudes and abilities (learning intent and absorptive capacity), skills of joint alliance management (joint management competence) and structural characteristics that are formalized, decentralized and simple in the organization arrangement will be positively related to the perceived level of knowledge transfer effectiveness.
9	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 the effectiveness knowledge transfer.
10	Relationship capital consisting of trust, commitment and bilateral information exchange among the university-industry alliance partners will be positively related to the perceived level of knowledge transfer effectiveness.

2.7 Chapter Summary

In today's highly competitive business environment, a collaborative R&D alliance partnership is currently considered as a win-win strategy to move Thai universities and Thai industrial sectors 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 in order 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 developed a framework of the RDCE model that is believed to include the important factors necessary for measuring the effective collaboration between universities and industries. The contribution of the study offers some theoretical understanding of the university-industry alliance, which can be a starting point for conducting empirical studies to uncover the phenomena underlying strategic alliances in the R&D alliance context.

Additionally, three theoretical perspectives, namely, inter-organizational relations (IORs), the knowledge-based view of knowledge management perspectives, and the resource-based view of a firm were used to explain this phenomenon. The 8 S-framework of determinant factors —strategic alignment, source attractiveness, staff’s learning attitudes and abilities, skills of joint management, structural characteristics, shared values, support system, and styles of relationship in four groups of variables, (partner complementarity, partner characteristics, coordination factors, and relationship-based factors)—were integrated to measure the effectiveness of knowledge transfer. The RDCE model was also proposed as a measurement of knowledge transfer effectiveness, which consists of research outcomes, development through tacit knowledge transfer, commercialization, and efficient coordination. The hypotheses are summarized. Then, the framework of this study will be further operationalized and empirically studied in the next chapter.

CHAPTER 3

RESEARCH METHODOLOGY

This chapter describes research methodology of this study. The first section introduces the design of sampling methods, research instrument and method of data collection. Next, the construct and measurement as well as the purification of measures are presented. In the last section, the data analysis procedures are described.

3.1 Research Designs and Sampling Methods

The survey was carried out with a cross-sectional design at which the data were collected at one time. This study will be implemented both qualitative and quantitative research, of which information was conducted in the form of field research by distributing a self- administered questionnaires and interviews.

This combined method is known as triangulation. The purpose of the qualitative analysis is to discover how the effectiveness of knowledge transfer is affected by the measures. At the same time, the quantitative method, which is more, involved in statistical and mathematical analysis is implemented by using SPSS programs version 15.0 and AMOS program version 6.0 to analyze data in order to confirm the findings of the qualitative analysis. Specifically, the hypotheses are tested empirically using the linear structural equation model (LISREL), in the form of a causal relationship among the constructs and path analysis. On the other hand, the proposed determinant factors and the results of the quantitative analysis could be clarified and supplemented by a qualitative approach to achieve a more credible conclusion.

3.1.1 Target Population and Units of Analysis

Based on related theories and empirical research, this dissertation aims to consolidate and expand the existing literature on relationship between alliance partners and to contribute a wider body of literature on inter-organizational relationships. The sample consists of the so-called "university-industry alliance." It refers to non-equity based alliance between universities and industrial firms in the technology-based sections of electrical and electronics products, civil engineering, vehicle parts and accessories, food science, chemistry and agricultural technology.

The population of industrial partners is from a broad cross section of industries, and is both domestic and international in nature. Although a sample from such a heterogeneous population of alliances may increase the chances of extraneous sources of variation, it is argued that the diverse nature of the sample is useful. The author posits that partners' complementarities and partner attributes are key antecedent variables for the effectiveness of knowledge transfer in all types of not just specific alliances. In other words, all forms of alliances should evidence similar mechanisms in terms of knowledge transfer, including an alliance competence, strategic alignment, partner attributes and specific resource advantages (Day, 1995: 660-679 and Varadarajan and Cunningham, 1995: 282-296).

The criteria of industry selection in this study are from the main university-industry alliance purposes of transforming the academic technology outputs for commercialization and application-oriented basis in the forms of new product development and innovation. Most of agreements are technology-based concerns from the real needs of industrial partners and government sectors in order to improve the people wellness and firms' competitiveness in the marketplace. Thus, the sample of alliance partners in the party of industrial firms are from private and public sectors engaged in technology transfer with universities especially, through an agreement on R&D sponsorship for commercial purposes and public interest either in the forms of research grants or spin-off companies in the university's incubation centers.

The database was drawn from members involved in research agreements with universities. The 1000 name lists of the respondents were derived from the office of Thailand Research Funds (TRF) and the Bureau of Commission on Higher Education and they were screened to identify all constituents both from universities'

counterparts, broker associations, government institutions and focal alliance partners involved in the alliance projects, especially from IRPUS projects (Industrial Research for Undergraduate Students) during 2006-2008. As the R&D agreement in the current year are mostly confidential due to high competition in the market place, the budget, titled projects and new product development offered to researchers were not disclosed. Thus, the samples were selected from the most current information. Every attempt was made to append the latest list of focal alliance partners and university scholars in order to get the most up-to-date picture of the studied samples. From 1,000 name lists, they were screened. The redundant names were discarded from the lists, 550 researchers were from both public and private universities from various parts of Thailand, 30 government institutions were retrieved from the lists, 20 focal alliance partners were state enterprises and another 250 industrial partners were from private sectors. Thus, the whole population of the study was 850 constituents. Table 3.1 presents the number of population.

Table 3.1 Population of the Study

Institutions/Industries	Population
Public Universities	500
Private Universities	50
Private Companies	250
Governmental Institutions	30
State Enterprises	20
Total	850

The alliance project consists of different departments that are in charge of different tasks concerning the alliance networks. The respondents include coordinated alliance manager projects from industrial partners, directors of alliance projects, project coordinators will be asked to select projects that came to their attention recently. (Not a successful, failed or typical project but the one that they worked on most recently). Measures will be developed and refined on the basis of the guidelines

provided by Churchill (1979: 64-73) and Gerbing and Anderson (1988: 186-192). The questionnaires will be used to ask the respondents about their experiences with partnership and alliance projects. The data used in the analyses were collected with a mail survey during June to August, 2009.

The measures used were designed to examine perceptions of both university and focal alliance partners. The data will be collected from both partners' viewpoints through mail surveys. However, the in-depth interview will be mostly conducted from universities perspectives rather than the focal alliance partners. Thus, the use of an informant “speaking” on behalf of the partnership and answering question on dyadic issues and conditions which is sometimes referred to "proxy-report" are also implemented (Menon et al., 1995: 77). In addition, Lambe et al. (2000: 141-158) state that although researchers widely recognize the value of gathering data from both sides of the firm dyad (because of the confirmation of perceptions and the validity testing such data permit,) the difficulties associated with gathering and using such data are so great. As a matter of facts, most studies that involve firms partners and joint participation use proxy-reports instead of using data from both parties (Menon et al., 1995: 77-84).

3.1.2 Sampling Techniques

Although some kind of sampling plan should be used to identify the appropriate sample size, this study used the entire population instead. This is due to the nature of the research question of this study which data were to be analyzed by factor analyses and structural equation modeling analyses. In relation to these two techniques, Hair et al. (1995) suggest that the researcher generally would not analyze a sample of fewer than 50 observations, and preferably the sample size should be 100 or larger. As a general rule, the minimum was to have at least five observations for each independent variable or five times as many observations as there are variables to be analyzed, and the more acceptable range would be a ten-to-one ratio. In relation to the structural equation model testing, a general rule is that there should be five observations for each independent variable (Hair et al., 1998).

The questionnaires were distributed to the sampling respondents while in-depth interviews were undertaken through a purposive sampling and using a snowball

technique. These individuals were chosen on the basis of their involvement and knowledge about the alliance in terms of knowledge and technology transfer. The purpose of gathering data from the interviews is to get individual opinions and describe the deeper and more detailed facets of the situations in their responsibilities dealing with the alliance partners in the different networks and alliance projects. The purposive sample is arbitrarily selected because the researcher wanted to get only the persons involved directly in the working process, both on the passive and active sides.

3.2 Methods of Data Collection

Self-administered questionnaires will be mailed to the target population. Cover letters will be sent with the questionnaires confirmed the respondent's involvement with the alliance in question, stressed the importance of the research, stressed the importance of the respondent's participation, and offered an incentive (an executive summary of the final results) for participating. To maximize response, the mail survey methods suggested by Dillman (1978) are utilized in the study. Two weeks after the initial mailing, all remaining non-respondents will be sent a second follow-up letter, plus a replacement questionnaire.

The final count of total population was 1,000 name lists with possible university to industry technology transfer experience. The original pre-qualified database of 1,000 was reduced to a final total of 850 through a process of qualifying the informants (as having experience with university-to-industry technology transfer agreements) using e-mail, phone calls, and the mailing itself. The redundant names were also discarded. The final response was 255 surveys returned, 240 being usable (29%).

3.2.1 Response Rate

In an effort to increase the response rate, a modified version of Dillman's (1978) total design method was followed. All mailings, including a cover letter, the survey and a postage-paid return envelope, were sent via mail. Two weeks after the initial mailing, remainder postcards were sent to all potential respondents. For those who did not respond, a second mailing of surveys, cover letters and postage-paid

return envelopes were mailed approximately 14 days after the initial mailing. After the screening of the redundant names and alliance projects, of the first 700 surveys mailed, 25 were returned because of address discrepancies and non-contracted persons. From the resulting sample size of 675, a total of 153 first responses were received, resulting in a response rate of 22.6 percent. Thus, the follow-up 150 questionnaires were randomly resent to those who didn't return the questionnaires.

With follow-up, the surveys for 102 firms were returned. Later, with careful follow-ups, a total of returned questionnaires were 255, resulted in a response rate of 30.9percent. However, of these, 15 questionnaires were discarded, five declined to response because they had never experienced in any alliance projects and another 10 questionnaires were not usable either due to non-completion of questions. Finally, a total of completed questionnaires were 240, resulted in a usable response rate of 29 percent (240/825). Table 3.2 summarizes the mail survey result.

Table 3.2 Mail Survey Results

	Amount	%
Questionnaires sent (1)	700	
Undeliverable questionnaires	25	
Received questionnaires (1)	153	
Questionnaires sent for follow-up	150	
Questionnaires received (2)	102	
Total questionnaires sent (1)-(2)	825	
No response	570	
Response	255	
Decline to participate	5	
Unusable	10	
Completed questionnaires	240	

3.2.2 Non-Bias Testing between Early and Follow-up Mail Responses

From the matter of facts that questionnaires were collected twice, Bourque and Clark (1991) suggest that if there is appreciable non-response, investigators should attempt to evaluate how non-response subjects compare with subjects for whom data exist. One common check is to compare the demographic characteristics of the sample with those of the population from which it came. Armstrong and Overton (1977: 306-325) describe that information received from companies who respond only after repeated contacts resemble that of non-respondents. For the comparison of early and late respondents, the sample was divided into early (approximately 60% of the sample, n_1=153) versus late (approximately 40% of the sample, n_2=102) depending on whether their responses were received in the first or second collection process.

Non-response bias was tested using T-test indicated no statistically significant differences (at 99 percent confidence interval) between the sample and population. Additionally, the response of early wave group consisted of 153 responses and late wave group consisted of 102 responses were compared to provide additional support of non-response bias (Armstong and Overton, 1977: 306-325).

A Levene's test for homogeneity of variances and a t-test for equality of means of the two groups were performed by using SPSS version 15.0. Two assumptions underlying this test were that the population variances and means were approximately equal. The null and alternative hypotheses were:

1) **H0:** $\sigma_1^2 = \sigma_2^2$

   H_a: $\sigma_1^2 \neq \sigma_2^2$

2) **H_0:** $\mu_1 = \mu_2$

   H_a: $\mu_1^2 \neq \mu_2^2$

To prove the hypotheses, the statistical one way ANOVA at 95% confidence interval was implemented to test the variance between early and follow-up responses. When p value was less than 0.05, the null hypothesis would be rejected. The findings of hypothesis testing were summarized in table 3.3.

Table 3.3 Statistical Comparison of Respondent's Opinions from Early and Late Response

Opinion towards Independent/ dependent variables	Questionnaires				t-value	P
	Early response (n_1=153)		Follow-up Response (n_2=102)			
	$\bar{x}$	S.D.	$\bar{x}$	S.D.		
X1	3.65	0.39	3.64	0.40	0.093	0.926
X2	3.48	0.63	3.73	0.75	-1.738	0.083
X3	3.39	0.67	3.48	0.62	-0.521	0.603
X4	3.99	0.41	4.03	0.38	-0.387	0.699
X5	0.35	0.12	0.34	0.26	-0.337	0.112
X6	0.30	0.21	0.25	0.16	0.717	0.085
X7	2.91	0.82	3.04	0.78	0.725	0.325
X8	3.63	0.51	3.78	0.48	0.929	0.667

Note: sig < .05, p value <0.05

X1= Partner complementarities
X2= Partner attributes
X3= Coordinating Factors
X4= Relationship Factors
X5= Research Outcomes
X6= Development through tacit knowledge transfer
X7= Commercialization
X8= Efficient coordination

As shown in table 3.3, the t-test performed on the responses of these two groups yielded no statistically significant differences (at 95 percent confidence interval). No significance levels were found between early (i.e., before follow-up letters) and late (i.e., after follow-up letters) respondents. When p value was more than 0.05, the null hypothesis was accepted. That means the respondents' opinion between early and follow-up responses were not different. The results indicated that non-response bias was relatively minor concerns. These results suggest that non-response may not be a problem and this analysis suggested that responses appeared to be a good representative of the overall population.

3.3 Methods of Data Analysis

3.3.1 Qualitative Analysis

Data from interview will be synthesized through the use of inductive analysis. To achieve these goals, two techniques were implemented to analyze the data: domain analysis and componential analysis.

1) Domain analysis is undertaken by data indexing from the available information, classifying the information into a group of relevant setting topic or a set of criteria according to the common qualities that the data possessed.

2) Componential analysis is also implemented in order to group information into the same component and make comparison of similarities and differences among the overall obtained data.

3.3.2 Quantitative Analysis

The data analysis was accomplished with the SPSS program for Windows, Version 15.0 (statistical package for social science), which was used for testing non-biased analysis between early and follow-up survey and analyzing the characteristics and opinions of the respondents. In addition, the path analysis was implemented by using the AMOS program, version 6.0 (Analysis of Moment Structure) to test the research hypotheses and create the linear structural relationship equation model (LISREL) of the knowledge transfer effectiveness among the university-industry alliance. In order to test the hypotheses developed in the study, the present study employed two main statistical methods. First, confirmatory factor analysis was employed in testing the validity of the constructs. Second, most of the hypotheses were tested using structural equation model (SEM), which would be an ideal technique to test main hypotheses given the complex relationships between the constructs.

Structural equation analytic methods are selected in this study for three reasons. As recommended by Messick (1985: 100-115), structural equation modeling (SEM) could be used for construct validation in a numbers of ways, foremost, perhaps, its heuristic feature that helps researchers reduce data and interpret finding. Likewise, many other researchers (for example, Chen and Rossi, 1989: 391-396 and

Costner and Schoenberger (1973: 167-199) have pointed out, SEM forces researchers to consider the expected causal relationships among observed variables and theoretical constructs in an explicit framework. To define the framework, the researcher must clarify and explain the theoretical reasons for allowing certain variables to interrelate. Therefore, SEM encourages the researcher to think clearly and in detail about the causal mechanisms underlying the correlation in the data.

Second, SEM is useful in theory construction because "it provides a convenient and efficient way to test theories and their inherently complex effects" (Wallberg and Reynolds, 1992: 221). Theories for social process often involved many interrelated variables whose overall effects cannot be easily understood and explained. Many of these effects involve underlying hypothetical constructs. With the help of SEM, we can simultaneously estimate the effects of underlying variables and their relationships included in the model. Structural equation modeling has some advantages compared to multiple regression including for instance more flexible assumptions, use of confirmatory factor analysis to reduce measurement error by having multiple indication per latent variable, overall testing of the model fit rather than coefficients individually, the ability to test models with multiple dependent variables, the ability to model mediating variables, the ability to model error terms.

Thus, by carefully and rigorously examining the relations among constructs, we can have greater precision about social phenomena, which is often not possible with simple correlation, regression or qualitative data analysis. Additionally, because SEM can examine the indirect effects of variables, it can aid the researcher in identifying more complex causal relations though investigating the variables that may have been disregarded because they lacked direct effects.

Third, SEM is flexible in handling problems of measurement errors and omitted variables (Wallberg and Reynolds, 1992: 221-251). The statistical basis of SEM methods provides a means of inference regarding the plausibility of a model. It provides information on how well the selected variables serve as estimates of the latent constructs and how much of the variance in the model is explained by the included variables. In this manner, the researcher can assert the likelihood of important effects of included versus possible missing variables.

However, despite its recent growing popularity in social science research, SEM, like other data analytic methods, can be misused. When inappropriately applied, SEM may result in seriously distorted models, misleading users of the results. Therefore, researchers should follow guidelines to improve the soundness of their models. First, they should use theories of the field and findings of previous studies to guide the selection of variables and construction of models (Wallberg and Reynolds, 1992: 221-251). Second, they must understand the principles of SEM and improve their skills for conducting SEM analysis (Muthen, 1992). Finally, they must collect reliable and valid data and develop thoughtful models to explain the structure underlying the data (Cliff, 1992).

3.4 Data Analysis Procedures

The data analysis as described above is presented in two parts as follows:

Part I: The characteristics of sample respondents and the taxonomies of university-industry alliance are presented by the descriptive statistic techniques of mean and standard deviation. The data obtained from the questionnaire survey were analyzed using SPSS program (version 15.0). Descriptive statistics such as mean, average, and frequency were used to describe the general characteristics of the respondents and variables. In order to describe the variables in this study, the interpretation of mean scores of each variable can be retrieved from the following formula, suggested by Boonrueng Khajornsilp (2003: 12-14).

$$\text{Likert Scales} = \frac{\textbf{Maximum scores – Minimum Scores}}{\textbf{5 scales (strongly agree- strongly-disagree)}}$$

$$\text{Score Interval } \bar{x} = \frac{5-1}{5} = 0.80$$

Table 3.4 Measurement Scales

Measurement Scale	Score ($\bar{x}$)
Strongly disagree/ extremely low	1.00-1.80
Disagree/ Low	2.00-2.60
Neither agree or disagree/ Moderate	3.00-3.40
Agree/ High	4.00-4.20
Strongly disagree/ extremely high	4.21-5.00

Part II: The research hypotheses were empirically tested by 1) confirmatory factor analysis and 2) structural equation model analysis to explain the cause-effect relationship of the factors affecting knowledge transfer effectiveness among the university-industry alliance.

3.4.1 Confirmatory Factor Analysis

In the present study, factor analysis was used to confirm the observed measurement items that define latent theoretical constructs as expected on the basis of theoretical grounds. Measurement items are selected on the basis of prior theory and factor analysis is used to see whether they load as predicted on the expected number of factors. Confirmatory factor analysis thereby complements the use of Cronbach's alpha coefficients in evaluating the reliability and validity of the constructs.

Besides confirming the correct number of factors, the factor analysis was used to confirm that the measurement items loaded on correct factors. In confirmatory factor analysis, a common rule of thumb is that only item with factor loading of .60 or higher on the primary factor and loading of .30 or lower on any other factors are retained. These guidelines were employed in the present study.

3.4.2 Structural Equation Modeling (SEM)

Structural equation modeling is multivariate method that can be used to examine a set of regression equations simultaneously (Bollen, 1989 and Hair et al., 1995). Structural equation modeling may be used as more powerful alternative for instance to multiple regression, path analysis, factor analysis, time series analysis, and analysis of covariance. These procedures can be viewed as special cases of structural equation modeling which is an extension of the general linear model. Major applications of structural equation modeling include:

1) Causal modeling, or path analysis, which hypothesizes causal relations among variables and tests the causal models with a linear equation system. Causal models can involve either manifest variables, latent variables, or both.

2) Confirmatory factor analysis, an extension of factor analysis in which specific hypotheses about the structure of the factor loadings and inter-correlations are tested.

Structural equation modeling is normally viewed as a confirmatory rather exploratory procedure (Byrne, 2001: 35-52). Structural equation modeling uses goodness-of-fit tests to determine if the pattern of variances and covariance in the data is consistent with the hypothesized structural model specified a prior. Structural equation modeling can also be used to test two or more causal models to determine which has the best fit (Loehlin, 1987: 15-25).

However, structural equation modeling (SEM) cannot test directionality in relationships. It cannot itself draw causal arrows in models or resolve causal ambiguities, theoretical insight and judgment by the researcher is critically important. As a matter of facts, the directions of arrows in a structural equation model represent the researcher's hypotheses of causality within a system. The researcher's choice of variables and pathways represented will limit the structural equation model's ability to recreate the sample covariance and variance patterns that have been observed in nature. Because of this, there may be several models that fit the data equally well.

In spite of this, the SEM approach remains useful in understanding relational data in multivariate systems. The abilities of SEM to distinguish between indirect and direct relationships between variables and to analyze relationships between latent variables without random error differentiate SEM from other simpler, relational

modeling processes. SEM is a combination of factor analysis and multiple regressions. It also goes by the aliases “causal modeling” and “analysis of covariance structure”.

3.4.3 The LISREL Approach to SEM

In this study, the model for evaluating program implementation was tested with the computer program AMOS version 6.0 (Joreskog and Sorborn, 1993: 20-32). This program is popular because of its ability to test a wide variety of proposed theoretical models. In this section, some technical terms of the LISREL program will be briefly explained.

3.4.3.1 Model Testing

To test a model is to examine how well the hypothetical modified by the researcher fits the empirical data. A well-fit model is one that "not only fits the data well from a statistical point of view but also has the property that every parameter of the model can be given a substantively meaningful interpretation" (Joreskog and Sorbon, 1993: 24).

3.4.3.2 Error in a Model

Two types of errors are measured in model testing: the random measurement error associated with each observed variable and the residual error in each structural equation representing the unexplained variance in each latent construct of the model. Measurement error results from problems in the data collection procedures. The residual error of latent variables results from variables and relationships that are not included in the model. Both types of error are indicator of the soundness of the model.

3.4.3.3 Path Diagram

A LISREL model is conventionally depicted with a path diagram for ease of presentation and interpretation. Path analysis is a subset of Structural Equation Modeling (SEM), the multivariate procedure that, as defined by Ullman (1996: 709-811), “allows examination of a set of relationships between one or more independent variables, either continuous or discrete, and one or more dependent variables, either continuous or discrete.” SEM deals with measured and latent variables. Most structural model consists of two types of variables, observed variables and latent variables. An observed variable is measured with data collection instrument such as

questionnaires. Latent variables are theoretical constructs that are defined by measuring the observed indicators of these variables because they cannot be directly observed (Long, 1983).

3.4.3.4 Measurement Component and Structural Component

There are two components in the LISREL model: the measurement component and structural component. In the measurement components, the latent constructs are identified through confirmatory factor analysis (CFA) on the covariance among the observed variables. Any proposed model must be well measured. This helps establish the construct validity of the latent variables. In structural component, the relations among the identified constructs are estimated through 1) specifying the causal relations among the constructs, 2) determining the strengths of such relations, and 3) specifying the amount of variance in the data that is explained by the model.

3.4.3.5 Output of LISREL Analysis

The output of an LISREL analysis shows 1) the latent constructs that can be defined from the observed variables, 2) the reliability of the observed variables as estimates of the latent constructs, 3) the strength of the causal relationships among the latent constructs, 4) the amount of variance in the data that is left unexplained by the model, and 5) indexes of the model's fit to the empirical data. LISREL output also provides recommendations to the researcher on how to modify to improve fit with the data. However, "only the researcher is capable of judging the balance between statistical and substantive model fit," and "model respecification must remain the decision of the researcher and not of the LISREL program" (Byrne, 2001: 38).

From the above discussion, while the confirmatory factor analysis (CFA), is used to test that the factors and the loading of measurement items on them conform to what is expected on the basis of pre-established theory, LISREL model, on the other hand, is used to evaluate and verify the proposed model in the forms of: 1) overall model fit measures and 2) component fit measures (Nongluck Wiratchai, 1994: 53-55).

1) Overall Model Fit Measures

First of all, chi-square statistic (X^2) is employed to assess the magnitude of discrepancy between the sample and fitted covariance metrics (Hu and Bentley, 1999: 100). A good model fit would provide an insignificant result at a 0.05

threshold (Barrett, 1999), thus the Chi-square statistic is often referred to as either a 'badness of fit' (Kline, 2005) or a 'lack of fit measure (Mulaik and Milbap, 2000: 36-73). It can be assumed that the chi-square tests should be non-significant because the non-significant tests indicate that differences of the observed (sample) and estimated covariance metrics are non-significant. However, reliance on the chi-square test as the sole measure of a model fit is not recommended because the test is sensitive to sample size such that small deviations from a true model can reject the hypothesized model in large samples and large deviations of a hypothesized model from a true model may not be detected (Bagozzi et al., 1991: 421-458).

The second measure is chi-square statistic comparing the tested model and the independent model with the saturated model (CMIN/DF). These statistic ranges from 0 to 1 but it is generally accepted that values of 0.90 or greater indicate well fitting models. (Arbuckle, 1995) The closer value to 1.0 indicates good fit of the data (Bollen, 1989: 270). Besides the chi-square test, there are many other indices used in the testing of model fit such as the Goodness of Fit Statistic (GFI), Adjusted of Goodness of Fit Index (AGFI), the Normed Fit Index (NFI), the Incremental Fit Index (IFI), the Comparative Fit Index (CFI), the Root Mean Square Error of Approximation (RMSEA), and the Root Mean Square Residuals (RMR).

As suggested by Bollen (1989), goodness-of-fit index (GFI) is calculated by comparing the predicted squared residuals with the obtained residuals. This measure is for absolute fit, and not adjusted by degrees of freedom. The range of this index is between 0 (no fit) and 1.0 (perfect fit). Models with GFI is above .90 are considered to have a good fit. This index has been argued to be insufficient because it is overly influenced by sample size (Fan et al., 1999).

Fan et al. (1999) also mentioned that adjusted goodness-of-fit index (AGFI) is a variant of GFI which adjusts GFI for degrees of freedom: the quantity (1 - GFI) is multiplied by the ratio of the model's df divided by df for the baseline model, then AGFI is 1 minus this result. AGFI can yield meaningless negative values. AGFI > 1.0 is associated with just-identified models and models with almost perfect fit. AGFI < 0 is associated with models with extremely poor fit, or based on small sample size. AGFI should also be at least .90. Many scholars (i.e, Schumarker and Lomax, 2004: 82) suggest using .95 as the cutoff. Like GFI, AGFI is

also biased downward when degrees of freedom are large relative to sample size, except when the number of parameters is very large. Like GFI, AGFI tends to be larger as sample size increases correspondingly. Additionally, the normed fit index (NFI) is developed as an alternative to CFI, but one which did not require making chi-square assumptions. "Normed" means it varies from 0 to 1, with 1 = perfect fit. NFI represents chi-square for the null model or chi-square for the default model/chi-square for the null model. NFI reflects the proportion by which the researcher's model improves fit compared to the null model (random variables, for which chi-square is at its maximum. For instance, NFI = .50 means the researcher's model improves fit by 50% compared to the null model. Put another way, the researcher's model is 50% of the way from the null (independence baseline) model to the saturated model. By convention, NFI values above .95 are good (ex., by Schumarker and Lomax, 1996: 71-94), between .90 and .95 acceptable, and below .90 indicates a need to respecify the model.

In addition, the incremental fit index (IFI) is chi-square for the null model or degree of freedom for the default model. By convention, IFI should be equal to or greater than .90 to accept the model. IFI can be greater than 1.0 under certain circumstances. IFI is relatively independent of sample size and is favored by some researchers for that reason. Moreover, comparative fit index (CFI) is another measure which compares the proposed model to the null model. This index is also adjusted by the degrees of freedom.

Also, CFI ranges between 0 (no fit) and 1.0 (perfect fit). Models with CFI above .90 are considered to have a good fit (Hu and Bentley, 1999: 1-55). However, the recent research recommends higher cut-off value close to .95 (Hu and Bentler, 1999). The CFI represents the relative improvement in fit of the hypothesized model over the null model. The CFI provides and unbiased estimate of its corresponding population value regardless of sample size. The CFI is an indication of how much variation in measures is accounted for from a practical standpoint. The CFI values greater than 0.9 are generally considered good fit indices (Bergami and Bagozzi, 2000: 555-577).

Furthermore, the root mean square error (RMR) known as the standard error of the estimate is the square root of the residual mean square. It is the

standard deviation of the data about the regression line, rather than about the sample mean. RMR is the mean absolute value of the covariance residuals. Its lower bound is zero but there is no upper bound, which depends on the scale of the measured variables. The closer RMR is to 0, the better the model fit. One sees in the literature such rules of thumb as that RMR should be < .10, or .08, or .06, or .05, or even .04 for a well-fitting model. These rules of thumb are not unreasonable, but since RMR has no upper bound, an unstandardized RMR above such thresholds does not necessarily indicate a poorly fitting model. Unstandardized RMR is the coefficient which results from taking the square root of the mean of the squared residuals, which are the amounts by which the sample variances and covariances differ from the corresponding estimated variances and covariance, estimated on the assumption that the model is correct. "Fitted residuals" result from subtracting the sample covariance matrix from the fitted or estimated covariance matrix.

Finally, root mean square error of approximation (RMSEA) is an estimate of the discrepancy between the observed and estimated covariance matrices in the population (Hair et al., 1998). The RMSEA measures the discrepancy per degree of freedom (df). Values less than .05 are considered to be good and values ranging from .05-.08 are considered to be acceptable (Brown and Cudeek, 1993 and McCallum and Dwyer, 1991: 130-149). It is generally reported in conjunction with the RMSEA and in a well-fitting model the lower limit is close to 0 while the upper limit should less than 0.08 (McQuitty, 2004: 422-446). However, Hu and Bentley (1999: 1-55) cautioned that when the sample size is small, the RMSEA tends to reject correct models too easily.

From the above explanation, multiple indices which are typically used to determine the model fit measures can be summarized in table 3.5.

Table 3.5 Goodness-of-Fit Criteria in Structural Equation Modeling

Criterion	Description	Interpretation
Chi-square(X^2)	Calculation of difference between observed and estimated covariance matrices	p >.05 model to be acceptable; sensitivity to sample size
Chi-square Statistic Comparing the Tested Model and the Independent Model with the Saturated Model (CMIN/DF).	comparing the tested model and the independent model with the saturated model	Range from 0 to 1 Recommendation above 0.90 or greater. The closer value to 1.0 indicates good fit of the data
Goodness of Fit Index (GFI)	Predicted squared residuals compared with obtained residuals, not adjusted by degrees of freedom	Range between 0 (no fit) to 1.0 (perfect fit); recommendation above.90
Adjusted Goodness of Fit Index (AGFI)	Adjusted goodness of fit based on parameters in the model	Value can fall outside 0-1.0 range. AGFI > 1.0 (perfect fit). AGFI < 0 (extremely poor fit) Recommendation value greater than .95 is acceptable.
Normed Fit Index (NFI)/ Incremental Fit Index (IFI)	Assesses fit relative to a base line model which assumes no covariance between the observed variables. High tendency to overestimate fit in small samples	Value greater than 0.90-0.95 is acceptable.
Comparative Fit Index (CFI)	Proposed model compared with the null model, adjusted by degrees of freedom	Range between 0 (no fit) to 1.0 (perfect fit); recommendation above.95
The Root Mean Square Error (RMR)	Average squared difference between the residuals of the sample covariance and the residuals of the estimated covariance	Good model has small RMR. The closer RMR is to 0, the better the model fit.
Root Mean Square Error of Approximation (RMSEA)	Discrepancy per degree of freedom	Values below .08 are acceptable.

Source: Summarized from Byrm, 2001: 42 and Schumarker and Lomax, 2004: 82.

2) Component Fit Measures

After the overall fit model measures was completely implemented, in order to reconfirm the best fit between variables, the examination of component fit measures can be respectively undertaken using parameter estimates as its criteria in the perspectives of standard error and the value of square multiple correlation (R^2) as follows**:**

In terms of standard error (S.D), parameters should have the correction sign and size according to the underlying theory. The determination of the model fit on the parameter estimate level is the assessment of the appropriateness of the standard errors. Large standard errors can lead to non-significant parameter estimates, with the exception of error variances, can be considered unimportant for the model. Standard errors that are either excessively large or small are indicative of poor model fit (Byrne, 2001: 35-52). It should be noted that sample size influences the significance of the parameters (Byrne, 2001: 35-52). This assessment is subjective because the magnitude of standard errors is dependent on the unit of measurement and the parameter estimates. However; LISREL program can help increase the accuracy because the assessment of standard deviation can be undertaken by using Ordinary Least Squares (OLS) where the multiple observable variables are normally distributed in the model (Joreskog and Sorbon, 1993: 27)**.**

On the other hand, squared multiple correlation coefficient (R^2) is the correlation between the observed values and the predicted values. It is also called the "Coefficient of Determination" (R^2). R^2 is the ratio of the regression sum of squares to the total sum of squares. It is the proportion of the variability in the response that is fitted by the model. Some calls "R^2" as the proportion of the variance explained by the model. In SEM the reliability of a measured variable is estimated by a squared correlation coefficient, which is the proportion of variance in the measured variable that is explained by variance in the latent variable(s).If a model has perfect predictability, $R^2=1$. If a model has no predictive capability, $R^2=0$. (In practice, R^2 is never observed to be exactly 0 the same way the difference between the means of two samples drawn from the same population is never exactly 0.) The closer value to 1.0, the higher validity will be. The lower value indicates poor validity of the model

(Nongluck Wiratchai, 1994: 59). The proportion of variation more than .40 that dependent variables can be explained by the independent variable in the linear regression model are considered to be accepted (Saris and Strenkhorst, 1984: 28)

3.5 Research Instrument

The two data collection methods employed was: document research from secondary data collection, structured interviews and self-administered questionnaire.

3.5.1 Documentary Research and Secondary Data

Information on alliance in terms of profiles of alliance partners, research participants, scholars and academic output were obtained from research documents, published documents from library and electronic database.

3.5.2 Structured Interviews

Indeed, the study will be done based on library research. Most of the information used will be taken from texts, periodicals, publications, and documents. However, since most of the information from library research can only provide a broad view on alliances. Thus, the questionnaires will be used to gather primary data and some interviews will be conducted on individuals in management positions in the alliance projects. Information derived from the structured interviews helped to revise the questionnaires as well as provide secondary data and comments to reconfirm the determinant factors and results of the quantitative studies.

3.5.3 Self-Administered Questionnaires

This study used a questionnaire as the instrument of data collection. The measure development began with a literature review and some field interview. The in-depth interviews of the researcher and alliance coordinators were conducted to help define the scope and content of the measures. To approach some executives and researchers who can give an interview, the cover letters from National Institutes of Development Administration (NIDA) were sent as references to identify the purposes and scope of the study. Two executives from private companies and two directors,

including one from government institution and the other one from state enterprises accepted to cooperate. Five researchers from public and private universities were also interviewed. Inquiring about quantitative information was not suggested since it required too much time and effort of the respondents. Moreover, the quantitative information was considered critical to the competitiveness of firm. Inquiring about such information would result in reluctant responses.

In the survey, the self –administered questionnaires are designed both open-ended and closed-ended questions. The researcher tried to select questions, which corresponded to the objectives of the study and the hypotheses to be proved. Some measures in questionnaire are newly developed and some are adapted and obtained from previous studies. It is comprised of two parts. The first part from item 1- to item 6 collects the information about respondents. The following parts ranging from item 7 to item 17 collects the information about technology-based universities and the focal alliance partners relating to the variables in the proposed conceptual framework. The questionnaire was written in Thai. Measures from previous studies, which were originally written in English, were translated into Thai. The translated version was reviewed by three Thai readers who had studied in the United States and were unfamiliar with the research. After the review, all readers did not suggest any further correction of the translated version.

A cross-sectional mail survey was used for data collection. Each theoretical construct is made up of four or more items (Cronbach and Meehl, 1955: 281-302 and Likert, 1951). In an effort to increase the response rate, a modified version of Dillman's (1978) total design method was followed. A five-point Likert scale with end points of "strongly disagree" and "strongly agree" was used to measure the items. The commercialization was measured using five-point Likert scales with end points of extremely low, low, neither low nor high, high and extremely high to specify the level of the respondents' attitudes.

Prior to data collection, the content validity of the instrument was established by grounding in its existing literature. Pre-testing the measurement instrument was implemented by distributing questionnaires to 30 lecturers from King Mongkut' s Institutes of Technology, Lad Krabang (KMITL) who have affiliated with university-industry alliances or extensive experiences dealing with the partners in the alliance

projects. In fact, to make the study meaningful and the sample be representatives of the alliance projects as a whole, the investigators should have followed mainly the process of random sampling. However, with the limit of time, and this study is only a pilot project to construct and to test the reliability of the questionnaire measurement, the samples collected into this study were gathered only thirty cases. The respondents were asked to reply the questionnaires and then their responses were run by SPSS program to compute the reliability testing. There were comments on several questions. The questionnaire was revised according to the results of reliability testing and submitted to three executives and two doctoral candidates whom were asked to answer and comment on it. No further comments among respondents were suggested. A mail survey, then, was conducted.

3.6 Measurement and Purification Process

The domain of the effectiveness of knowledge transfer and all antecedent factors were specified and a sample of items was generated for each construct (Churchill, 1979: 64-73).Previous research into the determinants of the effectiveness of inter-organizational relationships has used only a limited number of items to measure each of the relevant constructs (Mohr and Spekman, 1994: 135-152 and Monczka et al., 1998: 533-578). This study, however, has sought, following a through review of the literature, to develop a broader range of items in order to improve our understanding of each construct. Operational definitions and measurements of independent and dependent variables are hereby discussed.

3.6.1 Independent Variables (Antecedent Factors)

Partner complementarities can be measured through two main sub-concepts: strategic alignment and source attractiveness.

Strategic alignment refers to the motivation and goal which is congruent among the alliance partners to pursue the alliance formation and knowledge transfer. 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 correspondence with one another (Smith and Barclay, 1997: 3-21). Correspondence of motivations signals whether partners have mutually beneficial intentions and determines the likelihood that the partners will engage in opportunistic behaviors. On the hand, goal correspondence means that partners have exactly the same goals as long as they are not conflicting and can be achieved through a common benefit. These two sub-concepts were measured by using the 4-item measures of strategic alignment, developed by Smith and Barclay (1997). An example of question is "-Your organization and your partners need each other's resources to accomplish the overall goals and responsibilities". Responses were measured on a scale ranging from 1= strongly disagree to 5=strongly agree.

On the other hand, source attractiveness is represented by complementary and supplementary resource and knowledge. These two subcategories of variable refer to development and distribution of synergies of resource and knowledge for complementary and supplementary know-how and resource exchange and to match of resources pooled within strategic alliances.

Complementary resources and knowledge refers to the extent to which the acquired resources and knowledge from the focal alliance partners can increase knowledge concentration and deepen the existing field of specialization and current core competences. On the other hand, supplementary resource and knowledge refers to the extent to which an organization can widen its scope of specialization by acquiring resource and knowledge from the focal partners, thereby broadening its range of specialization. The measurement of these two constructs are derived and modified from the related studies of different scholars (Harrigan, 1988: 83-103; John et al., 1996: 981-1004 and Stanek, 2004: 182-204). The items tapped the level of resource interdependence in the relationship by measuring the extent to which both partners perceived the value of resources and capabilities that the other brought to the relationship. Three–item, five point scales anchored by "strongly agree" to "strongly disagree" were implemented.

To indicate the partner complementarities, ten-item statements were adapted (item 9.1-9.11 in questionnaire 9). The reliability tests suggested the deletion of 4 items because of low correlation. The reliability test suggested the deletion of three

items from two sub-concepts: two items from "goal correspondence" and one item from "complementary resource and knowledge."

1) "The goal of alliance can reach consensus among partners;"

2) "Partners have conflicting goals." (Item 9.5- 9.6)

3) "It is clear that how partners expertise complement and resources contributed by both firms were significant in getting the bids." (Item 9.8)

The overall ten-item measure of partner complementarities developed by Harrigan (1985: 83-103); John et al. (1996: 981-1004); Smith and Barclay (1997) and Stanek (2004) can increase the reliability with the Cronbach's alphas through the deletion of 3 items, which resulted in the improved cronbach's alpha from 0.7281 to 0.7577 (See table 3.11). However, only one item in the sub-concept "complementary resource and knowledge" have encountered with the sufficient item to calculate for the cronbach's alphas value and factors loading. Thus, the sub-concepts of strategic alignment and source attractiveness were gathered and adapted into a single construct of partner complementarities.

3.6.2 Independent Variables (Mediating Variables)

3.6.2.1 Partner Attributes

Partner attributes were represented by staff's learning attitudes and abilities, skill of joint management competence and structural characteristics.

1) Staff's learning attitudes and abilities refer to learning intent and absorptive capacity. Learning intent was defined as the extent to which the organization's members have intent not only to acquire externally generated knowledge, but also to facilitate internal assimilation of that knowledge.

On the other hand, absorptive capacity refers to the extent of firm's ability to internalize knowledge obtained from its partner or generated, and integrate explicit knowledge in cooperation with the partner, which stands for system, coordination and socialization capability. Five-item measurement was derived and modified from the study of Jolly and therin, 2007 which measure the degree to which a capability can access additional knowledge and reconfigure existing knowledge with wide scope and flexibility through the structuring of relations between members of a group and active participation in the process of knowledge creation. The respondents

were asked to indicate their agreement on the degree of their staff's learning attitudes and abilities, ranging from 1 (strongly disagree) to 5 (strongly agree).

2) Skills of Joint Management

This construct refers to an organizational ability for finding, developing, and managing alliances to help the firm compete in its marketplace. Management competence is comprised of three facets: alliance experience, alliance management and development capability and partner identification propensity.

This sub-concept stands for the ability of a firm's alliance management to select potential partner and negotiate with its partners to secure relationship and minimize the conflict. The scale measures the skill of joint management, consisting of five items which were adapted from the statement of Lambe et al. (1997: 102-116; 2002: 141-158) and Sherwood and Covin (2008: 162-179). The original items were selected and adapted to suit the interest of the study. The respondents was indicated on a scale of 1= strongly disagree to 5= strongly agree. An example of items is "Your organization has capable alliance managers who know how to solve the conflict between partners very well."

3) Structural CharacteristicsThree types of alliances structural characteristics are examined in a three -item approaches: centralization, the extent of concentration of decision-making and control mechanisms. In terms of control mechanisms, in measuring "control" approach was adopted which considered the scope of control as well as the extent and mechanisms of control (Geringer and Hebert, 1989: 235-254). Formalization refers to the extent to which explicit rules and procedures govern decision-making; and complexity refers to the degree of differentiation that exists within an organization consisting of the degree of horizontal separation between units, the depth of the organization hierarchy and the degree to which the location of an organization's facilities and personnel are dispersed geographically. The scale consists of seven-item developed by Madhok and Tallman (1998: 326-339); Sivadas and Dwyer (2000: 31-49) and Stanek (2004: 182-204). The respondents were asked to indicate the organizational structure tapping into formalization, centralization and complexity through 5 scales ranging from 1 (strongly disagree) to 5 (strongly agree).

To measure the partner attributes, seventeen- item statements measure were developed to illustrate all three constructs: staff's learning abilities, skill of joint alliance management and structural characteristics. Refer to table 3.8 and 3.11; an example of items (item 9.11-9.20 and 10.1-10.7) is "The organizational culture of your organization and partners encourages learning new ideas, concepts and methods and promoting the sharing of ideas across different units of functions". The cronbach's alpha is 0.8211.The reliability tests suggested none of items should be deleted.

3.6.2.2 Coordinating Factors

1) Shared Value (Cultural Compatibility)

Share value is represented by cultural compatibility which can be measured by management team culture through their perception on behavioral and operating norms clustered in terms of task support (norms having to do with information sharing, helping other groups, and concern about efficiency); task innovation (norms for being creative, being rewarded for creativity, and doing new things) and social relationships (norms for socializing with one's work group and mixing friendships with business).Cultural compatibility was operationalized through a two-item scale that measured the perceived levels of similarity and congruence in organizational norms and values (Madhok and Tallman, 1998: 326-339; Sivadas and Dwyer, 2000: 31-49) and mutual appreciation of each other's goals and objectives.

2) Support Systems: (Operational Compatibility and Flexible University Policies)

Operational compatibility addresses the extent of congruence in the partners' procedural capabilities. Operational compatibility was measured using a two-item, five-point scale, measured the extent of synergy in the objectives and capabilities of the partners and the level of congruence in the partners' managerial skills, organizational procedures, and technical capabilities (Madhok, 1995: 57-74 and Madhok and Tallman,1998: 326-339).

3) Flexible University Policies

Flexible university policies refer to the ability of university to make adjustments to overcome operating misfit and re-establish strategic fit with its partners. Burns and Stalker's (1961) notion suggest an organization's constant

adjustment is driven by member interaction, where shared beliefs about values and goals substitute for fixed and rigid command and control systems (Burns and Stalker 1961). At the meantime, in this study, flexible university policies were represented by the three traits of conflict resolution which are based on attenuation, compromise, and delay the university's decision-making and /or routine procedures on academic publications in order to meet the benefits and needs of their industrial partners.

Flexible university policies can be measured through the extent to which the agreement between partners regarding how to jointly management aspects of the alliance can reach the consensus through the flexible university policies. A total of three items were assessed in this study. Respondents were asked to indicate the agreement on the degree of flexible university policies ranging from a scale of 1=strongly disagree to 5=strongly agree. An example from the measure is "University makes an effort to make decision on implementing daily operation based on mutual benefit and consensus with the industrial partners."

All mentioned above**,** coordinating factors were measured by using the nine-item statement to elaborate three sub-concepts (question 11 item 11.1-11.9), reported reliability based on the coefficient alpha of 0.7145. To indicate the coordinating factors, respondents were asked to assess on a scale of 1= strongly disagree to 5= strongly agree. The result of the test suggested that terminate two items on (11.5-11.6) the statement "In general, the routines of the different organizations that had to work with one another were well established" (item 11.5) and "The different job and work activities around the alliance project development activity fit together very well." (Item 11.6), the cronbach's alpha will be improved from 0.7145 to 0.7827 (See table 3.11).

3.6.2.3 Relationship Factors

Relationship factors consist of three-related variables that are trust, commitment and bilateral information exchange.

1) Trust

Trust is defined as the confidence that an organization has in the ability and motivation of the alliance partner to produce positive outcomes for the organization which are categorized as character-based trust and competence-based trust. Character-based trust was measured through a three-item scale that assessed the

perceived trust level of qualitative characteristics of the partner in terms of moral integrity, fairness, and dependability in the relationship. Another three-item measure of competence-based trust builds on Mohr and Spekman's (1994: 135-152), Morgan and Hunt's (1994: 20-38) work which includes the aspects of partners' capabilities and reliability on their day-to-day working basis.

2) Commitment

Commitment was operationalized using Porter et al.'s (1974: 603-609) organizational commitment questionnaire, which measured the extent to which each party identifies with the goals and objectives of the alliance, is willing to exert effort on behalf of the alliance and intends to maintain the relationship. These items were measured through a five-item scale adapted from Anderson et al. (1992: 18-34) and the organizational commitment literature. The scale measured the mutual willingness of each partner to invest required resources into the relationship, willingness of the partner to stay in the relationship and commitment to objectives and goals of the alliance.

3) Bilateral Information Exchange

Bilateral information exchange was measured through a eight-item scale adapted form Heide and John (1988: 24-36); Mohr and Spekman (1994: 135-152 and Sherwood and Covin (2008: 162-179). This construct tapped the extent to which partners exchanged and shared information through face-to-face and mediated interaction. Bilateral Information exchange is conceptualized to include the formal and informal sharing of timely, adequate, critical, and proprietary information among alliance partners. The measurement consists of nine-items, five-point Likert type scale that reflects communication quality (timeliness and adequacy of information) and information sharing (willingness to exchange critical proprietary information). Also, participation in planning and goal setting refers to the extent to which partners actively engage in planning and goal setting.

From above, the relationship factors were altogether measured by using the twenty-two-item statement, which is reported reliability based on cronbach's alpha of 0.7758. From the estimation for the reliability of the measures, two statements on sub-concepts: "competence-based trust" and "commitment to stay in the relationship" were suggested to eliminate because of their low level of

explanation. The two statements are “We rely upon common values to guide day-to-day performance by alliance members.” (Item12.7) and “The relationship between partners is important to achieve strategic long-term objectives” (Item12.13). The deletion of these two items resulted in the improved cronbach’s alpha of the retained four items was from 0.7758 to 0.8127.

3.6.3 Dependent Variables (The Effectiveness of Knowledge Transfer)

The effectiveness of knowledge transfer in the university-industry alliance is measured by four dimensions of RDCE model, including research outcomes, development through tacit knowledge transfer, commercialization and efficient coordination.

1) Research Outcomes

The measurement of research outcomes refer to the extent to which each alliance partner generates, absorb, apply the knowledge and transfer the relevant explicit knowledge within the organization boundaries through tangible consequences which can be measured through patents, licenses, publications and rewards. The measurement of this construct was developed in a twelve-item scale for measuring the outcomes of explicit knowledge transfer.

2) Development through Tacit Knowledge Transfer

Development through tacit knowledge transfer can occur through co-operative education programs and from the hiring of recent graduates. 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 learn how to serve 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 professionalism development can be considered as tacit knowledge transfer that both industrial partners and university mutually exchange their expertise and needs. Four-item measurement are implement to identify the numbers of co-

operative studies, the numbers of hiring graduate and participation in the on-going research projects as well as joint new product development.

3) Commercialization

Commercialization refers to the extent to which industrial firms and universities collaborate, participate and involve in the process of decision-making, developing and commercializing product or process from the projects. These purposes can be achieved through technology transfer and cooperation among the partners. Four-item measures were developed from the study of Santoro and Chakrabarti, 1999 to identify the degree of time spent, decision-making involvement, numbers of personnel exchange and level of participation in jointly owned operation facilities for developing and commercializing new technologies.

4) Efficient Coordination

Additionally, efficient coordination was represented by the efficiency of coordination in terms of comprehension, usefulness, goal attainment, speed and economy in university-industry context. The conceptualization of "usefulness" can be viewed as the extent to which such knowledge was relevant and salient to organizational success. "Goal attainment" can be measured as the extent to which knowledge that has been transferred to a partner within an alliance. Following Zander and Kogut (1995: 76-92) and Zahra and George (2002: 185-203), speed of knowledge transfer signifies 'how rapidly (the recipient) acquires new insights and skills". Finally, based on the work of Szulanski (1995: 27-43) and Hansen et al. (2005: 776-793), economy of knowledge transfer relates to the costs and resources associated with the knowledge transfer. All these constructs were measured through an eight-item scale. The respondents were asked to indicate their perception of efficient coordination related to their focal alliance partners by ranking from 1 (extremely low) to 5 (extremely high).

Altogether, these four sub-concepts were measured by twenty-eight-item statement representing the variable "effectiveness of knowledge transfer" (item 13.1-13.12, 14.1-14.4, 15.1-15.4 and 16.1-16.4). The Cronbach's alpha is 0.7926.The reliability tests suggested every item should be retained.

Tables 3.6-3.10 summarize all remaining items measured and its location in the questionnaires.

Table 3.6 Elements Measured of Partner Complementarities (Antecedent Factors) Affecting the Effectiveness of Knowledge Transfer

VARIABLES	ELEMENTS MEASURED	MODIFIED AND DERIVED FROM	ITEMS MEASURED IN THE QUESTIONNAIRES
1. Partner Complementarities	-Your organization and your partners need each other's resources to accomplish the overall goals and responsibilities.	Smith and Barclay, 1997	9.1
1.1 Strategic Alignment -Motivation Correspondence	-This cooperation will be of strategic importance for our organization and our partner for the future.	Smith and Barclay, 1997	9.2
-Goal Correspondence	-There is lack of agreed upon objectives between your organization and your partners.(reversed code)	Smith and Barclay, 1997	9.3
	-The alliance activity is not tied to the overall corporate strategy for all partners.(reversed code)	Smith and Barclay, 1997	9.4
	-The goal of alliance can reach consensus among partners.	Smith and Barclay, 1997	9.5
	-Partners have conflicting goals. (reverse code)	Smith and Barclay, 1997	9.6
1.2 Source Attractiveness -Complementary Resources and Knowledge	-Your partners' knowledge and expertise can help improve the existing product or service in terms of production technology and system.	John et al.,1996	9.7
	-It is clear that how expertise complement and the resources contributed by both organizations were significant in getting the bids.	Harrigan, 1985	9.8
-Supplementary Resources and Knowledge	-Your organization and your partner contribute with different resources and competencies which broaden your knowledge range and resource to be more competitive in terms of the launch of new product or services	Stanek, 2004	9.9
	-Your partner possesses distinctive core competences and the acquired knowledge from them helps increase the scope of your business and specialization.	Stanek, 2004	9.10

Table 3.7 Elements Measured of Partner Attributes (Mediating Factors) Affecting the Effectiveness of Knowledge Transfer

VARIABLES	ELEMENTS MEASURED	MODIFIED AND DERIVED FROM	ITEMS MEASURED IN THE QUESTIONNAIRES
2. Partner Attributes	-The organizational culture of your organization and partners encourages learning new ideas, concepts and methods and promotes the sharing of ideas across different units of functions.	Cimon, 2004	9.11
2.1 Staff's Learning Attitudes and Abilities -Learning Intent	-Your organization and view learning about new skills and knowledge as a key investment in your organization's future.	Cimon, 2004	9.12
-Absorptive Capacity	-Your organization and your partners are capable of managing new information in meaningful way.	Jolly and therin, 2007	9.13
(System Capacity)	-Your organization and your partners are capable of integrating new information from various sources.	Jolly and therin, 2007	9.14
(Coordinated /Socialization Capability)	Your organization combine knowledge acquired from outside technologies into your business activities.	Jolly and therin, 2007	9.15
2.2 Skill of Joint Management -Alliance Experience	-Your organization has learned how to handle alliance through previous cooperative ventures.	Lambe et al., 2002	9.16
-Alliance Management and Development Capacities	-Your organization has capable alliance managers who know how to solve the conflict between partners very well.	Lambe et al., 2002	9.17
	.-The alliance managers are competent in managing the projects in terms of collaboration with the partners.	Lambe et al., 2002	9.18
-Partner Identification Propensity	-Your organization can anticipate which partner could help accomplish the innovation.	Sherwood and Covin, 2008	9.19
	-Your organization scans for and identifies potential partners that have the complementary resources that are needed in the alliance project.	Sherwood and Covin, 2008	9.20

Table 3.7 (Continued)

VARIABLES	ELEMENTS MEASURED	MODIFIED AND DERIVED FROM	ITEMS MEASURED IN THE QUESTIONNAIRES
2.3 Structural Characteristics	-All issues are contacted and transferred through alliance managers.	Sivadas and Dwyer, 2000	10.1
-Centralization	-All information concerning alliance projects were channeled through designated offices.	Sivadas and Dwyer, 2000	10.2
-Formalization	-Your organization and your partner rely extensively upon contractual rules and policies in controlling day-to-day operation of the alliances.	Sivadas and Dwyer, 2000	10.3
	-Your organization and your partner have or plan to have detailed legal documents for the projects we have agreed to work on to protect against loss of intellectual property.	Sivadas and Dwyer, 2000	10.4
	-The amount of financial resources each partner in the alliance was expected to contribute toward the alliance development was clearly laid out in the contract.	Sivadas and Dwyer, 2000	10.5
-Complexity	-Problems in alliances are resolved hierarchically from different management ranking.	Madhok and Tallman, 1998	10.6
	-Each alliance organization makes decision on change in daily operation without complexity because of few departments assigned for dealing with alliance projects.	Stanek, 2004	10.7

Table 3.8 Elements Measured of Coordinating Factors (Mediating Factors) Affecting the Effectiveness of Knowledge Transfer

VARIABLES	ELEMENTS MEASURED	MODIFIED AND DERIVED FROM	ITEMS MEASURED IN THE QUESTIONNAIRES
3. Coordinating Factors 3.1 Shared Values	- The relationship between partners is marked by a high degree of harmony in management styles.	Sivadas and Dwyer, 2000	11.1
-Cultural Compatibility	-The organizational values and social norms prevalent in the alliance partners were congruent. Alliance partners were congruent.	Madhok and Tallman, 1998	11.2
-Operational Compatibility	- Both partners involved in this project had compatible philosophies/approaches to business dealings.	Madhok, 1995; Madhok and Tallman, 1998	11.3
	-There is a same agreement between partners regarding to jointly management aspects of the alliance.	Madhok, 1995	11.4
	-In general, the routines of the different organizations that had to work with one another were well established.	Madhok, 1995	11.5
	-The different job and work activities around the alliance project development activity fit together very well.	Madhok and Tallman, 1998	11.6
3.2 Support systems -Flexible University policies	-University makes an effort to make decision on implementing daily operation based on mutual benefit and consensus with the industrial partners.	Santoro and Chakrabarti, 1999	11.7
	-There is flexibility for the universities to modify predefined goals of their academic studies to match well with the needs of all industrial partners.	Santoro and Chakrabarti, 1999	11.8
	-There is a same agreement between university and industrial partners regarding to the launch of new product, patent and publication of the new product and process development.	Santoro and Chakrabarti,1999	11.9

Table 3.9 Elements Measured of Relationship Capital (Mediating Factors) Affecting the Effectiveness of Knowledge Transfer

VARIABLES	ELEMENTS MEASURED	MODIFIED AND DERIVED FROM	ITEMS MEASURED IN THE QUESTIONNAIRES
4.Relationship Capital	-Your organization trusted that that the partners would act in your organization's best interest.	Whipple and Frankel, 2000	12.1
4.1 Styles of Relationship	-Both firms were generally honest and truthful with each other.	Mohr and Spekman, 1994	12.2
- Trust (Character-based Trust)	-Your organization had confidence in the partner's competence and abilities as well as its motives in sharing these abilities.	Whipple and Frankel, 2000	12.3
(Competence-based Trust)	-Your organization and your partners trust the values and experiences of alliance members in controlling day-to-day activities.	Mohr and Spekman, 1994	12.4
	-Your organization and your partners are competent to fulfill the agreement.	Whipple and Frankel, 2000	12.5
	-Your partner's personnel are knowledgeable in solving problems	Whipple and Frankel, 2000	12.6
	-We rely upon common values to guide day-to-day performance by alliance members.	Morgan and Hunt, 1994	12.7
-Commitment (Commitment to make an effort for cooperation in the alliance)	-Your organization and your partners are willing to dedicate whatever people and resources it took to transfer knowledge in the alliance project.	Dwyer et al., 1987	12.8
	-Both firms were committed to making the project a success of knowledge transfer	Dwyer et al., 1987	12.9
(Commitment to meet goals and objectives of the alliance)	-Both partners have senior level management commitment toward the use of alliances to achieve strategic goals.	Dwyer et al., 1987	12.10
	-We believe that long-term relationship will be profitable.	Anderson et al., 1992	12.11
(Commitment to stay in the relationship)	-Staying in relationship is a necessity.	Lambe et al., 2002	12.12
	-The relationship between partners is important to achieve strategic long-term objectives.	Lambe et al., 2002	12.13

Table 3.9 (Continued)

VARIABLES	ELEMENTS MEASURED	MODIFIED AND DERIVED FROM	ITEMS MEASURED IN THE QUESTIONNAIRES
-Bilateral Information Exchange (Information Quality)	-Alliance partner provided us with adequate information.	Heide and John, 1988	12.14
	-Alliance partner provided us with timely information.	Heide and John, 1988	12.15
(Information Sharing)	To what extent are/were the following used in relations to the technology agreement with the university? -Meeting between university and industrial partners' technology experts -Site Visit between experts from both parties -E-mail communication between university and your firm's technology experts -Telephone communication between university and your firm's technology experts.	Sherwood and Covin, 2008	12.16-12.20
	-Exchange of information in this relationship took place frequently and informally.	Heide and John, 1988	
(Participation in planning and making decisions)	-Partners participate in planning activities before decision-making.	Mohr and Spekman, 1994	12.21
	- Partners seek advice from each other and participate in planning activities in decision-making toward s the alliance	Mohr and Spekman, 1994	12.22

Table 3.10 Elements Measured of Dependent Variables (the Effectiveness of Knowledge Transfer)

VARIABLES	ELEMENTS MEASURED	MODIFIED AND DERIVED FROM	ITEMS MEASURED IN THE QUESTIONNAIRES
5. The Effectiveness of Knowledge Transfer - Research Outcomes through Explicit Knowledge Transfer	**Patents** 1.Copyright 2.Invention Patent 3.Petty Patent 4.Production Design Product **Licenses** 5.Thailand Industrial Standards (TIS) marks 6.ISO/IER Guide25 (Laboratory accreditation) 7.TIS/ISO9000 (System) 8.TIS/ISO14000 (Environmental Management System) 9.TIS 18000 (Occupational Health and Safety Management System) 10Trademarks 11.**Reward or certificate** guaranteed knowledge and competence 12**.Publications**	Erden, 1997 quoted in Panid Kulsiri, 1999	13.1-13.12
- Development through Tacit Knowledge Transfer	-Firm's involvement in the development and use of cooperative education programs or research in the alliance projects	Deutch, 1991	14.1
	-Hiring graduates who passed on-going personnel exchange and/or apprenticeship.	Deutch, 1991	14.2
	-Number of personnel exchanges specifically for developing and commercializing new technologies;	Deutch, 1991	14.3
	-Level of participation in joint product development or new management systems and procedures.	Deutch, 1991	14.4

Table 3.10 (Continued)

VARIABLES	ELEMENTS MEASURED	MODIFIED AND DERIVED FROM	ITEMS MEASURED IN THE QUESTIONNAIRES
5. The Effectiveness of Knowledge Transfer	-Time spent interacting with university research center personnel specifically for developing and commercializing new technologies	Santoro and Gopalakrishnan, 2000	15.1
-Commercialization	-Level of joint decision-making in technological consulting arrangements for developing and commercializing new technologies	Santoro and Gopalakrishnan, 2000	15.2
	-Number of personnel exchanges specifically for developing and commercializing new technologies	Santoro and Gopalakrishnan, 2000	15.3
	-Level of participation in jointly owned operation facilities for developing and commercializing new technologies.	Santoro and Gopalakrishnan, 2000	15.4
-Efficient Coordination (Goal Attainment)	The new knowledge that our organization acquired from our partners was complete enough to become proficient with it	Lane and Lubatkin, 1998	16.1
(Comprehension)	-The new knowledge that we acquired from our partners was well understood in the organization	Lane and Lubatkin, 1998	16.2
(Usefulness)	-The knowledge held by the university research center directly resulted in new products and service offered to the market.	Choo, 1998	16.3
	-Our production process has been advanced and accredited with the acquired technology from our partners.	Lord and Ranft, 2000; Lane and Lubatkin, 1998	16.4
-Speed	-Important new product and process technologies are quickly diffused from our partners.	Zander and Kogut, 1995	16.5
	-It took our company a short time to acquire and implement the knowledge provided by our partners	Zahra and George, 2002	16.6
-Economy	-The new knowledge provided by our partners was acquired and implemented at a very low cost.	Szulanski, 1995	16.7
	-The acquisition and implementation of the new knowledge from our partners did not require the utilization of too many company resources.	Hansen et al., 2005	16.8
Total			85 items

Table 3.11 Reliability Testing of Pilot Study and the Cronbach's Value before and after Deleting some Items

Variables	Sub-Concept	Number of Items	Cronbach's Alpha before Adjustment	Number of Remaining Items	Cronbach's Alpha after Deleting some Items
Partner Complementa-rities	**Overall**	10	0.7281	7	0.7577
	Motivation	2	0.7482	2	0.7482
	Goal	4	0.5843	2	0.6141
	Complementary	2	0.516	1	n.a
	Supplementary	2	0.6245	2	0.6245
Partner Attributes	**Overall**	17	0.8211	17	0.8211
	Staff Learning	5	0.6553	5	0.6553
	Skills	5	0.7986	5	0.7986
	Structural	7	0.8014	7	0.8014
Coordinating Factors	**Overall**	9	0.7145	7	0.7236
	Cultural	2	0.7827	2	0.7827
	Operational	4	0.5841	2	0.6125
	Flexible	2	0.6234	2	0.6234
Relationship Capital	**Overall**	20	0.7758	18	0.8127
	Trust	7	0.7856	6	0.8215
	Commitment	5	0.6545	4	0.6928
	Bilateral	8	0.7314	8	0.7314
Effectiveness of Knowledge	**Overall**	29	0.7926	29	0.7926
	Research	13	0.8020	13	0.8020
	Development	4	0.6574	4	0.6574
	Commercialization	4	0.7941	4	0.7941
	Efficient	8	0.7625	8	0.7625
	Overall reliability	85	0.7147	78	0.7845

3.7 Reliability Testing of the Measures

According to Churchill (1995: 67) as quoted in Kulsiri (1999), every multiple-item measures was subject to a "purification process." The purification involves eliminating items that seem to create confusion among respondents and items that do not discriminate between subjects with fundamentally different position on the construct. The purification of measures is to assess the reliability and the validity of the proposed measures. Reliability concerns the tendency toward consistency of the results given by repeated measurements (Carmines and Zeller, 1982). Validity concerns the extent to which an indicator of some abstract concept measures what it purports to measure (Carmines and Zeller, 1982).

The SPSS version 15.0 was used to analyze all data. Internal reliability tests showed satisfactory Cronbach's alphas ranging from .6125 through 0.8215. The reliability of these measures is provided in Table 3.11. The reliability will be presented in terms of internal consistency and undimensionality accordingly.

3.7.1 Internal Consistency

The reliability of the final instrument was operationalized using the internal consistency method that is estimated using Cronbach's ∞ (Cronbach, 1951). Cronbach's alpha is a commonly used measure testing the extent to which multiple indicators for a latent variable belong together. It varies from 0 to 1.0. A common rule of thumb is that the indicators should have a Cronbach's alpha of .7 to judge the set reliable. It is possible that a set of items will be below .7 on Cronbach's alpha, yet various fit indices (see below) in confirmatory factor analysis will be above the cutoff (usually .9) levels. Alpha may be low because of lack of homogeneity of variances among items, for instance, and it is also lower when there are fewer items in the scale/factor.

In the study, the reliability of multiple-item scales was assessed by its internal consistency and unidimensionality of the multiple item scale was assessed based on coefficient alpha and item-to-total statistics. All the items used to measure the constructs in the questionnaires were closed-ended with five-point Likert-type scales of strongly agree to strongly disagree.

The internal consistency method assesses the homogeneity of a set of items. The basic rational for the assessments rest on the fact that items in a scale should behave similarly (Davis and Cosenza, 1993). The internal consistency of a set of items forming the scale is based on the coefficient alpha (Cronbach's alpha). Coefficient alpha provides a summary measure of the inter-correlations that exist among a set of items. This examination offers some initial information on the behavior of measurement models and helps to point to problem prone constructs and questionable measures. The coefficient alpha is expressed as follows:

Where N is equal to the number of items and p is equal to the mean inter-item correlation (Carmines and Zeller, 1982). It implies that if all the items in a measure are drawn from the domain of a single construct, responses to those items should be highly inter-correlated. A high value of alpha supports high reliability (maximum value being 1) and a low value indicates low reliability (minimum value being 0). Nunally (1978) suggests that reliability measures should exceed 0.50 for a minimum degree of internal consistency with recommendation of coefficient above 0.60 is more appropriate. Churchill (1979: 64-73) suggests that if alpha is low, items with correlations near zero or items that produce a substantial or sudden drop in the item-to-total correlations would be deleted. It is because those items might not share equally in the common core, then, should be eliminated. In this study, all constructs had a cronbach's greater than 0.60 (Cronbach, 1951), which is a common threshold criterion to measure internal consistency of items (Kerlinger and Lee, 2000), thereby establishing the reliability of all the theoretical constructs.

By using SPSS's reliability analysis function, the respondents' answers in the categories of five variables include the partner complementarity, partner attributes, coordinating factors, relationship factors and the effectiveness of knowledge transfer. The outcomes are as follows:

Without any deletion of the items on this pre-test study, we may conclude from this data that the questionnaire we are using to measure the factors that influence on the effectiveness of knowledge transfer in the university-industry alliance is moderately reliable. To improve the reliability, the deletion of seven items used in this questionnaire is suggested. Their reliability displayed in the alpha of each concept category is ranging 0.6125 through 0.8215 and the average of alpha is 0.7845 as

shown in the table 3.11. To reconfirm the reliability with the overall respondents (240 cases), the retained items were retested as suggested by the reliability pre-test from 30 cases, the value of cronbach's alpha can be improved as shown in table3.12.

3.7.2 Unidimensionality

A unidimensionality is an assumption underlying the calculation of validity and is demonstrated when the items of a construct have acceptable fit on a single factor solution (Hair et al., 1995). The unidimensionality of each multiple item scale was assessed by using the confirmatory factor analyses, extracting factors with the examination of the correlation, factor loadings and communalities for each scale (Rindfleish, 1997).

Factor loadings are the correlations between the original variables and the factors, and the key to understand the nature of a particular factor (Hair et al., 1998). Factor loadings that were 0.50 or greater were considered practically significant whereas loadings greater than 0.30 were considered to meet the minimum level (Hair, et al., 1995). Factor loadings that were less than 0.3 were considered as not substantial (Kim and Mueller, 1990) and were eliminated. The item-to-item correlation between items in each of the proposed scale was examined. If the correlations between variables were small, it was unlikely that they shared common factors. Items with low correlation, thus, were eliminated. In the posttest as shown in table3.13, variables with communalities more than 0.30 were solely identified as having sufficient level of explanation (Hair et al., 1995) and were retained for further analysis.

It can be summarized that after dropping the items with low correlation, the multiple-item scales used in this study showed reasonable internal consistency and unidimensionality. All measures had Cronbach's alpha greater than.60. To reconfirm the pre-test results of pilot study (30 cases), the posttest with the overall 240 cases was evaluated. The reliability tests suggested none of items should be deleted. Without any deletion of the items on this post-test study, we may conclude from this data that the questionnaire we are using to measure the factors that influence on the effectiveness of knowledge transfer in the university-industry alliance is moderately reliable. The average of alpha is 0.8106 as shown in the table 3.12.

Table 3.12 Comparison between Reliability Pre-Test and Post-Test and Factor Loading Analyses

Variables	Indicators	No. of Items	Pretest (n=30) Alpha	Posttest (n=240) Alpha	Factor Loading
Partner Complementarity	Overall	7	0.7577	0.7734	
	Motivation	2	0.7482	0.7646	0.784
	Goal	2	0.6141	0.6536	-0.397
	Complementary	1	n.a	n.a	0.370
	Supplementary	2	0.6245	0.6548	0.407
Partner Attributes	Overall	17	0.8211	0.8665	
	Staff Learning	5	0.6553	0.6815	0.682
	Skills	5	0.7986	0.8058	1.193
	Structural	7	0.8014	0.8251	0.633
Coordinating Factors	Overall	7	0.7236	0.7381	
	Cultural	2	0.7827	0.8665	0.565
	Operational	3	0.6125	0.6233	0.764
	Flexible	2	0.6234	0.6808	0.605
Relationship Capital	Overall	18	0.8127	0.8866	
	Trust	6	0.8215	0.8320	0.844
	Commitment	4	0.6928	0.7335	0.701
	Bilateral	8	0.7314	0.7895	0.763
Effectiveness of Knowledge	Overall	29	0.7926	0.8296	
	Research	13	0.802	0.8299	0.518
	Development	4	0.6574	0.6982	0.719
	Commercialization	4	0.7941	0.8210	0.755
	Efficient	8	0.7625	0.8106	0.763
		78	0.7845	0.8106	0.763

3.8 Validity Testing

3.8.1 Content Validity

Content validity or face validity focuses on the adequacy with which the domain of the concept under study is captured by the measure (Churchill, 1995). The key to content validity lies in the procedures that are used to develop the instrument. These procedures include examining the literature and testing the internal consistency. In this study, careful scrutiny of the literature and testing the internal consistency, together with in-depth interviews of the top executive level and director of the projects as well as a pre-test were conducted to help ensure that only relevant items were included in the final instrument.

3.8.2 Convergent Validity

Confirmatory factor analysis (CFA) was conducted to ensure whether each factor exhibits convergent validity. Convergent validity is defined as the agreement among measures of the same factor. Convergent validity is established when a CFA models satisfactorily and all factor loadings are significantly and preferably "high" (Bagozzi et al., 1991: 421-458). Refer to table 3.12; every item had factor loadings and communality over 0.30, indicating its practical significance and sufficient level of explanation, respectively.

3.9 Chapter Summary

This chapter describes the development of the mail surveys, measures for the surveys, data collection and data analysis procedures. The sample frame was university-industry alliance partners. It was indicated that the hypotheses would be tested using structural equation modeling analysis. Reliability and validity testing were conducted. Confirmatory factor analysis was used to find out whether each indicator truly represented each factor. The next chapter will further address the results from the measurement model assessment and present the results by the structural model testing.

CHAPTER 4

RESEARCH RESULTS

This chapter presents the results of the hypothesis tests. It is organized into four sections. The first section describes the characteristics of the respondents and organizations. The second section presents the descriptive statistics of all research variables. The next section presents the statistical assumption testing and the results of the hypothesis testing. The last section summarizes the results.

4.1 Sample Characteristics

The description of the findings in this section was summarized according to the main relevant elements of the study, illustrated by distribution of percentages, mean score and standard deviation in the forms of cross tabulation.

As shown in table 4.1, the final sample included 240 alliance project coordinators, 38 respondents working in the position of presidents, owners, chief executive, managing director, deputy managing director, dean and director of department. 103 of them were in the operational positions such as chief operations, deputy vice president in operations, factory manager, head of operational department and general manager. 99 of them were researchers and project coordinators. The majority of the respondents worked primarily for public universities accounting for nearly 70% of the respondents. Private companies, broker associations from both governmental and public sectors as well as governmental institutions were 11.3%, 7.9% and 4.2% respectively. The respondents those who worked for joint venture companies, private companies and state enterprises were the minority of the sample group. Of the 240 respondents, 82% have experienced in alliance partnership before. 48.9% are mainly partners in the forms of joint R & D or joint marketing with contract-based agreement followed by 23.3% of individual consultancy in the forms

of personnel exchange, training or curriculum development for particular project. 16.4% is partners with no equity and 11.7% is joint ventures accordingly.

Table 4.1 Profile of Respondents

Characteristics		Number	Percent
Position	President, Owner, Chief executive, Managing Director, Deputy Managing director, Dean, Director of Department	38	15.83
	Chief operations, Vice president in operation	103	42.92
	Deputy vice president in operations; factory manager, Operation manager, Head of operation department, General manager		
	Researcher, Project coordinator	99	41.25
	Total	**240**	**100.0**
Type of Organization	Public University	166	69.2
	Private University	5	2.1
	State Enterprise	5	2.1
	Governmental Institutions (Ministry, Bureau, Department)	10	4.2
	Private company	27	11.3
	Joint ventures	8	3.3
	Broker Association	19	7.9
	Total	240	100.0
Alliance Experience	Yes	197	82.0
	No	43	18.0
	Total	240	100.0
Type of Alliance Partnership	Joint ventures	25	11.7
	Joint R&D or joint marketing with contract-based agreement	124	48.9
	No equity, no contract agreement	35	16.4
	Individual consultancy for particular projects	56	23.3
	Total	240	100.0

Table 4.2 Characteristics of Alliance Partnership

Characteristics		Number	Percent
Motives of Alliance Collaboration	Gaining access to financial support from partner.	88	19.2
	Acquiring new technological and know-how Breakthrough from partner.	161	35.2
	Gaining tacit knowledge and technological know-how from partner	84	18.3
	Using facilities and resources provided by partner.	78	17.0
	Others	47	10.3
	Total	**458**	**100.0**
Characteristics Of Alliance Partnership	Individual consultancy with a particular researcl or professor (paid for or free)	166	21.1
	Informal exchange forums and workshops	77	9.8
	Scholarships and postgraduate linkages researches	73	9.3
	Student interns program	142	18.0
	Cooperative education Program	47	6.0
	Collaboration through broker associations	53	6.7
	Cooperative research projects between partners with contract agreement	119	15.1
	Research grants and donations for R&D, general or directed to specific departments in university department	70	8.9
	University-industry research consortia	35	4.4
	Others	5	0.6
	Total	**787**	**100.0**
Purposes of Alliance Collaboration	To innovate new product development for public interest and commercial purposes	227	96.2
	Others	9	3.8
	Total	**240**	**100.0**

Table 4.2 provides the respondent's purposes of alliance collaboration which can be more than one option. Approximately 35.2% of the respondents enter into the alliance partnership in order to develop innovation and scientific breakthrough. Nineteen point two percent want to gain financial support from the partners. To gain tacit knowledge and technical know-how was accounted for 18.3%, followed by the

purposes of using the partners' facilities and equipment at 17.0%. The miscellaneous purposes such as for research sponsored projects, problem-solving consultants; academic services, cooperative education and student internship constituted 10.3% respectively. Most of respondents about 96.2% were involved in the university-industry projects that focused on the development of new products and innovation for public interest and commercial purposes while only 3.8% have other purposes.

As can be seen, in each alliance project, partnership and agreement can be in various forms. Many respondents mentioned that alliance project in which they were in charge of can be in multiple facets in one designated project such as individual consultancy, research grant, student internship and so on. As revealed by the results, the characteristics of university-industry alliance partnership were mainly more than one form. However, the majority were classified into the patterns of individual consultancy with a particular researcher or professor (paid for or free), followed by student interns and collaborative research projects with partners through contract-based agreement by 18.0% and 15.1% accordingly. Cooperative education program and other type of partnership were the minority of the sampling group.

4.2 Descriptive Statistics

Refer to table 4.3, in university-industry partnership, the activities that were organized to exchange the information and educate their personnel for development during the alliance collaboration were taken place between 1-6 times/ year. Site visit and tour in university or focal partner's entrepreneurial places were the most popular activities about 79.6%, followed by co-developing the research department between partners, student interns, in-training courses and training courses organized by partners and broker associations respectively. In terms of joint involvement in university curriculum development to meet industrial needs, these activities were organized either none or 1-6 times/ year in some particular projects.

As illustrated in table 4.4, in the perspectives of resource contribution towards alliance, the results show that university contributed the most in manufacturing-related technology and know-how by 17.9%, followed by information technology (13.3%), human resources (12.7%) and quality control (11.7%). Only 1.4% view that the co-

development of research project and personnel exchange was the resources for major contribution.

Table 4.3 The Frequency of Activities in Information and Knowledge Exchange between University-Industry Partnerships in Developing the Effectiveness of Alliance Collaboration

	Number of Time				$\bar{x}$	S.D.
	None	1-6	7-12	13 or more		
1.In-house training courses	58 (26.5%)	137 (62.6%)	4 (1.8%)	20 (9.1%)	1.94	0.80
2.Training courses organized by partner	88 (44.4%)	95 (48.0%)	4 (2.0%)	11 (5.6%)	1.69	0.77
3.Training courses organized by broker associations	63 (33.7%)	107 (57.2%)	12 (6.4%)	5 (2.7%)	1.78	0.68
4.Student interns	28 (12.6%)	151 (68.0%)	20 (9.0%)	23 (10.4%)	2.17	0.78
5. site visit and tours	14 (6.3%)	176 (79.6%)	11 (5.0%)	20 (9.0%)	2.17	0.67
6. Co-develop research department between partners	34 (15.8%)	156 (72.6%)	9 (4.2%)	16 (7.4%)	2.03	0.71
7. Joint involvement in university curriculum development to meet industrial needs	94 (49.5%)	94 (49.5%)	1 (0.5%)	1 (0.5%)	1.52	0.54
8. others	4 (33.3%)		4 (33.3%)	4 (33.3%)	2.67	1.30
Total					**1.95**	**0.50**

Likewise the focal alliance partners, they also contributed most to the alliance in terms of manufacturing-related technology and know-how by 14.8%. Quality control was pretty much the same by 10.3%. However, the industrial partners contributed more than their university partners in terms of raw materials counted by 12.1%, followed by marketing know-how and marketing access (11.4%), financial resources (9.7%), and distribution channel (9.5%).The co-development research project and personnel exchange were counted in the lowest priority (about 2.2% and 1.4%) for both parties.

Table 4.4 The Percentage of Partners' Contribution towards the Alliance Partnership

Resource Exchange in the Partnership	Focal Partner		University	
	Number	(%)	Number	(%)
1.Manufacturing-related technology and know-how	86	14.8	166	17.9
2. Creative ideas and scientific breakthroughs	42	7.2	126	13.6
3. Quality control	60	10.3	108	11.7
4.Marketing know-how and marketing access	55	9.5	40	4.3
Distribution channel	70	12.1		4.4
5. Raw materials			41	
6. Marketing know-how and marketing access	66	11.4	41	4.4
7. Financial resources	56	9.7	75	8.1
8. Human resources	50	8.6	118	12.7
9. Management systems	48	8.3	75	8.1
10. Information technology	34	5.9	123	13.3
11. Others, (co-research development/ personnel exchange)	13	2.2	13	1.4
Total	**580**	**100.0**	**926**	**100.0**

4.3 Research Variables

4.3.1 Partner Complementarities

Table 4.5 provides the level of strategic alignment together with resource and knowledge complementarities between alliance partners. The frequency distributions, means and other descriptive statistics of the partner complementarities are displayed. The results indicate that the mean score of the partner complementarities is 3.60 and the standard deviation is 0.48, indicating a moderate level.

As can be seen, a majority of the respondents, 42.9 percent, perceived that the alliance partners need each other's resources to accomplish the overall goals and responsibilities. Around 52.1 percent agree with the fact that the alliance cooperation will be of strategic importance for their organization and their focal partners for the future. 47.3 percent of them agree that the alliance partnership could not be established without their partners' knowledge and expertise to widen and improve the existing specialized knowledge. Approximately, 52.3 and 56.1 percent of them perceive that their organization and partner contribute with different resources and competencies will mutually extend the scope of their existing businesses and specialization accordingly. However, 38.1 percent strongly disagree that the alliance activity is tied to the overall corporate strategy for all partners and 29.8 percent strongly disagree that there is lack of agreed upon objectives between alliance partners.

Table 4.5 Resource Contributions between Partners in Terms of Strategic Alignment, Resource and Knowledge Complementarities

	Level					$\bar{x}$	S.D.
	Strongly Disagree	**Disagree**	**Uncertain**	**Agree**	**Strongly Agree**		
-Your organization and your partners need each other's resources to accomplish the overall goals and responsibilities.	**4** (**1.7%**)	**8** (**3.3%**)	**22** (**9.2%**)	**103** (**42.9%**)	**103** (**42.9%**)	**4.22**	**0.87**
-This cooperation will be of strategic importance for our organization and our partner for the future.	**5** (**2.1%**)	**4** (**1.7%**)	**30** (**12.6%**)	**124** (**52.1%**)	**75** (**31.5%**)	**4.09**	**0.83**
-There is lack of agreed upon objectives between your organization and your partners.(reversed code)	**91** (**38.1%**)	**61** (**25.5%**)	**57** (**23.8%**)	**24** (**10.0%**)	**6** (**2.5%**)	**2.13**	**1.11**
-The alliance activity is not tied to the overall corporate strategy for all partners.(reversed code)	**70** (**29.8%**)	**51** (**21.7%**)	**49** (**20.9%**)	**53** (**22.6%**)	**12** (**5.1%**)	**2.51**	**1.27**
-The alliance partnership will not able to establish without your partners' knowledge and expertise to help broaden the existing specialized knowledge to be more efficient.	**10** (**4.2%**)	**16** (**6.7%**)	**25** (**10.5%**)	**113** (**47.3%**)	**75** (**31.4%**)	**3.95**	**1.03**
-Your organization and your partner contribute with different resources and competencies which broaden your knowledge range and resources to be more competitive in terms of the launch of new products or services.	**5** (**2.1%**)	**8** (**3.3%**)	**37** (**15.5%**)	**125** (**52.3%**)	**64** (**26.8%**)	**3.98**	**0.86**
-Your partner possesses distinctive core competences and the acquired knowledge from them helps increase the scope of your business and specialization.	**8** (**3.3%**)	**11** (**4.6%**)	**21** (**8.8%**)	**134** (**56.1%**)	**65** (**27.2%**)	**3.99**	**0.92**
Total (Partner Complementarities)						**3.60**	**0.48**

4.3.2 Partner Attributes

Table 4.6 and 4.7 provide the level of partner attributes which are measured by the degree of staff's learning attitudes and abilities, skills of joint alliance management and structural characteristics. The results indicate that the alliance partners have achieved overall partner attributes at a high level (Mean score = 3.64), especially in all areas of learning attitudes and abilities (mean score = 3.90), skills of joint alliance management (Mean score =3.52), and structural characteristics (Mean score = 3.50) accordingly.

1) Staff's Learning Attitudes and Abilities

As can be seen, 47.3 percent of respondents view that the organizational culture of alliance partners encourages learning new ideas, concepts and methods and promotes the sharing of ideas across different units of functions.

In addition, 42.9% of them evaluate that the alliance partners view learning new skills and knowledge as a key investment in your organization's future. In terms of absorptive capacity, the results also indicate that over 50 percent of the respondent report that the alliance partners are capable of integrating new information from various sources, combining knowledge acquired from outside technologies into their business activities and managing new information in meaningful way.

2) The Skills of Joint Alliance Management

Next, in the perspectives of joint alliance management, the results of the study show that 51.7 percent of the respondents view that their organization has learned how to handle alliance through previous cooperative alliance. 39.3 percent of them view that their organization has capable alliance managers who know how to solve the conflict between partners very well. 42.2 percent perceive that the alliance managers are competent in managing the projects in terms of collaboration with the partners. Approximately 38.5 percent of them agree that their organization can anticipate which partner could help accomplish the innovation and 43.1 percent of the respondents perceive that the alliance manager scans for and identifies potential partners that have the complementary resources that are needed for the alliance project.

3) Structural Characteristics

Table 4.7 shows the structural characteristics of the alliance partners which are measured by the degrees of formalization, centralization and complexity. The results indicate that the alliance partners have achieved overall structural characteristics at a high level (mean score = 3.50). In terms of centralization, 51.9 percent of the respondents view that all issues of alliance projects are contacted and transferred through alliance managers. 41.8 percent of them evaluate that all information concerning alliance projects were channeled through designated offices.

Approximately 42.1 percent agree that the alliance partner rely extensively upon contractual rules and policies in controlling day-to-day operations of the alliances. More than 50 percent report that the alliance partners have or plan to have detailed legal documents for the financial concerns and projects they have agreed to work on to protect against loss of intellectual property. Nearly 50 percent of them agree that problems in alliances are resolved hierarchically from different management rankings. Almost 60 percent perceive that in the alliance organization, their daily operations are not complex because a few departments were assigned for dealing with alliance projects.

Table 4.6 Partner Attributes in Terms of Staff's Learning Abilities and Skill of Joint Alliance Management

	Level					$\bar{x}$	S.D.
	Strongly Disagree	Disagree	Uncertain	Agree	Strongly Agree		
-The organizational culture of your organization and partners encourages learning new ideas, concepts and methods and promotes the sharing of ideas across different units of functions.	**1** (**0.4%**)	**4** (**1.7%**)	**59** (**24.9%**)	**112** (**47.3%**)	**61** (**25.7%**)	**3.96**	**0.78**
-Your organization view learning about new skills and knowledge as a key investment in your organization's future.	**0**	**5** (**2.1%**)	**24** (**10.1%**)	**107** (**45.0%**)	**102** (**42.9%**)	**4.29**	**0.73**
-Your organization and your partners are capable of managing new information in meaningful way.	**2** (**0.8%**)	**14** (**5.9%**)	**70** (**29.3%**)	**126** (**52.7%**)	**27** (**11.3%**)	**3.68**	**0.78**
-Your organization and your partners are capable of integrating new information from various sources.	**5** (**2.1%**)	**4** (**1.7%**)	**56** (**23.4%**)	**135** (**56.5%**)	**39** (**16.3%**)	**3.83**	**0.79**
-Your organization combines knowledge acquired from outside technologies into your business activities**.**	**4** (**1.7%**)	**15** (**6.3%**)	**53** (**22.2%**)	**126** (**52.7%**)	**41** (**17.2%**)	**3.77**	**0.86**
Total (Learning Abilities)						**3.90**	**0.53**
-Your organization has learned how to handle alliance through previous cooperative ventures.		**18** (**7.6%**)	**26** (**10.9%**)	**123** (**51.7%**)	**71** (**29.8%**)	**4.04**	**0.84**
-Your organization has capable alliance managers who know how to solve the conflict between partners very well.	**11** (**4.6%**)	**24** (**10.0%**)	**88** (**36.8%**)	**94** (**39.3%**)	**22** (**9.2%**)	**3.38**	**0.95**
.-The alliance managers are competent in managing the projects in terms of collaboration with the partners.	**4** (**1.7%**)	**22** (**9.4%**)	**87** (**37.0%**)	**99** (**42.1%**)	**23** (**9.8%**)	**3.49**	**0.86**
-Your organization can anticipate which partner could help accomplish the innovation.	**8** (**3.3%**)	**25** (**10.5%**)	**92** (**38.5%**)	**92** (**38.5%**)	**22** (**9.2%**)	**3.40**	**0.91**
-Your organization scans for and identifies potential partners that have the complementary resources that are needed in the alliance project.	**5** (**2.1%**)	**48** (**20.1%**)	**67** (**28.0%**)	**103** (**43.1%**)	**16** (**6.7%**)	**3.32**	**0.94**
Total (The Skills of Joint Alliance Management)						**3.52**	**0.68**

Table 4.7 Partner Attributes in Terms of Structural Characteristics (Formalization, Centralization and Complexity)

	Level					$\bar{x}$	S.D.
	Strongly Disagree	Disagree	Uncertain	Agree	Strongly Agree		
-All issues are contacted and transferred through alliance managers.	**8** (**3.4%**)	**35** (**14.8%**)	**35** (**14.8%**)	**123** (**51.9%**)	**36** (**15.2%**)	**3.61**	**1.02**
-All information concerning alliance projects were channeled through designated offices	**13** (**5.6%**)	**44** (**19.0%**)	**62** (**26.7%**)	**97** (**41.8%**)	**16** (**6.9%**)	**3.25**	**1.02**
-Your organization and your partner rely extensively upon contractual rules and policies in controlling day-to-day operation of the alliances.	**21** (**9.0%**)	**33** (**14.2%**)	**69** (**29.6%**)	**98** (**42.1%**)	**12** (**5.2%**)	**3.20**	**1.05**
-Your organization and your partner have or plan to have detailed legal documents for the projects you have agreed to work on to protect against loss of intellectual property.	**12** (**5.2%**)	**13** (**5.6%**)	**52** (**22.3%**)	**118** (**50.6%**)	**38** (**16.3%**)	**3.67**	**0.99**
-The amount of financial resources each partner in the alliance was expected to contribute toward the alliance development was clearly laid out in the contract.	**9** (**3.9%**)	**14** (**6.0%**)	**31** (**13.3%**)	**127** (**54.5%**)	**52** (**22.3%**)	**3.85**	**0.96**
-Problems in alliance activities are resolved from different management rankings.	**11** (**4.7%**)	**33** (**14.2%**)	**52** (**22.3%**)	**113** (**48.5%**)	**24** (**10.3%**)	**3.45**	**1.01**
-Each alliance organization makes decisions on change in daily operation without complexity because of few departments assigned for dealing with alliance projects.	**16** (**6.8%**)	**12** (**5.1%**)	**52** (**22.2%**)	**133** (**56.8%**)	**21** (**9.0%**)	**3.56**	**0.97**
Total Structural Characteristics						**3.50**	**0.69**
Total (Partner Attributes)						**3.64**	**0.51**

Table 4.8 The Summary of Mean Scores and Standard Deviation of Partner Attributes

Partner Attributes	$\bar{x}$	S.D.	Level	Ranking
-Staff's Learning Attitudes and Abilities	3.90	0.53	High	3
-Skills of Joint Alliance Management	3.52	0.68	High	1
-Structural Characteristics	3.50	0.69	High	2
Total (Partner Attributes)	3.64	0.51	High	

According to table 4.8, mean scores and standard deviation of the partner attributes are at the high level ($\bar{x}$ = 3.90). Among three sub-concepts of partner attributes, staff's learning attitudes and abilities are primarily positioned in the ranking. Skills of joint alliance management ($\bar{x}$ =3.52) and structural characteristics ($\bar{x}$ = 3.50) are in the second and third rankings, respectively.

4.3.3 Coordinating Factors

1) Cultural Compatibility

Table 4.9 shows the level of coordinating factors which are measured by the degrees of cultural and operational compatibility and flexible university policies. Based on the overall data, the alliance partners have achieved a high level of coordination (mean Score = 3.42). However, In terms of cultural compatibility, the respondents has achieved a degree of cultural compatibility at a moderate level (Mean score = 3.12). About 38.4 percent are uncertain as to whether the relationship between partners is marked by a high degree of harmony in management styles and the organizational values and social norms prevalent in the alliance partners, were congruent or not.

2) Operational Compatibility

On the other hand, the mean score of operational compatibility was 3.66, indicating a high level of these coordinating factors. Approximately 51 percent of the respondents perceived that both partners involved in this project had compatible

philosophies concerning, and approaches to business dealings. About 62.7 percent agreed that there was the same agreement between partners regarding to joint management aspects of the alliance.

3) Flexible University Policies

In terms of flexible university policies, the mean score of this sub-concept was 3.87, indicating a high level of coordination. More than 40 percent of respondents viewed that the university makes an effort to make decision on implementing daily operations based on the mutual benefit and consensus with the industrial partners. Approximately 46 percent of them felt that there was flexibility for the universities to modify the predefined goals of their academic studies to match well with the needs of all industrial partners and there was the same agreement between university and industrial partners regarding the launch of new products, patents and publication of academic outputs that was transformed to the new products and process development.

Table 4.9 Coordinating Factors in Terms of Operational and Cultural Compatibility and Flexible University Policies

	Level					$\bar{x}$	S.D.
	Strongly Disagree	Disagree	Uncertain	Agree	Strongly Agree		
- The relationship between partners is marked by a high degree of harmony in management styles.	**3** (**1.3%**)	**66** (**27.8%**)	**91** (**38.4%**)	**62** (**26.2%**)	**15** (**6.3%**)	**3.08**	**0.92**
-The organizational values and social norms prevalent in the alliance partners were congruent.	**6** (**2.5%**)	**51** (**21.5%**)	**91** (**38.4%**)	**78** (**32.9%**)	**11** (**4.6%**)	**3.16**	**0.90**
Total (Cultural Compatibility)						**3.12**	**0.85**
- Both partners involved in this project had compatible philosophies/approaches to business dealings.	**0**	**21** (**9.0%**)	**79** (**33.9%**	**119** (**51.1%**)	**14** (**6.0%**)	**3.54**	**0.74**
-There is a same agreement between partners regarding to jointly management aspects of the alliance.	**0**	**9** (**3.9%**)	**54** (**23.2%**)	**146** (**62.7%**)	**24** (**10.3%**)	**3.79**	**0.67**
Total (Operational Compatibility)						**3.66**	**0.54**
-University makes an effort to make decision on implementing daily operation based on mutual benefit and consensus with the industrial partners.	**3** (**1.3%**)	**49** (**20.9%**)	**58** (**24.8%**)	**100** (**42.7%**)	**24** (**10.3%**)	**3.40**	**0.97**
-There is flexibility for the universities to modify predefined goals of their academic studies to match well with the needs of all industrial partners.	**7** (**2.9%**)	**31** (**13.0%**)	**57** (**23.9%**)	**110** (**46.2%**)	**33** (**13.9%**)	**3.55**	**0.98**
-There is a same agreement between university and industrial partners regarding to the launch of new product, patent and publication of the new product and process development.	**7** (**3.0%**)	**14** (**6.0%**)	**61** (**26.1%**)	**109** (**46.6%**)	**43** (**18.4%**)	**3.71**	**0.94**
Total (Flexible University Policies)						**3.47**	**0.85**
Total (Coordinating Factors)						**3.42**	**0.47**

Table 4.10 The Summary of Mean Scores and Standard Deviation of Coordinating Factors

Coordinating Factors	$\bar{x}$	S.D.	Level	Ranking
Cultural Compatibility	3.12	0.85	Moderate	3
Operational Compatibility	3.66	0.54	High	1
Flexible University Policies	3.47	0.85	High	2
Total (Coordinating Factors)	**3.42**	**0.57**	**High**	

According to table 4.10, the mean scores and standard deviation of the coordinating factors were at a high level ($\bar{x}$ = 3.42). Among the three sub-concepts of coordinating factors, operational compatibility was in the first ranking followed by flexible university policies ($\bar{x}$ =3.47) and cultural compatibility ($\bar{x}$ = 3.12) respectively.

4.3.4 Relationship Factors

Table 4.11 provides the opinion on the level of relationship quality in terms of trust, commitment, and bilateral information exchange. The relationship quality is indicated by the degree of respondent's agreement with the levels of character-based and competence-based trust, commitment to meeting goals and objectives, commitment to making effort for the alliance, commitment to the relationship, information quality, information sharing, and participation in planning and goal setting. The mean score of the relationship factors was 4.03, indicating a high level of these relationships.

1) Trust

In terms of trust, approximately 46 percent of the respondents viewed that the alliance partners would act in their organization's best interest. Especially noteworthy was the relationship factors in terms of trust, where approximately 60 to 70 percent of the respondents agreed that the alliance partners are trusted and relied on the partner's competence and abilities in day-to-day activities, were knowledgeable in solving problems and fulfilled agreements.

Table 4.11 Relationship Factors in Terms of Character-Based and Competence-Based Trust

	Level					$\bar{x}$	S.D.
	Strongly Disagree	**Disagree**	**Uncertain**	**Agree**	**Strongly Agree**		
-Your organization trusted that that the partners would act in your organization's best interest.	**3 (1.3%)**	**12 (5.0%)**	**90 (37.5%)**	**111 (46.3%)**	**24 (10.0%)**	**3.59**	**0.79**
-Both firms were generally honest and truthful with each other.	**0**	**7 (2.9%)**	**34 (14.2%)**	**156 (65.0%)**	**43 (17.9%)**	**3.98**	**0.66**
-Your organization had confidence in the partner's competence and abilities as well as its motives in sharing these abilities.	**0**	**6 (2.5%)**	**33 (13.8%)**	**171 (71.3%)**	**30 (12.5%)**	**3.94**	**0.60**
-Your organization and your partners trust the values and experiences of alliance members in controlling day-to-day activities.	**0**	**4 (1.7%)**	**71 (29.6%)**	**144 (60.0%)**	**21 (8.8%)**	**3.76**	**0.63**
-Your organization and your partners are competent in fulfilling the agreement.	**0**	**0**	**28 (11.7%)**	**166 (69.5%)**	**45 (18.8%)**	**4.07**	**0.55**
-Your partner's personnel are knowledgeable in solving problems	**0**	**0**	**51 (21.3%)**	**138 (57.5%)**	**51 (21.3%)**	**4.00**	**0.65**
Total (trust)						**3.89**	**0.48**

Table 4.12 Relationship Factors in Terms of Commitment

	Level					$\bar{x}$	S.D.
	Strongly Disagree	**Disagree**	**Uncertain**	**Agree**	**Strongly Agree**		
-Your organization and your partners are willing to dedicate whatever people and resources it took to transfer knowledge in the alliance project.	**2 (0.8%)**	**4 (1.7%)**	**15 (6.3%)**	**111 (46.3%)**	**108 (45.0%)**	**4.33**	**0.74**
-Both firms were committed to making the project a success of knowledge transfer**.**	**0**	**0**	**23 (9.6%)**	**126 (52.5%)**	**91 (37.9%)**	**4.28**	**0.63**
-Both partners have senior level management commitment toward the use of alliances to achieve strategic goals.	**0**	**13 (5.5%)**	**37 (15.7%)**	**108 (45.8%)**	**78 (33.1%)**	**4.06**	**0.84**
-Staying in a relationship is a necessity.	**0**	**0**	**25 (10.5%)**	**112 (46.9%)**	**102 (42.7%)**	**4.32**	**0.66**
Total (Commitment)						**4.24**	**0.54**

2) Commitment

Table 4.12 presents the respondents on the commitment of the alliance partners. As can be seen, the mean score of commitment is 4.24, indicating a high level of commitment. Almost 80 percent of the respondents view that the alliance partners were willing to dedicate for knowledge transfer in the alliance project and stay in the relationship. They agree that their senior level management exhibits commitment toward to the use of alliances in order to achieve strategic goals.

3) Bilateral Information Exchange

Table 4.13 summarizes the opinions regarding the level of bilateral information exchange. These factors are comprised of the information quality, information sharing, and participation in planning and goal setting. Approximately, 60 percent agree that information quality is achieved in the partnership in terms of its timely quality and adequacy.

The data also shows that about 80 percent of respondents agree and strongly support that the alliance partners have enough information sharing in terms of meetings, site visits, e-mails and telephone communications as well as the levels of participation in planning and setting the mutual goals between partners.

Table 4.13 Relationship Factors in Terms of Information Sharing

	Level					$\bar{x}$	S.D.
	Strongly Disagree	**Disagree**	**Uncertain**	**Agree**	**Strongly Agree**		
-Alliance partner provided us with adequate information.	**0**	**7 (2.9%)**	**63 (26.4%)**	**137 (57.3%)**	**32 (13.4%)**	**3.81**	**0.69**
-Alliance partner provided us with timely information.	**0**	**11 (4.6%)**	**76 (31.8%)**	**128 (53.6%)**	**24 (10.0%)**	**3.69**	**0.71**
-To what extent are/were the following used in relations to the technology agreement with the university? -Meeting between university and industrial partners' technology experts.	**0**	**15 (6.3%)**	**39 (16.3%)**	**155 (64.6%)**	**31 (12.9%)**	**3.84**	**0.72**
-Site visit between experts from both parties	**0**	**1 (0.4%)**	**29 (12.1%)**	**149 (62.1%)**	**61 (25.4%)**	**4.13**	**0.61**
-E-mail communication between university and your firm's technology experts	**0**	**3 (1.3%)**	**34 (14.2%)**	**142 (59.2%)**	**61 (25.4%)**	**4.09**	**0.66**
-Telephone communication between university and your firm's technology experts.	**0**	**8 (3.3%)**	**30 (12.5%)**	**152 (63.3%)**	**50 (20.8%)**	**4.02**	**0.68**
-Exchange of information in this relationship took place frequently and informally.	**2 (0.8%)**	**4 (1.7%)**	**40 (16.7%)**	**144 (60.0%)**	**50 (20.8%)**	**3.98**	**0.72**
- Partners seek advice from each other and participate in planning activities in decision-making toward s the alliance	**1 (0.4%)**	**1 (0.4%)**	**33 (13.8%)**	**167 (69.6%)**	**38 (15.8%)**	**4.00**	**0.59**
Total (Relationship Factors)						**3.94**	**0.43**

Table 4.14 The Summary of Mean Scores and Standard Deviation of Relationship Factors

Relationship Factors	$\bar{x}$	S.D.	Level	Ranking
Trust	3.89	0.48	High	3
Commitment	4.25	0.54	High	1
Bilateral Information Exchange	3.94	0.43	High	2
Total (Relationship Factors)	**4.03**	**0.41**	**High**	

According to table 4.14, the mean scores and standard deviation of the relationship factors were at a high level ($\bar{x}$ = 4.03). Among three sub-concepts of relationship factors, commitment was at the highest level ($\bar{x}$ = 4.25), followed by bilateral information exchange ($\bar{x}$ =3.94) and trust ($\bar{x}$ = 3.89), respectively.

4.3.5 Effectiveness of Knowledge Transfer

1) Research Outcomes

From table 4.15, the data indicate that the majority of respondents about 87 percent were likely to publish researches and around 54 percent granted certificate guaranteed knowledge and competence rather than patents and licenses.

2) Development through Tacit Knowledge Transfer

As shown in table 4.16, in terms of the human capital development through tacit knowledge transfer, 36.8 percent agreed that there was participation between alliance partners in developing the cooperative education programs or research in the alliance projects. About 29 percent of the respondents reported that graduates that had passed on-going personnel exchanges and/or apprenticeships were hired by the focal partner. Also, around 24 percent believed that there were personnel exchanges specifically for developing and commercializing new technologies, whereas about 10.1 percent confirmed that there was participation in new product development or new management systems and procedures.

Table 4.15 Research Outcomes from the Alliance Partnership

Research Outcomes	None	Granted/ Applying
Patents		
1. Copyright	**112 (76.7%)**	**34 (22.3%)**
2. Invention Patent	**107 (67.3%)**	**52 (32.7%)**
3. Petty Patent	**111 (66.5%)**	**56 (33.6%)**
4. Patent for Production Design	**118 (77.1%)**	**35 (22.9%)**
Average Mean/ Standard Deviation	$\bar{x}$ **= 0.18**	**S.D = 0.29**
Licenses		
5. Thailand Industrial Standards (TIS) marks	**129 (91.5%)**	**12 (8.6%)**
6. ISO/IER Guide25 (Laboratory accreditation)	**97 (70.8%)**	**40 (29.2%)**
7. TIS/ISO9000 (System)	**107 (75.4%)**	**35 (24.6%)**
8. TIS/ISO14000 (Environmental Management System)	**118 (83.1%)**	**24 (16.9%)**
9. TIS 18000 (Occupational Health and Safety Management System)	**121 (86.4%)**	**19 (13.6%)**
10 Trademarks	**110 (78.6%)**	**30 (21.4%)**
Average Mean/ Standard Deviation	$\bar{x}$ **= 0.11**	**S.D = 0.24**
Reward		
11 Grant certificate guaranteed knowledge and competence	**71 (45.8%)**	**84 (54.2%)**
Average Mean/ Standard Deviation	$\bar{x}$ **= 0.35**	**S.D = 0.48**
Publications		
12. Research Publication	**25 (12.8%)**	**170 (87.2%)**
Average Mean/ Standard Deviation	$\bar{x}$ **= 0.71**	**S.D = 0.46**
Total (Research Outcomes)	$\bar{x}$ **= 0.34**	**S.D = 0.26**

Table 4.16 The Percentage of Development through Tacit Knowledge Transfer

Development through tacit Knowledge Transfer	Numbers	Percentage (%)	$\bar{x}$	S.D
-Firm's involvement in the development and use of cooperative education programs or research in the alliance projects	**175**	**36.8**	**0.70**	**0.45**
-Hiring graduates that passed on-going personnel exchange and/or apprenticeships	**121**	**23.9**	**0.50**	**0.50**
-.Number of personnel exchanges specifically for developing and commercializing new technologies	**48**	**10.1**	**0.20**	**0.40**
-Level of participation in proceeding new product development or new management systems and procedures	**128**	**29.2**	**0.48**	**0.50**
Total (Development through Tacit Knowledge Transfer)	**476**	**100.0**	**0.48**	**0.28**

3) Commercialization

Table 4.17 shows the respondents' on the degree of commercialization between alliance partners, which consists of the extent to which industrial firms and universities collaborate, participate, and are involved in the process of decision-making, developing, and commercializing products or processes from the projects in terms of time spent, joint decision-making, numbers of personnel exchanges and levels of jointly-owned operational facilities between partners. The mean score of this type of collaboration was 3.19, indicating a moderate level of commercialization between the firms. About 44 percent agreed that the level of joint decision-making was the highest level of collaboration between the partners.

4) Efficient Coordination

Table 4.18 shows the opinion of respondents regarding alliance performance in terms of mutual comprehension, usefulness of the alliance project, goal attainment, and speed and economy. The mean score of the collaboration performance was 3.62, indicating a high level. In terms of mutual comprehension, about 80 percent of them agreed that the new knowledge that they acquired from their partners was well understood in their organization**.** Around 66 percent of them felt

that the new knowledge acquired from their partners was complete enough in order for them to become proficient with it Around 60-70 percent stated that the alliance projects were useful in terms of producing new products and services offered to the market, together with new production processes which had been learnt from their partners. However, about 53 percent of them were uncertain that the new knowledge provided by their partners was acquired and implemented at a low cost. In addition, approximately 50 percent of the respondents perceived that the acquisition and implementation of the new knowledge from the partners did not require the utilization of too many company resources.

Table 4.17 The Extent of Commercialization within the Alliance Partnership

	Level					$\bar{x}$	S.D.
	Very low	**Low**	**Moderate**	**High**	**Very High**		
-Time spent interacting with university research center personnel specifically for developing and commercializing new technologies	**15 (6.3%)**	**29 (12.2%)**	**95 (40.1%)**	**77 (32.5%)**	**21 (8.9%)**	**3.25**	**0.99**
-Level of joint decision-making in technological consulting arrangements for developing and commercializing new technologies	**11 (4.6%)**	**25 (10.5%)**	**67 (28.3%)**	**106 (44.7%)**	**28 (11.8%)**	**3.48**	**0.99**
-Number of personnel exchanges specifically for developing and commercializing new technologies	**19 (8.0%)**	**61 (25.7%)**	**89 (37.6%)**	**59 (24.9%)**	**9 (3.8%)**	**2.91**	**0.98**
-Level of participation in jointly owned operation facilities for developing and commercializing new technologies	**17 (7.2%)**	**56 (23.6%)**	**80 (33.8%)**	**64 (27.0%)**	**20 (8.4%)**	**3.06**	**1.06**
Total (Commercialization)						**3.17**	**0.81**

Table 4.18 The Effectiveness of Knowledge Transfer: Efficient Coordination Dimensions

	Level					$\bar{x}$	S.D.
	Strongly Disagree	Disagree	Uncertain	Agree	Strongly Disagree		
-The new knowledge that our organization acquired from our partners was complete enough to become proficient with it	**0**	**14 (6.0%)**	**64 (27.5%)**	**127 (54.5%)**	**28 (12.0%)**	**3.76**	**0.75**
-The new knowledge that we acquired from our partners was well understood in the organization	**0**	**10 (4.2%)**	**36 (15.3%)**	**142 (60.2%)**	**48 (20.3%)**	**3.70**	**0.73**
-The knowledge held by the university research center directly resulted in new products and service offered to the market.	**0**	**10 (4.2%)**	**66 (27.8%)**	**128 (54.0%)**	**33 (13.9%)**	**3.78**	**0.73**
-Our production process has been advanced and accredited with the acquired technology from our partners.	**2 (0.8%)**	**4 (1.7%)**	**62 (26.2%)**	**144 (60.8%)**	**25 (10.5%)**	**3.78**	**0.68**
-Important new product and process technologies are quickly diffused from our partners.		**8 (3.4%)**	**97 (41.6%)**	**110 (47.2%)**	**18 (7.7%)**	**3.59**	**0.68**
-It took our company a short time to acquire and implement the knowledge provided by our partners	**1 (0.4%)**	**30 (12.7%)**	**98 (41.4%)**	**91 (38.4%)**	**17 (7.2%)**	**3.39**	**0.81**
-The new knowledge provided by our partners was acquired and implemented at a very low cost	**5 (2.1%)**	**31 (13.2%)**	**124 (53.0%)**	**46 (19.7%)**	**28 (12.0%)**	**3.26**	**0.91**
-The acquisition and implementation of the new knowledge from our partners did not require the utilization of too many company resources.	**6 (2.6%)**	**21 (9.0%)**	**88 (37.6%)**	**93 (39.7%)**	**26 (11.1%)**	**3.48**	**0.90**
Total (Efficient Coordination)						**3.65**	**0.51**
Total (Efficient Coordination)						**1.91**	**0.33**

Table 4.19 The Summary of Average Mean Scores of Each Construct Measurement

Descriptive Statistics			
	N	**Mean**	**Std. Deviation**
motivation	240	4.15	0.77
goal	240	2.33	0.99
complementary	240	3.95	1.03
supplementary	240	3.98	0.77
p_complementary	240	3.60	0.48
learning	240	3.90	0.53
skill	240	3.52	0.68
structural	240	3.50	0.69
p_attributes	240	3.64	0.51
cultural	240	3.12	0.85
operation	240	3.66	0.54
flexible	240	3.47	0.85
coordinating	240	3.42	0.57
trust	240	3.89	0.48
commitment	240	4.24	0.54
bilateral	240	3.94	0.43
relationship	240	4.03	0.41
patent	240	0.18	0.29
license	240	0.11	0.24
reward	240	0.35	0.48
public	240	0.71	0.46
research	240	0.34	0.26
educate	240	0.73	0.45
hiring	240	0.50	0.50
proced	240	0.48	0.50
person	240	0.20	0.40
develop	240	0.48	0.28
time	240	3.25	0.99
joint	240	3.48	0.99
exchange	240	2.91	0.98
techno	240	3.06	1.06
commercial	240	3.17	0.81
compre	240	3.70	0.75
useful	240	3.95	0.73
attain	240	3.77	0.73
speed	240	3.48	0.55
economy	240	3.36	0.81
efficient	240	3.65	0.52
effectiveness	240	1.91	0.33
Valid N (listwise)	**240**		

4.4 Results of the Proposed Model Testing

The two goals of the data analysis in this study were: to 1) estimate the strength of the independent variables in explaining the level of effectiveness of knowledge transfer in the university-industry alliance, and 2) to assess the amount of variance in the level of effectiveness of knowledge transfer that can be accounted for by the variables included in the structural model. The data were analyzed in three stages: 1) examining the distribution of the data and to generate input matrixes for the LISREL analysis, 2) using a confirmatory factor analysis (CFA) to examine how well the latent variables are defined by the observed variables, and 3) using LISREL program version 6.0 to estimate the structural relations among the latent variables in the model.

Following with the above steps, this section of the study presents the statistical analysis of the research hypotheses of the effectiveness of knowledge transfer in the university-industry alliance. Evaluations of multicollinearity were first examined, followed by the hypothesis testing respectively. The independent variables included in the evaluation were partner complementarity (strategic alignment and resource and knowledge complementarity), partner attributes (staff's learning abilities, skill of alliance management, and structural characteristics), coordinating factors (operational and cultural compatibility and flexible university policies), and relationship factors (trust, commitment, and bilateral information exchange). Summary statistics and the correlation matrix for the constructs in the model are presented in table 4.20.

4.4.1 Evaluation of Multicollinearity

It is suggested that the independent variables that are included in a model should not be multicollinear. Multicollinearity means that independent variables are highly correlated and this makes it difficult to determine the contribution of each independent variable because the impact is mixed. The presence of a high correlation above 0.5 is the first sign of multicollinearity (Pichit Petaktepsombat, 2005: 548). However, Suchart Prasith-Rathsint (1997) and Hair et al. (1998) argue that the presence of a correlation of 0.8 and above indicates a multicollinearity problem.A

high correlation among the independent variables, 0.90 and above indicates substantial multicollinearity (Hair et al., 1995).

In case multicollinearity is detected, it can be dealt with by 1) omitting one or more highly correlated predictor variables and identifying other, better predictor variables; 2) using the model only for prediction and making no attempt to interpret the regression coefficients; 3) using simple correlation between each predictor and dependent variable in order to understand the predictor dependent variable relationship; and/or 4) use a more sophisticated method of analysis such as Bayesian regression or regression on principal components in order to obtain a model that clearly reflects the simple effects of the predictors (Hair et al., 1995).

In this study, the existence of potential multicollinearity was also examined on the basis of correlation metrics. Table 4.19 presents the mean, standard deviation and correlation matrix for all the variables. The standard deviations of all of the variables indicated a fair amount of the variance in the responses. All means indicated the positive sides of the responses. As illustrated in table 4.20, the correlation matrix was used to examine the collinearity between independent variables as well as the correlation between the dependent variables and the independent variables. However, it is found that the correlation coefficients ranged from 0.008 to 0.574 at the 0.05 level of significance. This is indicated that multicollinearity was not problematic in subsequent analysis. Thus, all variables were retained for further analysis.

Table 4.20 Correlation Matrix

Variables		motivation	goal	complementary	supplementary	learning	skill	structural	cultural	operation	flexible	trust	commitment	bilateral	patent	license
Motivation	r	1.000														
	p	.														
goal	r	-0.252*	1.000													
	p	0.000	.													
complementary	r	0.188	-0.042	1.000												
	p	0.004*	0.518	.												
suppementary	r	0.241*	-0.086	0.312*	1.000											
	p	0.000	0.183	0.000	.											
learning	r	0.445*	-0.334*	0.136*	0.181*	1.000										
	p	0.000	0.000	0.035	0.005	.										
skill	r	0.234*	-0.122	0.140*	0.079	0.539*	1.000									
	p	0.000	0.059*	0.030	0.220	0.000	.									
structural	r	0.398*	-0.016	0.061	0.077	0.397*	0.452*	1.000								
	p	0.000	0.801*	0.350*	0.237	0.000	0.000	.								
cultural	r	-0.070	-0.007	0.031	0.157*	0.246*	0.251*	0.185*	1.000							
	p	0.282	0.912	0.629	0.015	0.000	0.000	0.004	.							
operation	r	0.089	-0.187*	0.138*	0.032	0.345*	0.365*	0.276*	0.417*	1.000						
	p	0.169	0.004	0.032	0.623*	0.000	0.000	0.000	0.000	.						
flexible	r	0.116	0.021	-0.069	0.039	0.143*	0.089	0.372*	0.313*	0.410*	1.000					
	p	0.073	0.748	0.285	0.545	0.027	0.168	0.000	0.000	0.000	.					
trust	r	0.240*	-0.299*	0.134*	0.149*	0.465*	0.241*	0.179*	0.363*	0.525*	0.213*	1.000				
	p	0.000	0.000	0.038	0.021	0.000	0.000	0.005	0.000	0.000	0.001	.				
commitment	r	0.323*	-0.235*	0.103	0.279*	0.441*	0.314*	0.381*	0.103	0.373*	0.249*	0.572*	1.000			
	p	0.000	0.000	0.112	0.000	0.000	0.000	0.000	0.110	0.000	0.000	0.000	.			
bilateral	r	0.129*	-0.139*	0.178*	0.221*	0.332*	0.318*	0.359*	0.207*	0.490*	0.369*	0.574*	0.562*	1.000		
	p	0.046	0.031	0.006	0.001	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	.		
patent	r	0.210*	-0.131*	0.106	0.074	0.124*	0.135*	0.204*	0.063	0.143*	0.247*	-0.005	0.064	0.105	1.000	
	p	0.001	0.043	0.102*	0.254	0.055	0.037	0.001	0.331	0.027	0.000	0.935	0.327	0.103	.	
license	r	0.121	0.027	0.007	0.086	0.117	0.202*	0.155*	0.175*	0.112*	0.165*	0.109	0.127	0.110	0.518*	1.000
	p	0.061*	0.672	0.910*	0.186	0.070	0.002	0.016	0.007	0.083	0.011	0.092	0.050*	0.089	0.000	.
reward	r	0.008	0.099	0.022	0.039*	-0.067	0.085	0.157*	-0.196*	-0.121*	0.127*	-0.075	0.033	0.073	0.448*	0.399*
	p	0.899	0.125	0.739	0.552	0.305	0.188	0.015	0.002	0.061	0.049	0.248	0.612	0.258	0.000	0.000
public	r	0.241*	-0.161*	-0.069	-0.038	0.161*	0.227*	0.134*	-0.132*	-0.089	0.051	0.061	0.261*	0.143*	0.201*	0.123
	p	0.000	0.012	0.284	0.561	0.013	0.000	0.038	0.041	0.170	0.434	0.349	0.000	0.027	0.002	0.057
educate	r	0.109	-0.138*	0.050	0.170*	0.098	0.199*	0.167*	0.174*	0.254*	0.237*	0.148	0.084	0.283*	0.240*	0.053
	p	0.093	0.033	0.442	0.008	0.129	0.002	0.010	0.007	0.000	0.000	0.022	0.193	0.000	0.000	0.411
hiring	r	-0.037	-0.166*	-0.052	-0.070	0.103	0.050	0.082	0.105	0.322*	0.149*	0.177*	0.070	0.234*	0.148*	0.104
	p	0.568	0.010	0.421	0.278	0.111	0.437	0.203	0.106	0.000	0.021	0.006	0.282	0.000	0.022	0.107
proced	r	0.133*	-0.269*	0.050	0.156*	0.175*	0.046	-0.030	0.108	0.155*	0.087	0.205*	0.154*	0.205*	0.342*	0.245*
	p	0.040	0.000	0.440	0.015	0.007	0.477	0.644	0.095	0.016	0.179	0.001	0.017	0.001	0.000	0.000

Table 4.20 (Continued)

Variables		motivation	goal	complementary	supplementary	learning	skill	structural	cultural	operation	flexible	trust	commitment	bilateral	patent	license
person	r	0.125	-0.047	0.188*	0.051	-0.044	0.052	0.136*	0.078	0.171*	-0.073	0.048	-0.033	0.117	0.308*	0.412*
	p	0.053	0.473	0.003	0.427	0.501	0.423	0.035	0.231	0.008	0.261	0.461	0.612	0.070	0.000	0.000
time	r	0.296*	-0.047	0.009	0.164*	0.173*	0.187*	0.288*	-0.230*	-0.083	0.010	0.075	0.210*	0.271*	0.132*	0.101
	p	0.000	0.473	0.887	0.011	0.007	0.004	0.000	0.000	0.203	0.878	0.247	0.001	0.000	0.041	0.120
joint	r	0.274*	-0.078	-0.172*	0.074	0.275*	0.356*	0.438*	0.037	0.177*	0.308*	0.183*	0.384*	0.413*	0.207	0.140*
	p	0.000	0.229	0.008	0.254	0.000	0.000	0.000	0.571	0.006	0.000	0.004	0.000	0.000	0.001	0.030
exchange	r	-0.045	0.127	-0.203*	0.073	0.125	0.387*	0.400*	0.046	0.031	0.178*	-0.208*	0.078	0.172*	0.063	0.072
	p	0.485	0.050*	0.002	0.262	0.053	0.000	0.000	0.480	0.630	0.006	0.001	0.229	0.007	0.334	0.269
techno	r	0.105	0.032	0.041	0.237*	0.199*	0.438*	0.395*	0.111	0.214*	0.288*	-0.017	0.327*	0.272*	0.242*	0.199*
	p	0.104	0.627	0.525	0.000	0.002	0.000	0.000	0.085	0.001	0.000	0.789	0.000	0.000	0.000	0.002
compre	r	0.111	-0.085	0.261*	0.329*	0.046	0.085	0.083	-0.007	0.234*	0.298*	0.292*	0.115	0.490*	0.183*	0.051
	p	0.085	0.190	0.000	0.000	0.481	0.191	0.199	0.914	0.000	0.000	0.000	0.076	0.000	0.004	0.434
useful	r	0.144*	-0.055	-0.015	0.389*	0.179*	0.243*	0.227*	0.040	0.387*	0.323*	0.167*	0.241*	0.457*	0.219*	0.133*
	p	0.025	0.393*	0.820*	0.000	0.006	0.000	0.000	0.537	0.000	0.000	0.010	0.000	0.000	0.001	0.040
attain	r	0.115	-0.046	0.000	0.237*	0.323*	0.374*	0.192*	0.229*	0.303*	0.368*	0.286*	0.202*	0.446*	0.220*	0.067
	p	0.075	0.479	0.998	0.000	0.000	0.000	0.003	0.000	0.000	0.000	0.000	0.002	0.000	0.001	0.300
speed	r	-0.164*	0.123	0.075	-0.006	0.201*	0.189*	0.136*	0.296*	0.233*	0.261*	0.223*	0.021	0.216*	-0.072	-0.124
	p	0.011	0.057	0.244	0.930	0.002	0.003	0.036	0.000	0.000	0.000	0.001	0.750	0.001	0.264	0.055
economy	r	-0.023	-0.028	-0.077	0.138*	0.137*	0.142*	0.069	0.188*	0.184*	0.263*	0.239*	0.009	0.373*	0.131*	0.044
	p	0.723	0.661	0.235	0.033	0.035	0.028	0.287	0.003	0.004	0.000	0.000	0.892	0.000	0.042	0.502
	mean	4.15	2.33	3.95	3.98	3.90	3.52	3.50	3.12	3.66	3.47	3.89	4.24	3.94	0.18	0.11
	s.d.	0.77	0.99	1.03	0.77	0.53	0.68	0.69	0.85	0.54	0.85	0.48	0.54	0.43	0.29	0.24

Table 4.20 (Continued)

Variables		reward	public	educate	hiring	proced	person	time	joint	exchange	techno	compre	useful	attain	speed	economy
motivation	r															
	p															
goal	r															
	p															
complementary	r															
	p															
supplementary	r															
	p															
learning	r															
	p															
skill	r															
	p															
structural	r															
	p															
cultural	r															
	p															
operation	r															
	p															
flexible	r															
	p															
trust	r															
	p															
commitment	r															
	p															
bilateral	r															
	p															
patent	r															
	p															
license	r															
	p															
reward	r	1.000														
	p	.														
public	r	0.356*	1.000													
	p	0.000	.													
educate	r	0.133*	0.228*	1.000												
	p	0.040	0.000	.												
hiring	r	-0.059	-0.178*	0.183*	1.000											
	p	0.367	0.006	0.004	.											
proced	r	0.247*	0.225*	0.167*	0.109	1.000										
	p	0.000	0.000	0.010	0.092	.										

Table 4.20 (Continued)

Variables		reward	public	educate	hiring	proced	person	time	joint	exchange	techno	compre	useful	attain	speed	economy
person	r	0.135*	0.046	0.094	0.121	0.171*	1.000									
	p	0.036	0.480	0.148	0.062	0.008	.									
time	r	0.283*	0.310*	0.154*	-0.120	0.097	-0.042	1.000								
	p	0.000	0.000	0.017	0.063	0.134	0.516	.								
joint	r	0.202*	0.397*	0.288*	0.009	0.122	-0.074	0.712*	1.000							
	p	0.002	0.000	0.000	0.894	0.059	0.252	0.000	.							
exchange	r	0.203*	0.155*	0.182*	-0.076	-0.090	-0.060	0.432*	0.557*	1.000						
	p	0.002	0.016	0.005	0.242	0.165	0.358	0.000	0.000	.						
techno	r	0.183*	0.174*	0.229*	0.063	0.066	0.071	0.361*	0.471*	0.683*	1.000					
	p	0.004	0.007	0.000	0.333	0.308	0.273	0.000	0.000	0.000	.					
compre	r	0.103	-0.070	0.098	0.076	0.053	0.059	0.348*	0.323*	0.105	0.149*	1.000				
	p	0.110	0.280	0.132	0.242	0.416	0.366	0.000	0.000	0.104	0.021	.				
useful	r	0.218*	0.195*	0.383*	0.206*	0.271*	0.049	0.283*	0.435*	0.274*	0.334*	0.409*	1.000			
	p	0.001	0.002	0.000	0.001	0.000	0.454	0.000	0.000	0.000	0.000	0.000	.			
attain	r	0.114	0.283*	0.279*	0.048	0.326*	-0.068	0.327*	0.485*	0.214*	0.265*	0.399*	0.649*	1.000		
	p	0.077	0.000	0.000	0.458	0.000	0.293	0.000	0.000	0.001	0.000	0.000	0.000	.		
speed	r	-0.046	-0.014	0.175*	-0.102	0.032	-0.153*	-0.041	0.071	0.066	0.084	0.220*	0.148*	0.418*	1.000	
	p	0.474	0.835	0.007	0.115	0.617	0.017	0.526	0.276	0.305	0.192	0.001	0.021	0.000	.	
economy	r	0.187*	0.025	0.343*	0.025	0.201*	-0.088	0.235*	0.248*	0.111	0.125	0.413*	0.425*	0.457*	0.521*	1.000
	p	0.004	0.696	0.000	0.703	0.002	0.174	0.000	0.000	0.087	0.053	0.000	0.000	0.000	0.000	.
	mean	0.35	0.71	0.73	0.50	0.48	0.20	3.25	3.48	2.91	3.06	3.70	3.95	3.77	3.48	3.36
	s.d.	0.48	0.46	0.45	0.50	0.50	0.40	0.99	0.99	0.98	1.06	0.75	0.73	0.73	0.55	0.81

* p< 0

Refer to figure 4.1, the representation of latent variables based on their relation to the observed indicator variables is one of the defining characteristics of the SEM. There are four latent constructs in the model present in figure 4.1. The first construct, “partner attributes,” represents the staff’s learning abilities, the skills of joint alliance management, the structural characteristics. The second latent variable is “coordinating factors”. It is measured with three observed variables indicating respondent opinions about operational and cultural compatibility between alliance partners. The third construct, representing the “relationship factor,” is measured with three observed variables: the respondents' opinions about trust, commitment and bilateral information exchange. The last latent variable, representing “the effectiveness of knowledge transfer between university-industry alliances” includes four principle variables 1) research outcomes, 2) development through tacit knowledge transfer, 3) commercialization, and 4) efficient coordination. Figure 4.1 shows the hypothesized relationships among the observed and latent variables of which all elements in the model are hypothesized to have both a direct and indirect effect upon the effectiveness of knowledge transfer.

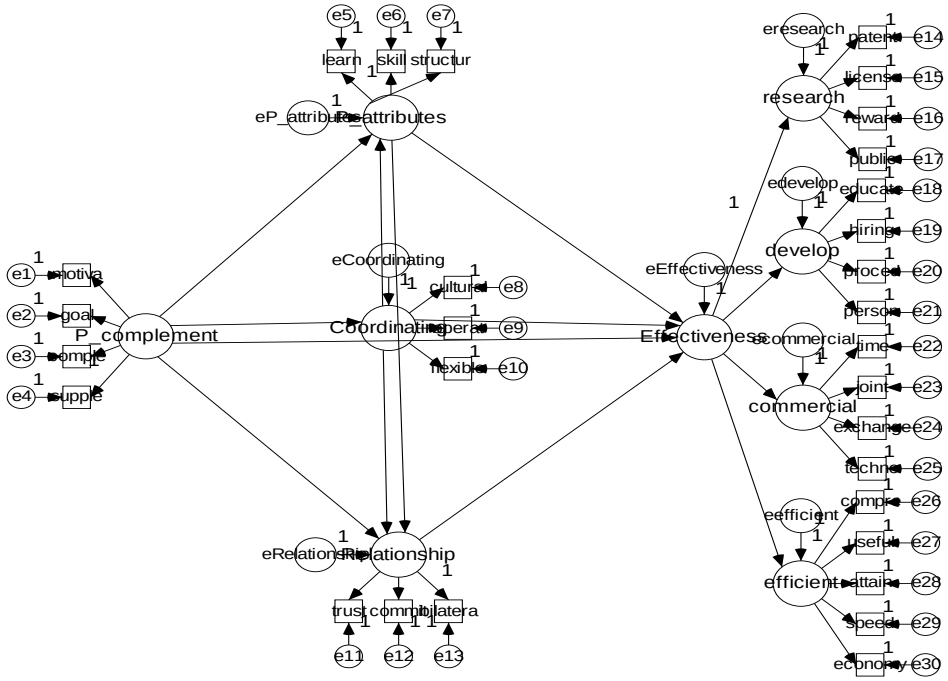


Figure 4.1 The Analytical Model of the Study

According to the conceptual framework and literatures of the study, all proposed variables can be illustrated in the following analytical models which depict the hypothesized relations among ten causal relations and the effectiveness of knowledge transfer measures. The holdout sample (n=240) was used for testing the hypothesized relationships with AMOS Version 6.0. The symbols and abbreviations used in the analysis are summarized according to its categories of latent and observed variables.

In a LISREL path diagram, the observed variables are enclosed in rectangles and the latent construct is enclosed in circles or ovals. Causal relationships among constructs in a model are indicated by straight lines with arrows, leading from the causal variables to the affected variables. The strength of the effect is written on the line. The unexplained portion of the variance (or error) in a latent construct is shown in parentheses, with an arrow pointing at the corresponding latent constructs.

A measured variable is a variable that can be observed directly and is measurable. Measured variables are also known as observed variables, indicators, or manifested variables. On the other hand, a latent variable is a variable that cannot be observed directly and must be inferred from measured variables. Latent variables are implied by the covariance among two or more measured variables. They are also known as factors (i.e., factor analysis), constructs, or unobserved variables. The SEM is a combination of multiple regression and factor analysis. Path analysis deals only with measured variables.

For tests of the SEM, individual items were used to operationalize constructs. Each factor (latent variables) was operationalized with indicators comprised of subsets of items in which each indicator was constructed as the sum (or average) of two or more observable items. Both latent and observable variables as well as symbols used in the analytical path model were primarily classified in table 4.21-4.23.

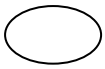
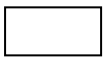
Table 4.21 Symbols of Independent Variables (Antecedent and Mediating Factors)

Symbols of Independent Variables (Antecedent and Mediating Factors)			
Partner Complementarities			
P_Complement	**refer to**	**Partner Complementarities**	**Latent Variable**
Motivation	refers to	Motivation Correspondence	Observed Variable
Goal	refers to	Goal Correspondence	Observed Variable
Complementary	refers to	Complementary Resource & Knowledge	Observed Variable
Supplementary	refers to	Supplementary Resource & Knowledge	Observed Variable
Partner Attributes			
P_Attributes	**refer to**	**Partner Attributes**	**Latent Variable**
Learn	refers to	Staff's Learning Abilities	Observed Variable
Skill	refers to	Skill of Joint Alliance Management	Observed Variable
Structure	refers to	Structural Characteristics	Observed Variable
Coordinating Factors			
Coordination Factors	**refers to**	**Coordinating Factors**	**Latent Variable**
Cultural	refers to	Cultural Compatibility	Observed Variable
Operation	refers to	Operational Compatibility	Observed Variable
Flexible	refers to	Flexible University Policies	Observed Variable
Relationship Factors			
Relationship	**refers to**	**Relationship Factors**	**Latent Variable**
Trust	refers to	Trust	Observed Variable
Commitment	refers to	Commitment	Observed Variable
Bilateral	refers to	Bilateral Information Exchange	Observed Variable

Table 4.22 Symbols of Dependent Variables (Knowledge Transfer Effectiven**ess)**

Symbols of Dependent Variables (Knowledge Transfer Effectiveness)			
Research Outcomes			
Research	**refers to**	**Research outcomes**	**Latent Variable**
Patent	refers to	Patents	Observed Variable
License	refers to	Licenses	Observed Variable
Reward	refers to	Rewards	Observed Variable
Public	refers to	Publications	Observed Variable
Development of Tacit Knowledge Transfer			
Development	**refers to**	**Development of Tacit Knowledge**	**Latent Variable**
Educate	refers to	Co-education development	Observed Variable
Hiring	refers to	Hiring Graduates from the Project	Observed Variable
Proceed	refers to	Proceed New Product Development	Observed Variable
Person	refers to	Personnel Exchange	Observed Variable
Commercialization			
Commerciali-zation	**refers to**	**Commercialization**	**Latent Variable**
Time	refers to	Time Spent Interacting with University Research Developing and Commercializing New Technologies	Observed Variable
Joint	refers to	Level of Joint Decision-Making in Technological Consulting and Commercializing New Technologies	Observed Variable
Exchange	refers to	Number of Personnel Exchanges for Developing and Commercializing New Technologies	Observed Variable
Techno	refers to	Commercializing New Technologies	Observed Variable
Efficient Coordination			
Efficient	**refers to**	**Efficient Coordination**	**Latent Variable**
Compre	refers to	Comprehension	Observed Variable
Useful	refers to	Usefulness	Observed Variable
Attain	refers to	Goal Attainment	Observed Variable
Speed	refers to	Speed	Observed Variable

Table 4.23 Statistical Symbols and Definition of Symbols in Path Diagram

Statistical Symbols	and Definition of Symbols in Path Diagram	
	refers to	Latent Variables
	refers to	Observed Variables
	refers to	Causal Relations Where Variables are on the Receiving End of Single-Headed Straight Arrows Indicating A Regression Path And Implying A Causal Relationship.
n	refers to	Sample Size
%	refers to	Percentage
$\overline{X}$	refers to	Arithmetic Mean
S.D.	refers to	Standard Deviation
r	refers to	Pearson Product Moment Correlation
x^2	refers to	Chi-square Test
df	refers to	Degree of Freedom
CMIN/DF	refers to	Chi-Square Statistic Comparing the Tested Model and the Independent Model with the Saturated Model
GFI,AGFI, NFI, IFI	refers to refers to	GFI (Goodness-of-Fit Index), AGFI (Adjust Goodness-of-Fit Index), NFI (Normal Fit Index), Incremental Fit Index (IFI)
CFI	refers to	Comparative Fit Index
RMSEA	refers to	Root Mean Square Error of Approximation
RMR	refers to	Root Mean Square Residual)
S.E.	refers to	Standard Error
R^2	refers to	Square Multiple Correlation
TE	refers to	Total Effect
DE	refers to	Direct Effect
IE	refers to	Indirect Effect
t	refers to	T-distribution
F	refers to	F-distribution
P-value	refers to	Probability Value

4.4.2 Evaluation of the Proposed Model

The results of the analytical model are displayed in figure 4.2. The data analysis has been done step by step as follows:

1) The Assessment of the Overall Model Fit

The first step in structural modeling is to assess the overall model fit with respect to one or more goodness-of-fit measures. The first measure is the likely ratio chi-square of 369.905(df (x^2) = 305). If the model is to provide a satisfactory representation of the data, it is important for the chi-square value to be non-significant ($p<0.05$). The significance level of 0.253 for the chi-square of our model is beyond the usually acceptable threshold of 0.05, indicative of acceptable fit.

The second measure reported the normalized chi-square (Joreskog and Sorborn, 1993), where the chi-square is adjusted by the degrees of freedom in assessing model fit. Models with adequate fit should have a normalized chi-square less than 2.0 or 3.0 (Carmines and Mcver, 1981). With a normalized chi-square of 1.210, the proposed model provides a fairly satisfactory representation of the data.

The third measure is the incremental fit of the model compared to the null model. The Normalized Fit Index of 0.946 is sufficiently close to the desired threshold level of 0.90. Overall, although not perfect, the level of fit seems sufficient enough to proceed with the assessment of the measurement and structural models.

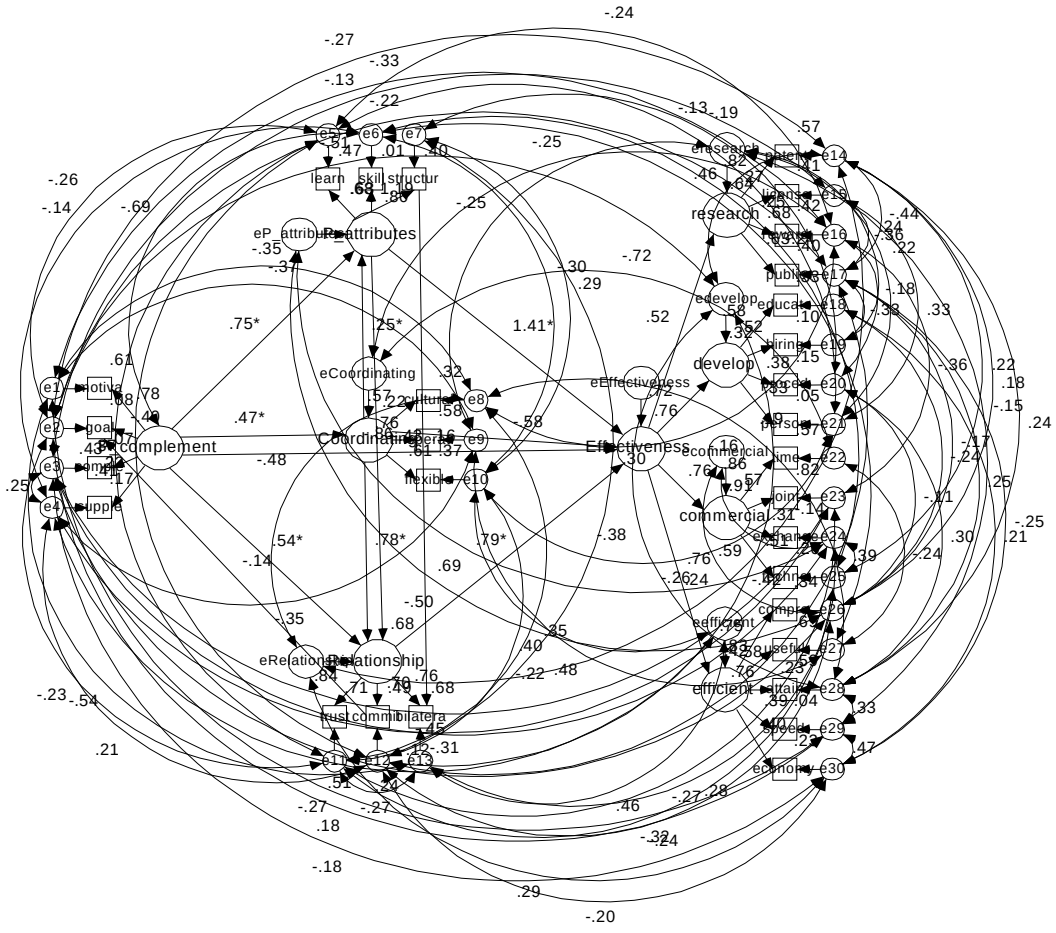
Likewise, the Incremental Fit Index (IFI) which should be equal to or greater than .90 to accept the model. Incremental index of 0.922 is greater than 0.90, indicating a good model fit. Also, in terms of Comparative Fit Index (CFI), the CFI above .90 is considered to have a good fit. This index is 1.00, confirming the soundness of model fit.

The sixth and seventh measures are the GFI and AGFI index. These are non-statistical measures ranging in value from 0 (poor fit) to 1 (perfect Fit). For this model, the GFI is .977 and the AGFI is .913, indicating a good model fit.

The last two indices, the Root Mean Square Residual (RMR), in contrast, is a measure of the variance and covariance that are unexplained in the model. For a good model fit this index should be close to 0. In this model, the RMR is .039, suggesting the soundness of model fit that little of the variance and covariance was left unaccounted for by the hypothesized model. On the other hand, the Root

Mean Square Error of Approximation (RMSEA) is an estimate of the discrepancy between the observed and estimated covariance matrices in the population. It is generally reported in conjunction with the RMSEA and in a well-fitting model the lower limit is close to 0. In the model, the RMSEA is .040, indicating a good model fit.

This finding further confirms the soundness of model fit. As shown in table 4.21, it can be concluded that the overall model fit of the study is consistent with the empirical data.



∗P<0.05

Figure 4.2 The Results of the Analytical Model

Note: Chi-square = 369.905, df = 305, p-value = 0.253, CMIN/DF =1.210, GFI = 0.977, RMSEA = 0.040

Table 4.24 Statistical Results for Evaluating the Overall Model Fit

Indices	Criteria	Statistical Results
Chi-square	P ≥ 0.05	0.253
CMIN/DF	Close to 1.00	1.210
GFI	≥ 0.90	0.977
AGFI	≥ 0.90	0.913
NFI	≥ 0.90	0.946
IFI	≥ 0.90	0.922
CFI	≥ 0.90	1.000
RMR	< 0.05	0.039
RMSEA	< 0.05	0.040
Good Model Fit for All Criteria		

2) The Measurement Model Fit

Confirmatory Factor Analysis (CFA) may be used to confirm that the indicators sort themselves into factors corresponding to how the researcher has linked the indicators to the latent variables. Confirmatory factor analysis plays an important role in structural equation modeling. CFA models in SEM are used to assess the role of measurement error in the model, to validate a multifactorial model, to determine the group effects on the factors. Using CFA for examining the relationship between observed and latent variables, the objective of CFA is to examine how well the observed variables measure the hypothesized latent variables and constructs and test the fit of a measurement model. In this study, all of the observed variables loaded at a minimum cutoff value greater than 0.30 on each latent variable, as shown in table 5.1 (partner attributes, coordinating factors, relationship factors, and the effectiveness of knowledge transfer). It can be concluded that the latent variables are valid underlying constructs for the observed variables and that the observed variables, in turn, are reliable measures of the latent variables (Kim and Mueller, 1990). The statistical significance of the loadings was tested with t-values.

The conclusion, therefore, could be drawn that the proposed CFA model accurately accounts for the variance and covariance in the data, and that the model satisfactorily explains the relationships between the observed variables and their corresponding latent constructs. Having confirmed that the observed variables account accurately for the latent variables, it is appropriate now to examine the fit of the structural model to the empirical data how the latent constructs are related.

Table 4.25 Goodness-of-Fit Statistics of the Confirmatory Factor Analysis (CFA Model): the Results of Confirmatory Factor Analysis Loadings and the Final Set of Observed Variables on the Latent Variables

Variables	Indicators	Factor Loading	Factor Score Coefficient
Partner Complementarities	Motivation correspondence	0.784	0.298
	Goal correspondence	-0.397	-0.023
	Complementary resources and knowledge	0.370	-0.054
	Supplementary resources & knowledge	0.407	0.109
Partner Attributes			
	Staff Learning	0.682	0.103
	Skills of management	1.193	0.124
	Structural characteristics	0.633	-0.012
Coordinating Factors	Cultural compatibility	0.565	0.068
	Operational compatibility	0.764	0.355
	Flexible university policies	0.605	0.164
Relationship Capital			
	Trust	0.844	0.302
	Commitment	0.701	-0.043
	Bilateral info exchange	0.763	0.343
Effectiveness of Knowledge	Research	0.518	-
	Development	0.719	-
	Commercialization	0.755	-
	Efficient coordination	0.763	-
Research			
	patent	0.822	0.437
	license	0.643	0.243
	reward	0.676	0.044
	publication	0.629	0.271
Development			
	Co-education	0.579	0.110
	Hiring graduates	0.320	0.042
	Proceeding joint product development	0.384	0.082
	Personnel exchange	0.329	0.033
Commercialization			
	Time spent	0.861	0.190
	Joint decision	0.906	0.557
	exchange	-0.313	0.223
	techno	0.508	-0.040
Efficient			
	comprehension	0.746	-0.114
	useful	0.733	0.022
	Goal attainment	0.765	0.031
	speed	0.389	-0.028
	economy	0.396	0.042

In the measurement model, the first step was to examine the loading of the manifest indicators on the underlying theoretical constructs and to focus on non-significant loadings. As we see in table 4.21, all indicators are significantly related to their respective underlying constructs (p-value <0.05).The significance of the factor loadings provides support for the convergent validity of the respective scales (Anderson and Gerbing, 1988: 411-423). In this study, we see that all of the reliability estimates exceeded the minimum threshold of 0.30. This result suggested that the manifest indicators were significant and reliable measures of the latent constructs being used.

In terms of component fit measurement**,** the proposed model was analyzed using the LISREL program. The scores for the four latent variables were the summated average of the items within. These scores were used as single indicators for the corresponding latent variables. As summarized below, factor coefficients of each observable variable can be used to explain the factor scales of the latent variables with the following linear equation.

Factor Analysis: Factor Score

$$F_i = b_{i1} Z_1 + b_{i2} Z_{2\ldots\ldots\ldots} + b_{ip} Z_p$$

Table 4.26 The Summary of Factor Scores (The Latent Variables of Determinant Factors and Dependent Variables)

Independent Variables	
Z Complementarities	= 0.298 Z Motivation - 0.023 Z Goal - 0.054 Z Complementary + 0.109 Z Supplementary
Z Partner Attributes	= 0.103 Z Staff Learning + 0.124 Z Skills – 0.012 Z Structural
Z Coordinating Factors	= 0.068 Z Cultural + 0.355 Z Operational +0.164 Z Flexible

Table 4.26 (Continued)

Dependent Variables	
Z Research	= 0.437 Z Patent + 0.243 Z License + 0.044 Z Reward + 0.271 Z public
Z Development	= 0.110 Z Educate + 0.042 Z Hiring + 0.082 Z Proced + 0.033 Z Person
Z Commercialization	= 0.190 Z Time + 0.557 Z Joint + 0.223 Exchange -0.040 Z Techno
Z Efficient	= -0.114 Z Compre + 0.022 Z Useful + 0.031 Z Attain - 0.028 Z Speed +0.042 Z Economy

After achieving adequate fit of the CFA model to the data, the final step of data analysis was to test the fit of a structural model. The weighted least squares (WLS) methods of LISREL were used to analyze the data.

3) The Fit of the Structural Model

Having assessed the overall model fit and the measurement model, the theoretical relationships between the underlying constructs will be examined. The most obvious examination in the structural model involved the significance of the estimated coefficients. Table 4.23 contains the results for the various structural equations.

The hypotheses for the relationships were tested using their associated t-statistics. Figure 5.2 presents the results of the relationships between the exogenous and endogenous variables, as well as the relationships between the endogenous variables. In this figure, the significance for all of the relationships is also presented. Seven out of the ten hypothesized relationships were found to be significant. All of the hypotheses were statistically significant at the 0.05 level. One of the major advantages of using the SEM is the ready accessibility to indirect and total effects, in addition to the direct effects between the exogenous and endogenous variables. Table 4.2 presents the direct, indirect, and total effects between the variables in the model together with detailed results of the causal relations in the hypothesis testing.

In this study, it is proposed that the factors that have a positive effect on the extent of knowledge transfer effectiveness, both directly and indirectly, between the university-industry alliances at the statistically significant level of 0.05. However, it is found that partner attributes and relationship factors have a direct impact on the effectiveness of knowledge transfer, whereas partner complementarities and coordinating factors have only an indirect effect.

However, statistically, it is possible to estimate several models in order to examine which of them explains the data best. However, in this study, the primary goal in using structural modeling was to assess the basic adequacy of a model that simultaneously accounted for the multiple dependent relationships that we theoretically proposed, rather than to **ex post** identify the best-fitting model that had not been theoretically proposed **ex ante.** Because these relationships could probably address very different questions from the ones that it were proposed here, it was chosen not to test competing models that estimated other theoretically plausible relationships between the constructs were not tested.

Table 4.27 The Path Coefficients of the Analytical Model of the Effectiveness of Knowledge Transfer

Regression Weights: (Group number 1 - Default model)

			Estimate	S.E.	C.R.	P	Label
Coordinating	<---	P_complement	.671	.157	4.261	***	
P_attributes	<---	P_complement	.826	.136	6.096	***	
P_attributes	<---	Coordinating	.195	.050	3.935	***	
Relationship	<---	P_complement	.556	.164	3.394	***	
Relationship	<---	Coordinating	.564	.090	6.261	***	
Relationship	<---	P_attributes	-.400	.235	-1.705	.067	
Effectiveness	<---	P_attributes	.490	.106	4.609	***	
Effectiveness	<---	Relationship	.297	.065	4.545	***	
Effectiveness	<---	Coordinating	-.157	.133	-1.178	.081	
Effectiveness	<---	P_complement	-.332	.292	-1.138	.092	
commit	<---	Relationship	1.158	.105	11.050	***	
structur	<---	P_attributes	1.215	.127	9.604	***	
develop	<---	Effectiveness	1.526	.285	5.349	***	
commercial	<---	Effectiveness	5.245	.906	5.786	***	
research	<---	Effectiveness	1.000				
efficient	<---	Effectiveness	3.481	.602	5.786	***	
supple	<---	P_complement	1.000				
comple	<---	P_complement	.841	.195	4.307	***	
goal	<---	P_complement	-.604	.215	-2.808	.005	
motiva	<---	P_complement	1.895	.309	6.139	***	
cultural	<---	Coordinating	1.000				
operat	<---	Coordinating	.912	.103	8.821	***	
flexible	<---	Coordinating	1.147	.147	7.811	***	
bilatera	<---	Relationship	1.000				
trust	<---	Relationship	1.223	.095	12.881	***	
learn	<---	P_attributes	1.000				
skill	<---	P_attributes	2.175	.307	7.090	***	
bilatera	<---	structur	.100	.030	3.379	***	
goal	<---	commit	-.258	.114	-2.252	.024	
patent	<---	research	1.000				
license	<---	research	.650	.076	8.534	***	
reward	<---	research	1.364	.148	9.232	***	
public	<---	research	1.185	.158	7.515	***	
educate	<---	develop	1.000				
hiring	<---	develop	.609	.143	4.267	***	
proced	<---	develop	.723	.155	4.649	***	
person	<---	develop	.347	.105	3.300	***	
time	<---	commercial	1.000				
joint	<---	commercial	1.017	.064	15.851	***	
exchange	<---	commercial	-.126	.133	-.947	.344	
techno	<---	commercial	.599	.070	8.538	***	
compre	<---	efficient	1.000				
useful	<---	efficient	1.071	.093	11.495	***	
attain	<---	efficient	.971	.089	10.949	***	
speed	<---	efficient	.178	.061	2.890	.004	
economy	<---	efficient	.553	.092	5.989	***	

Table 4.27 (Continued)

Standardized Regression Weights: (Group number 1 - Default model)

			Estimate
Coordinating	<---	P_complement	.470
P_attributes	<---	P_complement	.747
P_attributes	<---	Coordinating	.252
Relationship	<---	P_complement	.541
Relationship	<---	Cooridating	.784
Relationship	<---	P_attributes	-.431
Effectiveness	<---	P_attributes	1.406
Effectiveness	<---	Relationship	.793
Effectiveness	<---	Coordinating	-.581
Effectiveness	<---	P_complement	-.863
commit	<---	Relationship	.701
structur	<---	P_attributes	.633
develop	<---	Effectiveness	.719
commercial	<---	Effectiveness	.755
research	<---	Effectiveness	.518
efficient	<---	Effectiveness	.763
supple	<---	P_complement	.407
comple	<---	P_complement	.370
goal	<---	P_complement	-.397
motiva	<---	P_complement	.784
cultural	<---	Coordinating	.565
operat	<---	Coordinating	.764
flexible	<---	Coordinating	.605
bilatera	<---	Relationship	.763
trust	<---	Relationship	.844
learn	<---	P_attributes	.682
skill	<---	P_attributes	1.193
bilatera	<---	structur	.158
goal	<---	commit	-.142
patent	<---	research	.822
license	<---	research	.643
reward	<---	research	.676
public	<---	research	.629
educate	<---	develop	.579
hiring	<---	develop	.320
proced	<---	develop	.384
person	<---	develop	.329
time	<---	commercial	.861
joint	<---	commercial	.906
exchange	<---	commercial	-.313
techno	<---	commercial	.508
compre	<---	efficient	.746
useful	<---	efficient	.833
attain	<---	efficient	.765
speed	<---	efficient	.389
economy	<---	efficient	.396

Note: C.R. (t-statistic) > 1.96 refers to significant level 0.05

From the analysis of the variables, it was indicated that partner complementarities, partner attributes, coordinating factors, and relationship factors could adequately explain the effectiveness of knowledge transfer with the value of a correlation efficient greater than .40 (R^2=0.761) (Joreskog and Sorbon, 1993: 26).

The results of the data analysis have shown that the observed variables are reliable measures of the four latent variables. The theoretical model also fits the empirical data satisfactorily which helps to support its construct validity. The variables in model account for 76.1 percent of the variance in the effectiveness of knowledge transfer (Saris and Strenkhorst, 1984: 22-61). Chronologically, path coefficients among variables which are statistically significant at 0.05 levels can be summarized according to their relationship as follows:

Table 4.28 The Summary of Path Coefficients among Variables

Relationship between Variables	Path Coefficients
Relationship between Antecedent factor and Mediating Factor	
Partner Complementarities ⟶ Partner Attributes (H2)	0.747*
Partner Complementarities ⟶ Coordinating Factors (H3)	0.470*
Partner Complementarities ⟶ Relationship Factors (H4)	0.541*
Reciprocal Relations between Mediating Factors	
Coordinating Factors ⟶ Partner Attributes (H5)	0.252*
Coordinating Factors ⟶ Relationship Factors (H6)	0.748*
Relationship between Mediating Factors and Dependent Variables	
Partner Attributes ⟶ Effectiveness of knowledge transfer (H8)	1.406*
Relationship Factors ⟶ Effectiveness of knowledge transfer(H10)	0.793*

Sig.* p<.05

Referring to table 4.25, the significance of the parameter estimates in the model, especially statistically significant at level 0.05 ($p<.05$), is shown. The parameter estimates in the model represent the simultaneous significant relation contribution of the observed and latent variables in the overall model. The significance of the parameter estimates was tested with a T-test (i.e., the ratio of the estimate to the standard error). In table 4.26, the direct and indirect effects among the constructs are summarized.

Table 4.29 The Path Coefficients among Variables in Terms of Total Direct and Indirect Effects

Variables	Effect	Partner Complementarities	Partner Attributes	Coordinating Factors	Relationship Capital
Partner Attributes	DE	**0.747**	0.000	**0.252**	0.000
	IE	0.119	0.000	0.000	0.000
	TE	0.866	0.000	0.000	0.000
Coordinating Factors	DE	**0.470**	0.000	0.000	0.000
	IE	0.000	0.000	0.000	0.000
	TE	0.470	0.000	0.000	0.000
Relationship Capital	DE	**0.541**	-0.431	**0.748**	0.000
	IE	-0.005	0.000	-0.109	0.000
	TE	0.537	-0.431	0.675	0.000
Effectiveness of Knowledge	DE	-0.863	**1.406**	-0.581	**0.793**
	IE	1.370	-0.342	0.890	0.000
	TE	0.507	1.064	0.310	0.793

Note: Total effects (TE) indicate the direct effects (DE)and indirect effects (IE) that result from the correlations among exogenous variables, reciprocal effects and indirect effects (effect through combined paths refers to **TE= DE+ IE**)

4) The Coefficient of Determination (R^2) in the Model

As shown in table 4.26, it is indicated that the variables in model account for 76.1 percent of the variance (R^2=0.761) in the effectiveness of knowledge transfer (Saris & Strenkhorst, 1984: 22-61). Of the four independent variables, two were statistically significant at a significant level of $p<0.05$ with the effectiveness of knowledge transfer. It was shown that the best predictor of knowledge transfer effectiveness is partner attributes (R^2=0.799). The second best predictor was relationship factors (R^2=0.681). Coordinating factors were the least significant predictor of the effectiveness of knowledge transfer (R^2=0.221) because it did not have a direct impact on the effectiveness of knowledge transfer. It was found that partner complementarities were not statistically significant at $p<0.05$ with the effectiveness of knowledge transfer but they were positively related to the mediating variables significantly, in terms of both direct and indirect impact. The analytical results of the effectiveness of knowledge transfer between university-industry alliances are noted in the following structural equation models (SEMs).

Table 4.30 The Coefficient of Determination (R^2) in the Model

Variables	Structural Equation Modeling (SEMs)	The Coefficient of Determination (R^2)
Partner Attributes	=0.747*Partner Complementarities +0.252*Coordinating Factors R^2= 0.799 {79.9%}	79.9% (0.799x100)
Coordinating Factors	= 0.470* Partner Complementarities R^2=0.221 {22.1%}	22.1% (0.221x100)
Relationship Capital	=0.541*Partner Complementarities -0.431 Partner Attributes +0.748*Coordinating Factors R^2=0.681 {68.1%}	68.1%(0.681x100)
Effectiveness of Knowledge Transfer	= -0.863 Partner Complementarities +1.406*Partner Attributes -0.581Coordinating Factors + 0.793* Relationship Capital R^2=0.761 {76.1%}	76.1%(0.761x100)

P<0.05

4.5 Results of Hypotheses Testing

This section of the present study examines the relationships of variables proposed in the conceptual framework. The LISREL program was employed to test the ten hypotheses. The findings from the structural equation models (SEMs) were combined to form a path model of the effectiveness of knowledge transfer among the university-industry alliances.

H_1: Partner complementarities will be positively associated with the perceived level of the effectiveness of knowledge transfer.

Partner Complementarities ⟶	The effectiveness of knowledge Transfer	-0.863

In hypothesis 1, the results indicate that the direct effect of partner complementarities on the effectiveness of knowledge transfer in the university-industry alliance is not statistically significant (β=-0.863; $p > 0.05$), thus, hypothesis one was rejected.

H_2: Partner complementarities will be positively associated with the partner attributes in terms of staff's learning abilities, the skills of joint alliance management, and structural characteristics.

Partner Complementarities ⟶	Partner Attributes……	0.747*

As can be seen, the hypotheses linking partner complementarities to partner attributes in hypothesis 2 were supported by the underlying data. The paths leading from partner complementarities to partner attributes (β=0.747; $p<0.05$), were statistically significant. When alliance partners have resources and knowledge complementarities and strategic alignment, they seem to have the attributes that their focal partners are seeking for such as the leaning abilities, skills of management, and

favorable organizational structures that facilitate the coordination. Therefore, hypothesis two was supported.

H_3: Partner complementarities will be positively associated with coordinating factors in terms of cultural and operational compatibility, as well as flexible university policies.

Partner Complementarities	⟶ Coordinating Factors	0.470*

Hypothesis 3 hypothesizes that partner attributes will positively affect coordinating factors in terms of cultural and operational compatibility and flexible university policies. As expected, the paths leading from partner complementarities to coordinating factors (β =0.470; $p<0.05$) were statistically significant in the expected directions. The greater the degree of favorable partner attributes in terms of their learning abilities, skills, and facilitating organizational structures, the better coordination will be. Therefore, hypothesis three was substantiated.

H_4: Partner complementarities will be positively associated with the relationship factors in terms of trust, commitment, and bilateral information exchange.

Partner Complementarities	⟶ Relationship Factors	0.541*

Likewise, the hypotheses linking partner complementarities to the relationship factors in hypothesis 4 were supported by the findings. The paths leading from partner complementarities to relationship factors (β=0.541; $p<0.05$) were statistically significant in the expected directions. If the alliance partners exhibit strategic alignment in terms of motivation and goal correspondence, together with complementary and supplementary resources and knowledge, the more trust, commitment, and information exchange will be enhanced. The results of the analysis thus indicated that partner complementarities had a direct effect on the partner attributes. Therefore, hypothesis four was supported.

H_5: Coordinating factors, consisting of cultural and operational compatibility and flexible university policies, will be positively associated with partner attributes in terms of staff's learning abilities, the skills of joint alliance management, and structural characteristics.

Coordinating Factors	⟶	Partner Attributes (H5)	0.252*

Coordinating factors were hypothesized to enhance partner attributes in hypothesis 5 between firms. The standardized coefficient for the relationships represented by hypothesis 5 (β =0.252; $p<0.05$) established the strong positive impact of coordinating factors on partner attributes. The interpretation is that if alliance partners have learning abilities, skillful management, and facilitating structural mechanisms, the coordination seems to be enhanced in terms of cultural and operational alignment, as well as flexibility in the university policies in publishing the academic output and trade secrets of the industrial partner. Therefore, hypothesis five was accepted.

H_6: Coordinating factors, consisting of staff's learning abilities, the skills of joint alliance management, and structural characteristics, will be positively associated with the relationship factors in terms of trust, commitment, and bilateral information exchange.

Coordinating Factors	⟶	Relationship Factors (H6)	0.748*

Coordinating factors were hypothesized to enhance the relationship factors between alliance partners in hypothesis 6. The standardized coefficient for the relationships represented by (H6) (β =0.748; $p<0.05$) established the strong positive impact of the coordinating factors on the relationship factors. The alliance partners that have high learning abilities, management skills, and facilitating organizational structure seems to have high degree of trust, commitment and information exchange Therefore, hypothesis six was confirmed.

H_7: Partner attributes in terms of staff's learning abilities, the skills of joint alliance management, and structural characteristics will be positively associated with the relationship factors in terms of trust, commitment, and bilateral information exchange.

Partner Attributes	⟶ Relationship Factors	-0.431

Contrary to expectations, the hypothesis linking partner attributes to relationship factors in hypothesis 7 was found to be insignificant (β=-0.431; p> 0.05).This result indicates that partner attributes do not have a direct impact on the relationship factors; thus, hypothesis seven was rejected.

H_8: Partner attributes in terms of staff's learning attitudes and abilities (learning intent and absorptive capacity), the skills of joint alliance management (joint management competence), and structural characteristics that formalized, decentralized, and simple in the organization arrangement will be positively related to the perceived level of knowledge transfer effectiveness.

Partner Attributes	⟶ Effectiveness of knowledge transfer	1.406*

The effect of partner attributes on the effectiveness of knowledge transfer in hypothesis 8 was found to be significant at the 95 percent confidence level (β =1.406; p<0.05), thereby suggesting that partner attributes can have a significant direct impact on the effectiveness of knowledge transfer. Therefore, hypothesis eight was accepted.

H_9: The greater the degree of coordination factors, consisting of cultural and operational compatibility, as well as flexible university policies, the greater the perceived levels of the effectiveness of knowledge transfer.

Coordinating Factors	⟶ Effectiveness of knowledge transfer	-0.581

Contrary to expectations, regarding the impact of coordinating factors on the effectiveness of knowledge transfer, the path coefficient was statistically insignificant and the sign was reversed (β=-.581; $p<.05$), thus indicating lack of support for hypothesis 9.

H_{10}: Relationship capital, consisting of trust, commitment, and bilateral information exchange among the university-industry alliance partners, will be positively related to the perceived level of knowledge transfer effectiveness.

Relationship Factors	⟶ Effectiveness of knowledge transfer (H10)	0.793*

Hypothesis 10 hypothesizes the positive impact of the relationship factors on the effectiveness of knowledge transfer. As expected, the standardized coefficient for the relationships represented by H10 (β = 0.48; $p<0.01$) shows that the relationship factors have a significant positive effect on the effectiveness of knowledge transfer. Therefore, hypothesis ten was substantiated.

In summary, the results indicate the importance of considering both the direct and indirect effects on the effectiveness of knowledge transfer, thus giving further credence to the theoretical rationale behind integrating partner complementarities, partner attributes, coordination, and relational perspectives into an explanation of knowledge transfer effectiveness.

Table 4.31 The Summary of Results from the Hypothesis Testing

Hypotheses	Findings
H_1:. Partner complementarities will be positively associated with the perceived level of the effectiveness of knowledge transfer.	Not supported
H_2: Partner complementarities will be positively associated with the partner attributes in terms of staff's learning abilities, the skills of joint alliance management, and structural characteristics.	**Supported**
H_3: Partner complementarities will be positively associated with coordinating factors in terms of cultural and operational compatibility, as well as flexible university policies.	**Supported**
H_4: Partner complementarities will be positively associated with relationship factors in terms of trust, commitment, and bilateral information exchange.	**Supported**
H_5: Coordinating factors, consisting of cultural and operational compatibility and flexible university policies, will be positively associated with the partner attributes in terms of staff's learning abilities, the skills of joint alliance management, and structural characteristics.	**Supported**
$H_{6:}$ Coordinating factors, consisting of cultural and operational compatibility and flexible university policies, will be positively associated with the relationship factors in terms of trust, commitment, and bilateral information exchange.	**Supported**
$H_{7:}$ Partner attributes in terms of staff's learning abilities, the skills of joint alliance management and structural characteristics will be positively associated with the relationship factors in terms of trust, commitment, and bilateral information exchange.	Not supported
H_8: Partner Attributes in terms of staff's learning attitudes and abilities (learning intent and absorptive capacity),the skills of joint alliance management (joint management competence), and structural characteristics that are formalized, decentralized, and simple in the organizational arrangement will be positively related to the perceived level of knowledge transfer effectiveness.	**Supported**
H_9: 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 the effectiveness of knowledge transfer.	Not Supported
H_{10}: Relationship capital, consisting of trust, commitment, and bilateral information exchange among the university-industry alliance partners, will be positively related to the perceived level of knowledge transfer effectiveness.	**Supported**

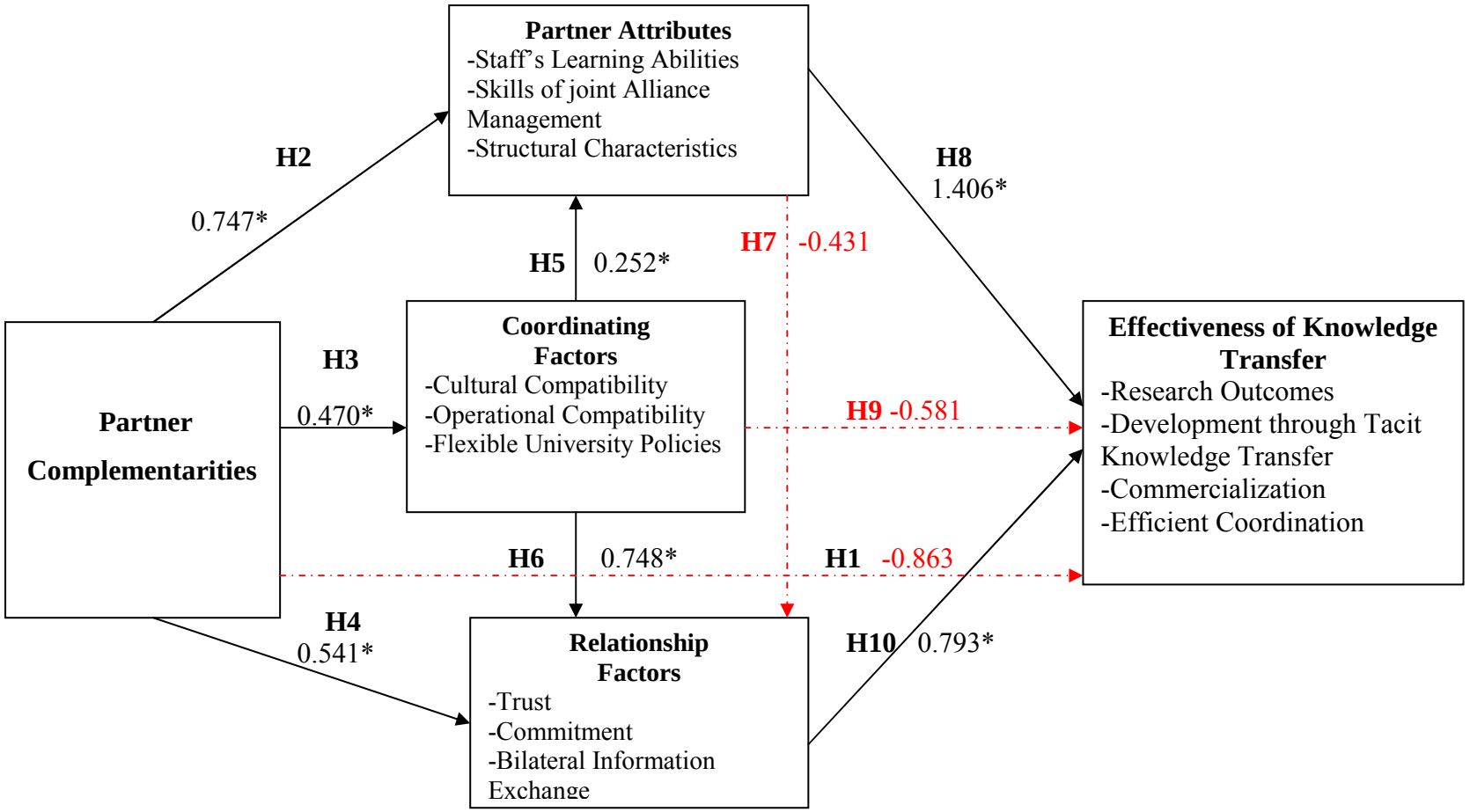


Figure 4.3 The Final Structural Model of Knowledge Transfer Effectiveness in the University-Industry Alliances

(*Sig. p<.05)

4.6 Chapter Summary

In the study, partner complementarities, partner attributes, coordinating factors, relationship factors were hypothesized to facilitate the effectiveness of knowledge transfer (H1), (H2), (H3), (H4), (H5), (H6), (H7), (H8), (H9) and (H10). It was found that partner complementarities were not significant with the effectiveness of knowledge transfer (H1). However, the standardized coefficient for the relationships represented by H2 (b= .747; $p<0.05$), H3 (b= .470; $p<0.05$), H4 (b= .541; $p<0.05$), H8 (b= 1.406; $p<0.05$), and H10 (b=.793; $p<0.05$) established a strong positive impact of all proposed variables on the effectiveness of knowledge transfer. In terms of the reciprocal relations between mediating variables (partner attributes, coordinating factors, and relationship factors) in H5, H6, and H7 showed that coordinating factors have a significant positive effect on partner attributes and relationship factors with the standard coefficient H5 (b= .252; $p<0.05$) and H6 (b= .748; $p<0.05$). Neither the hypothesis linking partner attributes to relationship factors (H7), nor the effect of coordinating factors on the effectiveness of knowledge transfer (H9), however, was found to be significant, and thereby implying that only partner attributes and relationship factors have a direct impact on the effectiveness of knowledge transfer.

Seven out of ten hypotheses were accepted. It may be then concluded that the effectiveness of knowledge transfer was very well accounted for by the observed and latent variables included in the model (R^2=0.761 {76.1%}). Partner attributes (staff's learning abilities, the skill of joint alliance management, and structural characteristics) had the strongest direct effects on the effectiveness of knowledge transfer (R^2= 0.799 {79.9%}, followed by relationship factors (R^2=0.681 {68.1%}). Coordinating factors had the least total impact on the extent of knowledge transfer effectiveness in the university-industry alliance due to their one-way indirect effect (R^2=0.221 {22.1%}). Moreover, these observed indicators represent valid theoretical constructs for measuring the effectiveness of knowledge transfer in the university-industry context. Having tested the model fit and examined the significance of the model parameters, in the next chapter, the implications of the findings for evaluating the effectiveness of knowledge transfer will be discussed.

CHAPTER 5

CONCLUSION AND DISCUSSION

The last chapter consists of five sections. The first section discusses the results of the studies concerning the quantitative data of the proposed model for measuring the effectiveness of university-industry alliances, together with the theoretical and applied implications of the findings. The next section presents the conclusions of the overall study. The third section then discusses the limitations of this study in terms of its research design, generalizability, and measurement. The last section provides suggestions for further study.

5.1 Discussion and Managerial Suggestions

R&D alliances are recognized as an important vehicle for firms and universities to acquire outside resources and knowledge for improving their competitive advantages. How to create successful alliance collaboration for achieving the effectiveness of knowledge transfer is critical to the overall performance of both parties. When firms and universities decide to create a strategic alliance for knowledge transfer, some key variables become critical. The results of this study indicate that the effectiveness of knowledge transfer can be measured by four multi-faceted dimensions, including research outcomes, development through tacit knowledge transfer, commercialization, and efficient coordination (RDCE model). The empirical findings confirmed the relationship between the key determinants of partner complementarities, partner attributes, coordinating factors, relationship factors, and knowledge transfer effectiveness.

However, the study shows support for the direct effect of partner complementarities on the partner attributes, coordinating factors, and relationship factors but plays an indirect role in the effectiveness of knowledge transfer. Likewise, coordinating factors also play an indirect role in the effectiveness of knowledge transfer and they can only be considered as a facilitating mechanism, which indirectly enhances the degree of knowledge transfer effectiveness through its inter-related relationship with other determinants, such as partner attributes and relationship factors. The major findings and implications are discussed as follows:

5.1.1 Understanding the Partner Complementarities as Key Antecedent Factors in the Effectiveness of the Knowledge Transfer through the Role of Partner Attributes, Coordinating Factors, and Relationship Factors

H_1: Partner complementarities will be positively associated with the effectiveness of knowledge transfer.

With regard to partner complementarities in terms of strategic alignment and resource complementarities, the empirical findings indicate that partner complementarities do not have a direct effect on the effectiveness of knowledge transfer (H1: β=-0.863;$p > 0.05$). This appears plausible since mere complementarities may not lead to learning or knowledge transfer, which requires a certain depth of interaction, specific attributes of partners, and relationship quality for tacit know-how to be transferred.

Referring to adversarial findings in hypothesis 1, it can be assumed that in performing production and university-industry alliance activities, alliance partners are exposed to conflicts and uncertainties, about interests or operational issues, in the partnership. These problems arise from differences in the goals of the alliance partners and the manner in which the resources of alliance partners can not be combined to achieve a mission due to misaligned organizational cultures and operational practices. This incongruence has caused non-performing and non-value creating aspects of resource integration and utilization between the alliance (Hagedoorn, 1993: 371-385), which impede the effectiveness of the alliance (Olk, 1997: 155-159)

From the fact that universities have a culture that may be constrained by unique rules and regulations, which often are contrary to the operational methods of private organizations. More specific obstacles are faced by researchers operating in the type of university environment. The most notable is the merit process; universities tend to be rewarded based on published refereed articles and not the commercialization of products resulting from those published research efforts. The promotion and tenure evaluation process is based on the peer evaluation process. That is, even though top administration may support commercialization efforts, colleagues conducting the peer review process may not support the idea of commercialization as fulfilling the research mission of the institution. In their view, only referred journal articles may count toward positive promotion and tenure evaluations. Thus, the goal of university counterparts is not compatible with their industrial partners.

The next obstacle involves non-complementary and supplementary resources and knowledge since universities often do not have in place the infrastructure nor is the funding to support an infrastructure whose focus is on the commercialization of new university product ideas (intellectual property). Trade-offs will have to be made. As costs to operate universities continue to rise, there are increased pressures to identify and invest in alternative potential sources of revenue to support new and existing programs. Thus, universities are likely to take part in the R&D process but ignore involvement in the commercialization process of new joint product development.

In order for a partnership to prosper, it is suggested that the entities involved must be willing to work together. As universities strive to overcome above obstacles and shortfalls, the private sector should do its share to enhance and support the alliance partnership. The challenge facing the private sector will be its ability to adapt to the university culture if the partnership and the resulting commercialization process are to be successful. Private partners need to understand the multi-faceted mission of universities and their complex culture. This understanding and subsequent adaptation will help to align goals and strategic focus university partners. For example, in order to align the goals of all parties, the individuals involved in university-industry interaction may not only receive the rewards described in formal agreements such as money, equipment, goods or services, but also in non-monetary forms, such as

scientific publications or recognition in the conferences for academic forums and reputation in the business and/or scientific community for industrial researchers and managers. Thus, academics will work more enthusiastically in the projects where they expect that some of their professional objectives are likely to be met. Likewise, the promotion of an innovative culture, ethical concerns, and fairness of the management in assigning research projects will help to increase the researcher's motivation and absorptive capacity in transferring knowledge.

H_2: Partner complementarities will be positively associated with the partner attributes in terms of staff's learning abilities, the skills of joint alliance management, and structural characteristics.

As can be seen, the results of the data analysis of the relationship between partner complementarities and partner attributes in hypothesis two are confirmed. Partner complementarities are positively related to partner attributes at the 0.05 level of significance ($p<0.05$) with path coefficients (0.747*). 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. They bring a greater degree of partner attributes in terms of its abilities and attitudes, the skills of management, and structural characteristics.

In this study, the importance of leadership is recognized within the network. Management can be considered as a boundary main trainer and gatekeeper in facilitating the internal dissemination of knowledge and skills gained in the collaboration. Firms that have such experience will improve their ability to select, negotiate, and structure alliances so that they can secure alliance partners that have complementary resources (Day, 1995: 600-679 and Spekman et al., 1999: 747-772). First of all, the skills required for bridging and linking stakeholder groups are important for long-term coherence. These linkage roles are sometimes described as "boundary spanning" (Williams, 2002: 29-51) and sometimes as translation; the potential benefit is to forge a shared understanding of objectives and how each partner may contribute. Collaboration can be used to identify the potential partners and solve conflicts. Well-developed skills can alert managers so that they can gain learning benefits through certain partnerships as well as to acknowledge the problems inherent in such activity.

In order to stimulate staff's learning intent and absorptive capacity and to increase management skills, the alliance partners must first understand where in its partner the relevant information or expertise is located and who possesses it (Dyer and Singh, 1998)—close personal interaction between the partners enables individual members to develop this understanding. Learning or transfer of such know-how is contingent upon the exchange environment and the mechanisms that exist between the alliance partners. Marsden (1990: 435-463) and Kale et al. (2000: 217-227) have argued that close and intense interaction between individual members of the concerned organizations acts as an effective mechanism to transfer or learn tacit know-how across the organizational interface via site visits, seminars and workshops. The matchmaking, through open communication between the university and industrial partners is crucial to the alignment of university-industry needs and for maximizing resource utilization. By doing so, the university could match its competencies with what the industry expects. For example, in the R & D collaboration between three campuses of King Mongkut' s Institutes of Technology at Lad Krabang, North Bangkok and Thonburi and their industrial partners, all entities attempt to align academic researches with the trends and current market needs of industry. With lucid understanding of the industry needs, the faculty can create industry-driven research projects and with a pool of subject matter experts, professors and researchers, the university will provide technological know-how in helping industry to conduct related research.

Additionally, the industry should in turn understand the challenge in helping the university to conduct researches. The industry can provide funding by setting up special labs at universities and can also help by providing real case studies and problems for them. Authentic industry projects and teamwork can help focus the university orientation more responsive to industry requirements. This invaluable experience could not be replaced with traditional ways of research conduct (Matsuzawa and Ohiwa, 2007: 538-542). In this way, academia could gain precious hands-on experience from the industry. So, the industry could have a wish list of what they desire and present it to the university. However, this does not mean that universities should compromise their research orientation just for the sake of money.

The university should take precaution not to tailor its research focus simply to meet the narrowly-focused needs of a few corporations.

Moreover, in terms of organizational structures, Robbin (1990) has stated that the facilitating structure that enhances alliance coordination and information flow is likely to be less formalized, less centralized, and simple. Thus, any organization which 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. Specific structural characteristics, for example, formalization, are required in university-industry interactions, especially when a member of the staff is considered to have entered into a situation of potential conflict of interest. High formalization will also help fine tune the partners to the unique culture of the alliance. The organization's productivity in terms of accomplishment and service quality can help achieve consistency, uniformity, and standardization.

Low centralization also allows professionals to have autonomy, which is necessary to accomplish specialized tasks so that jobs are effectively performed. Also, when a simple organizational structure or high horizontal differentiation is achieved, organizations can respond rapidly to changing conditions at the point at which the change or innovation is taking place. Decentralization facilitates speedy action because it avoids the need to process information through a vertical hierarchy. Thus, this governance mechanism helps to align the goals of all parties and increase the potential of resource utilization. However, Parke (1993: 794-829) has argued that too flexible structural arrangements and less control mechanisms can result in a situation where individual partners may possess insufficient details on how to collaborate, little irreversible commitment, unclear property rights, and weak authority structure. Consequently, the bond between collaborative partners can weaken and alliance viability may be threatened as alliance partners join competing alliance groups. Thus, the advantages of a high level of rigidity, especially through equity investment, increasing incentives and commitment, aligning the partners' interests, and deterring opportunistic behavior are recommended (Parke, 1993: 794-829).

Hansen (1996: 82-111) has further added that even though low complexity, high formalization and decentralization helps, a new product development team with purposeful knowledge-sharing, they can only accelerate development speed in early

phases of exploration of non-complex knowledge rather than complex one. This argument is substantiated by the observation that exploration leading in the internalization of knowledge is characterized by relatively higher levels of individual autonomy. Conversely, absolute autonomy and loosely controlled structures will not be supportive, or even slow down speed, in situations of high knowledge complexity. Thus, regarding high formalization, low discretion and explicit rules help balance the situation by controlling that every task is performed in a consistent manner, thus resulting in a standardized output.

H_3: Partner complementarities will be positively associated with coordinating factors in terms of cultural and operational compatibility as well as flexible university policies.

Hypothesis 3 has posited that partner attributes will positively affect coordinating factors in terms of cultural and operational compatibility and flexible university policies. As expected, the paths leading from partner complementarities to coordinating factors were statistically significant in the expected direction (β = 0.470*; $p<0.05$). It can be assumed that a firm will be used to accept and assimilate new knowledge from the partners that are well coordinated. Coordination helps to enhance the opportunity for managers to learn through knowledge exchange by allowing them to successfully combine and synthesize their complementary resources over time in order to overcome the coordination barriers through mutual adjustment, operational compatibility, and conflict resolution.

Also, the inherent procedural, structural, and cultural differences between organizations can become insurmountable obstacles to successful cooperation. 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 with the partnership. Khanna et al. (1998: 193-210) have also mentioned that potential conflicts of interest in alliances inevitably occur due to private benefits and common benefits when partner firms' objectives in an alliance are not completely aligned and pooled resource integration is underutilized. Thus, the managers and university partners should pay attention to these concerns in order to increase the effectiveness of knowledge transfer between the partners. The best interest of the

university could be compromised in the personal interest of staff members. Various situations relating to technology transfer interactions with industry present the possibility for staff members to make money and the potential for making money and bias their objectivity. Other potential situations of conflict of interest include staff members acting as spokesmen of the university and its spin-offs, the purchase of equipment from its spin-off companies, and supervision of students or where a staff member has a financial interest in a company which is developing his/her technology or when a staff member is involved with a company holding a license on his/her technology. As mentioned by the respondents in the study regarding the problems with and solutions for alliance projects, the following situations, which are perceived to be conflicts, should be avoided.

1) Exploitation

Exploitation includes misuse of students by using them as "cheap labor," doing product development for the financial benefit of staff members. In cases where a staff member supervises final-year projects and postgraduate students, this includes shifting thesis topics towards commercial development or even biasing of grades.

2) Opportunism

Opportunism refers to either undertaking or changing the orientation of research (whether supported by university funds or external grants) to serve the research, product development, or other needs of the company, such as utilizing university resources, laboratory facilities, clerical and service support, for the activities of the company without permission and proper agreements or transmitting to the company information that is not made generally available. This includes withholding or reducing publications after transferring technology to the company, or failing to attend to industry visitors from competing companies.

3) Non-Transparency

Non-transparency in operational procedures includes the activity of purchasing major equipment, instruments, materials, or other items for university research from the company in which the staff member has an interest without disclosure of such interest and/or funding by the company of research projects related to the licensed technology with supervision by staff member without disclosure of

such arrangements. Some examples of financial attachments between a staff member and a company that could create the above concerns include: consulting, equity ownership, and royalty interest or family ties to someone financially attached to the company. From the above discussion, a staff member has the responsibility of informing and providing open communication with the university administration of the potential conflict situations and addressing how issues of conflict of interest are to be managed.

From the above discussion, it can be assumed that these unfavorable behaviors have resulted in the reduction of motivation, learning intent, absorptive capacity and commitment between the alliance partners. Thus, alliance partners are reluctant to transfer knowledge, trade secret and technical know-how when partners do not trust each other. In order to solve this problem, formalization, as favorable structural characteristics of the alliance to minimize the conflicts, can be used as a rule, a clear demarcation of both effort and incentive relating to faculty duties from the research activities associated with their staff members and their alliance partners. As suggested by Lei et al., 1997: 203-225, some formalized guidelines can be employed in order to prevent potential conflict of interests; the recommended guidelines are described respectively.

Table 5.1 Possible Conflict Situations, Formalized Policies and Guidelines for the University Counterparts

	Conflict Situations	Formalized policy and Guidelines
1)	**Exploitation** **-Misuse of students**	-Staff inventors must avoid directing students into research activities which serve their own personal interest at the expense of scholarly achievement. Supervisors of such staff inventors can decide if co-supervisor who have no direct interests in the spin-off company should be appointed or create a group of two or three peers to advise the inventor on issues related to conflict and to meet regularly with the inventor to evaluate the appropriateness of on-and off- campus activity.
2)	**Opportunism** **-Transmission of privileged information**	-Care should be taken to ensure that cooperative agreements with external organizations do not contain unacceptable limitations on open publication. Limited delays in publication may be acceptable to accommodate explorations of patentability or sponsor's utilization of research results for new products or processes. Such arrangements may not be considered if they impede the progress of students toward their degrees.
	-Undertaking or changing the orientation of the staff member's university research to serve the research or other needs of the company	-There should be differentiation between the work undertaken by a staff member for a company and the work undertaken for the university involving expertise for which the staff member is employed. In general, work with scholarly content should be performed as part of university duties, e.g., research with scholarly, publishable content vs. refinement of a specific process or product or service-oriented tasks, etc.
	-Utilization of university resources for the activities of a spin-off company	-The utilization of university resources, on-campus (laboratory facilities, academic advisory, clerical and service staff support, etc.), for the activities of a start-up company should be cleared and documented with the university administration. Arrangements should be covered in a letter of understanding which spells out the extent and rules governing usage of facilities beyond that available to other similarly qualified companies. -The involvement of university students and staff in off-campus spin-off company activities should be undertaken with caution. Safeguards must be instituted on a case-by-case basis to ensure that the performance of university duties and the scholarly mission of the university are not compromised. -The above policy also applies in relation to involvement of any company other than a university spin-off.

Table 5.1 (Continued)

	Conflict Situations	Formalized policy and Guidelines
3)	**Non-Transparency** **-Purchase of major equipment, materials, or other items from a company in which the staff member has an interest without disclosure of such interest** **-Funding of research projects by a start-up company** **-Supervision of student projects and thesis work** **-Lack of understanding of rules and acceptable behavior of staff inventors and those engaged in technology transfer activities**	-A staff member who has a direct interest in a company that has dealings with the university should bring this to the attention of relevant university administrators. These staff members should not be asked to perform administrative duties which may place them in a position of possible conflict of interest. -In addition, where a staff member or his research team is required to draw up specifications for equipment procurement that may result in the purchase of equipment form his/her company, an independent committee should review the specifications. -If a staff member owns equity in a company that has a license to a university invention, the company can fund research at university related the invention on a case-by-case basis. This is to prevent the university from becoming a development arm of the company. This also helps guard against misuse of students in the event that the research is driven by the interests of a biased sponsor. -If a staff member owns equity in a spin-off company, the staff member shall not act as academic supervisor or examiner of students' projects or thesis work where such work is the result of or forms the basis of collaboration between the university and the company. -To overcome the problem of managing conflicts, rules are available to assist department heads to advice staff members. -To minimize potential problems and facilitate collaboration, the mode of operation between the company and the mode of operation between the company and university for each cooperative activity should be set forth in a specific agreement approved by the university. -Staff members are advised not to act as spokespersons of the company to avoid any misconception with regard to their first loyalty.

Source: Adapted from the Study of Lei et al., 1997: 212.

On the other hand, interest conflict at the organization level between industrial partners and university counterparts can be derived from misaligned goals, benefits, and the involvement. Universities are likely not to engage in the process of commercializing faculty-driven intellectual capital which can limit them from reacting quickly enough to meet the demands of the private sector. Many universities do not view their role as promoting the commercialization process, and do not have in place a structure to support this process. Therefore, institutions have either ignored or overlooked the potential of commercializing faculty research. Revenue pressures, however, have forced many universities to look pragmatically at alternative potential sources of revenue, including those opportunities surrounding faculty research hence the trend of universities toward considering the commercialization of faculty research efforts (Rogers, 1986) seems to be a reactive approach to their focal partners.

Universities must eventually redirect their strategic focus to proactively develop research products to meet the private sector's needs. For example, all three campuses of King Mongkut' s Institutes of Technology have established their universities' incubation centers to take in charge of commercialization process. The first procedure of commercialization is a self-assessment whereby the university analyzes its research output to determine what it has to offer the market place in terms of new product concepts. The process includes project selection including identification and preliminary assessment of new product concepts. The second was an external assessment for private sector firms to determine what the university has to offer in terms of new product opportunities and the issues that would need to be addressed for successfully commercializing these opportunities by coordinating and conducting cost analyses, intellectual property assistance, market analyses and business planning.

Once these two interrelated activities have been completed the new product is moved to joint decision-making to identify the key issues and procedures necessary to commercialize the new products developed from their intellectual capital and research efforts. Then, the university incubation centers identify potential private sector partners. Through trade associations, potential manufacturers for the product are identified and an assessment is conducted in order to determine which has the strongest and closest match for the product. These companies are then contacted and

invited to the university presentation and product demonstration. The presentation, using the business plan and prepared prototype, is an effort to sell the product idea to one of the companies and to develop a partnership. Lastly, the industry partners then placed the product on the open market with both the faculty and university receiving royalties. These funds went the development of the second generation of the new product as well as the institutional research efforts. The involvement and mutual dependence between King Mongkut' s Institute of Technology and their alliance partners are illustrated in figure 5.1.

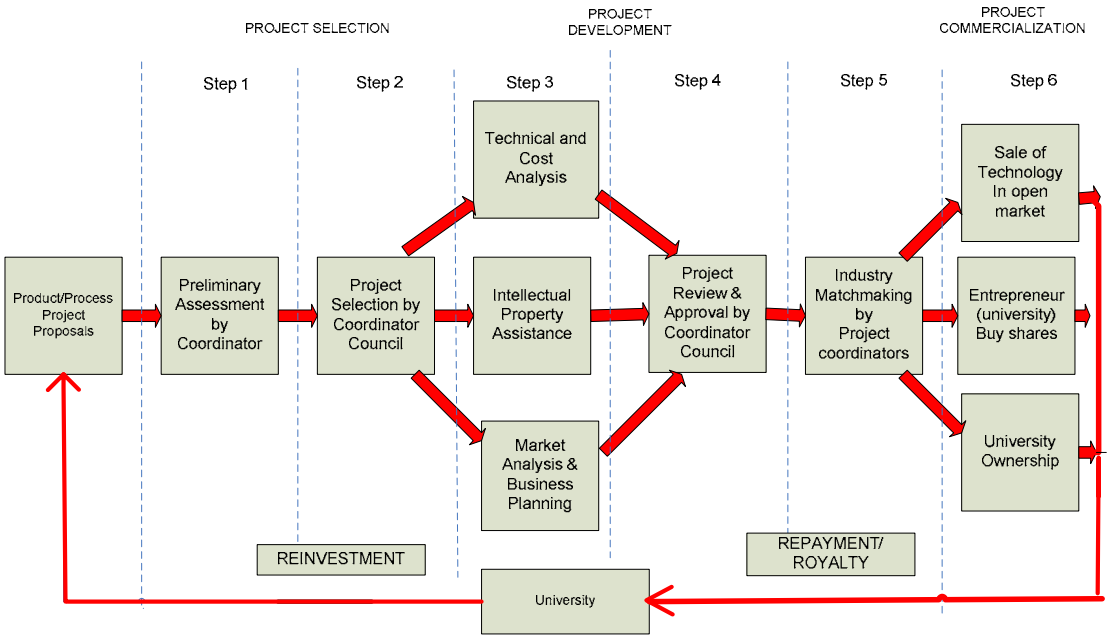


Figure 5.1 The Process of the Commercialization of University-Industry Intellectual Property

Source: Adapted from the Study of Logar et al., 2001: 210.

H_4: Partner complementarities will be positively associated with the relationship factors in terms of trust, commitment, and bilateral information exchange.

Likewise, the hypotheses linking partner complementarities to relationship factors in hypothesis 4 were supported by the findings. The paths leading from partner complementarities to relationship factors were statistically significant and in the

expected directions ($\beta = 0.541^{*}$; $p<0.05$). It can be assumed that relationship factors and partner complementarities in the alliance partnership motivate both the university and industrial partners to fulfill obligations and act in a beneficial fashion towards their co-development projects. Strategic and resource alignment lessens a firm's fears about knowledge misappropriation, thereby making them more willing to work closely with their university partner in order to transfer knowledge. The firm's perception of its partner's relational bonds with and goodwill toward the university partner leads to cooperation rather than skepticism. Consequently, the firm devotes more of its energies to task-related initiatives rather than worrying about its partner's possible opportunism, competence, and commitment in the job. Thus, resource interdependent partners are more likely to be motivated to create relationship capital by engaging in trustworthy acts that increase their vulnerability to each other, signaling their expectations of continuity and solidarity with the relationship by committing relationship-specific resources, and maintaining open and participative lines of communication.

However, open communications in an alliance context implies a greater depth and intensity of information exchange and the ability of key information to cross organizational boundaries in numerous places. In the study, it was suggested that network infrastructures such as information technologies and the roles of third parties such as broker associations should be considered for required institutional support. First of all, the findings revealed a significant degree of network interface and collaboration. Castell (1996) has argued that the implementation of information and communication technologies (ICTs) such as virtual universities has facilitated the rapid realization of the structural flexibility and information exchange that has come to characterize the network organizations. Therefore, industrial partners and university counterparts can exchange information to meet everyone's needs.

Secondly, the role of third parties, such as professional associations, trade associations, and publicly funded bodies specifically aimed at promoting innovation have a positive impact on the development of inter-organizational networks, communication, and innovation (Conway, 1995: 327-345). There are numbers of characteristics of third party involvement, however, that need to be considered. Third parties have a dual role in promoting innovation. They ideally act as neutral

knowledge brokers but also act as important conduits for the development of informal relationships (personal relations between individuals), which are the basis for the development of network relationships. The informal personal networks enable firms to develop thinking that steps outside their particular business system (Liyanage, 1995: 583-597). The role of broker associations within networks enables different business systems to communicate by generating trust between different parties in their common role as neutral agents (Sarkar et al., 1997: 255-285). In the other words, a broker association can strengthen the quality of the relationships within the network through network facilitation. It also can improve the level of shared trust, information sharing and can provide opportunities to learn about participants' characters, strengthen commitment and avoid exploitation.

5.1.2 The Role of Coordinating Factors as Key Mediating Variables and their Impact on Partner Attributes and Relationship Factors that Influences the Effectiveness of Knowledge Transfer

H_5: Coordinating factors consisting of cultural and operational compatibility and flexible university policies will be positively associated with partner attributes in terms of staff's learning abilities, the skills of joint alliance management, and structural characteristics.

Coordinating factors were hypothesized to enhance partner attributes in hypothesis 5 between firms. The standardized coefficient for the relationships represented by (H5) (β =0.252*; $p<0.05$) established a strong positive impact of coordinating factors on partner attributes. The reciprocity between partners is important. First, in managing a strategic alliance, written formal contracts are important but they are only a starting point in evolving a successful exchange. Successful strategic alliances require periodic review of the relationship. These reviews may result in changes and modifications in the goals as well as in the day-to-day work of strategic alliances. In the beginning, it can be difficult for the partners engaged in strategic alliances to evaluate the resources and capabilities of their counterparts. Successful strategic alliances do not evolve because of the initial strategic match between the alliance partners. A more important requirement is rather the ability of the alliance partners to manage interactions and to continuously adapt.

Strategic alliances should be viewed as organic arrangements evolving and changing over time. Strategic alliances need continuous reassessment. In managing these strategic alliances, flexibility of the partners is vital. Second, the paper also suggests that partners in strategic alliances should interact as frequently as possible. This interaction may be formal or informal. Success in strategic alliances is achieved more by interacting with the alliance partner than by the initial strategic compatibility between the alliance partners. Alliances involve sharing networks as well as resources. Sharma (1998: 511-528) argues that firms in an alliance need to understand the entire network relationship of alliance partners. This means that the greater the interaction between the two organizations, the greater the common relations that consolidate an alliance. Not only are partner's relationships a source of learning but the sharing of those relationships strengthens the connections between the two organizations.

H_6: Coordinating factors consisting of cultural and operational compatibility and flexible university policies will be positively associated with relationship factors in terms of trust, commitment, and bilateral information exchange.

Coordinating factors were hypothesized to enhance relationship factors in hypothesis 6 between firms. The standardized coefficient for the relationships represented by (H6) (β =0.748*; $p<0.05$) established a strong positive impact of coordinating factors on relationship factors. The results of the study indicate that coordination factors in terms of cultural and operational compatibility, as well as flexible policies, are positively associated with the degree of relationship quality from the perspectives of trust, commitment, and bilateral information exchange. Coordination leads to trustworthiness, commitment, and bilateral information exchange as it is the inter-related factors that are indispensable in the alliance relationship.

Also, relationship factors can encourage partners' willingness to be more flexible in solving conflicts. Co-development relationships may evolve in ways that are difficult to predict; the manner in which value is created is not preordained. Doz and Hamel (1989) have stated that initial agreements have less to do with success than the ability to change. Clearly, adaptability or flexibility is a necessary characteristic

for co-development partners. In the relationship, alliance partners are expected to be able to make adjustments to ongoing circumstances.

H_7: Partner attributes in terms of staff's learning abilities, the skills of joint alliance management, and structural characteristics will be positively associated with the relationship factors in terms of trust, commitment, and bilateral information exchange.

Contrary to expectations, the hypothesis linking partner attributes to relationship factors in hypothesis 7 was found to be insignificant (β=-0.431; $p > 0.05$). The result indicates that partner attributes do not have direct impact on the relationship factors. It can be assumed that partner attributes will indirectly help enhance the degree of relationship quality between partners whenever they have good coordination in their co-development projects. Learning intent, absorptive capacity, and the skills of management are embodied in individuals, such as employees with expertise and know-how resulting from years of on-the-job experience, as well as in organizations, such as those with an established brand name, shared routines, and company culture (Khamseh and Jolly, 2008: 37-50). Thus, tacit knowledge, represented by personal quality, makes it difficult to formalize and communicate to others. If the managers who possess their capabilities change their job due to headhunting by competitor's firms, these partner attributes are vulnerable to the ethical requirements to keep trade secrets and to avoid opportunism.

Partners may become protective about their resources, especially when their competitive advantage relies on these resources. In that case, partners will strive to restrict knowledge and also will become excessively controlling over the alliance project. As a matter of fact, most universities and industrial partners are in a dilemma when they need to balance the internalization of useful information and complementary skills with the protection of core proprietary capabilities from being absorbed by the partner as well as the exploitation of the partners. This creates underlying tension between "trying to learn and trying to protect." Kale et al. (2000: 217-227) have mentioned that the dilemma arises because decentralization in decision-making and simple organizational structures that might facilitate the learning process is likely to expose firms to the danger of losing some of their knowledge to their partners. Thus, formalization can play a major role in balancing the situations

when there are some clear-cut rules to determine actions of the partners, but decentralization and simple organizational structure may not increase trust worthiness, commitment, and bilateral information exchange between partners. Thus, partners with commitment and long-term orientations are selected over others because long-term orientation gives the partner the ability to overcome obstacles, resolve conflicts, and continue knowledge exchange under uncertainty. Those partners should focus on achieving future goals and be concerned with both current and future outcomes and be willing to contribute without knowing the exact outcomes.

5.1.3 The Impact of Partner Attributes, Coordinating Factors, and Relationship Factors on the Effectiveness of Knowledge Transfer

H_8: Partner Attributes in terms of staff's learning attitudes and abilities (learning intent and absorptive capacity), the skills of joint alliance management (joint management competence), and structural characteristics that are formalized, decentralized, and simple in the organization arrangement will be positively related to the perceived level of knowledge transfer effectiveness.

The effect of partner attributes on the effectiveness of knowledge transfer in hypothesis 8 was found to be significant at the 95 percent confidence level (β = 1.406*; $p<0.05$). As expected, learning motivation positively influences the amount of transferred knowledge (Gupta and Govindarajan, 2000: 473-496), and lack of motivation in accepting knowledge leads to "stickiness" or difficulties in the transfer process. The motivation of the recipient related to knowledge transfer is positively associated with the speed of the knowledge transfer across organizations. If a recipient firm is highly motivated to acquire knowledge, its openness to receive such knowledge allows for more effective transfer. Likewise, firms with a high level of absorptive capacity are likely to have a better understanding of the new knowledge and to harness new knowledge from other firms to help their innovative activities (Tsai, 2001: 996-1004). Without such capacity, firms are hardly able to learn or transfer knowledge from outside. In the other words, firms can assimilate new knowledge more effectively if they possess a high level of learning absorptive capacity.

The empirical findings also reveal that if a firm has managers that have skills from prior experience with their partner's technology; it will better understand the assumptions that shape the partner's knowledge pertaining to that technology. These managers have the ability to review continually the fit of the alliance to the changing environment to make modifications as necessary. Competent alliance managers are able to negotiate, structure, and run alliances in ways that allow such firms to 1) secure attractive alliance partners, 2) minimize the chances of such alliance mismanagement as poor conflict resolution, 3) work with their partner firms to successfully combine and synthesize their complementary resources that lead to competitive advantage, and 4) scan for and identify potential partners having the complementary resources that are needed to complement existing competencies and increase the competitive advantage.

Well-coordinated alliances encourage sustainable and long-term collaboration where repeat partner firms can help develop procedural routines. Prior alliance experience of management plays an important role in developing skills of management and it therefore reduces the time and resources devoted to the pre-agreement of partner selection and screening. Experience with prior alliances influences the learning process of information exchange and interaction that has established routines fostering learning in subsequent alliances in response to the availability and analysis of feedback between organizational actions and outcomes.

In order to achieve knowledge transfer effectiveness, the staff's learning intent and absorptive capacity are needed to be stimulated through close coordination of staff members in the research, invention disclosure and transparency. While it is in the interest of universities to foster an entrepreneurial spirit in its university staff members and promote active university-industry relations, the management should recognize the importance for staff members to gain mutual benefit and win-win agreement as well as to avoid actual or apparent conflict of interest either between their obligations to their university and their outside interests or the researchers and their own universities. Learning accumulated through partner-specific alliance experience may lead to the emergence of dyadic inter-organizational routines that can facilitate the development of inter-firm knowledge-sharing routines and open communication, leading to their reliability, commitment and trustworthiness.

However, the respondents in the survey have stated that the organizational culture and procedural routines of universities were mostly against the alliance collaboration concept. Universities increasingly find themselves in a paradox of public and private orientation, in which they have been pushing towards a business model of networking while they are attempting to maintain collegial networks in terms of formalization, centralization, and complexity. These are considered oppressive aspects of network organization and deescalate the process of knowledge transfer. The model of the flattened, networked university is still very much an ideal rather than a norm (Marginson and Considine, 2000).

Thus, in order to overcome these obstacles, new forms of governance mechanisms must be implemented in the university systems through new roles of the university executives with vision and leadership styles that promote innovation in culture, self-managed market practices, and a reduction in collegial structures. In relation to the tension between centralized and decentralized approaches to university management, it was found in the study that a number of university executives expressed the need to move away from top-down directives and narrow forms of accountability and instead create a broader culture of cooperation and communication within the organization. As suggested by Logar et al. (2001: 206-217), traditional management styles can be shifted toward new styles for successful alliances in terms of organizational structures, corporate culture, operational procedures and organizational norms.

Building a network that can manage diversity, and make good use of diverse skills is essential for the effectiveness of knowledge transfer and sustainable collaboration. Knowledge exchange through the network is vital for creativity and growth. Firms frequently encounter barriers to innovation embedded in their bureaucratic structures. These businesses are stuck in a status quo and hide behind the fear of upsetting the hierarchy and social systems that have contributed to past successes. These barriers deliver a need to reevaluate organizational forms, structures, and business models. Transferring tacit or implicit knowledge requires close interaction and involvement in a community of practice, and requires awareness of each alliance partner's existing practices.

As suggested by Vidovich and Currie (1998: 193-211), devolved mechanisms, such as accountability-based and performance–oriented mechanisms, top-down accountability and increased autonomy among university communities are recommended by balancing between central control, tightly controlled rules and the degree of autonomy in relation to how the common goals are carried out. Rogers et al. (1995) has suggested that organizational structure should be more decentralized with open systems of communication and negotiation in terms of less complexity and low hierarchical decision-making. Success of organization should be nurtured through the collaboration with alliance partners as potential strategic resources to gain their knowledge and technical know-how from information sharing and knowledge exchange. Management should redirect strategic focus to be more long-term orientation to acquire new knowledge and capabilities through teamwork in formal and informal networking as well as training rather than the cost focus. In terms of organizational norms, alliance partners should be swiftly responsive to unpredictable change and commit to new challenges of innovative risk-sharing rather than staying in the existing wisdoms. The comparison of traditional management style and new management style is summarized in table 5.2.

Table 5.2 The Summary of Changing Traditional Management Style towards New Management Style for Successful Alliance Collaboration

Traditional Style	New Style
Organizational Structures: -Total control over resources to achieve objectives -Organizational structure: "closed system" -Conflict resolved through hierarchy when other means fail	**Organizational structures:** -Shared/distributed control -"open system" -Absence of such a "hierarchy" in the alliance and focus on negotiation skills
Corporate culture: -Success based on competition -Emphasis on secrecy of operation -Focus on generating internal resources' know-how technologies to maintain/create competitive advantage -Emphasis on internal production	**Corporate culture:** -Success based on cooperation. Competitors regarded as potential strategic resources -Need for sharing of information with partners -Using alliances as a strategic leverage to procure resources to maintain/create competitive advantage -Encourage search for better ideas beyond corporate boundaries -Long-term view for gaining access to newly acquired capabilities
Operational Procedures: -Separate teamwork in various levels of workforce -No specific programs to seek out alliances and make them successful	**Operational Procedures:** -Open communications, training, and team-building efforts at all levels of workforce -Specific programs to broaden the experience and education of the workforce. Mutual learning and dependence encouraged through formal training and informal networking
Organizational norms: -Fear of failure -Slow to react to changes -Alliance often viewed as a threat (reduced control/power, loss of job, hence resisted or at worst rejected) -Status quo	**Organizational norms:** -Failure tolerated and expected to lead to new insights -Encourage rapid and flexible response to changes -Alliance viewed as strategic tool -Rethinking, relearning, adopting new ideas, experimentation to do better to avoid the trap of yesterday's wisdom

Source: Adapted from the Study of Logar et al. 2001: 219.

H_9: The greater the degree of coordination factors consisting of cultural and operational compatibility, as well as flexible university policies, the greater the perceived levels of knowledge transfer effectiveness.

Contrary to expectations regarding the impact of coordinating factors on the effectiveness of knowledge transfer (β=-.581; p>.05), the path coefficient was statistically insignificant and the sign is reversed, thus indicating lack of support for hypothesis 9. It can be assumed that the degree of coordination does not have a direct impact on the effectiveness of knowledge transfer; on the other hand, the findings stress the indirect impact through the degree of partner attributes and relationship factors. Spekman et al. (1999) has stated that norms, values, or procedural routines may not be congruent when partners do not share similar expectations or behaviors, thus 1) impeding understanding and information flows; and 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 in a dyadic relationship. In order to have effective communication and exchange of knowledge, there has to be at least a minimum congruence in norms and procedures, that is, in the way of doing things. Partners with compatible cultures are more likely to understand one another and to work toward common goals.

From the university perspectives, the influence of cultural differences between university-industry partners can be problematic to the alliance projects as university can be characterized as more or less ‘monoculture’ relating primarily to their own professional field, and people are focused on the development of knowledge and have low commitment to the industrial product development target. Within the university, researchers are not challenged by manufacturing and marketing people, and traditionally neither by a strong directive management. A manager should establish teamwork in order to break the monoculture into a more productive tension between different cultures within the alliance partners to become more multifunctional. This produces a stronger need for communication across functional and organizational barriers, which brings specific objectives. The further the integration of these industrial criteria into their own culture is crucial to improving the future performance of product development of both parties. The focus should not be on creating a new industrial culture, but rather on creating the ability to cope with cultural differences.

The university-industry partners need to adapt themselves to each other in the procedural activities of product development. From the respondents' opinions, most universities usually do not release products until they are convinced that the product itself is as close to perfect as possible. In other instances, in the time it takes for this level of perfection to be determined, the market environment for the product has changed. The faculty member may not value being first to the market as much as his or her private sector counterpart. Faculty need to recognize that many companies do not require perfection but view product development as an ongoing process in which products go through many stages of continuous development and are marketed as such; for example, when a product at present performs one function but when perfected could be multi-functional. The faculty member may not release the product until all multiple functions can be performed. Yet the private sector and current market would accept one function followed by improvements in the future, in the form of second, third, and fourth generation products, if the one function performed now is superior to the same function performed by competitive products now on the market.

As a matter of fact, most of those they overcome these conflicts are likely to achieve mutual adjustment. Organizational patterns must change in order to accommodate the blending of each member's talents. At the same time, members must resolve the conflict, 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 and improve their coordination. A lack of understanding of partners' operations, culture, strategic intent and ideology can lead to resistance and conflict. If cooperation is lacking, opportunistic behavior will become the norm and impede the effectiveness of knowledge transfer.

Mutual dependence is also a critical feature of purpose-driven collectives and preferably does not rely on only one person. The relative importance of the relationship can be described with reference to the level of intensity and to the level of reciprocity. The asymmetry in the mutual dependence of partners might increase the perception of vulnerability and reduce the propensity to open collaboration and communication. Unbalanced situations can lead to conflicts; if conflicts are not resolved, they can eventually lead to relation disruption. Thus, aligning the

perspectives of different kinds of stakeholder groups is a necessary but challenging task. These groups bring to the table different issue perspectives, disciplinary approaches, and strategic orientation. In order to solve the conflict, managers may use their skills to negotiate and decelerate the situations by stimulating the motivation of learning and involvement among partners in the relationship. Risk sharing, involvement to meet innovative goals, and information sharing are some of the recommended activities in developing R & D alliances. Specifically, the awareness of all partners in terms of available resources, technological feasibility, and possible risks that can occur regarding scientific breakthroughs should be increasingly nurtured. Gaining consensus from the beginning about long-term goals and objectives is generally seen as desirable.

However, goal clarity is difficult to achieve. This mission can be accomplished through on-going management support. Continuity of total commitment to the alliance and consistent management vision are needed at all levels in the organization. When managers that have negotiated or implemented the initial alliance agreement are changed due to promotion, transfers, retirement or terminations, commitment and ongoing policies may be interrupted. Thus, lack of long-term commitment and support may cause ineffective knowledge transfer in the alliance collaboration.

H_{10}: Relationship capital, consisting of trust, commitment, and bilateral information exchange among the university-industry alliance partners will be positively related to the perceived level of knowledge transfer effectiveness.

Hypothesis 10 hypothesizes the positive impact of relationship factors on the effectiveness of knowledge transfer. As expected, the standardized coefficient for the relationships represented by H10 ($\beta = 0.793^*$; $p<0.05$) shows that relationship factors have a significant positive effect on the effectiveness of knowledge transfer. The results of the data analysis indicate that trust, commitment, and bilateral information have positive and significant relations with knowledge transfer effectiveness. These findings confirm the recognition of prior studies on the importance of relationship factors to the effectiveness of knowledge transfer. When firms are intent on utilizing the alliance to learn from each other, they must recognize that trust, commitment, and bilateral information exchange are the basis of collaboration. Opportunistic behavior

and poor communication often lead the alliance to failure. Therefore, firms should first carefully choose their partners and thereafter, act honestly with the partner during the collaboration process as the sense of trust and commitment is built up between partners when less monitoring and fewer safeguards against opportunistic behavior are needed.

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. Also, commitment can create a positive environment that facilitates the overcoming of barriers to collaboration success among alliance partners. This positive climate fosters greater dedication to the project. The mutuality of commitment in situations of reciprocal interdependence reduces uncertainty for the parties, leading to the effectiveness of knowledge transfer. From the perspective of bilateral information exchange, and timely, adequate, critical, and proprietary information among alliance partners helps to facilitate the realization of mutual benefits by allowing exchange of necessary information and by reducing misunderstandings and uncertainty. 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 thus critical in any alliance activities.

Related to the issue of trust, in the alliance context, it might be useful to distinguish between two kinds of learning; namely the learning of (technical or operational) skills on the one hand, and the learning of how to manage the alliance, i.e., the build-up of an alliance capability (Kale et al. 2000: 217-237). Related to the former type of learning, past research has suggested that firms are able to learn from alliance partners more easily when the level of transparency for openness between them is high (Doz and Hamel, 1989). Also, mutual trust between partners reduces the fear of opportunistic behavior, i.e., “stealing” other partners’ proprietary know-how and capabilities (Gulati, 1995: 85-112). Finding a compromise between opening up for more learning opportunities and being concerned about partners copying too much of their core capabilities would appear to be a challenge for many firms. Concerning the latter type of learning, it seems that in today’s situation many firms would benefit

from greater ‘relational capital,’ which refers to the mutual trust, respect, and friendship that reside at the individual level between alliance partners, as suggested by Kale et al. (2000: 217-237). Open and prompt communication among partners is believed to be an indispensable characteristic of trusting relationships (Kanter, 1990: 15-22). Information in alliance networks should be open and free-flowing after protected information has been clearly identified, with frequent meetings between the partners’ top management to help ascertain proper functioning and to further mutual understanding (Gulati et al., 1994: 61-69).

In terms of bilateral information exchange, a collaborative alliance requires a continuous information flow between partners in order to ensure the best possible integration as well as flexibility (Dyer and Singh, 1998: 660-679) so that the conflict of interest can be prevented and ways to resolve this contradiction can be found. Especially, top management support is critical to ensure that potential alliance managers receive the kind of training and experience they need to become discernable and capable alliance managers. Firstly, the adaptation of a new style of management requires a change in corporate culture, which must be initiated and nurtured from the top. Not only do cultural differences exist among firms seeking alliances, but corporate cultures may be different among firms from the same country. Flexibility and learning are the great tools in overcoming this barrier.

5.2 Conclusion

By combining inter-organizational relations (IORs), the knowledge-based view (KBV) and the resource-based view (RBV), this research attempts to propose an integrated model for measuring the knowledge transfer effectiveness in the university-industry alliance. This research investigates the intriguing interaction between partner complementarities, partner attributes, coordinating factors, relationship factors and a broader conceptualization of knowledge transfer effectiveness consisting of research outcomes, development through tacit knowledge transfer, commercialization, and efficient coordination (RDCE model) that are not accounted for in prior research. The theoretical frameworks, which integrate the diversity-related characteristics of alliance partners, contribute to its greater explanatory power over the existing

measurement of knowledge transfer outcomes. Before testing the proposed hypotheses, the constructs were tested for reliability, validity, and uni-dimensionality. The model was analyzed using the structural equation modeling approach. Seven of the ten hypotheses tested were found to be significantly supported.

The results of the empirical findings reveal that the proposed model in this study has a significant mediating effect that contributes to knowledge transfer effectiveness. The results support the view that partner attributes, coordinating factors and relationship factors affect the effectiveness of knowledge transfer, but they also indicate that: 1) partner complementarities have only an indirect effect on the effectiveness of knowledge transfer through partner attributes, coordinating factors, and relationship factors; and 2) coordinating factors also have only an indirect effect on the effectiveness of knowledge transfer through partner attributes and relationship factors. These findings suggest that coordinating factors are a key mediating variable that influences the knowledge transfer outcomes and that 3) partner attributes are not positively related to the relationship factors, as expected.

By providing a better understanding of the sequence of actions—decisions associated with policies relevant to enhancing knowledge transfer in the alliance partnership—the present study provides university counterparts and industrial managers with useful insights. Strategic management is about coordination and resource allocation across firm boundaries. The empirical findings have found that the partner complementarities in terms of strategic and resource alignment, an antecedent key of alliance formation, can lead to improved coordination between the dyadic partners. In addition to supporting prior research concerning these constructs, the results of the study also strongly support this argument. Specifically, it demonstrates that the strategic role of partner complementarities can 1) have a positive effect on the degree of supporting partner attributes, 2) enhance coordination, and 3) help in increasing trust, commitment, communication, and frequent sharing of pertinent and sensitive information. The significance of the indirect and total effects further suggests that, by fostering superior relationships, coordination and supporting partner attributes, partner complementarities ultimately result in improved quality performance for the university-industry partners. For management, the results imply

that the critical issues identified in the model for the effectiveness of knowledge transfer in the university-industry alliances are:

1) Goal compatibility: short-term and long-term compatibility among alliance partners are crucial. Without such compatibility, the alliance partners may pull in different directions.

2) Synergy among partners in terms of cultural and procedural routines is an advantage of the alliance. The partnership is then efficient, effective, and as a result, much more competitive compared to each alliance partner performing similar tasks individually.

3) Openness and transparency among partners create clear understanding of what value each partner will bring to the alliance. It is the foundation on which trust and relationships are built for future success.

4) Involvement and mutual benefit by balancing the contribution of partners in areas of product development, manufacturing, and commercialization are necessary so that no one partner dominates the alliance. Absence of such balance may result in the takeover of the weaker partner by the dominant firm or a short-term relationship, usually resulting in breaking the alliance without achieving its full potential.

5) Adaptability of new management style is also critical in solving conflict and in encouraging collaboration. Innovative culture and vision of management, which do not concentrate on personal interest or nepotism but rather focus on transparency of procedures in the university, can help reduce exploitation in alliances.

6) Balancing governance mechanisms facilitates innovation and avoid opportunism In terms of structural characteristics, as suggested by Vidovich and Currie (1998: 193-211), devolved mechanisms, such as accountability-based and performance–oriented mechanisms, top-down accountability, and increased autonomy for the university research community are recommended but management needs to balance how rigidity the structure should be implemented to cultivate innovation and speed production while in the meantime prevent exploitation and opportunism.

In the research, it found that partner complementarities and coordinating factors do not have a direct impact on knowledge transfer effectiveness. This appears plausible since mere complementarities and coordination between partners may not lead to learning or knowledge transfer, which requires a certain depth of partner interaction in terms of the specific attributes of partners and relationship quality. This study provides further empirical validation for this emphasis by showing that alliance partners possessing strategic and resource alignment are more likely to achieve knowledge transfer effectiveness upon their focus in terms of the ways in which they enhance each other's competitive advantage, resulting in a win-win situation and involvement. Moreover, coordinating factors in terms of compatible cultures and operational routines, as well as flexible policies, are better able to develop relationships characterized by supporting partner attributes, such as staff's learning attitudes and abilities, the skills of management and favorable organizational structures, increasing communication, cooperation, and coordination of the activities associated with commercialization for the end customers. Thus, both partners cultivate relationship-specific interaction routines and special coordination mechanisms that are sustainable and difficult to imitate. The significant indirect effects of this construct on knowledge transfer effectiveness provide empirical evidence for the fact that while coordinating factors may not have a direct impact on knowledge transfer effectiveness, they foster relationship in terms of trust, commitment, and bilateral information exchange between alliance partners for better understanding and more effective problem-solving, thereby improving the effectiveness of knowledge transfer.

To support this relationship, the empirical findings reveal that partner attributes and relationship factors can have a significant direct impact on knowledge transfer effectiveness context, and they also reveal that partner attributes are the key enablers of this effectiveness. The motivation to learn, the absorptive capacity within the organization, and structural characteristics can facilitate knowledge exchange in alliance activities. At the individual level, ethical concerns should be implemented in order to promote mutual benefit and fairness between researchers and entrepreneurs in order to prevent conflict of interest that may impede motivation and learning abilities in the knowledge transfer process.

The relationship factors were the second best predictors of knowledge transfer effectiveness. Thus, selecting a partner with the maximum potential to sustain the relationship should be highlighted, especially concerning relational alignment. Decision-makers must recognize that trust, commitment, and bilateral information exchange are the basis of collaboration to reduce opportunistic behavior in relation to poor communication can be reduced so that the level of transparency between partners can be enhanced. Partners with commitment and long-term orientation should be selected over others because they can help to overcome obstacles, solve conflicts, and continue knowledge exchange in situations of uncertainty. Institutional support such as vision of management can enhance openness, mutual dependence, and involvement in the commercialization process between partners.

Based on these results, it can be concluded that timely exchange of information through effective communication can improve the coordination of buyer and supplier activities. Frequent and timely exchange of information and knowledge and/or know-how will also foster confidence and help eliminate negative attitudes such as mistrust, fear, disappointment, frustration, and dishonest acts on both sides, thereby leading to improved knowledge transfer and competitive advantages. Braverman (1974) has further argued that the introduction of technology into the workplace and manpower have tended to broaden and deepen the diffusion of information and knowledge sharing, thus increasing network connectivity and involvement. Additionally, an alliance is a network organization which is socially embedded in spite of being dominated by a single entity. The incorporation of a strategic orientation between university-industry alliance partners is necessary for the enhancement of knowledge transfer effectiveness for containing opportunism, and to prevent defection from the university-industry alliances. From a practical perspective, the findings of the significant indirect and total effects among partner complementarities, partner attributes, coordinating factors, and relationship factors suggest that partner complementarities play a synergistic role in fostering superior coordinating factors, which in turn leads to improved knowledge transfer effectiveness.

In sum, this research shows that maximizing the potential for creating synergistic value through R & D alliances hinges on three elements: 1) increasing the potential of partner attributes through the enhancement of ethical concerns in terms of fairness, rewards, and recognition for increasing motivation, learning attitudes, and maximum potential for creating know-how synergy, trust, commitment, and the usefulness of pooled resources and information flow; 2) implementing the adjustment of governance mechanisms in order to transform the status quo and bureaucratic procedures in university systems so that they comply with those of industrial partners in terms of working policies, operational procedures, and corporate cultures; 3) providing institutional support to promote coordination and relationship quality in terms of network infrastructures, such as technology, funding support, and broker associations in order to facilitate collaboration, favorable leadership styles of management for promoting innovation, transparency, openness between partners, and communication channels such as the virtual university; and finally, 4) promoting a network interface in order to maximize the usefulness of partner complementarities in terms of dyadic communication, mutual dependence between partners, and participation in decision-making regarding the commercialization process so that conflicts of interest and strategic and resource misalignment can be prevented.

5.3 Limitations of the Study

In this study, during the instrument purification process, seven items were deleted in order to improve the reliability and validity of their underlying theoretical constructs. The sub-concept of partner complementarities, 'complementary resources', was reduced to only one item because two out of three indicators were deleted in this process. Although the factor exhibited good complementary resources properties, future research should refine it and consider including additional indicators in order to ensure that other aspects of this construct are also represented. Furthermore, the indicator of "commercialization" constructs focus primarily on process rather than tangible outcomes. Although the intention of this study was to capture the extent of commercialization involvement, the indicators may not have explicitly measured this essential notion. It is suggested that future research

conceptualize the optimization aspect of commercialization by adding other indicators. It should also be noted that university-industry alliance relationships are a multidimensional construct and that future research can include other aspects of coordination and other intervening control variables such as the nature of knowledge, the types of specific alliances, and the size and industry sectors of the partners. However, as this research is a part of a larger study that included more than 100 indicators and it may have restricted the focus on the measurement of multi-dimensional facets of knowledge transfer effectiveness, the creation of models and techniques for such an evaluation is clearly a complex task and requires a specific research effort.

Another limitation of this research is related to the sample population. Because respondents were drawn from an alliance project list of the Bureau of Commission on Higher Education and Thailand Research Projects for Undergraduate Study (IRPUS), the results of this research are generalizable only to the population of the firms represented by these two databases. Although the final sample in this study spanned a wider range of industrial firms sectors in terms of demographics, such as industrial sectors and type of alliance partnership, it is suggested that future research endeavors attempt to include a mixed population of respondents from multiple sources so as to extend the generalizability of the results. Since the sample firms were also limited to technology-based firms, future research can include service-oriented firms in the sample in order to validate the relationships established in this research.

Additionally, strategic alliances are a longitudinal process, and the survey technique can only provide a cross-sectional snapshot. Furthermore, only one alliance project was chosen arbitrarily by respondents; though they were asked to pick a typical one, their choice may not have reflected all of the facts since many organizations have more than one alliance experience. Moreover, the author assumed that the alliance constitutes partnerships between firms of roughly equal size and market power. Therefore, this study provided only broad perspectives on the collaboration among alliance partners and did not capitalize on different degrees of alliance integration or different types of collaboration. Neither did this study test for a reversed causal order of the direct impact between constructs. A dual causality

relationship might exist in the study and provide alternative explanations for a possible reverse causation.

5.4 Suggestions for Further Study

For the further study, future research should include a comparative study and distinguish all of the conditions and environmental factors in order to assess the collaborative inter-organizational relationships between different types of university-industry alliances. Several intriguing questions remain. For example, various contingencies that moderate the relationship between various partner characteristics and performance variables may exist. For example, "does the proposed causal relationship hold in different conditions and alliance context?" "Which other control factors that may have an intervening impact on the effectiveness of knowledge transfer?" The size of the organization, the types of industrial partners, the form of collaboration, and the nature of knowledge transfer and innovation should be also included as determinant factors in measuring knowledge transfer phenomena.

Additionally, the majority of respondents were university's counterparts. Due to high competition among firms in the same industry and unpredicted relationship, some industrial firms are reluctant to disclose their confidential performance data and information about strategic activities. The findings from the in-depth interviews and perceptions were, therefore, mainly derived from the university partners' perspectives. This investigation may have possible biases and neglect some important facets in relation to partners. Although the respondent selection process ensured highly knowledgeable respondents and research supports the use of proxy-reports, it is suggested that the future study might be able to improve the accuracy of the existing data by having a respondent from each firm report on the alliance rather than having one individual report on the alliance. This limitation, however, needs to be balanced against the difficulty of combining the responses of two informants in dyadic fashion (Jap, 1999: 461-475). Also, informant anonymity prevented contacting alliance partners. Regardless, with or without dyadic data, future research should explore alliances with asymmetries in partner firm alliance competence in order to determine if such asymmetries affect alliance outcomes and/or if there are variables that

moderate the effect of partner firm alliance competence asymmetries on alliance outcomes. However, the scope of this study limits the ability to empirically test these propositions, and it remains for future research to unravel these questions.

5.5 Chapter Summary

This chapter first summarizes the findings of the hypothesis testing of the proposed model for measuring the effectiveness of knowledge transfer. The major determinants of the effectiveness of knowledge transfer consist of partner complementarities, partner attributes, coordinating factors, and relationship factors. The relationships between variables are combined to form the effectiveness of a transfer model of university-industry alliances. Of the four constructs, two are statistically significant at a significant level $p<0.05$ with the effectiveness of knowledge transfer. It is shown that the best predictor of knowledge transfer effectiveness is partner attributes ($R^2=0.799$). The second best predictor is relationship factors ($R^2=0.681$). Coordinating factors are the least significant predictors of the effectiveness of knowledge transfer ($R^2=0.221$) because it does not have a direct impact on the effectiveness of knowledge transfer. It is found that partner complementarities and coordinating factors are not statistically significant at $p<0.05$ with the effectiveness of knowledge transfer but they are positively related with the other mediating variables significantly in terms of both direct and indirect impact. It is implied that the effectiveness of knowledge transfer is contingent upon a combination of partner complementarities, partner attributes, and coordinating and relationship factors. Next, a discussion on the findings is carried out regarding the relationship between the proposed constructs. This chapter then provides theoretical contributions and applied implications of the findings. Additionally, the limitations of this study regarding its research design, the generalizability of the findings, and measurement issues are discussed, together with suggestions for future research.

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APPENDIX A

QUESTIONNAIRE (ENGLISH VERSION)

QUESTIONNAIRE

A Study of Knowledge Transfer Effectiveness of University-Industry

Introduction: This questionnaire is part of research undertaken in a doctoral degree study in the doctoral program in public administration at the National Institute of Development Administration (NIDA).

The purpose of this research study is to examine factors that enhance competitiveness in university-industry alliance partnership in terms of mutual knowledge transfer and then to provide policy makers in the relevant industry strategic suggestions for sustaining competitiveness. This research project gives significant contribution to not only university but also both public and private sectors that are interested in sponsorship the research with the universities to develop innovative R&D for the sake of the overall society and commercial purposes.

Definition: University-Industry alliance are any form of cooperation between universities, research centers and industrial firms, in particular, those that involve production process know-how, R&D process and technology, to achieve their strategic objectives and innovation by pooling their resources, knowledge and skills together. Partners may or may not possess equity shares in the collaborated project. Alliance include both formal and informal agreement, especially in the form of personnel exchange, cooperative research project and education as well as sponsorship the academic researches for innovation. The University-industry alliance still exists or no longer exists**.**

Instructions:

1. In total, there are 8 pages. (including this page) Please answer every question. Please be assured that **your response is strictly confidential** and only aggregate reports are reported.
2. Select the alliance with any partner, which you have experienced during 2004-at present as a priority. Please complete this survey even if your organization is no longer participating in the alliance or it is terminated.

Thank you for your time and effort that are contributed to this study.

Patthareeya Lakpetch,

Ph.D.Candidate in Public Administration at NIDA and Project Coordinator,

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Section A: About Yourself, Your Organization and Your Partner

Instruction: Please select one latest alliance and one partner in the alliance operated from 2003 until at present to be used as the focal basis of information whether or not the objectives established for it were achieved. Please mark (x) at your response in the following questions that indicate most precisely your perception, estimation, or facts for each question

1. The following items are the specific types of university-industry alliance relationship please check one that best represents the type of your alliance project.

- □ Individual consultancy with a particular researcher or professor (paid for or free)
- □ Informal exchange forums and workshops
- □ Scholarships and postgraduate linkages for researches
- □ Student interns program
- □ Cooperative education Program
- □ Collaboration through broker associations, please specify……
- □ Contract research
- □ Cooperative research projects between partners
- □ Research grants and donations for R&D, general or directed to specific departments in university department
- □ University-industry research consortia
- □ Others, please specify…….

2. Does your specific job in your organization concerning university-industry alliance projects that focuses on the linkage between universities, academic institutions and industrial firms for developing researches, new product and production process for the sake of the overall society and commercial purposes as mentioned above?

- □ No (please forward this survey to the person you see fit, thank you)
- □ Yes

3. Which category best describes your position in the organization?

- □ President, owner, chief executive, managing director, deputy managing director, general manager
- □ Chief operations, director in operations, vice president in operations, deputy vice president in operations, factory manager, operation manager, operation department head, dean
- □ Others, please specify,……

4. Which industry sector is the best fit with your organization?

- □ Public universities
- □ Private universities
- □ State enterprises
- □ Private companies ,
- □ Joint ventures
- □ Others, please specify…….

5. What was your organization's motive (s) for entering this alliance? (can select more than one)

- □ Gaining access to financial support from partner.
- □ Acquiring technological and know-how support from partner.
- □ Gaining tacit knowledge and technological know-how from partner
- □ Using facilities and resources provided by partner.
- □ Others, please specify……

6. Has your organization ever engaged in other technology agreements or alliance collaboration before?

□ No, this is (was) our first or only one project.
□ If yes, please specify the type of your alliance collaboration as follows:
……Joint ventures

……Joint R&D or joint marketing with contract-based agreement in Order to (please specify)……..

……No equity, no contract, but agree to cooperate by the means of……..

……Others, please specify…….

7. How often has your organization and your partner exchanged the information and educated their personnel for development during the alliance collaboration?

	Number of Time			
	None	1-6	7-12	13 or more
1. In-house training course				
2.Training courses organized by partner				
3.Training courses organized by other institutions				
4.Student interns				
5. Site visit and tours				
6. Co-develop research department between partners				
7. Joint involvement in university curriculum development to meet industrial needs				
8. Others, Please specify……..				

8. Which resource (s) that your organization and this partner have contributed to the alliance?

Your Organization	**Contributions**	**Your Partner**
…….	1. Manufacturing-related technology and know-how	……
…….	2. Creative idea and scientific breakthroughs	……...
…….	3. Quality control	…….....
…….	4. Distribution channel	…….....
…….	5. Raw materials	……
…….	6. Marketing know-how and market access	……
…….	7. Financial resources	……
…….	8. Human resources	……
…….	10. Information technology	……
…….	11.Others, please specify	……..

9. To what extent do you agree or disagree with these statements concerning your partner and your organization. Please answer to every item.

1= strongly disagree 2= disagree 3= neither disagree nor agree 4= agree 5= strongly agree

	Extent				
	1	2	3	4	5
1. Both organizations need each other's resources to accomplish their goals					
2. This cooperation will be of strategic importance for our organization and our partner for the future.					
3. There is lack of agreed upon objectives between our organization and our partners.					
4. The alliance activity is not tied to the overall corporate strategy for all partners.					
5. This cooperative alliance would not be possible without your partner's resources and competencies since it contribute with similar specialized knowledge that helps broaden the existing knowledge scope to be more efficient and reduce uncertainty.					
6. Your partner possesses distinctive core competences and the acquired knowledge from them helps increase the scope of your business and supplementary specialization.					
7. Partners' knowledge and expertise can help improve your existing product or service or lunch a new product or service					
8. Organizational culture of the two organizations encourages learning new ideas, concepts and method and promotes the sharing of ideas across different units of functions.					
9. We view learning about new skill and knowledge as a key investment in our organization's future.					
10. We are capable of managing new information in meaningful ways.					
11. We are capable of integrating new information from variety of sources.					
12. We frequently incorporate knowledge about outside technologies and innovations into our business activities.					
13. We have learned how to handle alliance through previous cooperative alliance**.**					
14. We have capable alliance managers who know how to solve the conflict between partners very well.					
15. Our alliance management are competent in managing the projects in terms of collaboration with the partners.					
16. We can anticipate which partner could help accomplish the innovation.					
17. We scan for and identify potential partners that have the complementary resources that are needed in the alliance project.					

10. To what extent do you agree or disagree concerning your organizational structure and university policies in terms of cooperation

1= Strongly Agree 2=Agree 3=Neither disagree nor agree 4= agree 5= strongly agree

	Extent				
	1	2	3	4	5
1. All issues will be contacted through alliance managers.					
2. All information channeled through designated offices.					
3. We rely extensively upon contractual rules and policies in controlling day-to-day operation of the alliances.					
4. Your organization and your partner have or plan to have detailed legal documents for the projects we have agreed to work on to protect against loss of intellectual property.					
5. The amount of financial resources each partner in the alliance was expected to contribute toward the alliance development was clearly laid out in the contract.					
6. Problems in alliances are resolved hierarchically from different management ranking.					
7. Each alliance organization makes decision on changes in daily operation without complexity because of few departments assigned for dealing with alliance projects.					

11. To what extent do you agree or disagree concerning the degree of coordination between alliance partners

1= Strongly Disagree 2=Disagree 3=N either disagree nor agree 4= agree 5= strongly agree

	Extent				
	1	2	3	4	5
1. The relationship between partners is marked by a high degree of harmony in management styles.					
2. The organizational values and social norms prevalent in the alliance partners were congruent.					
3. Both partners involved in this project had compatible philosophies/approaches to business dealings.					
4. There is a same agreement between partners regarding to jointly management aspects of the alliance.					
5. University makes an effort to make decision on implementing daily operation based on mutual benefit and consensus with the industrial firm partners.					
6. There is flexibility for the universities to modify predefined goals of their academic studies to match well with the needs of all industrial partners.					
7. There is a same agreement between university and industrial partners regarding to the launch of new product, patent and publication of the new product and process development.					

12. To what extent do you agree or disagree concerning the quality of relationship between alliance partners

1= Strongly Disagree 2=Disagree 3=Neither disagree nor agree 4= agree 5= strongly agree

	Extent				
	1	**2**	**3**	**4**	**5**
Trust between partners:					
1. Our organization trusted that the partners would act in our organization's best interest.					
2. Both partners were generally honest and truthful with each other.					
3. Our organization had confidence in the partner's competence and abilities as well as its motives and fairness sharing these abilities.					
4. Both partners trust the values and experiences of alliance members in controlling day-to-day activities.					
5. Our partner is competent to fulfill the agreement.					
6. Our partner's personnel are knowledgeable in solving problems.					
Commitment between partners:					
7. We were willing to dedicate whatever people and resources it took to transfer knowledge in the alliance project.					
8. We were committed to making the project a success of knowledge transfer.					
9. Both partners have senior level management commitment toward the use of alliances to achieve strategic goals.					
10. We believe that long-term relationship will be profitable.					
11. Staying in relationship is a necessity.					
Information Exchange between partners:					
12. Alliance partner provided us with adequate information.					
13. Alliance partner provided us with timely information.					
14. To what extent are/were the following used in relations to the technology agreement with the university? - Meeting between university technology experts and firm partner's technology experts					
15. Mutual Visit to partners' research facilities					
16. E-mail communication between university and firm partner's technology experts					
17. Telephone communication between university and firm partner's technology experts					
18. Exchange of information in this relationship took place frequently and informally.					
19. Partners participate in planning activities before decision-making.					
20. Partners seek advice from each other in decision-making towards the alliance.					

13. After entering this alliance, has your organization been awarded any new certification by the government authority or other institutions?

Research Outcomes	None	Awarded/ Applying
1. Copyright		
2. Invention patent		
3. Petty patent		
4. Production design patent		
5. Thailand Industrial Standards (TIS) marks		
6. ISO/IER Guide 25 (Laboratory accreditation)		
7.TIS/ISO 9000 (System)		
8.TIS/ISO 14000 (Environmental management System)		
9. TIS 18000 (occupational health and safety management system)		
10. Trademarks		
11.Reward and certified knowledge and competence		
12. Publication		

14. After joining the alliance, in which activities has the collaborative agreement resulted in your organization?

- □ Cooperative education in other projects
- □ Hiring the graduates who have joined in the apprenticeship
- □ On-going Personnel exchange
- □ Proceeding new product development

15. Think about the process of commercialization that your organization and your partner have coordinated in order to transform the academic outputs for innovative and commercial purposes. Please indicate to what extents do you agree or disagree with these statements. Please answer to every item.

1= Extremely low 2=Low 3= Neither low nor high 4= High 5= extremely high

	Extent				
	1	2	3	4	5
1. Time spent interacting with university research center personnel specifically for developing and commercializing new technologies;					
2. Level of joint decision-making in technological consulting arrangements for developing and commercializing new technologies					
3. Number of personnel exchanges specifically for developing and commercializing new technologies					
4. Level of participation in jointly owned operated facilities For commercializing new technologies.					

16. Think about technical know-how and knowledge in the production process that your partner has transferred to the alliance and please indicate to what extents do you agree or disagree with these statements. Please answer to every item.

1= Strongly Disagree 2=Disagree 3=Neither disagree nor agree 4= agree 5= strongly agree

	Extent				
	1	**2**	**3**	**4**	**5**
1. The new knowledge that our organization acquired from our partners was complete enough to become proficient with it.					
2. The new knowledge that our organization acquired from our partners was well understood in the organization.					
3. The knowledge held by the university research center directly resulted in new products and service offered to the market.					
4. Our production process has been advanced and accredited with the acquired technology from our partners.					
5. Important new product and process technologies are quickly diffused from our partners.					
6. It took our organization a short time to acquire and implement the knowledge provided by our partners					
7. The new knowledge provided by our partners was acquired and implemented at a very low cost.					
8. The acquisition and implementation of the new knowledge from our partners did not require the utilization of too many company resources.					

17. In your opinion, which ways that the effectiveness of knowledge transfer between university-industry alliance can be enhanced? And how the relationship between partners can be sustained in long-term?

……
……
……
……
……

Thank you for completing the survey. The result of this survey will be depicted in a summary report. If you would like a copy of this report, please provide us with the following information:

Name	
Address	

Please either mail (with a postage paid envelop attached) or fax the completed form to Ms. Patthareeya Lakpetch P.O box 2 Dusit Bangkok 10300

Fax: (02) 668-4670, Tel: (02) 241-1181. For any inquiries please do not hesitate to contact: e-mail: cherrylufthansa@yahoo.com or mobile phone: (081) 349-8146

Interview Questionnaires

(Briefly describe the study and its objectives. Mention the proposed structure of the interview and ask how much time we have.)

Background questions:

- □ Name of Interviewee

- □ The title and field of responsibility of the interviewee in the company.

Context, Industry and Alliance:

- □ How would you characterize the industry or market in which the company operates?

- □ How would you describe the strategy (goal/aspiration) of the company?

- □ Do you think that cooperation with other organizations (alliance partners) is important for your firms/ your universities? Why / Why not?

- □ What are the main goals of your organization for forming an alliance partnership with other firm / universities?

- □ What are the main factors that your company considers as prerequisite for the partner selection?

- □ In your view, what characteristics of the alliance partner that can enhance the cooperation?

- □ What is your personal experience with partnerships/cooperation/alliances? (What have you done/learned/seen?)

- What is the specific type of your alliance collaboration? Are alliance partnership grouped or ranked somehow in your company? How?

- In your view, how are alliances, cooperation or partnership handled in the company?

- Is there a separate organization/ resource for this (e.g. alliance management team)?

- Do you think organizational structure (centralization, formalization, complexity of hierarchy) affect the effectiveness of cooperation? If yes, how?

- In what areas do you think it could be especially beneficial to create an alliance?

- Do you know if there is a formulated alliance strategy of some kind to enhance the knowledge transfer between your partners? (e.g hired student interns, cooperative training education)

- What do you think would be typical benefits in terms of knowledge transfer that could be achieved through alliances? How should they be measured (e.g. publication, license, patent, human resource quality, new product/process development)

Cooperation with alliance partner:

- Do you know when the cooperation with your partner first started? Are there any adequate information concerning about this project?

- Which communication channels are mainly used to contact with your partner? Meeting, visit, e-mail, telephone, informal communication? Have you kept informed about important decision?

- Have there been any results from the cooperation with alliance partner? What?

- Do you think the alliance project can reach the company target in terms of mutual comprehension, usefulness, speed and economy (cost reduction, economies of scale and economies of scope and risk sharing)?

- Can you name some good sides about working with your alliance partner?

- Can you name some bad sides about working with alliance partner?
- Do you think that the alliance projects achieve the target of commercialization and innovation with your academic partners?

- Is there any development in your organization after joining alliance projects? (curriculum development in university, skills of workforce, competence)

- What would you say were the most important things that made the alliance partnership successful? How knowledge transfer between partners could be enhanced?
  (if needed, suggest factors, like trust, commitment, communication, participation, conflict handling, information handling)

Additional questions for the interviews:

- How do/did you see the role of trust and opportunism in creating alliances?

- How can trust be created among alliance partners?

- How could the knowledge transfer process be made more efficient?

APPENDIX B

QUESTIONNAIRE (THAI VERSION)

ประสิทธิภาพในการแลกเปลี่ยนองค์ความรู้ในพันธมิตรระหว่าง มหาวิทยาลัยและภาคอุตสาหกรรม
A Study of Knowledge Transfer Effectiveness of University-Industry Alliances

แบบสอบถามนี้เป็นส่วนหนึ่งของการวิจัยในการศึกษาระดับปริญญาเอกของคณะรัฐประศาสนศาสตร์ สาขาการบริหารพัฒนา หลักสูตรนานาชาติ สถาบันบัณฑิตพัฒนบริหารศาสตร์ (นิด้า)

การวิจัยนี้มีวัตถุประสงค์เพื่อศึกษาปัจจัยที่ส่งเสริมประสิทธิภาพในการแลกเปลี่ยนองค์ความรู้ในพันธมิตรระหว่างมหาวิทยาลัยและภาคอุตสาหกรรมตามหลักการของการแลกเปลี่ยนองค์ความรู้ระหว่างองค์กร เพื่อเป็นข้อเสนอแนะในการวางนโยบายในเชิงกลยุทธ์ในอุตสาหกรรมที่เกี่ยวข้องเพื่อยกระดับความสามารถในการแข่งขันอย่างยั่งยืน การวิจัยนี้ไม่เพียงแต่เอื้อประโยชน์ให้แก่มหาวิทยาลัยในการพัฒนาศักยภาพของเครือข่ายพันธมิตรในการร่วมมือเพื่อค้นคว้าและวิจัย รวมทั้งการแลกเปลี่ยนความรู้และบุคคลากรในโครงการสหกิจศึกษาเพื่อพัฒนาความรุ้และทักษะต่างๆ ให้ตรงตามความต้องการขององค์กรคู่พันธมิตร (Alliance partners) แต่ยังคลอบคลุมถึงองค์กรภาครัฐและภาคเอกชนที่สนใจในการสนับสนุนการวิจัยในมหาวิทยาลัยเพื่อการค้นคว้าและพัฒนานวัตกรรมใหม่ ๆ เพื่อประโยชน์ต่อสังคมโดยรวมและเพื่อประโยชน์ในเชิงการค้าพาณิชย์

<u>ความหมาย:</u> พันธมิตรระหว่างมหาวิทยาลัยและภาคอุตสาหกรรม หมายถึง ความร่วมมือในทุกรูปแบบระหว่างมหาวิทยาลัย ศูนย์การวิจัยและภาคอุตสาหกรรม โดยเฉพาะอย่างยิ่งความร่วมมือเกี่ยวกับกระบวนการผลิตการค้นคว้าพัฒนาและเทคโนโลยีทั้งภาคอุตสาหกรรมหลัก การบริการ และการสาธารณสุขเพื่อบรรลุวัตถุประสงค์ในเชิงกลยุทธ์และการสร้างสรรนวัตกรรมโดยการใช้ทรัพยากร ความรู้และทักษะต่าง ๆ ร่วมกัน คู่พันธมิตรมีทั้งที่มีการร่วมทุนหรือไม่มีการร่วมทุนด้วยกันในโครงการนอกจากนั้นยังรวมถึงที่เป็นข้อตกลงอย่างเป็นทางการและไม่เป็นทางการโดยมีการแลกเปลี่ยนในโครงการสหกิจศึกษา การแลกเปลี่ยนบุคคลากรผู้เชี่ยวชาญ การรับนักศึกษาฝึกงานในองค์กรคู่พันธมิตร ความรู้ต่าง ๆ มีโครงการศึกษาวิจัยร่วมกันและการให้การสนับสนุนงานวิจัยทางวิชาการในการสร้างสรรนวัตกรรมพันธมิตรในที่นี้มีความหมายครอบคลุมถึงพันธมิตรที่ยังมีการดำเนินการอยู่หรือพันธมิตรที่ได้ยุติลงแล้วก็ตาม

ข้อเสนอแนะในการตอบแบบสอบถาม:

1. แบบสอบถามนี้มีทั้งหมด 8 หน้า (รวมหน้านี้) กรุณาตอบคำถามทุกข้อ คำตอบทุกข้อของท่านจะถูกเก็บเป็นความลับโดยจะมีการรายงานเฉพาะผลการวิจัยที่แสดงถึงภาพรวมอุตสาหกรรมเท่านั้นเท่านั้น
2. ในการตอบแบบสอบถามนี้ กรุณาให้ข้อมูลของการเป็นพันธมิตรระหว่างมหาวิทยาลัยและองค์กรของท่านทั้งจากภาครัฐและภาคเอกชนที่มีการร่วมมือกันเพื่อการค้นคว้าพัฒนาในระหว่างปี พ.ศ 2548 จนกระทั่งปัจจุบัน เป็นอันดับแรก ถึงแม้ว่าองค์กรของท่านจะไม่ได้ร่วมในพันธมิตรนั้นแล้วหรือ พันธมิตรนั้นได้ยุติลงแล้วก็ตาม

กรุณาคืนแบบสอบถามที่ตอบโดยครบถ้วนแล้วภายในวันที่ 20 สิงหาคม 2552 หรือโดยเร็วที่สุดที่ท่านสะดวกโดยใช้ซองติดแสตมป์ที่แนบมานี้ที่ 742/14 ซอยเศรษฐสุนทร ถนนพระราม 5 ดุสิต กรุงเทพ ฯ 10300 หากท่านประสงค์จะได้รับผลการวิจัยของการศึกษาครั้งนี้ขอได้โปรดแนบนามบัตรพร้อมกับแบบสอบถามที่ส่งคืนมาด้วย

ขอขอบพระคุณที่ท่านกรุณาสละเวลาตอบแบบสอบถามนี้

นางสาวพัทรียา หลักเพ็ชร

นักศึกษาปริญญาเอก สังกัดคณะรัฐประศาสนศาสตร์ นิด้า และผู้ประสานงานโครงการวิจัย

หากท่านประสงค์จะติดต่อสอบถาม ขอได้โปรดติดต่อที่

โทรศัพท์ 081 349-8146,081 347-0904,02 374-4977 หรือ โทรสาร 02 668-4670

ส่วน A: ข้อมูลเกี่ยวกับตัวท่าน, องค์กรของท่าน และการร่วมพันธมิตร

คำชี้แจง: โปรดเลือกหนึ่งโครงการพันธมิตรที่องค์กรของท่านที่มีดำเนินการล่าสุด ในช่วงระหว่างปี 2548 จนกระทั่งปัจจุบัน และ 1 องค์กรที่ร่วมเป็นคู่พันธมิตรกับองค์กรของท่านเพื่อใช้เป็นข้อมูลในการตอบแบบสอบถาม โดยโครงการพันธมิตรที่ท่านเลือกไม่เฉพาะเจาะจงแต่โครงการที่ประสบความสำเร็จบรรลุตามวัตถุประสงค์เท่านั้น โปรดทำเครื่องหมายกากบาท (x) สำหรับคำตอบของท่านในแต่ละคำถามต่อไปนี้

1. หัวข้อต่อไปนี้ คือลักษณะของความสัมพันธ์ในพันธมิตรระหว่างมหาวิทยาลัยและภาคอุตสาหกรรมในรูปแบบต่าง ๆ กัน โปรดเลือกข้อที่ตรงกับลักษณะของพันธมิตรที่องค์กรของท่านกำลังดำเนินการอยู่ หรือเคยดำเนินการมาแล้วมากที่สุด (เลือกได้มากกว่าหนึ่งข้อ)

- □ การร่วมมือในลักษณะการขอรับคำปรึกษากับนักวิจัยหรือคณาจารย์เฉพาะเจาะจงเป็นรายบุคคล (ทั้งที่เสียค่าใช้จ่ายและไม่เสียค่าใช้จ่าย)
- □ การจัดการประชุมแลกเปลี่ยนข้อคิดเห็นอย่างไม่เป็นทางการและจัดเวิร์คช็อประหว่างองค์กรคู่พันธมิตรให้มีการฝึกฝนในเชิงปฏิบัติการจริง
- □ การให้ทุนการศึกษาและการติดต่อกับบัณฑิตเพื่อการวิจัย
- □ โครงการนักศึกษาฝึกหัดงาน (โครงการสหกิจศึกษาที่มีการผึกงานนักศึกษาในสถานประกอบการจริง)
- □ การร่วมมือกันในการจัดโปรแกรมการศึกษา
- □ การร่วมมือกันโดยผ่านองค์กร หรือหน่วยงานกลาง โปรดระบุ.....
- □ โครงการวิจัยร่วมกันระหว่างองค์กรคู่พันธมิตรภายใต้สัญญา และเงื่อนไขที่กำหนด
- □ การให้เงินทุนสนับสนุนงานวิจัยในด้านต่าง ๆ ในลักษณะเงินบริจาค หรือเงินให้เปล่าทั้งที่เป็นการให้โดยระบุหรือไม่ระบุหน่วยงานใดหน่วยงานหนึ่งอย่างเฉพาะเจาะจงในการค้นคว้าพัฒนาทางอุตสาหกรรมหรือการบริการด้านต่างๆ
- □ การจัดตั้งสถาบันหรือหน่วยงานเฉพาะเป็นการภายในเพื่อวิจัยร่วมกันอย่างเป็นทางการระหว่างมหาวิทยาลัยและภาคอุตสาหกรรม
- □ อื่น ๆ โปรดระบุ.....

2. งานภายใต้การรับผิดชอบของท่านเกี่ยวข้องกับโครงการพันธมิตรระหว่างมหาวิทยาลัยสถาบันทางวิชาการและภาคอุตสาหกรรมเพื่อพัฒนาการวิจัย ผลิตภัณฑ์และขั้นตอนการผลิต การแลกเปลี่ยนวิทยาการใหม่ ๆรวมทั้งการแลกเปลี่ยนบุคคลาการเพื่อแลกเปลี่ยนความรู้ที่เป็นประโยชน์ต่อสังคมโดยรวมและเพื่อประโยชน์ในเชิงพาณิชย์ตามที่กล่าวมาแล้วข้างต้นหรือไม่

- □ ไม่ใช่ (โปรดส่งแบบสอบถามนี้ให้แก่บุคคลที่มีหน้าที่สอดคล้องตามที่อ้างถึง ขอบคุณค่ะ)
- □ ใช่

3. ตำแหน่งงานของท่านจัดอยู่ในหมวดใดต่อไปนี้

- □ ประธานบริษัท, เจ้าของ, หัวหน้าฝ่ายบริหาร, กรรมการผู้จัดการ, ผู้ช่วยกรรมการผู้จัดการ, อธิการบดีหรือคณบดีในมหาวิทยาลัย
- □ หัวหน้าฝ่ายปฏิบัติการ, กรรมการฝ่ายปฏิบัติการ, ผู้อำนวยการฝ่ายปฏิบัติการ, ผู้ช่วยผู้อำนวยการฝ่ายปฏิบัติการ, ผู้จัดการโรงงาน, ผู้จัดการฝ่ายปฏิบัติการ, หัวหน้าแผนกฝ่ายปฏิบัติการโครงการ, ผู้ประสานงานโครงการ
- □ อื่น ๆ โปรดระบุ,.....

4. องค์กรของท่านจั้ดอยู่ในอุตสาหกรรมประเภทใด

- □ มหาวิทยาลัยรัฐ
- □ มหาวิทยาลัยเอกชน
- □ รัฐวิสาหกิจ
- □ กระทรวง ทบวง กรม หรือสถาบันของรัฐ
- □ บริษัทเอกชน โปรดระบุประเภทอุตสาหกรรม .....
- □ บริษัทเอกชนร่วมทุนกับต่างชาติโปรดระบุประเภทอุตสาหกรรม.....
- □ อื่น ๆ โปรดระบุ.....

5. องค์กรของท่านเข้าร่วมพันธมิตรเพื่ออะไร (เลือกได้มากกว่าหนึ่งข้อ)

- □ รับความร่วมมือด้านการเงินจากองค์กรที่เป็นพันธมิตร
- □ เพื่อการพัฒนาสิ่งประดิษฐ์ ผลผลิตหรือแนวคิดที่ยังไม่เคยมีมาก่อน
- □ รับความร่วมมือในการแลกเปลี่ยนบุคคลากรเพื่อพัฒนาความรู้และทักษะทางเทคโนโลยีจากองค์กรที่เป็นพันธมิตร
- □ เพื่อประโยชน์ในการใช้เครื่องอำนวยความสะดวกและทรัพยากรขององค์กรที่เป็นพันธมิตร
- □ อื่น ๆ โปรดระบุ.....

6. องค์กรของท่านเคยเข้าร่วมการเป็นพันธมิตร หรือมีข้อตกลงทางด้านเทคโนโลยีร่วมกับองค์กรอื่น มาก่อนหรือไม่

□ ไม่เคย นี่เป็นโครงการแรก หรือ โครงการเดียวที่องค์กรของท่านมีการดำเนินการ
□ ถ้าเคย โปรดระบุประเภทของพันธมิตรที่มีการร่วมมือ ดังต่อไปนี้:
..... การร่วมมือกันในลักษณะสัดส่วนของการร่วมหุ้น

..... การร่วมมือกันในการค้นคว้าพัฒนา หรือ การร่วมมือกันทางด้านการตลาด โดยมีข้อตกลงที่เป็นสัญญาร่วมกัน โปรดระบุ.....

.....ไม่มีหุ้นส่วน หรือ สัญญาแต่ตกลงร่วมมือกัน โดยวิธี (โปรดระบุ).....
..... อื่น (โปรดระบุ).....

7. **องค์กรของท่านจัดกิจกรรมการแลกเปลี่ยนข่าวสารและให้ความรู้ต่อบุคคลาการในการพัฒนาศักยภาพเพื่อความร่วมมือกับองค์กรคู่พันธมิตร (Alliance partners) โดยเฉลี่ยมากน้อยเพียงใด**

	จำนวนครั้งโดยประมาณต่อปี			
	ไม่เคย	1-6	7-12	13 หรือมากกว่า
1. การอบรมสัมมนาที่องค์กรของท่านจัดขึ้นเอง				
2. การอบรมสัมมนาที่จัดโดยองค์กรที่เป็นคู่พันธมิตร				
3. การอบรมสัมมนาที่จัดโดยสถาบันหรือหน่วยงานกลางภายนอกองค์กรของท่านและองค์กรคู่พันธมิตร				
4. โครงการนักศึกษาฝึกหัดงาน				
5. การเยี่ยมชมสถานที่ปฏิบัติงาน				
6. การมีส่วนร่วมในการสนับสนุนหน่วยงานวิจัยร่วมกันระหว่างองค์กรคู่พันธมิตร				
7.การมีส่วนร่วมในการพัฒนาหลักสูตรการเรียนการสอนในมหาวิทยาลัยให้ตรงวัตถุประสงค์ของภาคอุตสาหกรรมที่เป็นองค์กรคู่พันธมิตร				
8. อื่น ๆ โปรดระบุ.....				

8. **กรุณาใส่เครื่องหมาย กากบาท (X) หน้าหัวข้อต่อไปนี้เพื่อระบุ ทรัพยากร เทคโนโลยี ความรู้ และบุคคลากรที่องค์กรของท่าน และองค์กรคู่พันธมิตรจัดสรรให้แก่การร่วมพันธมิตรในครั้งนี้ (ระบุได้มากกว่า 1 รายการ ตามความเป็นจริง)**

องค์กรของท่าน	ทรัพยากรที่ให้ในการร่วมพันธมิตร	องค์กรคู่พันธมิตร
…….	1. ความรู้เกี่ยวกับระบบการผลิต ออกแบบและเทคโนโลยีการผลิต	…….
…….	2. ความคิดสร้างสรรทางวิทยาศาสตร์ ที่ยังไม่มีการค้นพบมาก่อน	……...
…….	3. การควบคุมคุณภาพ	.....
…….	4. ช่องทางการจำหน่าย	……
……	5.วัตถุดิบ	…….....
…….	6. ความรู้เกี่ยวกับวิธีการจัดการตลาดและการเข้าถึงตลาด	…….....
…….	7. แหล่งเงินทุน	……
…….	8. แหล่งทรัพยากรบุคคล	…….
…….	9. ระบบการจัดการ	…….
……..	10. ระบบเทคโนโลยีและสารสนเทศ	…….
…….	11. อื่น ๆ โปรดระบุ	…….

9. ท่านเห็นด้วยกับข้อความเกี่ยวกับความร่วมมือระหว่างองค์กรของท่านและองค์กรคู่พันธมิตรอย่างไรบ้าง (กรุณาตอบทุกข้อ)

1= ไม่เห็นด้วยอย่างยิ่ง 2=ไม่เห็นด้วย 3=ไม่แน่ใจ 4= เห็นด้วย 5= เห็นด้วยอย่างยิ่ง

	ระดับ				
	1	2	3	4	5
1. ทั้งสององค์กรมีความต้องการในการใช้ทรัพยากรของกันและกัน เพื่อบรรลุเป้าประสงค์					
2. ความร่วมมือนี้มีความสำคัญในเชิงกลยุทธ์การจัดการต่อองค์กรของท่านและองค์กรคู่พันธมิตรในอนาคต					
3. ทั้งสององค์กรมีข้อตกลงที่ไม่ตรงกันเกี่ยวกับวัตถุประสงค์ที่ได้กำหนดขึ้นร่วมกัน					
4. กิจกรรมที่เกี่ยวข้องกับโครงการร่วมมือกับพันธมิตรไม่เกี่ยวข้องกับกลยุทธ์ขององค์กรโดยรวมของทั้งสองฝ่าย					
5. การร่วมมือกับพันธมิตรจะไม่สามารถเกิดขึ้นได้ถ้าขาดทรัพยากร และศักยภาพขององค์กรคู่พันธมิตรที่ช่วยให้ความรู้เฉพาะด้านที่คล้ายกันให้มีขอบข่ายที่กว้างขวางและมีประสิทธิภาพมากยิ่งขึ้น					
6. ความรู้ที่ได้รับจากองค์กรคู่พันธมิตรที่มีความสามารถหลักที่โดดเด่นช่วยธุรกิจของท่านให้ครอบคลุมได้กว้างขวางและเพิ่มความเชี่ยวชาญเฉพาะด้านขององค์กรท่าน					
7 ความรู้และความเชี่ยวชาญขององค์กรคู่พันธมิตรช่วยเพิ่มคุณภาพของระบบการผลิตและเทคโนโลยีการผลิตให้ดียิ่งขึ้น					
8. วัฒนธรรมองค์กรของทั้งสองฝ่ายสนับสนุนการเรียนรู้ แนวความคิดใหม่ ๆ และส่งเสริมการแลกเปลี่ยนความคิดข้ามหน่วยงานอื่น ที่มีการปฏิบัติงานในด้านต่าง ๆ กัน					
9. การเรียนรู้ความรู้และทักษะใหม่ ๆ เป็นการลงทุนสำคัญสำหรับองค์กรของท่านในอนาคต					
10. องค์กรของท่านสามารถจัดการเกี่ยวกับข่าวสารใหม่ ๆ ได้อย่างดียิ่ง					
11. องค์กรของท่านสามารถรวบรวมข่าวสารใหม่ ๆ จากหลาย ๆ แหล่งข้อมูล					
12. มีการจัดการรวบรวมความรู้ เทคโนโลยี และนวัตกรรมจากภายนอกเข้ากับความรู้ภายในองค์กรของท่าน					
13. องค์กรของท่านมีประสบการณ์ในการร่วมมือระหว่างมหาวิทยาลัยและองค์กรในภาคอุตสาหกรรมหรือ เข้าร่วมพันธมิตรในโครงการอื่น ๆ มาก่อน					
14.องค์กรของท่านมีผู้จัดการที่มีความรู้ ความสามารถในการแก้ข้อขัดแย้งที่เกิดขึ้นในพันธมิตรได้เป็นอย่างดี					
15. ฝ่ายบริหารเกี่ยวกับโครงการร่วมพันธมิตรในองค์กรของท่านมีความสามารถในการจัดการทางด้านความร่วมมือระหว่างองค์กรในกลุ่มพันธมิตร					
16. องค์กรของท่านสามารถคาดคะแนเลือกองค์กรคู่พันธมิตรที่มีขีดความสามารถที่จะช่วยให้ประสบผลสำเร็จในการสร้างสรรนวัตกรรมและการแลกเปลี่ยนความรู้ร่วมกัน					
17. องค์กรของท่านเลือกเฉพาะองค์กรคู่พันธมิตรที่มีศักยภาพให้การเพิ่มทรัพยากรที่มีประโยชน์และเป็นที่ต้องการในโครงการที่มีความร่วมมือ					

10. ท่านเห็นด้วยกับข้อความเกี่ยวกับโครงสร้างองค์กรของท่านและนโยบายของมหาวิทยาลัยที่ให้ความร่วมมือในพันธมิตรนี้อย่างไร

1= ไม่เห็นด้วยอย่างยิ่ง 2=ไม่เห็นด้วย 3=ไม่แน่ใจ 4= เห็นด้วย 5= เห็นด้วยอย่างยิ่ง

	ระดับ				
	1	2	3	4	5
1. ทุกเรื่องราวที่เกี่ยวกับความร่วมมือกับพันธมิตรจะผ่านการพิจารณาจากผู้ประสานงานหรือผู้อำนวยการโครงการ					
2. ช่องทางเกี่ยวกับข่าวสารจะส่งผ่านฝ่ายสำนักงานเฉพาะที่ได้รับมอบหมาย					
3. งานที่มีการปฏิบัติและร่วมมือกับพันธมิตรในแต่ละวันจะขึ้นอยู่กับกฎข้อบังคับ และนโยบายตามสัญญา					
4. ทั้งสององค์กรมีแผนที่จะดำเนินการเอกสารทางกฎหมายเกี่ยวกับโครงการที่มีความร่วมมือเพื่อป้องกันการสูญเสียต่อทรัพย์สินทางปัญญา					
5. จำนวนเงินทุนจากแต่ละองค์กรเพื่อพัฒนาพันธมิตรคาดว่าจะถูกกำหนดอย่างเป็นลายลักษณ์อักษรในสัญญาที่ทำขึ้นระหว่างกัน					
6. ปัญหาที่เกิดขึ้นในโครงการพันธมิตรจะถูกแก้ไขโดยผ่านฝ่ายบริหารจัดการตามลำดับขั้นตำแหน่งที่ลดหลั่นกันไป					
7. ภายในองค์กรที่ร่วมพันธมิตรสามารถตัดสินใจเกี่ยวกับการเปลี่ยนแปลงในการปฏิบัติงานประจำวันได้ โดยไม่ซับซ้อนเนื่องจากมีเพียง 2-3 หน่วยงานเท่านั้นที่ได้รับมอบหมายให้จัดการโครงการนี้					
8. ทางมหาวิทยาลัยพยายามที่จะตัดสินใจเกี่ยวกับการปฏิบัติงานประจำวันบนพื้นฐานของผลประโยชน์และข้อตกลงที่มีร่วมกันกับองค์กรคู่พันธมิตรในภาคอุตสาหกรรมต่าง ๆ					
9. ทางมหาวิทยาลัยมีความยืดหยุ่นในการแก้ไขเปลี่ยนแปลงเป้าประสงค์ที่ได้ตั้งไว้เกี่ยวกับการศึกษาทางวิชาการเพื่อให้สอดคล้องกับความต้องการขององค์กรคู่พันธมิตรจากภาคอุตสาหกรรม					
10. ระหว่างมหาวิทยาลัยและภาคอุตสาหกรรมมีข้อตกลงเดียวกันเกี่ยวกับผลผลิต สินค้าใหม่ การจดสิทธิบัตร ตีพิมพ์ผลงานการสร้างสรรผลิตภัณฑ์และขั้นตอนการผลิตที่พัฒนาขึ้นร่วมกัน					

11. ท่านเห็นด้วยเกี่ยวกับระดับในการให้ความร่วมมือกันระหว่างองค์กรของท่านและองค์กรคู่พันธมิตรในโครงการนี้อย่างไร

1= ไม่เห็นด้วยอย่างยิ่ง 2=ไม่เห็นด้วย 3=ไม่แน่ใจ 4= เห็นด้วย 5= เห็นด้วยอย่างยิ่ง

	ระดับ				
	1	2	3	4	5
1. ทั้งสององค์กรมีความกลมกลืนกันอย่างมากในวิธีการบริหารจัดการและวัฒนธรรมองค์กร					
2. ทั้งสององค์กรมีปรัชญาและวิธีการดำเนินธุรกิจที่เข้ากันได้ดีเพราะค่านิยมและบรรทัดฐานทางสังคมของทั้งสององค์กรสอดคล้องกัน					
3. กิจกรรมเกี่ยวกับการพัฒนาโครงการพันธมิตรที่มีความแตกต่างกันในวิธีการดำเนินงานในแต่ละองค์กรในเครือข่ายพันธมิตรสามารถเข้ากันได้เป็นอย่างดี					
4. ทั้งสององค์กรมีข้อตกลงเดียวกันเกี่ยวกับการร่วมมือบริหารจัดการโครงการพันธมิตร					

12. ท่านเห็นด้วยอย่างไรเกี่ยวกับคุณภาพของความสัมพันธ์ระหว่างองค์กรที่เป็นคู่พันธมิตรกันในโครงการนี้

1= ไม่เห็นด้วยอย่างยิ่ง 2=ไม่เห็นด้วย 3=ไม่แน่ใจ 4= เห็นด้วย 5= เห็นด้วยอย่างยิ่ง

ความเชื่อใจกันระหว่างองค์กรที่เป็นพันธมิตร:	**ระดับ**				
	1	**2**	**3**	**4**	**5**
1. ท่านเชื่อว่าองค์กรคู่พันธมิตรของท่านจะปฏิบัติงานต่าง ๆ เพื่อผลประโยชน์ขององค์กรของท่าน					
2. ทั้งสองฝ่ายในโครงการที่ร่วมมือกันมีความซื่อสัตย์และไว้วางใจกัน					
3. องค์กรของท่านมีความเชื่อมั่นในศักยภาพความสามารถ และแรงจูงใจขององค์กรคู่พันธมิตรในการแบ่งปันความรู้ความสามารถเพื่อประโยชน์ร่วมกันในโครงการนี้					
4. ทั้งสององค์กรเชื่อมั่นในค่านิยมและประสบการณ์ขององค์กรคู่พันธมิตรในการปฏิบัติภารกิจในแต่ละวัน					
5. องค์กรคู่พันธมิตรมีศักยภาพที่จะทำให้ข้อตกลงในโครงการที่มีความร่วมมือกันให้สำเร็จลุล่วงได้					
6. บุคคลากรขององค์กรคู่พันธมิตรมีความรู้ ความสามารถในวิธีการแก้ปัญหาที่เกิดขึ้นในโครงการที่มีการร่วมมือกัน					
ความยึดมั่นในการดำเนินการระหว่างคู่พันธมิตร:					
7. องค์กรของท่านยินดีให้ความร่วมมือในด้านทรัพยากร และบุคคลาการเพื่อประโยชน์ในการถ่ายทอดความรู้ระหว่างองค์กรในเครือข่ายพันธมิตรในโครงการที่มีการร่วมมือระหว่างกัน					
8. องค์กรของท่านเชื่อมั่นในการที่จะแลกเปลี่ยนความรู้ในโครงการที่มีความร่วมมือกันให้ประสบผลสำเร็จ					
9. ผู้บริหารระดับสูงขององค์กรของท่านและองค์กรคู่พันธมิตรมีความยึดมั่นในพันธกิจที่จะผลักดันให้โครงการที่มีความร่วมมือกันประสบผลสำเร็จตามเป้าประสงค์					
10. ความสัมพันธ์กับองค์กรคู่พันธมิตรในระยะยาวจะก่อให้เกิดผลประโยชน์แก่องค์กรของท่าน					
การแลกเปลี่ยนข้อมูลระหว่างคู่พันธมิตร:					
11. องค์กรคู่พันธมิตรของท่านให้ข้อมูลข่าวสารที่เพียงพอ					
12. องค์กรคู่พันธมิตรของท่านให้ข้อมูลข่าวสารตามกำหนดเวลา					
13. ท่านเห็นด้วยกับระดับการแบ่งปันข้อมูลข่าวสารภายในโครงการที่มีความร่วมมือกันอย่างไร - การประชุมระหว่างผู้เชี่ยวชาญของมหาวิทยาลัยและองค์กรคู่พันธมิตร					
14. การเยี่ยมชมสถานประกอบการและเครื่องอำนวยความสะดวกที่ใช้ในโครงการที่มีความร่วมมือกันระหว่างผู้เชี่ยวชาญจากมหาวิทยาลัยและองค์กรคู่พันธมิตร					
15. การคิดต่อกันทางอีเมล์ระหว่างมหาวิทยาลัยและองค์กรคู่พันธมิตร					
16. การติดต่อสื่อสารทางโทรศัพท์ระหว่างมหาวิทยาลัยและผู้ประสานงานจากองค์กรคู่พันธมิตร					
17. การแลกเปลี่ยนข้อมูลข่าวสาร เกิดขึ้นอย่างไม่เป็นทางการและมีขึ้นบ่อยครั้งเกี่ยวกับโครงการที่มีความร่วมมือกัน					
18. องค์กรของท่านและองค์กรคู่พันธมิตรปรึกษาหารือและมีการวางแผนร่วมกันในการตัดสินใจในกิจกรรมเกี่ยวกับโครงการนี้					

13. ท่านเห็นด้วยกับข้อความเกี่ยวกับการถ่ายทอดความรู้และเทคโนโลยี (knowledge and technology know-how transfer) ระหว่างองค์กรคู่พันธมิตรและองค์กรของท่านต่อไปนี้อย่างไร

1= ไม่เห็นด้วยอย่างยิ่ง 2=ไม่เห็นด้วย 3=ไม่แน่ใจ 4= เห็นด้วย 5= เห็นด้วยอย่างยิ่ง

	ระดับ				
	1	2	3	4	5
1. ความรู้ที่ได้จากการแลกเปลี่ยนกับองค์กรคู่พันธมิตรของท่านสามารถเข้าใจได้เป็นอย่างดีภายในองค์กรของท่าน					
2. ความรู้ทั้งจากการวิจัยและความสามารถของบุคคลากรในมหาวิทยาลัยที่เกิดจากการแลกเปลี่ยนผ่านโครงการที่มีการร่วมมือกับองค์กรคู่พันธมิตรทำให้เกิดสินค้า ผลิตภัณฑ์ และการบริการใหม่ ๆ สู่ตลาดในภาคอุตสาหกรรมต่าง ๆ					
3. ความรู้ใหม่ที่องค์กรของท่านได้รับจากองค์กรคู่พันธมิตรบรรลุเป้าประสงค์และมีประสิทธิผลสมบูรณ์เพียงพอ					
4. ขั้นตอนการผลิตภายในองค์กรเพิ่มประสิทธิภาพจากความรู้และทักษะเกี่ยวกับเทคโนโลยีจากมหาวิทยาลัย					
5. วิธีการและขั้นตอนทางเทคโนโลยีสามารถถ่ายทอดระหว่างองค์กรในเครือข่ายพันธมิตรได้ง่ายและรวดเร็ว					
6. องค์กรของท่านใช้เวลาน้อยมากในการรับและประยุกต์ความรู้จากองค์กรคู่พันธมิตรของท่าน					
7. ความรู้จากองค์กรคู่พันธมิตรที่ได้รับและนำมาใช้งานโดยมีค่าใช้จ่ายที่เกิดขึ้นน้อยมาก					
8. การนำความรู้ที่ได้รับการถ่ายทอดจากองค์กรคู่พันธมิตรไม่สิ้นเปลืองทรัพยากรขององค์กร					

14. ท่านเห็นด้วยกับขั้นตอนในการพัฒนาผลงานทางวิชาการระหว่างองค์กรของท่านและองค์กรคู่พันธมิตรเพื่อประโยชน์ต่อสังคมโดยรวมและเพื่อการค้าพาณิชย์ต่อไปนี้อย่างไร กรุณาตอบให้ครบทุกข้อ

1= น้อยมาก 2=น้อย 3= ปานกลาง 4= สูง 5= สูงมาก

	ระดับ				
	1	2	3	4	5
1. เวลาที่ใช้ในการประสานงานระหว่างเจ้าหน้าที่จากมหาวิทยาลัยและองค์กรคู่พันธมิตรจากภาคอุตสาหกรรมในการพัฒนาเทคโนโลยีใหม่ เพื่อความต้องการที่ตรงกันและประโยชน์ทางการค้าพาณิชย์					
2. การมีส่วนร่วมในการ ตัดสินใจร่วมกันปรึกษาหารือ และร่วมมือกันระหว่างองค์กรพันธมิตรเพื่อ พัฒนาเทคโนโลยีใหม่เพื่อการพาณิชย์					
3. จำนวนบุคคลากรที่ใช้ในการแลกเปลี่ยนความรู้เพื่อพัฒนาเทคโนโลยีเพื่อการพาณิชย์					
4. การเป็นเจ้าของร่วมกันในอุปกรณ์เครื่องใช้เพื่ออำนวยความสะดวกเพื่อใช้ในการพัฒนาเทคโนโลยีใหม่เพื่อการพาณิชย์					

15. เมื่อเข้าร่วมในพันธมิตรแล้ว มีการเปลี่ยนแปลงในแง่ของการแลกเปลี่ยนบุคคลากร หรือการแลกเปลี่ยนความรู้กันในรูปแบบใดบ้าง (เลือกได้มากกว่าหนึ่งข้อ)

- □ มีโครงการศึกษาหรือวิจัยร่วมกันอีกในโครงการอื่น ๆ
- □ มีการจ้างนักศึกษาที่เคยมาฝึกงานในองค์กรคู่พันธมิตรหลังจากจบโครงการ
- □ มีแลกเปลี่ยนบุคคลากรในด้านต่าง ๆอย่างต่อเนื่อง
- □ มีการพัฒนาผลิตภัณฑ์ หรือขั้นตอนการจัดการและให้บริการใหม่ ๆ ร่วมกัน
- □ อื่น ๆ โปรดระบุ.....

16. เมื่อเข้าร่วมในพันธมิตรนี้แล้ว องค์กรของท่านได้รับการรับรองคุณภาพหรือสิทธิบัตรหรือจดทะเบียนใดบ้างจากหน่วยงานของรัฐ หรือ อื่น ๆ

	ไม่ได้รับ	ได้รับแล้ว	กำลังดำเนินการขอรับ
1. ลิขสิทธิ์			
2. สิทธิบัตรในการผลิต			
3. อนุสิทธิบัตร			
4. สิทธิบัตรในการออกแบบผลิตภัณฑ์			
5. เครื่องหมายมาตรฐานอุตสาหกรรมประเทศไทย (Thailand Best/TLS)			
6. การรับรองห้องปฏิบัติการ			
7.มาตรฐานอุตสาหกรรมการผลิต (มอก.) ISO 9000			
8.มอก - ISO 14000 (ระบบการจัดการสิ่งแวดล้อม)			
9. มอก -TIS 18000 (การรับรองระบบชีวอนามัยและความปลอดภัย)			
10. เครื่องหมายการค้า			
11. รางวัล หรือ เกียรติบัตรจากองค์กรต่าง ๆ เพื่อรับรองความรู้ความสามารถของบุคคลากร			
12. การตีพิมพ์ผลงานผ่านสื่อต่าง ๆ			

17. ในความคิดเห็นของท่าน มีวิธีใดบ้างที่จะช่วยเพิ่มประสิทธิภาพในการแลกเปลี่ยนความรู้ระหว่างมหาวิทยาลัยและภาคอุตสาหกรรมให้ดียิ่งขึ้น และทำอย่างไรความสัมพันธ์ในการให้ความร่วมมือระหว่างองค์กรคู่พันธมิตรในด้านต่าง ๆจะประสบความสำเร็จคงอยู่ได้ยืนยาว

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ขอขอบพระคุณเป็นอย่างสูงที่ท่านกรุณาให้ความร่วมมือตอบแบบสอบถามและส่งแบบสอบถามคืนในซองจดหมายที่ได้แนบมานี้ที่ตู้ ป.ณ2 ดุสิต กรุงเทพฯ 10300 หรือส่งผ่านโทรสาร 02 668-4670 ภายในวันที่ 15 มิถุนายน 2552 นี้

ท่านจะได้รับกิตติบัตรขอบคุณและผลการวิจัยทางไปรษณีย์ตามชื่อที่อยู่ที่ท่านแจ้งมาเมื่อการวิจัยนี้เสร็จสมบูรณ์ ซึ่งคาดว่าจะสำเร็จในราวปลายเดือนตุลาคม 2552

นางสาวพัทรียา หลักเพ็ชร โทร 081 3498146, 02 3744977e-mail address: cherrylufthansa@yahoo.com **โปรดติดนามบัตรหรือแจ้งที่อยู่ ของท่านที่นี่**

ชื่อ	
ที่อยู่	

คำถามที่ใช้ในการสัมภาษณ์

สรุปโดยย่อเกี่ยวกับวัตถุประสงค์การศึกษา และขอบข่ายการวิจัยรวมทั้งเวลาที่ใช้ในการสัมภาษณ์

ข้อมูลเกี่ยวกับผู้ให้สัมภาษณ์:

- □ ชื่อของผู้ให้สัมภาษณ์ ตำแหน่งงานในองค์กร และความรับผิดชอบในหน่วยงาน
- □ โครงการที่มีความร่วมมือพันธมิตรขององค์กรท่านเป็นรูปแบบพันธมิตรแบบใด และมีลักษณะหรือขอบข่ายโครงการอย่างไร

เนื้อหา เกี่ยวกับอุตสาหกรรมโดยภาพรวมและข้อมูลเกี่ยวกับโครงการร่วมพันธมิตร:

- □ ในกรณีที่เป็นบริษัทเอกชน หรือบริษัทร่วมทุนกับต่างชาติ
- □ ท่านจัดให้องค์กรของท่านอยู่ในกลุ่มอุตสาหกรรมหรือตลาดประเภทใด

  (ในกรณี กระทรวง ทบวง กรม สถาบันของรัฐ มหาวิทยาลัยของรัฐหรือเอกชน ให้ระบุด้วย)
- □ กลยุทธ์ จุดมุ่งหมาย หรือ แรงบันดาลใจขององค์กรท่านโดยภาพรวมเป็นอย่างไร
- □ ท่านคิดว่าการร่วมกันกับองค์กรอื่น ๆ ในลักษณะการร่วมพันธมิตร เพื่อการค้นคว้าวิจัย การแลกเปลี่ยนบุคคลากร หรือ โครงการสหกิจศึกษามีความสำคัญต่อองค์กรของท่านหรือไม่ อย่างไร
- □ วัตถุประสงค์หลักขององค์กรท่านในการร่วมมือในโครงการนี้ คืออะไร
- □ อะไรคือปัจจัยหลักที่องค์กรของท่านพิจารณาเลือกคู่พันธมิตรในการร่วมมือในโครงการนี้ และท่านคิดว่าแรงจูงใจ จุดมุ่งหมาย ที่สอดคล้องกัน รวมทั้งความสำคัญในเรื่องของทรัพยากรและความรู้ที่เกื้อกูลกันมีความสำคัญต่อการเลือกคู่พันธมิตรหรือไม่ อย่างไร
- □ ในความคิดเห็นของท่านคู่พันธมิตรควรมีลักษณะหรือคุณสมบัติอย่างไรในการส่งเสริมความร่วมมือในโครงการนี้
- □ ความตั้งใจในการเรียนรู้และความสามารถในการเรียนรู้ และการถ่ายทอดความรู้และทักษะมีความสำคัญกับโครงการนี้หรือไม่ อย่างไร
- □ ประสบการณ์ส่วนตัวของท่านเกี่ยวกับการร่วมมือในโครงการนี้เป็นอย่างไร
- □ การมีประสบการณ์มาก่อนเกี่ยวกับความร่วมมือในลักษณะพันธมิตรขององค์กรท่านและคู่พันธมิตรของท่านมีอิทธิพลต่อประสิทธิภาพในการแลกเปลี่ยนความรู้ระหว่างกันหรือไม่ อย่างไร
- □ ท่านคิดว่าศักยภาพ ความสามารถวิสัยทัศน์ของผู้บริหารมีความสำคัญต่อโครงการหรือไม่ อย่างไร

- □ ท่านคิดว่าในการเลือก และคัดกรององค์กรคู่พันธมิตรที่คาดว่าน่าจะมีศักยภาพก่อนการร่วมมือจะช่วยให้โครงการประสบความสำเร็จได้หรือไม่และช่วยได้มากน้อยเพียงใด

- □ การร่วมมือครั้งนี้ มีการจัดกลุ่ม จัดการ หรือ ตั้งหน่วยงานรับผิดชอบอย่างไรในองค์กรของท่าน มีการแยกหน่วยงาน หรือทรัพยากร รวมทั้งบุคคลากรเพื่อเพื่อการบริหารจัดการโครงการหรือไม่

- □ ท่านคิดว่าโครงสร้างขององค์กรท่านมีลักษณะอย่างไร ในแง่ของการทำงานแบบรวมศูนย์โดยอำนาจการบริหารจัดการอยู่ที่ผู้บริหารเท่านั้น รูปแบบความร่วมมือที่เป็นทางการ และความซับซ้อนและรบบศักดินาในองค์กรมีผลต่อประสิทธิภาพในการร่วมมือระหว่างองค์กร หรือไม่ อย่างไร

- □ ท่านคิดว่าในหน่วยงาน หรือการจัดการในส่วนใดที่จะได้ประโยชน์สูงสุดจากการร่วมมือในครั้งนี้ การร่วมมือกันในครั้งนี้มีผลอะไรบ้างกับองค์กรของท่านและองค์กรคู่พันธมิตร

- □ ท่านคิดว่าอะไรคือประโยชน์ที่ได้จากการแลกเปลี่ยนความรู้กันในโครงการนี้ ประสิทธิภาพของการแลกเปลี่ยนความรู้ในโครงการควรจะวัดและประเมินผลจากอะไรบ้างนอกจากในแง่ของคุณภาพบุคคลากร สินค้าและบริการใหม่ การตีพิมพ์งานวิจัย การจดสิทธิบัตรต่าง ๆ

ความร่วมมือกับองค์กรคู่พันธมิตร:

- □ การร่วมมือกับองค์กรพันธมิตรเริ่มต้นครั้งแรกเมื่อไร และมีข้อมูลข่าวสารเกียวกับโครงการการร่วมมือนี้เพียงพอหรือไม่

- □ ท่านติดต่อสื่อสารกับองค์กรคู่พันธมิตรของท่านโดยผ่านช่องทางใด (การประชุมสัมมนา การเยี่ยมชมสถานประกอบการ อีเมล์ โทรศัพท์ การติดต่อแบบไม่เป็นทางการ) และมีการแจ้งข่าวสารระหว่างกันเกี่ยวกับการตัดสินใจสำคัญหรือไม่

- □ ท่านคิดว่าโครงการนี้บรรลุเป้าประสงค์ขององค์กรของท่านหรือไม่ อย่างไร ในแง่ของ ความเข้าใจซึ่งกันและกันในความรู้และทักษะที่ได้มีการแลกเปลี่ยนกัน ประโยชน์ของโครงการ ความเร็ว และงบประมาณในการจัดการ เช่น ช่วยลดค่าใช้จ่าย เพิ่มประสิทธิภาพในการผลิต ขยายขอบข่ายของธุรกิจ หรือ ช่วยลดความเสี่ยง หรือไม่ อย่างไร

- □ อะไรคือสิ่งที่ดีในการทำงานร่วมกับองค์กรคู่พันธมิตรของท่าน

- □ อะไรคือด้านลบในการทำงานร่วมกับองค์กรคู่พันธมิตรของท่าน

- □ ท่านคิดว่าโครงการนี้บรรลุเป้าประสงค์ในการด้านการสร้างนวัตกรรม ผลิตภัณฑ์ใหม่จากผลงานทางวิชาการเพื่อการค้าพาณิชย์ได้หรือไม่

- □ ท่านคิดว่าหลังจากร่วมมือในโครงการนี้มีพัฒนาการทางด้านทักษะ ความสามารถของแรงงานเข้าสู่ตลาดได้หรือไม่ และมีการพัฒนาหลักสูตรให้สอดคล้องกับความต้องการของภาคอุตสาหกรรมได้มากน้อยเพียงใด

- □ อะไรคือสิ่งสำคัญที่สุดในการผลักดันให้โครงการนี้ประสบผลสำเร็จ โดยเฉพาะการถ่ายทอดความรู้ระหว่างองค์กรคู่พันธมิตร (ท่านคิดว่า ลักษณะเฉพาะของคู่พันธมิตร โครงสร้างองค์กร ประสบการณ์ ความพร้อมและความตั้งใจในการเรียนรู้ ความไว้ใจ ความยึดมั่นในพันธกิจ การแบ่งปันข่อมูลข่าวสาร ค่านิยมที่สอดคล้องและ ระบบที่เกื่อกูล อะไรมีอิทธิพลมากที่สุดต่อการแลกเปลี่ยนความรู้ในโครงการนี้

คำถามเพิ่มเติม:

- □ ท่านคิดว่าบทบาทของความไว้ใจและการฉวยโอกาสในการเรียนรู้มีผลกระทบต่อการสร้างพันธมิตรมากน้อยเพียงใด
- □ ท่านคิดว่าความไว้ใจสามารถสร้างขึ้นระหว่างองค์กรคู่พันธมิตรได้อย่างไร
- □ ท่านคิดว่าทำอย่างไรการถ่ายทอดความรู้จึงจะมีประสิทธิภาพสูงสุด

APPENDIX C

TESTIMONIALS AND LETTERS OF APPROVAL

ที่ ศธ 0526.02/072

คณะรัฐประศาสนศาสตร์
สถาบันบัณฑิตพัฒนบริหารศาสตร์
คลองจั่น บางกะปิ กทม. 10240

28 มิถุนายน 2552

เรื่อง ขอความอนุเคราะห์ข้อมูล แจกแบบสอบถามและสัมภาษณ์เพื่อประกอบการทำวิทยานิพนธ์เรียน

ด้วย นางสาวพัทรียา หลักเพ็ชร นักศึกษาหลักสูตรปรัชญาดุษฎีบัณฑิต (การบริหารการพัฒนา) หลักสูตรนานาชาติ คณะรัฐประศาสนศาสตร์ สถาบันบัณฑิตพัฒนบริหารศาสตร์ ได้รับอนุมัติให้ทำวิทยานิพนธ์เรื่อง "Knowledge Transfer Effectiveness of University-Industry Alliance" (ประสิทธิภาพในการแลกเปลี่ยนองค์ความรู้ในกลุ่มพันธมิตรระหว่างมหาวิทยาลัยและภาคอุตสาหกรรม) โดยนักศึกษามีความจำเป็นอย่างยิ่งที่จะต้องรวบรวมข้อมูลจากหน่วยงานของท่านเพื่อประกอบการทำวิทยานิพนธ์ให้สมบูรณ์ยิ่งขึ้น

คณะรัฐประศาสนศาสตร์ พิจารณาแล้วเห็นว่าหน่วยงานของท่านเป็นหนึ่งในหน่วยงานที่ส่งเสริมมีความร่วมมือกับทางมหาวิทยาลัยรัฐและเอกชนหลายองค์กรในการทำวิจัยทางด้านอุตสาหกรรมเทคโนโลยีและการบริการ ซึ่งมีความเกี่ยวข้องกับหัวข้อวิทยานิพนธ์ดังกล่าว อันจะเป็นประโยชน์อย่างยิ่งต่อการดำเนินการศึกษาในครั้งนี้ จึงเรียนมาเพื่อขอความอนุเคราะห์จากท่านในการให้ข้อมูลจากหน่วยงานที่เกี่ยวข้อง แจกแบบสอบถามและให้นักศึกษาสัมภาษณ์เพื่อประกอบการทำวิทยานิพนธ์ โดยข้อมูลที่รวบรวมได้จะเก็บไว้เป็นความลับและนำไปวิเคราะห์เพื่อประโยชน์ทางวิชาการโดยตรงเท่านั้น อนึ่ง หากท่านมีความประสงค์จะติดต่อกับนักศึกษา ขอความกรุณาติดต่อกับนักศึกษาโดยตรงได้ที่หมายเลขโทรศัพท์ 08-1349-8146, 08-1347-0904, 02-241-1181 หรือโทรสาร 02-668-4670

คณะรัฐประศาสนศาสตร์ หวังเป็นอย่างยิ่งว่า คงจะได้รับความอนุเคราะห์จากท่านเป็นอย่างดี จึงขอบคุณล่วงหน้ามา ณ โอกาสนี้

ขอแสดงความนับถือ

รองศาสตราจารย์ ดร. ZJM

(พรเพ็ญ เพชรสุขศิริ)

รักษาราชการแทนรองคณบดีฝ่ายวิชาการ

คณะรัฐประศาสนศาสตร์

หลักสูตรปริญญาเอก นานาชาติ โทรศัพท์ / โทรสาร 0-2374-4977

12 June, 2009

Dear Sirs and Madams,
Subject: Questionnaire Survey

I am currently a doctoral candidate of international program in public administration at the National Institute of Development Administration (NIDA) has been approved to conduct my dissertation entitled "Knowledge Transfer Effectiveness of University-Industry Alliances"

The purpose of this research project is to examine factors that enhance competitiveness in university-industry alliance partnership in terms of mutual knowledge transfer and then to provide policy makers in the relevant industry strategic suggestions for sustaining competitiveness. This research project gives significant contribution to not only university but also both public and private sectors that are interested in sponsorship the research with the technology-based university.

I would very much appreciate if either you or another individual in your university or your organization who knows the operations of university-industry alliance projects would participate in the survey and give important insights to the questions raised in this study. The survey will take approximately 10-15 minutes to complete. After all the questions are fully answered, please send it back by either mail with a prepaid envelop attached or fax to (02) 668-4670.Participation is voluntary and does not have any potential risk for you. **Pleased also be assured that your response is strictly confidential and only aggregate practices pertaining to the industry will be reported.** In other words, neither you nor your organization will be identified in any discussion of the findings.

Your contribution is greatly important to the success of this study. I truly appreciate your completion of this survey. If you would like to have a summarized finding of this study, please fill out the information at the end of the questionnaire attached. Also, if you have any inquiry, please don't hesitate to contact me at (081) 349-8146 or email cherrylufthansa@yahoo.com.

Sincerely Yours,

Patthareeya Lakpetch
Ph.D. Candidate at NIDA and Project Coordinator

Patthareeya Lakpetch is our advisee. Your participation to her study will definitely contribute to the success of this study and help enhance the quality of research and development in university-industry partnership. Please kindly spend some of your precious time to respond to this questionnaire.

Sincerely yours,

Tippawan Lorsuwannarat, Ph.D.
Associate Professor of Public Administration
and Director of School of Public Administration,
(NIDA)

Vichit Lorcheerachunkul ,Ph.D
Associate Professor of Applied Statistics
Faculty of Applied Statistics, NIDA

Sombat Muengkaew, Ph.D
Chancellor of Chankaserm Rajaphat Universit

APPENDIX D

DESCRIPTIVE STATISTICS

Frequency Table

1. Profiles of University and Industrial Partners

การร่วมมือในลักษณะการขอรับคำปรึกษากับนักวิจัยหรือคณาจารย์เฉพาะเจาะจงเป็นรายบุคคล (ทั้งที่เสียค่าใช้จ่ายและไม่เสียค่าใช้จ่าย)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่เลือก	74	30.8	30.8	30.8
	เลือก	166	69.2	69.2	100.0
	Total	240	100.0	100.0	

การจัดการประชุมแลกเปลี่ยนข้อคิดเห็นอย่างไม่เป็นทางการและจัดเวิร์ดช็อประหว่างองค์กรคู่พันธมิตรให้มีการฝึกฝนในเชิงปฏิบัติการจริง

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่เลือก	163	67.9	67.9	67.9
	เลือก	77	32.1	32.1	100.0
	Total	240	100.0	100.0	

การให้ทุนการศึกษาและการติดต่อกับบัณฑิตเพื่อการวิจัย

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่เลือก	167	69.6	69.6	69.6
	เลือก	73	30.4	30.4	100.0
	Total	240	100.0	100.0	

โครงการนักศึกษาฝึกหัดงานและโครงการสหกิจศึกษาที่มีการฝึกงานนักศึกษาในสถานประกอบการจริง

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่เลือก	98	40.8	40.8	40.8
	เลือก	142	59.2	59.2	100.0
	Total	240	100.0	100.0	

การร่วมมือในการจัดโปรแกรมการศึกษา

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่เลือก	193	80.4	80.4	80.4
	เลือก	47	19.6	19.6	100.0
	Total	240	100.0	100.0	

การร่วมมือกันโดยผ่านองค์กร หรือหน่วยงานกลาง

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่เลือก	187	77.9	77.9	77.9
	เลือก	53	22.1	22.1	100.0
	Total	240	100.0	100.0	

โครงการวิจัยร่วมกันระหว่างองค์กรคู่พันธมิตรภายใต้สัญญา และเงื่อนไขที่กำหนด

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่เลือก	121	50.4	50.4	50.4
	เลือก	119	49.6	49.6	100.0
	Total	240	100.0	100.0	

การให้เงินทุนสนับสนุนงานวิจัยในด้านต่างๆในลักษณะเงินบริจาค หรือเงินให้เปล่าทั้งที่เป็นการให้โดยระบุหรือไม่ระบุหน่วยงานใดหน่วยงานหนึ่ง

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่เลือก	170	70.8	70.8	70.8
	เลือก	70	29.2	29.2	100.0
	Total	240	100.0	100.0	

การจัดตั้งสถาบันหรือหน่วยงานเฉพาะเป็นการภายในเพื่อวิจัยร่วมกันอย่างเป็นทางการระหว่างมหาวิทยาลัยและภาคอุตสาหกรรม

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่เลือก	205	85.4	85.4	85.4
	เลือก	35	14.6	14.6	100.0
	Total	240	100.0	100.0	

อื่นๆ

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่เลือก	235	97.9	97.9	97.9
	เลือก	5	2.1	2.1	100.0
	Total	240	100.0	100.0	

งานภายใต้การรับผิดชอบของท่านเกี่ยวข้องกับโครงการพันธมิตรระหว่างมหาวิทยาลัย สถาบันทางวิชาการ และภาคอุตสาหกรรมเพื่อพัฒนาการวิจัย ผลิตภัณฑ์และขั้นตอนการผลิต การแลกเปลี่ยนวิทยาการใหม่ๆ รวมทั้งการแลกเปลี่ยนความรู้ที่เป็นประโยชน์ต่อสังคมโดยรวมและเพื่อประโยชน์

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่ใช่	9	3.8	3.8	3.8
	ใช่	231	96.3	96.3	100.0
	Total	240	100.0	100.0	

ตำแหน่งงานของท่านจัดอยู่ในหมวดใดต่อไปนี้

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ประธานบริษัท,เจ้าของ,หัวหน้าฝ่ายบริหาร	38	15.8	15.8	15.8
	หัวหน้าฝ่ายปฏิบัติการ,กรรมการฝ่ายปฏิบัติการ	103	42.9	42.9	58.8
	อื่นๆ	99	41.3	41.3	100.0
	Total	240	100.0	100.0	

องค์กรของท่านจัดอยู่ในอุตสาหกรรมประเภทใด

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	มหาวิทยาลัยรัฐ	166	69.2	69.2	69.2
	มหาวิทยาลัยเอกชน	5	2.1	2.1	71.3
	รัฐวิสาหกิจ	5	2.1	2.1	73.3
	กระทรวง ทบวง กรม หรือสถาบันของรัฐ	10	4.2	4.2	77.5
	บริษัทเอกชน	27	11.3	11.3	88.8
	บริษัทเอกชนร่วมทุนกับต่างชาติ	8	3.3	3.3	92.1
	อื่นๆ	19	7.9	7.9	100.0
	Total	240	100.0	100.0	

2. Purposes of Alliance Partnership

รับความร่วมมือด้านการเงินจากองค์กรที่เป็นพันธมิตร

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่เลือก	152	63.3	63.3	63.3
	เลือก	88	36.7	36.7	100.0
	Total	240	100.0	100.0	

เพื่อการพัฒนาสิ่งประดิษฐ์ ผลผลิตหรือแนวคิดที่ยังไม่เคยมีมาก่อน

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่เลือก	79	32.9	32.9	32.9
	เลือก	161	67.1	67.1	100.0
	Total	240	100.0	100.0	

รับความร่วมมือในการแลกเปลี่ยนบุคลากรเพื่อพัฒนาความรู้และทักษะทางเทคโนโลยีจากองค์กรที่เป็นพันธมิตร

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่เลือก	156	65.0	65.0	65.0
	เลือก	84	35.0	35.0	100.0
	Total	240	100.0	100.0	

เพื่อประโยชน์ในการใช้เครื่องอำนวยความสะอาดและทรัพยากรขององค์กรที่เป็นพันธมิตร

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	**ไม่เลือก**	162	67.5	67.5	67.5
	เลือก	78	32.5	32.5	100.0
	Total	240	100.0	100.0	

อื่นๆ

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่เลือก	193	80.4	80.4	80.4
	เลือก	47	19.6	19.6	100.0
	Total	240	100.0	100.0	

3. Alliance Types

องค์กรของท่านเคยเข้าร่วมการเป็นพันธมิตร หรือมีข้อตกลงทางด้านเทคโนโลยีร่วมกับองค์กรอื่นมาก่อนหรือไม่

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่เคย	44	18.3	18.3	18.3
	เคย	196	81.7	81.7	100.0
	Total	240	100.0	100.0	

การร่วมมือกันในลักษณะสัดส่วนของการร่วมหุ้น

		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	ไม่เลือก	215	89.6	89.6	89.6
	เลือก	25	10.4	10.4	100.0
	Total	240	100.0	100.0	

การร่วมมือในการค้นคว้าพัฒนา หรือการร่วมมือกันทางด้านดารตลาดโดยมีข้อตกลงที่เป็นสัญญาร่วมกัน

		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	ไม่เลือก	116	48.3	48.3	48.3
	เลือก	124	51.7	51.7	100.0
	Total	240	100.0	100.0	

ไม่มีหุ้นส่วน หรือสัญญาแต่ตกลงร่วมมือกัน

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่เลือก	205	85.4	85.4	85.4
	เลือก	35	14.6	14.6	100.0
	Total	240	100.0	100.0	

อื่นๆ

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่เลือก	211	87.9	87.9	87.9
	เลือก	29	12.1	12.1	100.0
	Total	240	100.0	100.0	

4. Frequency and Activities of Information Sharing

การอบรมสัมมนาที่องค์กรของท่านจัดขึ้นเอง

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่เคย	79	32.9	32.9	32.9
	1-6	137	57.1	57.1	90.0
	7-12	4	1.7	1.7	91.7
	13 หรือมากกว่า	20	8.3	8.3	100.0
	Total	240	100.0	100.0	

การอบรมสัมมนาที่จัดโดยองค์กรที่เป็นคู่พันธมิตร

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	**ไม่เคย**	130	54.2	54.2	54.2
	1-6	95	39.6	39.6	93.8
	7-12	4	1.7	1.7	95.4
	13 หรือมากกว่า	11	4.6	4.6	100.0
	Total	240	100.0	100.0	

การอบรมสัมมนาที่จัดโดยสถาบันหรือหน่วยงานกลางภายนอกองค์กรของท่านและองค์กรคู่พันธมิตร

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่เคย	116	48.3	48.3	48.3
	1-6	107	44.6	44.6	92.9
	7-12	12	5.0	5.0	97.9
	13 หรือมากกว่า	5	2.1	2.1	100.0
	Total	240	100.0	100.0	

โครงการนักศึกษาฝึกหัดงาน

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่เคย	46	19.2	19.2	19.2
	1-6	151	62.9	62.9	82.1
	7-12	20	8.3	8.3	90.4
	13 หรือมากกว่า	23	9.6	9.6	100.0
	Total	240	100.0	100.0	

การเยี่ยมชมสถานที่ปฏิบัติงาน

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่เคย	33	13.8	13.8	13.8
	1-6	176	73.3	73.3	87.1
	7-12	11	4.6	4.6	91.7
	13 หรือมากกว่า	20	8.3	8.3	100.0
	Total	240	100.0	100.0	

การมีส่วนร่วมในการสนับสนุนหน่วยงานวิจัยร่วมกันระหว่างองค์กรคู่พันธมิตร

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่เคย	59	24.6	24.6	24.6
	1-6	156	65.0	65.0	89.6
	7-12	9	3.8	3.8	93.3
	13 หรือมากกว่า	16	6.7	6.7	100.0
	Total	240	100.0	100.0	

การมีส่วนร่วมในการพัฒนาหลักสูตรการเรียนการสอนในมหาวิทยาลัยให้ตรงวัตถุประสงค์ของภาคอุตสาหกรรมที่เป็นองค์กรคู่พันธมิตร

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่เคย	144	60.0	60.0	60.0
	1-6	94	39.2	39.2	99.2
	7-12	1	.4	.4	99.6
	13 หรือมากกว่า	1	.4	.4	100.0
	Total	240	100.0	100.0	

อื่นๆ

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่เคย	232	96.7	96.7	96.7
	7-12	4	1.7	1.7	98.3
	13 หรือมากกว่า	4	1.7	1.7	100.0
	Total	240	100.0	100.0	

5. Resource Complementarity Gained from University Partners

ความรู้เกี่ยวกับระบบการผลิต ออกแบบและเทคโนโลยีการผลิต

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่เลือก	74	30.8	30.8	30.8
	เลือก	166	69.2	69.2	100.0
	Total	240	100.0	100.0	

ความคิดสร้างสรรค์ทางวิทยาศาสตร์ ที่ยังไม่มีการค้นพบมาก่อน

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่เลือก	114	47.5	47.5	47.5
	เลือก	126	52.5	52.5	100.0
	Total	240	100.0	100.0	

การควบคุมคุณภาพ

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่เลือก	132	55.0	55.0	55.0
	เลือก	108	45.0	45.0	100.0
	Total	240	100.0	100.0	

ช่องทางการจำหน่าย

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่เลือก	200	83.3	83.3	83.3
	เลือก	40	16.7	16.7	100.0
	Total	240	100.0	100.0	

วัตถุดิบ

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่เลือก	199	82.9	82.9	82.9
	เลือก	41	17.1	17.1	100.0
	Total	240	100.0	100.0	

ความรู้เกี่ยวกับวิธีการจัดการตลาดและการเข้าถึงตลาด

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่เลือก	199	82.9	82.9	82.9
	เลือก	41	17.1	17.1	100.0
	Total	240	100.0	100.0	

แหล่งเงินทุน

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่เลือก	165	68.8	68.8	68.8
	เลือก	75	31.3	31.3	100.0
	Total	240	100.0	100.0	

แหล่งทรัพยากรบุคคล

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่เลือก	122	50.8	50.8	50.8
	เลือก	118	49.2	49.2	100.0
	Total	240	100.0	100.0	

ระบบการจัดการ

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่เลือก	165	68.8	68.8	68.8
	เลือก	75	31.3	31.3	100.0
	Total	240	100.0	100.0	

ระบบเทคโนโลยีและสารสนเทศ

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่เลือก	117	48.8	48.8	48.8
	เลือก	123	51.3	51.3	100.0
	Total	240	100.0	100.0	

อื่นๆ

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่เลือก	227	94.6	94.6	94.6
	เลือก	13	5.4	5.4	100.0
	Total	240	100.0	100.0	

ความรู้เกี่ยวกับระบบการผลิต ออกแบบและเทคโนโลยีการผลิต

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่เลือก	154	64.2	64.2	64.2
	เลือก	86	35.8	35.8	100.0
	Total	240	100.0	100.0	

ความคิดสร้างสรรค์ทางวิทยาศาสตร์ ที่ยังไม่มีการค้นพบมาก่อน

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่เลือก	198	82.5	82.5	82.5
	เลือก	42	17.5	17.5	100.0
	Total	240	100.0	100.0	

การควบคุมคุณภาพ

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่เลือก	180	75.0	75.0	75.0
	เลือก	60	25.0	25.0	100.0
	Total	240	100.0	100.0	

ช่องทางการจำหน่าย

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่เลือก	185	77.1	77.1	77.1
	เลือก	55	22.9	22.9	100.0
	Total	240	100.0	100.0	

6. Resource Complementarity Gained from Industrial Partners

วัตถุดิบ

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่เลือก	170	70.8	70.8	70.8
	เลือก	70	29.2	29.2	100.0
	Total	240	100.0	100.0	

ความรู้เกี่ยวกับวิธีการจัดการตลาดและการเข้าถึงตลาด

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่เลือก	174	72.5	72.5	72.5
	เลือก	66	27.5	27.5	100.0
	Total	240	100.0	100.0	

แหล่งเงินทุน

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่เลือก	184	76.7	76.7	76.7
	เลือก	56	23.3	23.3	100.0
	Total	240	100.0	100.0	

แหล่งทรัพยากรบุคคล

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่เลือก	190	79.2	79.2	79.2
	เลือก	50	20.8	20.8	100.0
	Total	240	100.0	100.0	

ระบบการจัดการ

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่เลือก	192	80.0	80.0	80.0
	เลือก	48	20.0	20.0	100.0
	Total	240	100.0	100.0	

ระบบเทคโนโลยีและสารสนเทศ

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่เลือก	206	85.8	85.8	85.8
	เลือก	34	14.2	14.2	100.0
	Total	240	100.0	100.0	

อื่นๆ

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่เลือก	227	94.6	94.6	94.6
	เลือก	13	5.4	5.4	100.0
	Total	240	100.0	100.0	

7. Partner Complementarities

ทั้งสององค์กรมีความต้องการในการใช้ทรัพยากรของกันและกันเพื่อบรรลุเป้าประสงค์

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่เห็นด้วยอย่างยิ่ง	4	1.7	1.7	1.7
	ไม่เห็นด้วย	8	3.3	3.3	5.0
	ไม่แน่ใจ	22	9.2	9.2	14.2
	เห็นด้วย	103	42.9	42.9	57.1
	เห็นด้วยอย่างยิ่ง	103	42.9	42.9	100.0
	Total	240	100.0	100.0	

ความร่วมมือนี้มีความสำคัญในเชิงกลยุทธ์การจัดการต่อองค์กรของท่านและองค์กรคู่พันธมิตรในอนาคต

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่เห็นด้วยอย่างยิ่ง	5	2.1	2.1	2.1
	ไม่เห็นด้วย	4	1.7	1.7	3.8
	ไม่แน่ใจ	32	13.3	13.3	17.1
	เห็นด้วย	124	51.7	51.7	68.8
	เห็นด้วยอย่างยิ่ง	75	31.3	31.3	100.0
	Total	240	100.0	100.0	

ทั้งสององค์กรมีข้อตกลงที่ไม่ตรงกันเกี่ยวกับวัตถุประสงค์ที่ได้กำหนดขึ้นร่วมกัน

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่เห็นด้วยอย่างยิ่ง	91	37.9	37.9	37.9
	ไม่เห็นด้วย	61	25.4	25.4	63.3
	ไม่แน่ใจ	58	24.2	24.2	87.5
	เห็นด้วย	24	10.0	10.0	97.5
	เห็นด้วยอย่างยิ่ง	6	2.5	2.5	100.0
	Total	240	100.0	100.0	

กิจกรรมที่เกี่ยวข้องกับโครงการร่วมมือกับพันธมิตรไม่เกี่ยวข้องกัลกลยุทธ์ขององค์กรโดยรวมของทั้งสองฝ่าย

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่เห็นด้วยอย่างยิ่ง	70	29.2	29.2	29.2
	ไม่เห็นด้วย	51	21.3	21.3	50.4
	ไม่แน่ใจ	54	22.5	22.5	72.9
	เห็นด้วย	53	22.1	22.1	95.0
	เห็นด้วยอย่างยิ่ง	12	5.0	5.0	100.0
	Total	240	100.0	100.0	

การร่วมมือกับพันธมิตรจะไปสามารถเกิดขึ้นได้ถ้าขาดทรัพยากร และศักยภาพขององค์กรคู่พันธมิตรที่ช่วยให้ความรู้เฉพาะด้านที่คล้ายกันให้มีขอบข่ายที่กว้างขวางและมีประสิทธิภาพมากยิ่งขึ้น

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่เห็นด้วยอย่างยิ่ง	10	4.2	4.2	4.2
	ไม่เห็นด้วย	16	6.7	6.7	10.8
	ไม่แน่ใจ	26	10.8	10.8	21.7
	เห็นด้วย	113	47.1	47.1	68.8
	เห็นด้วยอย่างยิ่ง	75	31.3	31.3	100.0
	Total	240	100.0	100.0	

ความรู้ที่ได้รับจากองค์กรคู่พันธมิตรที่มีความสามารถหลักที่โดดเด่นช่วยธุรกิจของท่านให้ครอบคลุมได้กว้างขวางและเพิ่มความเชี่ยวชาญเฉพาะด้านขององค์กรท่าน

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่เห็นด้วยอย่างยิ่ง	5	2.1	2.1	2.1
	ไม่เห็นด้วย	8	3.3	3.3	5.4
	ไม่แน่ใจ	38	15.8	15.8	21.3
	เห็นด้วย	125	52.1	52.1	73.3
	เห็นด้วยอย่างยิ่ง	64	26.7	26.7	100.0
	Total	240	100.0	100.0	

ความรู้และความเชี่ยวชาญขององค์กรคู่พันธมิตรช่วยเพิ่มคุณภาพของระบบการผลิตและเทคโนโลยีการผลิตให้ดียิ่งขึ้น

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่เห็นด้วยอย่างยิ่ง	8	3.3	3.3	3.3
	ไม่เห็นด้วย	11	4.6	4.6	7.9
	ไม่แน่ใจ	22	9.2	9.2	17.1
	เห็นด้วย	134	55.8	55.8	72.9
	เห็นด้วยอย่างยิ่ง	65	27.1	27.1	100.0
	Total	240	100.0	100.0	

8. **Partner Attributes (Staff's Learning Abilities/ Absorptive Capacity)**

วัฒนธรรมองค์กรของทั้งสองฝ่ายสนับสนุนการเรียนรู้แนวความคิดใหม่ๆ และส่งเสริมการแลกเปลี่ยนความคิดข้ามหน่วยงานอื่น ที่มีการปฏิบัติงานในด้านต่างๆกัน

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่เห็นด้วยอย่างยิ่ง	1	.4	.4	.4
	ไม่เห็นด้วย	4	1.7	1.7	2.1
	ไม่แน่ใจ	62	25.8	25.8	27.9
	เห็นด้วย	112	46.7	46.7	74.6
	เห็นด้วยอย่างยิ่ง	61	25.4	25.4	100.0
	Total	240	100.0	100.0	

การเรียนรู้ความรู้และทักษะใหม่ๆ เป็นการลงทุนสำคัญสำหรับองค์กรของท่านในอนาคต

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่เห็นด้วย	5	2.1	2.1	2.1
	ไม่แน่ใจ	26	10.8	10.8	12.9
	เห็นด้วย	107	44.6	44.6	57.5
	เห็นด้วยอย่างยิ่ง	102	42.5	42.5	100.0
	Total	240	100.0	100.0	

องค์กรของท่านสามารถจัดการเกี่ยวกับข่าวสารใหม่ๆได้อย่างดียิ่ง

		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	ไม่เห็นด้วยอย่างยิ่ง	2	.8	.8	.8
	ไม่เห็นด้วย	14	5.8	5.8	6.7
	ไม่แน่ใจ	71	29.6	29.6	36.3
	เห็นด้วย	126	52.5	52.5	88.8
	เห็นด้วยอย่างยิ่ง	27	11.3	11.3	100.0
	Total	240	100.0	100.0	

องค์กรของท่านสามารถรวบรวมข่าวสารใหม่ๆ จากหลายๆแหล่งข้อมูล

		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	ไม่เห็นด้วยอย่างยิ่ง	5	2.1	2.1	2.1
	ไม่เห็นด้วย	4	1.7	1.7	3.8
	ไม่แน่ใจ	57	23.8	23.8	27.5
	เห็นด้วย	135	56.3	56.3	83.8
	เห็นด้วยอย่างยิ่ง	39	16.3	16.3	100.0
	Total	240	100.0	100.0	

มีการจัดการรวบรวมความรู้ เทคโนโลยี และนวัตกรรมจากภายนอกเข้ากับความรู้ภายในองค์กรของท่าน

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่เห็นด้วยอย่างยิ่ง	4	1.7	1.7	1.7
	ไม่เห็นด้วย	15	6.3	6.3	7.9
	ไม่แน่ใจ	54	22.5	22.5	30.4
	เห็นด้วย	126	52.5	52.5	82.9
	เห็นด้วยอย่างยิ่ง	41	17.1	17.1	100.0
	Total	240	100.0	100.0	

9. Partner Attributes (Skill of the Joint Alliance Management)

องค์กรของท่านมีประสบการณ์ในการร่วมมือระหว่างมหาวิทยาลัยและองค์กรในภาคอุตสาหกรรมหรือ เข้าร่วมพันธมิตรในโครงการอื่นๆมาก่อน

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่เห็นด้วย	18	7.5	7.5	7.5
	ไม่แน่ใจ	28	11.7	11.7	19.2
	เห็นด้วย	123	51.3	51.3	70.4
	เห็นด้วยอย่างยิ่ง	71	29.6	29.6	100.0
	Total	240	100.0	100.0	

องค์กรของท่านมีผู้จัดการที่มีความรู้

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่เห็นด้วยอย่างยิ่ง	11	4.6	4.6	4.6
	ไม่เห็นด้วย	24	10.0	10.0	14.6
	ไม่แน่ใจ	89	37.1	37.1	51.7
	เห็นด้วย	94	39.2	39.2	90.8
	เห็นด้วยอย่างยิ่ง	22	9.2	9.2	100.0
	Total	240	100.0	100.0	

ฝ่ายบริหารเกี่ยวกับโครงการร่วมพันธมิตรในองค์กรของท่านมีความสามารถในการจัดการทางด้านความร่วมมือระหว่างองค์กรในกลุ่มพันธมิตร

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่เห็นด้วยอย่างยิ่ง	4	1.7	1.7	1.7
	ไม่เห็นด้วย	22	9.2	9.2	10.8
	ไม่แน่ใจ	92	38.3	38.3	49.2
	เห็นด้วย	99	41.3	41.3	90.4
	เห็นด้วยอย่างยิ่ง	23	9.6	9.6	100.0
	Total	240	100.0	100.0	

องค์กรของท่านสามารถคาดคะเนเลือกองค์กรคู่พันธมิตรที่มีขีดความสามารถที่จะช่วยให้ประสบผลสำเร็จในการสร้างสรรนวัตกรรมและการแลกเปลี่ยนความรู้ร่วมกัน

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่เห็นด้วยอย่างยิ่ง	8	3.3	3.3	3.3
	ไม่เห็นด้วย	25	10.4	10.4	13.8
	ไม่แน่ใจ	93	38.8	38.8	52.5
	เห็นด้วย	92	38.3	38.3	90.8
	เห็นด้วยอย่างยิ่ง	22	9.2	9.2	100.0
	Total	240	100.0	100.0	

องค์กรของท่านเลือกเฉพาะองค์กรคู่พันธมิตรที่มีศักยภาพให้การเพิ่มทรัพยากรที่มีประโยชน์และเป็นที่ต้องการในโครงการที่มีความร่วมมือ

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่เห็นด้วยอย่างยิ่ง	5	2.1	2.1	2.1
	ไม่เห็นด้วย	48	20.0	20.0	22.1
	ไม่แน่ใจ	68	28.3	28.3	50.4
	เห็นด้วย	103	42.9	42.9	93.3
	เห็นด้วยอย่างยิ่ง	16	6.7	6.7	100.0
	Total	240	100.0	100.0	

10. Partner Attributes (Structural Characteristics/ Formalization/ Centralization and Complexity)

ทุกเรื่องราวที่เกี่ยวกับความร่วมมือกับพันธมิตรจะผ่านการพิจารณาจากผู้ประสานงานหรือผู้อำนวยการโครงการ

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่เห็นด้วยอย่างยิ่ง	8	3.3	3.3	3.3
	ไม่เห็นด้วย	35	14.6	14.6	17.9
	ไม่แน่ใจ	38	15.8	15.8	33.8
	เห็นด้วย	123	51.3	51.3	85.0
	เห็นด้วยอย่างยิ่ง	36	15.0	15.0	100.0
	Total	240	100.0	100.0	

ช่องทางเกี่ยวกับข่าวสารจะส่งผ่านฝ่ายสำนักงานเฉพาะที่ได้รับมอบหมาย

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่เห็นด้วยอย่างยิ่ง	13	5.4	5.4	5.4
	ไม่เห็นด้วย	44	18.3	18.3	23.8
	ไม่แน่ใจ	70	29.2	29.2	52.9
	เห็นด้วย	97	40.4	40.4	93.3
	เห็นด้วยอย่างยิ่ง	16	6.7	6.7	100.0
	Total	240	100.0	100.0	

งานที่มีการปฏิบัติและร่วมมือกับพันธมิตรในแต่ละวันจะขึ้นอยู่กับกฎข้อบังคับ และนโยบายตามสัญญา

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่เห็นด้วยอย่างยิ่ง	21	8.8	8.8	8.8
	ไม่เห็นด้วย	33	13.8	13.8	22.5
	ไม่แน่ใจ	76	31.7	31.7	54.2
	เห็นด้วย	98	40.8	40.8	95.0
	เห็นด้วยอย่างยิ่ง	12	5.0	5.0	100.0
	Total	240	100.0	100.0	

ทั้งสององค์กรมีแผนที่จะดำเนินดารเอกสารทางกฎหมายเกี่ยวกับโครงการที่มีความร่วมมือเพื่อป้องกันการสูญเสียต่อทรัพย์สินทางปัญญา

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่เห็นด้วยอย่างยิ่ง	12	5.0	5.0	5.0
	ไม่เห็นด้วย	13	5.4	5.4	10.4
	ไม่แน่ใจ	59	24.6	24.6	35.0
	เห็นด้วย	118	49.2	49.2	84.2
	เห็นด้วยอย่างยิ่ง	38	15.8	15.8	100.0
	Total	240	100.0	100.0	

จำนวนเงินทุนจากแต่ละองค์กรเพื่อพัฒนาพันธมิตร คาดว่าจะถูกกำหนดอย่างเป็นลายลักษณ์อักษรในสัญญาที่ทำขึ้นระหว่างกัน

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่เห็นด้วยอย่างยิ่ง	9	3.8	3.8	3.8
	ไม่เห็นด้วย	14	5.8	5.8	9.6
	ไม่แน่ใจ	38	15.8	15.8	25.4
	เห็นด้วย	127	52.9	52.9	78.3
	เห็นด้วยอย่างยิ่ง	52	21.7	21.7	100.0
	Total	240	100.0	100.0	

ปัญหาที่เกิดขึ้นในโครงการพันธมิตรจะถูกแก้ไขโดยผ่านฝ่ายบริหารจัดการตามลำดับขั้นตำแหน่งที่ลดหลั่นกันไป

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่เห็นด้วยอย่างยิ่ง	11	4.6	4.6	4.6
	ไม่เห็นด้วย	33	13.8	13.8	18.3
	ไม่แน่ใจ	59	24.6	24.6	42.9
	เห็นด้วย	113	47.1	47.1	90.0
	เห็นด้วยอย่างยิ่ง	24	10.0	10.0	100.0
	Total	240	100.0	100.0	

ภายในองค์กรที่ร่วมพันธมิตรสามารถตัดสินใจเกี่ยวกับการเปลี่ยนแปลงในการปฏิบัติงานประจำวันได้โดยไม่ซับซ้อนเนื่องจากมีเพียง 2-3 หน่วยงานเท่านั้นที่ได้รับมอบหมายให้จัดการโครงการนี้

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่เห็นด้วยอย่างยิ่ง	16	6.7	6.7	6.7
	ไม่เห็นด้วย	12	5.0	5.0	11.7
	ไม่แน่ใจ	58	24.2	24.2	35.8
	เห็นด้วย	133	55.4	55.4	91.3
	เห็นด้วยอย่างยิ่ง	21	8.8	8.8	100.0
	Total	240	100.0	100.0	

ทางมหาวิทยาลัยพยายามที่จะตัดสินใจเกี่ยวกับการปฏิบัติงานประจำวันบนพื้นฐานของผลประโยชน์และข้อตกลงที่มีร่วมกันกับองค์กรคู่พันธมิตรในภาคอุตสาหกรรมต่างๆ

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่เห็นด้วยอย่างยิ่ง	3	1.3	1.3	1.3
	ไม่เห็นด้วย	49	20.4	20.4	21.7
	ไม่แน่ใจ	64	26.7	26.7	48.3
	เห็นด้วย	100	41.7	41.7	90.0
	เห็นด้วยอย่างยิ่ง	24	10.0	10.0	100.0
	Total	240	100.0	100.0	

100. **Coordinating Factors (Operational and Cultural Compatibility/ Flexible University Policy)**

ทางมหาวิทยาลัยมีความยืดหยุ่นในการแก้ไขเปลี่ยนแปลงเป้าประสงค์ที่ได้ตั้งไว้เกี่ยวกับการศึกษาทางวิชาการเพื่อให้สอดคล้องกับความต้องการขององค์กรคู่พันธมิตรจากภาคอุตสาหกรรม

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่เห็นด้วยอย่างยิ่ง	7	2.9	2.9	2.9
	ไม่เห็นด้วย	31	12.9	12.9	15.8
	ไม่แน่ใจ	59	24.6	24.6	40.4
	เห็นด้วย	110	45.8	45.8	86.3
	เห็นด้วยอย่างยิ่ง	33	13.8	13.8	100.0
	Total	240	100.0	100.0	

ระหว่างมหาวิทยาลัยและภาคอุตสาหกรรมมีข้อตกลงเดียวกันเกี่ยวกับผลผลิต สินค้าใหม่ การจดสิทธิบัตรตีพิมพ์ผลงานการสร้างสรรพลิตภัณฑ์และขั้นตอนการผลิตที่พัฒนาขึ้นร่วมกัน

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่เห็นด้วยอย่างยิ่ง	7	2.9	2.9	2.9
	ไม่เห็นด้วย	14	5.8	5.8	8.8
	ไม่แน่ใจ	67	27.9	27.9	36.7
	เห็นด้วย	109	45.4	45.4	82.1
	เห็นด้วยอย่างยิ่ง	43	17.9	17.9	100.0
	Total	240	100.0	100.0	

ทั้งสององค์กรมีความกลมกลืนกันอย่างมากในวิธีการบริหารจัดการและวัฒนธรรมองค์กร

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่เห็นด้วยอย่างยิ่ง	3	1.3	1.3	1.3
	ไม่เห็นด้วย	66	27.5	27.5	28.8
	ไม่แน่ใจ	94	39.2	39.2	67.9
	เห็นด้วย	62	25.8	25.8	93.7
	เห็นด้วยอย่างยิ่ง	15	6.3	6.3	100.0
	Total	240	100.0	100.0	

ทั้งสององค์กรมีปรัชญาและวิธีการดำเนินธุรกิจที่เข้ากันได้ดีเพราะค่านิยมและบรรทัดฐานทางสังคมของทั้งสององค์กรสอดคล้องกัน

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่เห็นด้วยอย่างยิ่ง	6	2.5	2.5	2.5
	ไม่เห็นด้วย	51	21.3	21.3	23.8
	ไม่แน่ใจ	94	39.2	39.2	62.9
	เห็นด้วย	78	32.5	32.5	95.4
	เห็นด้วยอย่างยิ่ง	11	4.6	4.6	100.0
	Total	240	100.0	100.0	

กิจกรรมเกี่ยวกับการพัฒนาโครงการพันธมิตรที่มีความแตกต่างกันในวิธีการดำเนินงานในแต่ละองค์กรในเครือข่ายพันธมิตรสามารถเข้ากันได้เป็นอย่างดี

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่เห็นด้วย	21	8.8	8.8	8.8
	ไม่แน่ใจ	86	35.8	35.8	44.6
	เห็นด้วย	119	49.6	49.6	94.2
	เห็นด้วยอย่างยิ่ง	14	5.8	5.8	100.0
	Total	240	100.0	100.0	

ทั้งสององค์กรมีข้อตกลงเดียวกันเกี่ยวกับการร่วมมือบริหารจัดการโครงการพันธมิตร

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่เห็นด้วย	9	3.8	3.8	3.8
	ไม่แน่ใจ	61	25.4	25.4	29.2
	เห็นด้วย	146	60.8	60.8	90.0
	เห็นด้วยอย่างยิ่ง	24	10.0	10.0	100.0
	Total	240	100.0	100.0	

11. Relationship Factors (Trust/Commitment and Bilateral Information Sharing)

ท่านเชื่อว่าองค์กรคู่พันธมิตรของท่านจะปฏิบัติงานต่างๆ เพื่อผลประโยชน์ขององค์กรของท่าน

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่เห็นด้วยอย่างยิ่ง	3	1.3	1.3	1.3
	ไม่เห็นด้วย	12	5.0	5.0	6.3
	ไม่แน่ใจ	90	37.5	37.5	43.8
	เห็นด้วย	111	46.3	46.3	90.0
	เห็นด้วยอย่างยิ่ง	24	10.0	10.0	100.0
	Total	240	100.0	100.0	

ทั้งสองฝ่ายในโครงการที่ร่วมมือมีความซื่อสัตย์และไว้วางใจกัน

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่เห็นด้วย	7	2.9	2.9	2.9
	ไม่แน่ใจ	34	14.2	14.2	17.1
	เห็นด้วย	156	65.0	65.0	82.1
	เห็นด้วยอย่างยิ่ง	43	17.9	17.9	100.0
	Total	240	100.0	100.0	

องค์กรของท่านมีความเชื่อมั่นในศักยภาพความสามารถ และแรงจูงใจขององค์กรคู่พันธมิตรในการแบ่งปันความรู้ความสามารถเพื่อประโยชน์ร่วมกันในโครงการนี้

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่เห็นด้วย	6	2.5	2.5	2.5
	ไม่แน่ใจ	33	13.8	13.8	16.3
	เห็นด้วย	171	71.3	71.3	87.5
	เห็นด้วยอย่างยิ่ง	30	12.5	12.5	100.0
	Total	240	100.0	100.0	

ทั้งสององค์กรเชื่อมั่นในค่านิยมและประสบการณ์ขององค์กรคู่พันธมิตรในการปฏิบัติภารกิจในแต่ละวัน

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่เห็นด้วย	4	1.7	1.7	1.7
	ไม่แน่ใจ	71	29.6	29.6	31.3
	เห็นด้วย	144	60.0	60.0	91.3
	เห็นด้วยอย่างยิ่ง	21	8.8	8.8	100.0
	Total	240	100.0	100.0	

องค์กรคู่พันธมิตรมีศักยภาพที่จะทำให้ข้อตกลงในโครงการที่มีความร่วมมือกันให้สำเร็จลุล่วงได้

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่แน่ใจ	29	12.1	12.1	12.1
	เห็นด้วย	166	69.2	69.2	81.3
	เห็นด้วยอย่างยิ่ง	45	18.8	18.8	100.0
	Total	240	100.0	100.0	

บุคลากรขององค์กรคู่พันธมิตรมีความรู้ ความสามารถในวิธีการแก้ปัญหาที่เกิดขึ้นในโครงการที่มีการร่วมกัน

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่แน่ใจ	51	21.3	21.3	21.3
	เห็นด้วย	138	57.5	57.5	78.8
	เห็นด้วยอย่างยิ่ง	51	21.3	21.3	100.0
	Total	240	100.0	100.0	

องค์กรของท่านยินดีให้ความร่วมมือในด้านทรัพยากร และบุคลากรเพื่อประโยชน์ในการถ่ายทอดความรู้ระหว่างองค์กรให้เครือข่ายพันธมิตรในโครงการที่มีการร่วมมือระหว่างกัน

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่เห็นด้วยอย่างยิ่ง	2	.8	.8	.8
	ไม่เห็นด้วย	4	1.7	1.7	2.5
	ไม่แน่ใจ	15	6.3	6.3	8.8
	เห็นด้วย	111	46.3	46.3	55.0
	เห็นด้วยอย่างยิ่ง	108	45.0	45.0	100.0
	Total	240	100.0	100.0	

องค์กรของท่านเชื่อมั่นในการที่จะแลกเปลี่ยนความรู้ในโครงการที่มีความร่วมมือกันให้ประสบผลสำเร็จ

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่แน่ใจ	23	9.6	9.6	9.6
	เห็นด้วย	126	52.5	52.5	62.1
	เห็นด้วยอย่างยิ่ง	91	37.9	37.9	100.0
	Total	240	100.0	100.0	

ผู้บริหารระดับสูงขององค์กรของท่านและองค์กรคู่พันธมิตรมีความยึดมั่นในพันธกิจที่จะผลักดันให้โครงการที่มีความร่วมมือกันประสบผลสำเร็จตามเป้าประสงค์

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่เห็นด้วย	13	5.4	5.4	5.4
	ไม่แน่ใจ	41	17.1	17.1	22.5
	เห็นด้วย	108	45.0	45.0	67.5
	เห็นด้วยอย่างยิ่ง	78	32.5	32.5	100.0
	Total	240	100.0	100.0	

ความสัมพันธ์กับองค์กรคู่พันธไตรในระยะยาวจะก่อให้เกิดผลประโยชน์แก่องค์กรของท่าน

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่แน่ใจ	26	10.8	10.8	10.8
	เห็นด้วย	112	46.7	46.7	57.5
	เห็นด้วยอย่างยิ่ง	102	42.5	42.5	100.0
	Total	240	100.0	100.0	

องค์กรคู่พันธมิตรของท่านให้ข้อมูลข่าวสารที่เพียงพอ

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่เห็นด้วย	7	2.9	2.9	2.9
	ไม่แน่ใจ	64	26.7	26.7	29.6
	เห็นด้วย	137	57.1	57.1	86.7
	เห็นด้วยอย่างยิ่ง	32	13.3	13.3	100.0
	Total	240	100.0	100.0	

องค์กรพันธมิตรของท่านให้ข้อมูลข่าวสารตามกำหนดเวลา

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่เห็นด้วย	11	4.6	4.6	4.6
	ไม่แน่ใจ	77	32.1	32.1	36.7
	เห็นด้วย	128	53.3	53.3	90.0
	เห็นด้วยอย่างยิ่ง	24	10.0	10.0	100.0
	Total	240	100.0	100.0	

ท่านเห็นด้วยกับระดับการแบ่งปันข้อมูลข่าวสารภายในโครงการที่มีความร่วมมือกันอย่างไร

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่เห็นด้วย	15	6.3	6.3	6.3
	ไม่แน่ใจ	39	16.3	16.3	22.5
	เห็นด้วย	155	64.6	64.6	87.1
	เห็นด้วยอย่างยิ่ง	31	12.9	12.9	100.0
	Total	240	100.0	100.0	

การแยี่ยมชมสถานประกอบการและเครื่องอำนวยความสะดวกที่ใช้ในโครงการที่มีความร่วมมือระหว่างผู้เชี่ยวชาญจากมหาวิทยาลัยและองค์กรพันธมิตร

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่เห็นด้วย	1	.4	.4	.4
	ไม่แน่ใจ	29	12.1	12.1	12.5
	เห็นด้วย	149	62.1	62.1	74.6
	เห็นด้วยอย่างยิ่ง	61	25.4	25.4	100.0
	Total	240	100.0	100.0	

การติดต่อกันทางอีเมล์ระหว่างมหาวิทยาลัยและองค์กรคู่พันธมิตร

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่เห็นด้วย	3	1.3	1.3	1.3
	ไม่แน่ใจ	34	14.2	14.2	15.4
	เห็นด้วย	142	59.2	59.2	74.6
	เห็นด้วยอย่างยิ่ง	61	25.4	25.4	100.0
	Total	240	100.0	100.0	

การแลกเปลี่ยนข้อมูลข่าวสาร เกิดขึ้นอย่างไม่เป็นทางการและมีขึ้นบ่อยครั้งเกี่ยวกับโครงการที่มีความร่วมมือกัน

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่เห็นด้วยอย่างยิ่ง	2	.8	.8	.8
	ไม่เห็นด้วย	4	1.7	1.7	2.5
	ไม่แน่ใจ	40	16.7	16.7	19.2
	เห็นด้วย	144	60.0	60.0	79.2
	เห็นด้วยอย่างยิ่ง	50	20.8	20.8	100.0
	Total	240	100.0	100.0	

องค์กรของท่านและองค์กรพันธมิตรปรึกษาหารือและมีการวางแผนร่วมกันในการตัดสินใจในกิจกรรมเกี่ยวกับโครงการนี้

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่เห็นด้วยอย่างยิ่ง	**1**	**.4**	**.4**	**.4**
	ไม่เห็นด้วย	**1**	**.4**	**.4**	**.8**
	ไม่แน่ใจ	**33**	**13.8**	**13.8**	**14.6**
	เห็นด้วย	**167**	**69.6**	**69.6**	**84.2**
	เห็นด้วยอย่างยิ่ง	**38**	**15.8**	**15.8**	**100.0**
	Total	**240**	**100.0**	**100.0**	

12. Knowledege Transfer Effectives in terms of Research Outcomes (RDCE Model)

ลิขสิทธิ์

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่ได้รับ	**206**	**85.8**	**85.8**	**85.8**
	ได้รับแล้ว/กำลังดำเนินการขอรับ	**34**	**14.2**	**14.2**	**100.0**
	Total	**240**	**100.0**	**100.0**	

สิทธิบัตรในการผลิต

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่ได้รับ	188	78.3	78.3	78.3
	ได้รับแล้ว/ กำลังดำเนินการขอรับ	52	21.7	21.7	100.0
	Total	240	100.0	100.0	

อนุสิทธิบัตร

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่ได้รับ	184	76.7	76.7	76.7
	ได้รับแล้ว/ กำลังดำเนินการขอรับ	56	23.3	23.3	100.0
	Total	240	100.0	100.0	

สิทธิบัตรในการออกแบบผลิตภัณฑ์

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่ได้รับ	205	85.4	85.4	85.4
	ได้รับแล้ว/กำลังดำเนินการขอรับ	35	14.6	14.6	100.0
	Total	240	100.0	100.0	

เครื่องหมายมาตรฐานอุตสาหกรรมประเทศไทย

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่ได้รับ	228	95.0	95.0	95.0
	ได้รับแล้ว/กำลังดำเนินการขอรับ	12	5.0	5.0	100.0
	Total	240	100.0	100.0	

การรับรองห้องปฏิบัติการ

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่ได้รับ	200	83.3	83.3	83.3
	ได้รับแล้ว/กำลังดำเนินการ ขอรับ	40	16.7	16.7	100.0
	Total	240	100.0	100.0	

มาตรฐานห้องปฏิบัติการ

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่ได้รับ	205	85.4	85.4	85.4
	ได้รับแล้ว/กำลังดำเนินการขอรับ	35	14.6	14.6	100.0
	Total	240	100.0	100.0	

มอก.-ISO14000 ระบบการจัดการสิ่งแวดล้อม

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่ได้รับ	216	90.0	90.0	90.0
	ได้รับแล้ว/ กำลังดำเนินการขอรับ	24	10.0	10.0	100.0
	Total	240	100.0	100.0	

มอก.-TIS18000 (การรับรองระบบชีวอนามัยและความปลอดภัย)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่ได้รับ	221	92.1	92.1	92.1
	ได้รับแล้ว/กำลังดำเนินการขอรับ	19	7.9	7.9	100.0
	Total	240	100.0	100.0	

เครื่องหมายการค้า

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่ได้รับ	210	87.5	87.5	87.5
	ได้รับแล้ว/กำลังดำเนินการขอรับ	30	12.5	12.5	100.0
	Total	240	100.0	100.0	

รางวัล หรือเกียรติบัตรจากองค์กรต่างๆเพื่อรับรองความรู้ ความสามารถของบุคลากร

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่ได้รับ	156	65.0	65.0	65.0
	ได้รับแล้ว /กำลังดำเนินการขอรับ	84	35.0	35.0	100.0
	Total	240	100.0	100.0	

การตีพิมพ์ผลงานผ่านสื่อต่างๆ

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่ได้รับ	70	29.2	29.2	29.2
	ได้รับแล้ว/กำลังดำเนินการขอรับ	170	70.8	70.8	100.0
	Total	240	100.0	100.0	

อื่นๆ

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่ได้รับ	225	93.8	93.8	93.8
	ได้รับแล้ว/ กำลังดำเนินการขอรับ	15	6.3	6.3	100.0
	Total	240	100.0	100.0	

14. Knowledege Transfer Effectives in terms of Development Through Tacit Knowledge Transfer

มีโครงการศึกษาหรือวิจัยร่วมกันอีกในโครงการอื่นๆ

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่เลือก	65	27.1	27.1	27.1
	เลือก	175	72.9	72.9	100.0
	Total	240	100.0	100.0	

มีการจ้างนักศึกษาที่เคยมาฝึกงานในองค์กรคู่พันธมิตรหลังจากจบโครงการ

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่เลือก	119	49.6	49.6	49.6
	เลือก	121	50.4	50.4	100.0
	Total	240	100.0	100.0	

มีแลกเปลี่ยนบุคลากรในด้านต่างๆอย่างต่อเนื่อง

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่เลือก	192	80.0	80.0	80.0
	เลือก	48	20.0	20.0	100.0
	Total	240	100.0	100.0	

มีการพัฒนาผลิตภัณฑ์ หรือขั้นตอนการจัดการและให้บริการใหม่ๆร่วมกัน

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่เลือก	126	52.5	52.5	52.5
	เลือก	114	47.5	47.5	100.0
	Total	240	100.0	100.0	

อื่นๆ

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่เลือก	222	92.5	92.5	92.5
	เลือก	18	7.5	7.5	100.0
	Total	240	100.0	100.0	

15. Knowledege Transfer Effectives in terms of Commercialization

เวลาที่ใช้ในการประสานงานระหว่างเจ้าหน้าที่จากมหาวิทยาลัยและองค์กรพันธมิตรจากภาคอุตสาหกรรมในการพัฒนาเทคโนโลยีใหม่ เพื่อความต้องการที่ตรงกันและประโยชน์ทางการค้าพาณิชย์

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	น้อยมาก	15	6.3	6.3	6.3
	น้อย	29	12.1	12.1	18.3
	ปานกลาง	98	40.8	40.8	59.2
	สูง	77	32.1	32.1	91.3
	สูงมาก	21	8.8	8.8	100.0
	Total	240	100.0	100.0	

การมีส่วนร่วมในการตัดสินใจร่วมกันปรึกษาหารือและร่วมมือระหว่างองค์กรพันธมิตรเพื่อพัฒนาเทคโนโลยีใหม่เพื่อการพาณิชย์

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	น้อยมาก	11	4.6	4.6	4.6
	น้อย	25	10.4	10.4	15.0
	ปานกลาง	70	29.2	29.2	44.2
	สูง	106	44.2	44.2	88.3
	สูงมาก	28	11.7	11.7	100.0
	Total	240	100.0	100.0	

จำนวนบุคลากรที่ใช้ในการแลกเปลี่ยนความรู้เพื่อพัฒนาเทคโนโลยีเพื่อการพาณิชย์

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	น้อยมาก	19	7.9	7.9	7.9
	น้อย	61	25.4	25.4	33.3
	ปานกลาง	92	38.3	38.3	71.7
	สูง	59	24.6	24.6	96.3
	สูงมาก	9	3.8	3.8	100.0
	Total	240	100.0	100.0	

การเป็นเจ้าของร่วมกันในอุปกรณ์เครื่องใช้เพื่ออำนวยความสะดวก เพื่อใช้ในการพัฒนาเทคโนโลยีใหม่เพื่อการพาณิชย์

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	น้อยมาก	17	7.1	7.1	7.1
	น้อย	56	23.3	23.3	30.4
	ปานกลาง	83	34.6	34.6	65.0
	สูง	64	26.7	26.7	91.7
	สูงมาก	20	8.3	8.3	100.0
	Total	240	100.0	100.0	

16. Knowledege Transfer Effectives in terms of Effcient Coordination (Goal Attainment/ Usefulness/ Efficiency/ Speed/ and Econonomy)

ความรู้ที่ได้จากการแลกเปลี่ยนกับองค์กรคู่พันธมิตรของท่านสามารถเข้าใจได้เป็นอย่างดีภายในองค์กรของท่าน

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่เห็นด้วย	14	5.8	5.8	5.8
	ไม่แน่ใจ	71	29.6	29.6	35.4
	เห็นด้วย	127	52.9	52.9	88.3
	เห็นด้วยอย่างยิ่ง	28	11.7	11.7	100.0
	Total	240	100.0	100.0	

ความรู้ทั้งจากการวิจัยและความสามารถของบุคลากรในมหาวิทยาลัยที่เกิดจากการแลกเปลี่ยนผ่านโครงการที่มีการร่วมมือกับองค์กรคู่พันธมิตรทำให้เกิดสินค้า ผลิคภัณฑ์และการบริการใหม่ๆสู่ตลาดในภาคอุตสาหกรรมต่างๆ

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่เห็นด้วย	10	4.2	4.2	4.2
	ไม่แน่ใจ	40	16.7	16.7	20.8
	เห็นด้วย	142	59.2	59.2	80.0
	เห็นด้วยอย่างยิ่ง	48	20.0	20.0	100.0
	Total	240	100.0	100.0	

ความรู้ใหม่ที่องค์กรของท่านได้รับจากองค์กรคู่พันธมิตรบรรลุเป้าประสงค์และมีประสิทธิผลสมบูรณ์เพียงพอ

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่เห็นด้วย	10	4.2	4.2	4.2
	ไม่แน่ใจ	69	28.8	28.8	32.9
	เห็นด้วย	128	53.3	53.3	86.3
	เห็นด้วยอย่างยิ่ง	33	13.8	13.8	100.0
	Total	240	100.0	100.0	

ขั้นตอนการผลิตภายในองค์กรเพิ่มประสิทธิภาพจากความรู้และทักษะเกี่ยวกับเทคโนโลยีจากมหาวิทยาลัย

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่เห็นด้วยอย่างยิ่ง	2	.8	.8	.8
	ไม่เห็นด้วย	4	1.7	1.7	2.5
	ไม่แน่ใจ	65	27.1	27.1	29.6
	เห็นด้วย	144	60.0	60.0	89.6
	เห็นด้วยอย่างยิ่ง	25	10.4	10.4	100.0
	Total	240	100.0	100.0	

วิธีการและขั้นตอนทางเทคโนโลยีสามารถถ่ายทอดระหว่างองค์กรในเครือข่ายพันธมิตรได้ง่ายและรวดเร็ว

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่เห็นด้วย	8	3.3	3.3	3.3
	ไม่แน่ใจ	104	43.3	43.3	46.7
	เห็นด้วย	110	45.8	45.8	92.5
	เห็นด้วยอย่างยิ่ง	18	7.5	7.5	100.0
	Total	240	100.0	100.0	

องค์กรของท่านใช้เวลาน้อยมากในการรับและประยุกต์ความรู้จากองค์กรคู่พันธมิตรของท่าน

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่เห็นด้วยอย่างยิ่ง	1	.4	.4	.4
	ไม่เห็นด้วย	30	12.5	12.5	12.9
	ไม่แน่ใจ	101	42.1	42.1	55.0
	เห็นด้วย	91	37.9	37.9	92.9
	เห็นด้วยอย่างยิ่ง	17	7.1	7.1	100.0
	Total	240	100.0	100.0	

ความรู้จากองค์กรคู่พันธมิตรที่ได้รับและนำมาใช้งานโดยมีค่าใช้จ่ายที่เกิดขึ้นน้อยมาก

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่เห็นด้วยอย่างยิ่ง	5	2.1	2.1	2.1
	ไม่เห็นด้วย	31	12.9	12.9	15.0
	ไม่แน่ใจ	130	54.2	54.2	69.2
	เห็นด้วย	46	19.2	19.2	88.3
	เห็นด้วยอย่างยิ่ง	28	11.7	11.7	100.0
	Total	240	100.0	100.0	

การนำความรู้ที่ได้รับการถ่ายทอดจากองค์กรคู่พันธมิตรไปสิ้นเปลืองทรัพยากรขององค์กร

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ไม่เห็นด้วยอย่างยิ่ง	6	2.5	2.5	2.5
	ไม่เห็นด้วย	21	8.8	8.8	11.3
	ไม่แน่ใจ	94	39.2	39.2	50.4
	เห็นด้วย	93	38.8	38.8	89.2
	เห็นด้วยอย่างยิ่ง	26	10.8	10.8	100.0
	Total	240	100.0	100.0	

APPENDIX E

STRUCTURAL EQUATION MODEL
BY USING AMOS 6.0 VERSION

Print out by Amos Version 6.0

Analysis Summary

Groups

Group number 1 (Group number 1)

Notes for Group (Group number 1)

The model is recursive.
Sample size = 240

Variable Summary (Group number 1)

Your model contains the following variables (Group number 1)

Observed, endogenous variables
supple
comple
goal
motiva
cultural
operat
flexible
bilatera
commit
trust
research
develop
commer
efficien
learn
skill
structur
Unobserved, endogenous variables
Coordinating
Relationship
P_attributes
Effectiveness
Unobserved, exogenous variables
P_complement
e4
e3
e2
e1
e8
e9
e10
e13
e12

e11
e14
e15
e16
e17
eEffectiveness
eP_attributes
eCoordinating
eRelationship
e5
e6
e7

Variable counts (Group number 1)

Number of variables in your model:	43
Number of observed variables:	17
Number of unobserved variables:	26
Number of exogenous variables:	22
Number of endogenous variables:	21

Parameter summary (Group number 1)

	Weights	Covariances	Variances	Means	Intercepts	Total
Fixed	26	0	0	0	0	26
Labeled	0	0	0	0	0	0
Unlabeled	25	31	22	0	0	78
Total	51	31	22	0	0	104

Models

Default model (Default model)

Notes for Model (Default model)

Computation of degrees of freedom (Default model)

Number of distinct sample moments:	153
Number of distinct parameters to be estimated:	78
Degrees of freedom (153 - 78):	75

Result (Default model)

Minimum was achieved
Chi-square = 88.210
Degrees of freedom = 75
Probability level = .141

Group number 1 (Group number 1 - Default model)

Estimates (Group number 1 - Default model)

Scalar Estimates (Group number 1 - Default model)

Maximum Likelihood Estimates

Regression Weights: (Group number 1 - Default model)

			Estimate	S.E.	C.R.	P	Label
Coordinating	<---	P_complement	.787	.245	3.214	.001	
P_attributes	<---	P_complement	.832	.193	4.307	***	
P_attributes	<---	Coordinating	.310	.082	3.795	***	
Relationship	<---	P_complement	.217	.148	1.472	.141	
Relationship	<---	Coordinating	.506	.111	4.567	***	
Relationship	<---	P_attributes	-.113	.132	-.854	.393	
operat	<---	Coordinating	.863	.122	7.069	***	
commit	<---	Relationship	1.325	.127	10.448	***	
Effectiveness	<---	P_attributes	.138	.044	3.151	.002	
Effectiveness	<---	Relationship	.146	.044	3.339	***	
Effectiveness	<---	Coordinating	-.017	.025	-.709	.479	
Effectiveness	<---	P_complement	-.143	.008	-1.716	.077	
structur	<---	P_attributes	1.099	.123	8.971	***	
supple	<---	P_complement	1.000				
comple	<---	P_complement	.910	.251	3.619	***	
goal	<---	P_complement	-.896	.282	-3.172	.002	
motiva	<---	P_complement	2.740	.678	4.039	***	
cultural	<---	Coordinating	1.000				
flexible	<---	Coordinating	.921	.154	5.979	***	
bilatera	<---	Relationship	1.000				
trust	<---	Relationship	1.242	.120	10.366	***	
research	<---	Effectiveness	1.000				
develop	<---	Effectiveness	1.352	.332	4.074	***	
commer	<---	Effectiveness	10.463	2.628	3.981	***	
efficien	<---	Effectiveness	4.650	1.172	3.966	***	
learn	<---	P_attributes	1.000				
skill	<---	P_attributes	2.400	.444	5.404	***	
bilatera	<---	structur	.110	.030	3.700	***	
commer	<---	operat	-.408	.121	-3.378	***	
goal	<---	commit	-.285	.117	-2.441	.015	

Standardized Regression Weights: (Group number 1 - Default model)

			Estimate
Coordinating	<---	P_complement	.432
P_attributes	<---	P_complement	.580
P_attributes	<---	Coordinating	.394
Relationship	<---	P_complement	.190
Relationship	<---	Coordinating	.808
Relationship	<---	P_attributes	-.142
operat	<---	Coordinating	.750
commit	<---	Relationship	.721
Effectiveness	<---	P_attributes	.843
Effectiveness	<---	Relationship	.712
Effectiveness	<---	Coordinating	-.136
Effectiveness	<---	P_complement	-.613
structur	<---	P_attributes	.586
supple	<---	P_complement	.331
comple	<---	P_complement	.324
goal	<---	P_complement	-.333
motiva	<---	P_complement	.898
cultural	<---	Coordinating	.553
flexible	<---	Coordinating	.510
bilatera	<---	Relationship	.687
trust	<---	Relationship	.766
research	<---	Effectiveness	.392
develop	<---	Effectiveness	.395
commer	<---	Effectiveness	.784
efficien	<---	Effectiveness	.555
learn	<---	P_attributes	.697
skill	<---	P_attributes	1.305
bilatera	<---	structur	.178
commer	<---	operat	-.273
goal	<---	commit	-.156

Covariances: (Group number 1 - Default model)

		Estimate	S.E.	C.R.	P	Label
e12	<--> e7	.062	.014	4.431	***	
e11	<--> e16	-.094	.015	-6.148	***	
e13	<--> e17	.036	.009	4.233	***	
e14	<--> e15	.019	.003	5.789	***	
e15	<--> e9	.034	.007	5.159	***	
e10	<--> e7	.104	.025	4.176	***	
e17	<--> e12	-.053	.011	-4.611	***	
e10	<--> e17	.082	.019	4.429	***	
e4	<--> e17	.075	.018	4.102	***	
e4	<--> e3	.230	.046	4.980	***	
e3	<--> e16	-.144	.039	-3.662	***	
e13	<--> e15	.017	.004	4.120	***	
e2	<--> e15	-.050	.013	-3.717	***	
e2	<--> e5	-.078	.025	-3.146	.002	
e4	<--> e9	-.059	.018	-3.223	.001	
e8	<--> e11	.081	.018	4.606	***	
e1	<--> e13	-.064	.013	-5.001	***	
e10	<--> e6	-.107	.026	-4.132	***	
e10	<--> e14	.017	.008	2.165	.030	
e8	<--> eRelationship	-.069	.015	-4.636	***	
e6	<--> P_complement	-.129	.052	-2.495	.013	
e1	<--> e8	-.174	.037	-4.750	***	
e11	<--> e5	.051	.010	5.330	***	
e2	<--> e11	-.057	.019	-2.944	.003	
e17	<--> e6	-.024	.017	-1.379	.168	
e16	<--> e7	.123	.026	4.740	***	
e1	<--> e9	-.093	.023	-4.034	***	
e5	<--> e12	.040	.010	4.084	***	
e8	<--> e15	.025	.011	2.318	.020	
e2	<--> e7	.070	.030	2.333	.020	
e4	<--> e12	.049	.018	2.757	.006	

Correlations: (Group number 1 - Default model)

			Estimate
e12	<-->	e7	.299
e11	<-->	e16	-.528
e13	<-->	e17	.314
e14	<-->	e15	.376
e15	<-->	e9	.361
e10	<-->	e7	.258
e17	<-->	e12	-.338
e10	<-->	e17	.271
e4	<-->	e17	.247
e4	<-->	e3	.311
e3	<-->	e16	-.242
e13	<-->	e15	.234
e2	<-->	e15	-.205
e2	<-->	e5	-.222
e4	<-->	e9	-.227
e8	<-->	e11	.379
e1	<-->	e13	-.678
e10	<-->	e6	-.251
e10	<-->	e14	.121
e8	<-->	eRelationship	-.575
e6	<-->	P_complement	-.858
e1	<-->	e8	-.723
e11	<-->	e5	.443
e2	<-->	e11	-.201
e17	<-->	e6	-.098
e16	<-->	e7	.376
e1	<-->	e9	-.759
e5	<-->	e12	.287
e8	<-->	e15	.136
e2	<-->	e7	.134
e4	<-->	e12	.180

Variances: (Group number 1 - Default model)

	Estimate	S.E.	C.R.	P	Label
P_complement	.066	.026	2.553	.011	
eCoordinating	.177	.049	3.649	***	
eP_attributes	.042	.011	3.931	***	
eRelationship	.029	.008	3.487	***	
e9	.126	.019	6.751	***	
e12	.139	.015	9.354	***	
eEffectiveness	.001	.000	1.194	.232	
e7	.311	.030	10.304	***	
e4	.533	.049	10.903	***	
e3	1.026	.093	11.001	***	
e2	.867	.080	10.889	***	
e1	.118	.094	1.258	.209	
e8	.493	.053	9.236	***	
e10	.526	.051	10.403	***	
e13	.076	.008	9.163	***	
e11	.093	.011	8.129	***	
e14	.039	.004	10.839	***	
e15	.069	.006	11.162	***	
e16	.346	.057	6.061	***	
e17	.175	.018	9.563	***	
e5	.143	.016	9.050	***	
e6	.344	.123	2.802	.005	

Squared Multiple Correlations: (Group number 1 - Default model)

	Estimate
Coordinating	.186
P_attributes	.688
Relationship	.654
structur	.344
Effectiveness	.855
commit	.519
operat	.562
skill	.244
learn	.485
efficien	.308
commer	.460
develop	.087
research	.085
trust	.587
bilatera	.579
flexible	.260
cultural	.306
motiva	.806
goal	.101
comple	.050
supple	.109

Total Effects (Group number 1 - Default model)

	P_complement	Coordinating	P_attributes	Relationship	structur	Effectiveness	commit	operat
Coordinating	.787	.000	.000	.000	.000	.000	.000	.000
P_attributes	1.076	.310	.000	.000	.000	.000	.000	.000
Relationship	.494	.471	-.113	.000	.000	.000	.000	.000
structur	1.182	.341	1.099	.000	.000	.000	.000	.000
Effectiveness	.063	.094	.121	.146	.000	.000	.000	.000
commit	.655	.624	-.150	1.325	.000	.000	.000	.000
operat	.679	.863	.000	.000	.000	.000	.000	.000
skill	2.581	.744	2.400	.000	.000	.000	.000	.000
learn	1.076	.310	1.000	.000	.000	.000	.000	.000
efficien	.293	.437	.563	.679	.000	4.650	.000	.000
commer	.382	.631	1.267	1.528	.000	10.463	.000	-.408
develop	.085	.127	.164	.197	.000	1.352	.000	.000
research	.063	.094	.121	.146	.000	1.000	.000	.000
trust	.614	.585	-.140	1.242	.000	.000	.000	.000
bilatera	.625	.509	.008	1.000	.110	.000	.000	.000
flexible	.725	.921	.000	.000	.000	.000	.000	.000
cultural	.787	1.000	.000	.000	.000	.000	.000	.000
motiva	2.740	.000	.000	.000	.000	.000	.000	.000
goal	-1.083	-.178	.043	-.377	.000	.000	-.285	.000
comple	.910	.000	.000	.000	.000	.000	.000	.000
supple	1.000	.000	.000	.000	.000	.000	.000	.000

Standardized Total Effects (Group number 1 - Default model)

	P_complement	Coordinat-ing	P_attributes	Relation ship	structur	Effective ness	commit	operat
Coordinating	.432	.000	.000	.000	.000	.000	.000	.000
P_attributes	.750	.394	.000	.000	.000	.000	.000	.000
Relationship	.433	.752	-.142	.000	.000	.000	.000	.000
structur	.440	.231	.586	.000	.000	.000	.000	.000
Effectiveness	.269	.732	.742	.712	.000	.000	.000	.000
commit	.312	.542	-.102	.721	.000	.000	.000	.000
operat	.324	.750	.000	.000	.000	.000	.000	.000
skill	.979	.514	1.305	.000	.000	.000	.000	.000
learn	.522	.274	.697	.000	.000	.000	.000	.000
efficien	.149	.406	.411	.395	.000	.555	.000	.000
commer	.122	.368	.581	.558	.000	.784	.000	-.273
develop	.079	.216	.219	.210	.000	.295	.000	.000
research	.078	.213	.216	.208	.000	.292	.000	.000
trust	.332	.577	-.109	.766	.000	.000	.000	.000
bilatera	.376	.558	.007	.687	.178	.000	.000	.000
flexible	.220	.510	.000	.000	.000	.000	.000	.000
cultural	.239	.553	.000	.000	.000	.000	.000	.000
motiva	.898	.000	.000	.000	.000	.000	.000	.000
goal	-.282	-.084	.016	-.112	.000	.000	-.156	.000
comple	.224	.000	.000	.000	.000	.000	.000	.000
supple	.331	.000	.000	.000	.000	.000	.000	.000

Direct Effects (Group number 1 - Default model)

	P_complement	Coordinating	P_attributes	Relationship	structur	Effectiveness	commit	operat
Coordinating	.787	.000	.000	.000	.000	.000	.000	.000
P_attributes	.832	.310	.000	.000	.000	.000	.000	.000
Relationship	.217	.506	-.113	.000	.000	.000	.000	.000
structur	.000	.000	1.099	.000	.000	.000	.000	.000
Effectiveness	-.143	-.017	.138	.146	.000	.000	.000	.000
commit	.000	.000	.000	1.325	.000	.000	.000	.000
operat	.000	.863	.000	.000	.000	.000	.000	.000
skill	.000	.000	2.400	.000	.000	.000	.000	.000
learn	.000	.000	1.000	.000	.000	.000	.000	.000
efficien	.000	.000	.000	.000	.000	4.650	.000	.000
commer	.000	.000	.000	.000	.000	10.463	.000	-.408
develop	.000	.000	.000	.000	.000	1.352	.000	.000
research	.000	.000	.000	.000	.000	1.000	.000	.000
trust	.000	.000	.000	1.242	.000	.000	.000	.000
bilatera	.000	.000	.000	1.000	.110	.000	.000	.000
flexible	.000	.921	.000	.000	.000	.000	.000	.000
cultural	.000	1.000	.000	.000	.000	.000	.000	.000
motiva	2.740	.000	.000	.000	.000	.000	.000	.000
goal	-.896	.000	.000	.000	.000	.000	-.285	.000
comple	.910	.000	.000	.000	.000	.000	.000	.000
supple	1.000	.000	.000	.000	.000	.000	.000	.000

Standardized Direct Effects (Group number 1 - Default model)

	P_complement	Coordinating	P_attributes	Relationship	structur	Effectiveness	commit	operat
Coordinating	.432	.000	.000	.000	.000	.000	.000	.000
P_attributes	.580	.394	.000	.000	.000	.000	.000	.000
Relationship	.190	.808	-.142	.000	.000	.000	.000	.000
structur	.000	.000	.586	.000	.000	.000	.000	.000
Effectiveness	-.613	-.136	.843	.712	.000	.000	.000	.000
commit	.000	.000	.000	.721	.000	.000	.000	.000
operat	.000	.750	.000	.000	.000	.000	.000	.000
skill	.000	.000	1.305	.000	.000	.000	.000	.000
learn	.000	.000	.697	.000	.000	.000	.000	.000
efficien	.000	.000	.000	.000	.000	.555	.000	.000
commer	.000	.000	.000	.000	.000	.784	.000	-.273
develop	.000	.000	.000	.000	.000	.295	.000	.000
research	.000	.000	.000	.000	.000	.292	.000	.000
trust	.000	.000	.000	.766	.000	.000	.000	.000
bilatera	.000	.000	.000	.687	.178	.000	.000	.000
flexible	.000	.510	.000	.000	.000	.000	.000	.000
cultural	.000	.553	.000	.000	.000	.000	.000	.000
motiva	.898	.000	.000	.000	.000	.000	.000	.000
goal	-.233	.000	.000	.000	.000	.000	-.156	.000
comple	.224	.000	.000	.000	.000	.000	.000	.000
supple	.331	.000	.000	.000	.000	.000	.000	.000

Indirect Effects (Group number 1 - Default model)

	P_complement	Coordinating	P_attributes	Relation-ship	structur	Effective-ness	commit	operat
Coordinating	.000	.000	.000	.000	.000	.000	.000	.000
P_attributes	.244	.000	.000	.000	.000	.000	.000	.000
Relationship	.277	-.035	.000	.000	.000	.000	.000	.000
structur	1.182	.341	.000	.000	.000	.000	.000	.000
Effectiveness	.206	.111	-.016	.000	.000	.000	.000	.000
commit	.655	.624	-.150	.000	.000	.000	.000	.000
operat	.679	.000	.000	.000	.000	.000	.000	.000
skill	2.581	.744	.000	.000	.000	.000	.000	.000
learn	1.076	.310	.000	.000	.000	.000	.000	.000
efficien	.293	.437	.563	.679	.000	.000	.000	.000
commer	.382	.631	1.267	1.528	.000	.000	.000	.000
develop	.085	.127	.164	.197	.000	.000	.000	.000
research	.063	.094	.121	.146	.000	.000	.000	.000
trust	.614	.585	-.140	.000	.000	.000	.000	.000
bilatera	.625	.509	.008	.000	.000	.000	.000	.000
flexible	.725	.000	.000	.000	.000	.000	.000	.000
cultural	.787	.000	.000	.000	.000	.000	.000	.000
motiva	.000	.000	.000	.000	.000	.000	.000	.000
goal	-.187	-.178	.043	-.377	.000	.000	.000	.000
comple	.000	.000	.000	.000	.000	.000	.000	.000
supple	.000	.000	.000	.000	.000	.000	.000	.000

Standardized Indirect Effects (Group number 1 - Default model)

	P_complement	Coordinating	P_attributes	Relationship	structur	Effectiveness	commit	operat
Coordinating	.000	.000	.000	.000	.000	.000	.000	.000
P_attributes	.170	.000	.000	.000	.000	.000	.000	.000
Relationship	.243	-.056	.000	.000	.000	.000	.000	.000
structur	.440	.231	.000	.000	.000	.000	.000	.000
Effectiveness	.882	.868	-.101	.000	.000	.000	.000	.000
commit	.312	.542	-.102	.000	.000	.000	.000	.000
operat	.324	.000	.000	.000	.000	.000	.000	.000
skill	.979	.514	.000	.000	.000	.000	.000	.000
learn	.522	.274	.000	.000	.000	.000	.000	.000
efficien	.149	.406	.411	.395	.000	.000	.000	.000
commer	.122	.368	.581	.558	.000	.000	.000	.000
develop	.079	.216	.219	.210	.000	.000	.000	.000
research	.078	.213	.216	.208	.000	.000	.000	.000
trust	.332	.577	-.109	.000	.000	.000	.000	.000
bilatera	.376	.558	.007	.000	.000	.000	.000	.000
flexible	.220	.000	.000	.000	.000	.000	.000	.000
cultural	.239	.000	.000	.000	.000	.000	.000	.000
motiva	.000	.000	.000	.000	.000	.000	.000	.000
goal	-.049	-.084	.016	-.112	.000	.000	.000	.000
comple	.000	.000	.000	.000	.000	.000	.000	.000
supple	.000	.000	.000	.000	.000	.000	.000	.000

Model Fit Summary

CMIN

Model	NPAR	CMIN	DF	P	CMIN/DF
Default model	78	88.210	75	.141	1.176
Saturated model	153	.000	0		
Independence model	17	1494.236	136	.000	10.987

RMR, GFI

Model	RMR	GFI	AGFI	PGFI
Default model	.023	.960	.918	.471
Saturated model	.000	1.000		
Independence model	.097	.469	.403	.417

Baseline Comparisons

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	.941	.893	.991	.982	.990
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

Parsimony-Adjusted Measures

Model	PRATIO	PNFI	PCFI
Default model	.551	.519	.546
Saturated model	.000	.000	.000
Independence model	1.000	.000	.000

NCP

Model	NCP	LO 90	HI 90
Default model	13.210	.000	40.822
Saturated model	.000	.000	.000
Independence model	1358.236	1237.668	1486.224

FMIN

Model	FMIN	F0	LO 90	HI 90
Default model	.369	.055	.000	.171
Saturated model	.000	.000	.000	.000
Independence model	6.252	5.683	5.179	6.219

RMSEA

Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	.027	.000	.048	.969
Independence model	.204	.195	.214	.000

AIC

Model	AIC	BCC	BIC	CAIC
Default model	244.210	256.916	515.700	593.700
Saturated model	306.000	330.923	838.538	991.538
Independence model	1528.236	1531.005	1587.407	1604.407

ECVI

Model	ECVI	LO 90	HI 90	MECVI
Default model	1.022	.967	1.137	1.075
Saturated model	1.280	1.280	1.280	1.385
Independence model	6.394	5.890	6.930	6.406

HOELTER

Model	HOELTER .05	HOELTER .01
Default model	261	289
Independence model	27	29

Execution time summary

Minimization: .031
Miscellaneous: .094
Bootstrap: .000
Total: .125

BIOGRAPHY

Ms. Patthareeya Lakpetch

ACADEMIC BACKGROUND	1991-1994	Bachelor of Arts in French B.A (Major: French, Minor: English) Thammasat University
	1998-2000	Master of Business Administration (M.B.A.) in Marketing, University of Southern Queensland, Toowoomba Queensland, Australia
	2001-2003	Master of Arts (M.A.) in English for Careers**,** Language Institute, Thammasat University
EXPERIENCES	1991-1993	Part-Time French Interpreter, Presenter and Customer and Public Relation Officer (MISS ELF, 1991) Elf Lubricant, Co.,Ltd (Thailand)
	1994-1997	Regional Flight Attendant, Asiana Airlines, Seoul Korea
	2004-2007	Part-Time Lecturer, Tourism and Hospitality Service Program , Travel Industry Management Division, International College, Mahidol University
	1997-Present	Regional Flight Attendant, Lufthansa German Airlines