

A Proposed Framework of University to Industry Knowledge Transfer

Lina Anatan
 Faculty of Economics, Maranatha Christian University
 Email: lina.anatan@yahoo.com;
 lina.anatan@eco.maranatha.edu

— Review of —
**Integrative
 Business &
 Economics**
 — Research —

ABSTRACT

University to industry knowledge transfer (UIKT) has become one of many interesting issues in knowledge transfer literature and has generated conceptual and empirical results debates between two contrasting views concerned on the positive and negative effects of UIKT on organizational performance. The inconsistent results so far show that there are still many variables to be considered in explaining the effect of knowledge transfer on the alliance performance. The difference in culture and mission between university and industry lead to another problem to solve the alliance performance of university and industry alliance in the level of dyadic analysis. This paper discusses a proposed conceptual model of antecedents (knowledge attributes, organizational attributes, network attributes) and consequent of university to industry knowledge transfer and the role of uncertainties as moderating variable that might affect the relationship between UIKT and the alliance performance. Transaction cost economics, resource-based, and knowledge-based perspectives are used to develop some propositions to explain the relationships between variables in the proposed framework of university to industry knowledge transfer.

Keywords: university to industry knowledge transfer, strategic alliance, proposed framework of UIKT,

1. Introduction

The awareness of knowledge transfer issues has attracted great interest amongst academic researchers and policy makers since many years. Conceptual and empirical literature in the field of strategic management over the past 20 years show that organization may improve learning and innovation capability significantly through transfer of knowledge both within and between organization (Smith et al., 2005). Knowledge transfer may increase the ability to improve internal effort in achieving strategic goal and provide access to the specific knowledge that may be difficult or impossible to obtain within a single organization (Bercovitz & Feldman, 2007).

University to industry knowledge transfer (UIKT) has become one of many interesting issues in knowledge transfer literature. According to Rossi (2010), UIKT indicates extensive interaction between university and industry at different levels and

activities of knowledge and technology exchange. These activities include development of a start-up company, commercial exploitation of the university, performance of cooperative research, academic advising, development and commercialization of intellectual property rights, and other activities such as cooperation in education, training of company staff, and researcher exchange. Harryson et al. (2008) argued that UIKT creates synergies between the resources and knowledge to improve competitive advantage in market competition. In this process, university plays important role in society as producer and transmitter of knowledge (Fontana et al., 2006).

Literature on UIKT shows the increasing level of commercial activities such as academic activities and patents creation, licensing, and spin-off companies, an independent company established by parent company with different business sectors (Friedman & Silberman, 2003), which followed by an increase in joint research activities between university and industry (Hall et al., 2001), and joint publications (Calvert & Patel, 2003) as knowledge transfer mechanisms. The other mechanisms of knowledge transfer are joint ventures and strategic alliances (Powell et al., 1996), mergers and acquisitions (Haunschild & Miner, 1997). Organization that could effectively transfer the knowledge will be more productive and more likely to survive than organization that lack of knowledge transfer activities (Argote et al., 1990; Baum & Ingram, 1998; Darr et al., 1995).

In recent years, the study of UIKT has not only flourished but also generated a debate between two contrasting views as the most important empirical issues on UIKT literature. The debate concerned on the positive and negative effects of UIKT on organizational performance. According to the negative views, UIKT activities have negative effect on the academic community arising from their close involvement in commercial activities. In contrast, the positive views believe that UIKT activities have beneficial effect not only to organization, but also to the economy and society, and these activities considered to be a part of new form of knowledge product (Etzkowitz & Legdesdorf, 1997). The empirical evidence between the two groups seems to be contradictive too (Kwon & Martin, 2012). The inconsistent results so far show that there are still many variables to be considered in explaining the effect of knowledge transfer on the alliance performance.

This paper discussed a proposed conceptual model for further development of empirical literature of UIKT to investigate the inconsistent results of knowledge transfer effect on organizational performance and other factors that might affect the relationship between UIKT and organizational performance. The organization of the paper follow as: Section 2 will discuss theoretical assumption related to UIKT, Section 3 deal with empirical findings related to UIKT. Section 4 includes lesson learned and issues for further research. Section 5 the conclusion.

2. Theoretical assumption related to university to industry knowledge transfer

The important role of organizational collaboration within strategic alliances increased dramatically in recent years (Gulati, 1995; Glaister & Buckley, 1996),

however the collaboration often do not reach the goals, and many have failed. This fact raises a dilemma for the organization to decide their strategic alliance policy. Organizations are willing to get the benefits from the strategic alliances, on the other hand they are fear that the alliance will not match their expectations (Lin & Chen, 2002). In case of knowledge transfer through university and industry alliance, the effect of UIKT on organizational performance is still being debated. University is the main actors in the process of economic development, so that direct engagement with the industry needs to be improved through strategic alliance between university and industry. However, enthusiasm for the formation of this strategic alliance faced an obstacle associated with cost and time that may have negative impact on university research.

The argument based on two important reasons that: First, the research conducted at the university has an independent value, whether the university has a relationship within an alliance with the industry or not, because research is the breath and the culture of university. Second, university which has an intensive collaboration with industry is more interested in short-term problem-solving research in industry. This situation may reduce both the intellectual freedom of researchers associated with the research agendas and how to apply the results of research. Both of those reasons are important to debate whether the alliance between university and industry needs to be done or not and has positive impact on the performance of both parties or not.

Pogayo-Theotoky et al. (2002) in Link et al. (2005) discuss the important implications of conceptual issues debate of knowledge transfer through universities and industry alliances on policy-making. Many theoretical perspectives are used to explain various aspects of UIKT phenomena and each of this has a singular contribution to provide a holistic view of the theoretical foundation of strategic alliance. Theories suggest that strategic alliance choice influences both the ease of knowledge flow and incentives to share knowledge.

With regard to the explanation of UIKT phenomena through strategic alliance, there are three theoretical foundations in strategic alliance include *Transaction Cost Economics* (TCE), *Resource-Based View Theory* (RBT) and *Knowledge-Based View Theory* (KBT). The theories emphasize on explaining the resource access motive in strategic alliance formation as the advantage of two firms joining their complementary resources. Organizational involvement within strategic alliance will enable organizations to consider and to take every potential opportunity to promote their products or services at some level (Hill, 2005).

According to TCE, man is characterized by bounded rationality and opportunism (Williamson, 1975). The theory explained all economic activities revolve around a transaction exchange between two or more economic actors with an appropriate governance mechanism that match to the nature of transaction to optimize the exchange (Williamson, 1985). It deals with the question of economic organization by focusing on the transaction as the unit of analysis and minimum transaction cost achievement among various assets, include all the expenses and fees when preparing and implementing contracts and agreements, dealing with incurred legal claims about

the terms and conditions, stabilizing the working relationship and expanding the investment channels (Kogut, 1988).

The motivation of knowledge transfer behavior through the alliance can be explained from transaction cost perspective. Kogut (1988) explains TCE is the most useful theory for integrating the economic implication of organizational behavior into a strategic analysis of the firm. It emphasized on the use of internal organization to preserve incentives to cooperate and share knowledge via controlling threats of opportunism (Sampson, 2004). Organizations will establish alliances when the cost incurred is perceived to be lower than that involved in full integration of the given activity within the existing corporate hierarchy (Hennart, 1991). This argument supported by Kogut (1988), firms will engage in alliances only if inter-organizational knowledge transfers are more efficient than market means.

In RBV, the organizations or firms is defined as a set of productive resources and administrative organizations (Penrose, 1959). Resources are considered as important source of competitive advantage because firms have to exploit their internal strengths through their resources (Barney, 1991). Firm's competitive advantage is based on internal firm resources rather than on the basis of a firm's products (Wernefelt, 1984). A firm's resources are called as strategic resources if they have four attributes, include valuable; rare; imperfectly imitable; and substitutability to become the source of sustained competitive advantage (SCA). Based on Barney & Clark (2007) arguments, the resources, assets, and capabilities can be combinative and cumulative in nature.

Each bundle of strategic and complementary resources has a particular rent-generating potential that changes with resource variations and is highly dependent on management capabilities. The fundamental argument for alliance formation based on RBT is that firms try to create an appropriate value in inter-firm relationships by leveraging the superior resources they possess with complementary resources. The decision to engage within an alliance based on two reasons: firms are in a vulnerable strategic position and need resources from the alliance, and firms need to capitalize on their assets (Eisenhardt and Schoonhoven, 1996).

KBV emphasized on the use of firm or internal organization as a means to increase productive knowledge flow (Kogut & Zander, 1992). Grant (1996) mentioned knowledge as the strategically most significant resource of the firm. Researchers adopting the KBV perspective highlight that the firm's future growth is dependent on the productive integration of knowledge resources and derivative decision-making capabilities, and its competitive advantage comes from the coordination and combination of different knowledge resources at the firm level rather than the individual level through business activities (Spender, 1996).

According to KBV, knowledge is a firm's most important and primary resource (Grant, 2002; McEvily & Chakravarthy, 2002), especially tacit knowledge (Polanyi, 1968) is most valuable for organizations because it is linked to individuals, very difficult to articulate, difficult to transfer and thus can give a sustainable competitive

advantage. Polanyi (1961) defined tacit knowledge as to “know more than we can tell,” and views this knowledge as largely in-articulate, it is primarily seen through an individual actions rather than through specific explanations of what individual knows. Problem arises when firms are lack of absorptive capacity because knowledge, especially the complex, tacit and heterogeneous knowledge is hard to imitate, rather than raw materials that provide the driving forces of alliances competitiveness and performance (Barney, 1991).

The motivation of knowledge transfer behavior through the alliance according to KBV is to access other firm’s resources and to enhance knowledge in certain functional areas, as the required knowledge cannot be developed by a single company. Knowledge within alliance refers to skills, capabilities, and process which could be critical to enhance organizational performance and competitiveness (Hitt & Vaidyanath, 2002). The alliance brings partners to make similar contribution in case of sharing the risk of asset’s investment. Table 1 summarized the key concepts, links to alliance, and the advantage of TCE, RBT, and KBT approach to understand knowledge transfer within strategic alliance between university and industry.

Table 1.
Summary of Transaction Cost Economics Theory, Resource-based Theory, and Knowledge-based Theory

Theory	Concept	Link to Alliance	Advantage
<i>Transaction Cost Economics</i>	TCE focus on minimum transactions cost achievement among various assets (Kogut, 1988; Zajac & Olsen, 1993; Tallman, 2005).	Firms will establish alliances when the cost incurred is perceived to be lower than that involved in full integration of the given activity within the existing corporate hierarchy (Hennart, 1991).	<p>According to Ding et al., 2009, there are three advantages of TCE, RBT, and KBT approach</p> <ol style="list-style-type: none"> 1. The theories seek to develop competitive advantage for collaborating firms. 2. The theories try to maximize long run profit through using and developing firm resources (knowledge) 3. The theories create opportunities for learning of knowledge by partners.
Resource-based theories	According to RBT, resources are considered as important source of competitive advantage (Barney, 1991).	Through alliance, firms try to create an appropriate value in inter-firm relationships by leveraging the superior resources they possess with complementary resources.	
Knowledge-based theories	According to KBT, knowledge is a firm’s most important and primary resource (Grant, 2002; McEvily & Chakravarthy, 2002), especially tacit knowledge (Polanyi, 1968).	Firm decide to engage within an alliance to access other firm’s resources and to enhance knowledge in certain functional areas, as the required knowledge cannot be developed by a single company.	

Source: The author’s elaboration

Copyright © 2013 Society of Interdisciplinary Business Research (www.sibresearch.org)

3. Empirical Findings Related to University to Industry Knowledge Transfer

The effect of knowledge transfer on organizational performance, university and industry performance, are inconsistent. The empirical studies on the effect of knowledge transfer on university performance shows conflicting results. The majority of studies conducted to this issue showed a positive relationship between the performance of university knowledge transfer in alliances within university and industry (Breschi et al., 2006; Van Looy et al., 2004). The negative view states that UIKT is a time consuming activities with a very high cost, which in turn will hamper the development of research and knowledge in the university. This statement can be explained by the fact that intensive cooperation between university and industry lead to the changes in university focus related to research activities to resolve short-term problems in the industry, which in turn can reduce the university's intellectual freedom in research agenda and the application of the research results (Nelson, 2004). This argument is supported by Martin & Etzkowitz (2000) who explain that a close relationship between university and industry would eliminate the university autonomy in setting the research agenda in focusing academic-oriented activities of public benefit.

The statements support the earlier empirical study by Lee (1996) that found an alternative funding from industry through university and industry collaboration has an impact on the decline of government's obligation to provide financial support for research activities in university. Consequently, applied research will be more developed than basic research, which is primarily focused on university research agenda. With regard to the issue of the knowledge transfer accuracy, problems often arise because of the different priority between university and industry. The university priority is to share knowledge to public, while the industry priority is to get patent from the results of collaborative research (Jelenik & Markham, 2007). Dasgupta and David (1994) conduct empirical studies and concluded that optimizing dissemination of research results will likely hampered by the differences of interest between universities and industry. The university intends to publish the research results, on the other hand the industry attempted to block publication based on the reason to protect intellectual property.

The result of empirical studies on the effect of knowledge transfer on the industry performance is different as well. Knowledge transfer from university to industry the majority occur informally through citation, patent (Hall & Ziedonis, 2001), and spin-offs company (Link & Scott, 2005). Monjon & Waelbroeck (2003) who conducted a study in 1460 in the French company found that collaboration with universities in an alliance will enhance the company's radical innovation. But then the results of the study challenged by Sung (2005) who conduct empirical studies on Korean industries and proved that cooperation within the alliance was not a significant effect on the company's innovation in general in Korea. Due to the characteristics of knowledge and the means of knowledge transfer process occurs on an informal basis, university and the industry alliance does not have a direct impact on the success of the

company's innovation, it only affects the decision or project management research (George et al., 2002).

The empirical studies on UIKT have greater emphasis that aimed to investigate the effect of knowledge transfer on outcome variable, such organizational performance (Tsai, 2001; Pedersen, 2003; Kotabe, 2003; Szulanski et al., 2004; Dhanaraj et al., 2004; Echols & Tsai, 2005; Smith et al., 2005; Kabanoff & Brown, 2008); competitive advantage (Liao & Hu, 2007); new product development (Yli-Renko et al., 2001; Smith et al., 2005); innovation (Tsai, 2001; Ramasamy et al., 2006; Rothaermel & Hess, 2007; Weterings & Koster, 2007; Kang, 2009); technological capabilities (Mowery et al., 1996; Yli-Renko et al., 2001; Baba et al., 2009), and quality improvement (Levin, 2000). Many study of knowledge transfer performed to examine the role of mediating variable on knowledge transfer and performance relationship, such as the effect of learning capacities that mediate the relationship between knowledge transfer and performance (Levin, 2000; Simonin, 2004; Smith et al., 2005). Other study focused on investigating the effect of moderating variable such as the causal uncertainty (Daghfous, 2004), moderate the relationship between knowledge transfer and performance.

Based on the literature review UIKT, the empirical studies regarding UIKT has been fragmented in studies that examined the influence of knowledge transfer to many outcomes variable, the influence of moderating and mediating variable in explaining of the influence of knowledge transfer on outcomes variables. The further development of conceptual and empirical literature of knowledge transfer through university and industry alliances, should focus on explaining the inconsistent results in knowledge transfer and performance relationship, and to consider other factors that might affect the relationship, such as the need for consideration of moderating variables, and mediating variables within the proposed model of university to industry knowledge transfer.

4. Lesson Learnt and Issues for Further Research on UIKT

The inconsistency results of UIKT effects on organizational performance has proved that in reviewing and examining the effect UIKT to organizational performance need a fundamental assumption that UIK is not always directly effects organizational performance, it might influence by other variables. Despite much theoretical and empirical literature that addresses university and industry alliance, research centers, and public research organizations, few studies has been done based on comprehensive data to explain the transfer of knowledge through universities and industry alliance (Van Wijk et al., 2008). An integrative model should be developed to investigate the relationship the antecedents variable, and consequent variable in the process of knowledge transfer through universities and industry alliance is still very rare (Van Wijk et al., 2008; Martinkeinate (2011).

Van Wijk et al. (2008) and Martinkeinate (2011) conducted a literature review to provide a critical review of related to research on intra and inter-organizational knowledge transfer. Literature review concludes that the understanding of an

integrative model on UIKT is still unclear and there have been no quantitative studies that provide empirical evidence to explain the relationship between the related variables (Van Wijk et al., 2008). To understand how organizations organize and obtain benefits through the transfer of knowledge, it is necessary to develop an empirical studies focus on the integrative model of UIKT, but in fact there is still lack of systematic overview that explains and underlying knowledge transfer mechanism and outcomes. The development of integrative model is urgently needed to examine how the transfer of knowledge and other variable related effect on the consequent of knowledge transfer.

The inconsistency results of research on knowledge transfer and alliance performance relationship which requires further empirical evidence regarding the role of other variables in explaining the relationship, and the fragmented of previous studies on UIKT become basic reason for developing a proposed integrative model of UIKT. This proposed integrative model requires some modifications in the classification of moderating variables, mediating variables, and the consequent transfer of knowledge within university and industry alliance.

This paper discuss a proposed antecedents and consequences model of the transfer of knowledge based on conceptual and empirical literature review to test the antecedent variables that influence the transfer of knowledge and consequently, measured by the level of institutionalization of knowledge transfer activities, as well as examine the role of variable uncertainties include the technical uncertainty and organizational uncertainty in strategic alliance. Uncertainties are moderating variable that explains the relationship between knowledge transfer and innovation performance and capabilities of the organization.

4.1. Antecedent Variables

Knowledge Attribute: Knowledge Ambiguity

Knowledge attributes is the antecedent of knowledge transfer as measured by the ambiguity of knowledge (Birkinshaw et al., 2002; Simonin, 1999). Knowledge ambiguity refers to the inherent uncertainty and reduced to precisely determine the sources of knowledge that underlies and how they interact. In the context of this study, knowledge ambiguity is the conditions that complicate the process of knowledge transfer. Knowledge ambiguity contributes to the protection of knowledge so it is difficult to be imitated by competitors and hinder the transfer of knowledge within and between organizations. In the process of explanation and instruction concern on specific knowledge, it needs long time and high cost, so that it becomes a barrier for successful transfer of knowledge (Coff et al., 2006). The ambiguity of knowledge in this study refers to the causal ambiguity proposed by Simonin (1999) include (1) Tacitness, (2) Asset Specificity, (3) Complexity, (4) Experience (5); Partner Protectiveness (6) Cultural distance, and (7) Organizational Distance).

Tacitness is a source of destabilization or conflicts within the alliance as a result of difficulties and frustrations manifestation in the process of knowledge transfer. A

high level of tacitness in alliance indicates the low level of skills that will enhance knowledge transfer and imitation barriers for the process of knowledge transfer. Asset specificity refers to transaction costs of specific assets such as durable investments made in favor of certain transactions (Williamson, 1985 in Simonin, 1999); specific skills and assets transaction used in the production process and the provision of certain services to customer (Reed & DeFillippi, 1990). Knowledge to be transferred may not only have a high level of tacitness, but also specific, so it cannot be easily replicated or purchased, therefore, the specificity of assets is considered as a source of ambiguity and barriers in knowledge transfer process.

Complexity refers to previous experience or knowledge asset base to determine the level of familiarity associated with both information content and context, so that the process of knowledge transfer run well. The more complex human or technological system would generate a higher level of ambiguity that lead to prevent imitation and complicate the process of knowledge transfer (Reed & DeFillippi, 1990). Experience is defined as an organization own prior experiences related to the asset or knowledge base that determines the level of closeness and comfort with the content and context of the information and the ability to transfer knowledge (Simonin, 1999). Significant differences in the basic skills and knowledge between alliance partners will create gaps that make the difficulties in the process of knowledge transfer.

Partner protectiveness is the degree of openness among its alliance partners that are affected by the company's absorptive capacity and willingness to share knowledge. High degree of protection will increase conflict between alliance partners so that it might create bottleneck in the process of knowledge transfer. Cultural distance not only makes it difficult to identify market opportunities and describe the mechanisms of the market but also increase the barriers of communication with partners in understanding the nature of competitive advantage alliance. Organizational distance is the level of inequality practices among alliance partners, institutional and organizational culture (Simonin, 1999).

From TCE perspective, knowledge ambiguity has negative impact on the strategic alliance decisions, because decisions made strategic alliances occur when the perceived low cost. The greater the difference in organizational management, professional culture among the alliance partners will be the greater degree of difficulty in transferring knowledge by working in an alliance. Overall the results of empirical studies show that the high level of tacitness, asset specificity, complexity, experience, partner protectiveness, cultural distance, and organizational distance, not only become "imitation barrier" for competitors, but also will become an obstacle to the process of knowledge transfer in alliances between universities and industry. A proposition can be developed as follow:

Proposition 1: Transfer of knowledge is influence by the level of knowledge ambiguity

Organizational Attributes

Previous studies assessing the role of size, age, decentralization and the absorption as a measure of organizational attributes that have an important role as an antecedent of knowledge transfer in this study (Van Wijk et al., 2008). Empirical literature suggests that the size of an organization is defined as the size or number of employees, which has an important influence on the process of knowledge transfer within the organization (Serenko et al., 2007). The empirical studies on the effects of size on the performance of the organization showed different results is that the effect size of the organization for knowledge transfer is positive (Dhanaraj et al., 2004; Gupta & Govindarajan, 2000; Laursen & Salter, 2006; Strach & Everett, 2006 ; Namasivayam & Denizci, 2006), negative (Makino & Delios, 1996; Connely & Kolloway, 2003), and has no effect (Tsang, 2002), so it can be conclude the effect of firm size on the transfer of knowledge is inconclusive.

Gupta and Govindarajan (2000) suggest that the majority of studies assessing the effect of organizational size on knowledge transfer has a positive effect. This can be explained by large companies and subsidiaries that engage in strategic alliances may have more resources to high-quality resources are the intellectual capital of the organization to support the knowledge creation process in improving their ability to offer non-duplicative knowledge. The opinion is supported by a study conducted by Wong and Aspinwall (2004) who concluded that the size of small organizations lack the understanding of the concept of knowledge transfer so slow in implementing the knowledge transfer policy systematically. Rather large organizations have the resources and financial capabilities are much more successful in supporting the process of knowledge transfer. In explaining the role of the size of the organization, RBV indicate that alliance will occur in conditions of mutual resource dependency between alliance partners, both resources are tangible and intangible resources, such as knowledge and skills. Alliance used as a way to get the resources of a valuable alliance partner to improve performance and achieve competitive advantage.

Proposition 2a: Transfer of knowledge is influenced by organizational size

Organization age considered as an important factor that determines the limitations of an organization ability to learn and to adapt to a changing environment. The older age of the organization are considered to have limited ability to learn and adapt to changing circumstances change (Cyert & March, 1963). In explaining the role of age-related organizational learning organizations, KBV explained that the essence of an organization is the ability to create, to transfer, to integrate, and to exploit knowledge assets (Teece, 1998). Several researchers conducted empirical studies to prove that the alliance encourages the learning process within the organization, such as through the process of knowledge transfer and sharing of knowledge (Kogut, 1988; Mowery et al., 1996; Kale et al., 2000). Alliance helps organizations to utilize strategic alliances as a means to study science, technology, and new skills from alliance partners.

Proposition 2a: Transfer of knowledge is influenced by organizational age

Decentralized organization in the context of knowledge transfer is identical to the granting of autonomy to each unit in the organization for the development and creation of knowledge within the business unit. The higher level of autonomy will positively associated with the creation and development of knowledge (Gupta and Govindarajan 1991). The results of empirical studies proved that headquarters tend to reject the proposal submitted by the branch or business unit because of the centralized organizational structure. This resulted a decentralized organization will tend to be more adaptive, innovative, and able to adapt to complex business environment than organizations with a centralized structure. Decentralized organization has a strong orientation on use, acquisition, and transfer of knowledge. Decentralization also had an impact on the perception of freedom between the units and increase the motivation and desire to share knowledge within the organization (Damanpour, 1991; Sheremata, 2000 in Van Wijk et al., 2008).

Although some studies have found no effect of decentralization role in the transfer of knowledge organization (Frost et al., 2002), previous research suggests a positive influence on the transfer of knowledge between decentralization (Van Wijk et al., 2008) as more decentralized organizational structure will be positively related to creation and development of knowledge (Ghoshal and Nohria 1989; Gupta and Govindarajan 1991; Nohria and Ghoshal 1994; Persaud 2005). Hans et al. (1982) and Jehnsen and Mechling (1992) in Christie et al., (2003) suggested that the underlying theory of decentralized decision very simple, namely that the value increased by minimizing the total cost of knowledge transfer and knowledge transfer and control costs in accordance with the essence of TCE were emphasis on cost minimization.

Value maximization occurs when the party responsible for making the decision to have knowledge valuable to the decision being made. The right decision can be placed through the transfer of knowledge to the person who has the right to make the decision (a knowledge transfer fee) or transfer the decision on the person who has knowledge of (a charge control). In an organization, to minimize the total cost of requiring the allocation decision of the chairman on the lower level that can be achieved through a decentralized organizational structure.

Proposition 2c: Transfer of knowledge is influenced by organizational decentralization

Absorptive capacity relates to the ability of an organization to identify, to assimilate, and to apply new external knowledge and is determined by the number of prior related knowledge, beliefs, and cultural compatibility between the partners, the recipient organization's adaptability and capacity to absorb the amount of knowledge transfer. (Cohen & Levinthal, 1990). KBV emphasizes that absorptive capacity plays an important role in the learning process of inter-organizational knowledge transfer that determined by the basic knowledge similarities possessed between alliance partners, whereas the similarity to the specific knowledge has a negative correlation with organizational learning (Lane & Lubatkin, 1998). The study conducted by Szulanski (1996) and Mowery et al. (1996) provide empirical evidence that the absorption capacity facilitating inter-organizational knowledge transfer. Other

studies provide empirical evidence that the absorptive capacity has a significant contribution in the transfer of knowledge across units within the firm (Gupta & Govindarajan, 2000; Lane et al., 2001). It is generally concluded that the absorptive capacity has important role in increasing knowledge transfer both intra (within) and inter-organizational (inter) organization.

Proposition 2d: Transfer of knowledge is influenced by absorptive capacity

Network Attributes

Network attributes are the antecedents of knowledge transfer involved the operation attribute at dyad levels and related to social resources inherent in a relationship that includes social linkages, trust in a partnership relationship, and value systems. KBV explains that knowledge, especially tacit knowledge is the most valuable factor in the organization because it is difficult to transfer, thus providing a sustainable competitive advantage (Polanyi, 1968). But despite the tacit knowledge is difficult to transfer across organizational boundaries, empirical studies demonstrate that social capital plays an important role in facilitating the process of knowledge transfer. Yli-Renko et al. (2001) found that social capital inherent in the relationship with the customer is a major and important facilitator in the process of acquisition of knowledge of core customers.

Social context in the network attributes include three major dimensions of social capital: structural dimension, relational and cognitive (Inkpen & Tsang, 2005; Nahapiet & Ghoshal, 1998). Structural dimension of social capital include the relationship between the actors involved in the alliance are analyzed from the perspective of social interaction and relationship networks (Nahapiet & Ghoshal, 1998; Tsai & Ghoshal, 1998). Social interaction related to how the organization maintains close ties with alliance partner personally. The results of empirical studies prove that a strong attachment is an effective tool in the process of knowledge transfer within and between organizations involved in strategic alliances (Hansen, 1999). The intensity of the relationship with the organization and increase the accessible knowledge of relevant organizational unit and increase the capacity of the information that lead to increased knowledge flow in a partnership or alliance (Hansen, 1999; Gupta & Govindarajan, 2000). Network tied associated with specific ways interrelated actors in the network. Increased intensity of the relationships in a network will provide an increase in the level of knowledge transfer.

Proposition 3a: Transfer of knowledge is influenced by structural dimension

Relational dimension of social relations refers to the relationship itself and the nature of the assets that are rooted in it. In this study the relational dimension refers to the study Inkpen and Tsang (2005), which focuses on trust. Trust refers to the belief that the word and promise of alliance partners are reliable and the alliance partners will fulfill their obligations in a partnership. Cavusgil et al., (2003) conducted a study on the relationship between organizations in the alliance, each of which has an important position in the alliance. The study proved that the strength of alliance relationship is indicated by the level of trust, commitment, and high-quality and

intense communications that ultimately have positive impact on the process of knowledge transfer. (Granovetter, 1973; Kraatz, 1998; Morgan & Hunt, 1995). Previous studies found that trust between the partners has a positive influence on organizational knowledge transfer, as the increase in willingness and commitment of partner organizations to understand the new external knowledge (Lane et al., 2001). However, some studies suggest that high levels of trust can also inhibit new transfer external knowledge as collective blindness (Lane et al., 2001; Yli-Renko et al., 2001), so it can be concluded that there are inconsistencies in the findings of previous study studies, but in general both conceptual literature and in previous studies conclude that the relational dimension is associated with an increase in the transfer of knowledge (Van Wijk, et al., 2008).

Proposition 3b: Transfer of knowledge is influenced by relational dimension

Cognitive dimension in this study refers to the dimensions proposed by Inkpen and Tsang (2005) that includes shared goals and shared cultures. Shared goal is defined as the degree to which members of the organization share a common understanding and approach to the achievement of the task and the outcome depends on the type of tissue networks, tasks and outcomes may vary. In explaining the concept of shared goals, Inkpen and Tsang (2005) refers to the concept of shared visions proposed by Tsai and Ghoshal (1998), which focuses on efforts to achieve collective goals and aspirations of the members of the inter-organizational networks. When shared visions in the alliance, members have the same perception of how they should interact with one another.

Proposition 3c: Transfer of knowledge is influenced by cognitive dimension

4.2. The Relationship between Knowledge Transfer and the Institutionalization of Knowledge Transfer

Dyadic data analysis is still very rarely to use in the study on university and industry alliances, and most studies use a "proxy reports" because of problems encountered in the process of dyadic data collection. Based on data from both sides of the interrelated party, it reflects the two sides of a cooperative relationship, in this case dyadic research require to understand the reciprocal nature of the relationship. Several studies have analyzed the importance of the construct influences, other researchers examined the effect of the characteristics of the parties related to the alliance partners.

Studies conducted by Straub et al., (2004) developed a measurement related to the level, symmetry, and grade levels that emphasize not only the actual score, but also the overall potential score that allows in-depth analysis of dyadic research. In this proposed conceptual model of UIKT, the consequences of the transfer of knowledge is measured by the level of institutionalization of knowledge transfer activities in universities and industry alliance to investigate the level of outcomes resulting from the transfer of knowledge (Santoro & Gopalakrishnan, 2000).

The study conducted by Santoro & Gopalakrishnan (2000) show that the consequences of UIKT is measured by the level of institutionalization of knowledge transfer activities in the universities and industry alliance. The level of institutionalization of knowledge transfer activities aim to see the level of outcomes resulting from the transfer of knowledge that occurs. The institutionalization of knowledge transfer activities is the degree to which a company has institutionalized the knowledge acquisition. Based on the typology of the National Science Foundation on university and industry alliance, knowledge transfer are in a wide range of related activities that occur in the context of the university and industry. Knowledge transfer activities can enhance the ability of the exchange organization through the transfer of best practices and the development of organizational capability that is hard to duplicate to improve organizational performance in the alliance (Szulanski, 1996).

Santoro and Gopalakrishnan (2000) examine the institutionalization of knowledge transfer activities between industrial firms and university research centers. The results reinforce expectations for the relationship between the company and the internal context of the institutionalization of knowledge transfer activities. The ability of an organization to continuously gain knowledge to create competitive advantage is strongly influenced by the organization's absorptive capacity (Cohen & Levinthal, 1990), the ability of the organization to institutionalized the process of knowledge transfer, and the characteristics of knowledge (Grant, 1996).

Organizations absorb knowledge from external sources when the organization has been able to relieve constraints to perform scanning of knowledge from a variety of sources. The results of other empirical studies conducted by Meyer and Rowan (1977) in Sa'nchez-Meca et al. (2003) proved that to effectively interact with the external environment and to absorb knowledge, companies need to institutionalize the process of knowledge involving routine activities during the period of time, so it can be concluded knowledge transfer activities have a positive influence on the process of institutionalization of knowledge transfer that ultimately lead to a positive impact on the overall alliance performance. Based on conceptual and empirical literature review, the proposition is developed as follow:

Hedges & Olkin (1985) and Hunter & Schmidt (1990) in Sa'nchez-Meca et al. (2003) explained that the result of the studies on UIKT reveal differences in explaining the effects of the relationship homogeneity between organizational knowledge transfer and organizational performance, it can be concluded that there are other variables that might influence the effect of homogeneity in the study as discuss in the previous part of this paper. The discrepancies in the results of the study describes the effects of the relationship homogeneity between organizational knowledge transfer and organization performance leads to the necessity to prove the role of moderating variables in explaining the relationship amongst those variables in the integrative model of UIKT. According to the RBV theory, business strategy manager is seen as an attempt to find the best compromise between a company with a dynamic and uncertain, with emphasis on internal factors of the organization.

Referring to a study conducted by Daghfous (2007), this proposed integrative model of UIKT examines the role of uncertainty in explaining the relationship between knowledge transfer and alliance performance. The uncertainty includes technical uncertainty and organizational uncertainty as moderating variable that explain the relationship between UIKT and alliance performance (Westphal et al., 2006; Goerzen, 2007). Technical uncertainty and organizational uncertainty treated as moderating variable because it is a quantitative variable that affects the strength of the relationship between the dependent and independent variables (Baron & Kenny, 1986).

Technical uncertainty associated with conceptual and practical knowledge related to the transfer of knowledge, previous experience related to the implementation of the technology, and the level of technology the organizations involved in the alliance. Organizational uncertainty focus on the impact of policies on other functions within the organization, the impact of skills and mastery of new technology process, the impact on the main dimensions of the organization, such as organizational structure, incentives, and the need for skills (Daghfous, 2007). Technical uncertainty has a negative influence to the level of knowledge transfer habit (familiarity) in recipient organizations related to the features and the underlying knowledge transfer science, whereas organizational uncertainty has a negative effect on the level of habit (familiarity) recipient organizations on the potential impacts of the new knowledge and skills system that already exists in the organization. Uncertainty, both technically and organizationally, is a barrier that has a negative impact on the success of knowledge transfer processes that weaken the relationship between knowledge transfer and consequently.

Empirical studies that examined the role of uncertainty as moderating effect in the process of knowledge transfer has been widely applied (Daghfous, 2004). Song & Montoya-Wesis (2001) found that technological uncertainty has an influence as moderating variable in explaining the relationship between knowledge transfer and new product development projects in universities and industry alliances. Waldman et al. (2001) found that environmental uncertainty moderates the relationship between leadership and organizational performance characteristics in the process of knowledge transfer through university and industry alliances.

Daghfous (2007) states that although significantly correlated, technical knowledge has a significant impact on the operational performance of the company which benefits before the technical uncertainty. The result of the study conducted by Daghfous (2007) explained that technical knowledge has a correlation and a significant impact on the operational performance of the organization and provide a positive or beneficial effect only on the condition that prior to the technical uncertainty. The role of technical knowledge further investigated using subgroup analysis. Effect of non-technical knowledge remained significant for projects characterized both in technical uncertainty is high or low. Prior technical knowledge may be irrelevant if the new technical knowledge is intended to replace the existing knowledge. Propositions can be developed as follow:

Proposition 4: The relationship between knowledge transfer and the level of institutionalization of knowledge transfer activities is influenced by the level of uncertainty.

Proposition 4a: The relationship between the level of institutionalization of knowledge transfer and knowledge transfer activity will be stronger when there is low level of organizational uncertainty.

Proposition 4a: The relationship between the level of institutionalization of knowledge transfer and knowledge transfer activity will be stronger when there is low level of organizational uncertainty.

Conclusion

This study is a synthesis of previous studies that aim to develop a conceptual framework for understanding the effectiveness of knowledge transfer in strategic alliances in particular through universities and industry alliance. This proposed frameworks aims to integrate examine the antecedent variables, moderating variables and the dependent variable to explain the role of knowledge transfer in university and industry alliances. Studies on knowledge transfer in the relevant literature is still fragmented in testing the influence of knowledge transfer to the dependent variables such as performance, competitive advantage, innovation, technological capabilities, and quality improvement; examined the effect of the learning capacity that mediates the relationship between knowledge transfer and performance; examine the moderating variables such as collaborative know-how, learning capacity, alliance duration, and knowledge ambiguity and uncertainty and causal ambiguity moderate the relationship between knowledge transfer and performance, and testing of antecedent variables ambiguity of knowledge and human resources. Level of analysis proposed in this study focuses on the dyadic relationship between the university and industry alliances, previous studies focusing more on the perspective of each party, and it is rare to find studies that examined the relationship dyadic level, this happens because of two possibilities, the problem availability of data, and the problem of measuring the difference in performance between the two parties, both in terms of performance indicators and determinants of such performance has discussed in the background of the issues. Level of knowledge transfer institutionalization is proposed to measure the alliance performance between university and industry.

References

- [1] Argote, L., Beckman, S. L., & Epple, D., 1990. The persistence and transfer of learning in industrial settings. *Management Science*, 36, 140–154.
- [2] Baba, Y., Shichijo, N., & Sedita, S.R., 2009. How do collaborations with universities affect firms' innovative performance? The role of "Pasteur scientists" in the advanced materials field. *Research Policy*, 38, 756–764

- [3] Baum, J. A. C., & Ingram, P., 1998. Survival-enhancing learning in the Manhattan hotel industry, 1898–1980, *Management Science*, 44, 996–1016.
- [4] Barney, J.B., 1991. Firm Resources and Sustained Competitive Advantage. *Journal of Management*. 17 (1), 99-120.
- [5] Barney, J.B. & Clark, D.N. (2007). *Resource-Based Theory: Creating and Sustaining Competitive Advantage*. New York: Oxford University Press.
- [6] Bercovitz, J. and Feldman, M. 2007. Fishing Upstream: Firm Innovation Strategy and University Research Alliances. *Research Policy*. 36: 930-948.
- [7] Birkinshaw, J., Nobel, R., Ridderstrale, J., Knowledge as a contingency variable: do the characteristics of knowledge predict organization structure? *Organization Science*, 13 (3), 274-289
- [8] Breschi, S., Lissoni, S., & Montobbio, F., 2007. The scientific productivity of academic inventors: New evidence from Italian data. *Economic of Innovation and New Technology*, 16 (2), 101 – 118.
- [9] Calvert, J., Patel, P., 2003. University–industry research collaborations in the UK: bibliometric trends,
- [10] Cavusgil, S., Tamer, R., Calantone, J., & Zhao, Y., 2003, “Tacit knowledge transfer and firm innovation capability. *Journal of Business and Industrial Marketing*, Vol. 18 No. 1, pp. 6-21.
- [11] Cohen, W. M., & Levinthal, D., 1990. Absorptive capacity: A new perspective on learning and innovation. *Administrative Science Quarterly*. 35, 128–152.
- [12] Coff, R., Coff, D., & Eastvold, R., 2006. ‘The knowledge leveraging paradox: how to achieve scale without making knowledge imitable’ *Academy of Management Review*, 31, 1–13.
- [13] Connelly, C.E., & Kelloway, K., 2003. Predictors of employees’ perceptions of knowledge sharing cultures. *Leadership & Organization Development Journal*, 24 (5), 294-301.
- [14] Cyert, R. & March, J. G. (1963). *A Behavioral Theory of the Firm*. Oxford: Blackwell.
- [15] Daghfous, A., 2004. An empirical investigation of the role of prior knowledge and learning activities in technology transfer. *Technovation*, 24, 939-953
- [16] Damanpour F., 1991. Organizational innovation: a meta-analysis of effects of determinants and moderators. *Academy of Management Journal*. 34: 555-90
- [17] Darr, E., Argote, L., & Epple, D. (1995). The acquisition, transfer and depreciation of knowledge in service organizations: Productivity in franchises. *Management Science*, 41, 1750–1762.
- [18] Dhanaraj, C., Lyles, M. A., Steensma, H. K., & Tihanyi, L. (2004). Managing tacit and explicit knowledge transfer in IJVs: the role of relational embeddedness and the impact on performance. *Journal of International Business Studies*, 35, 428–42
- [19] Dasgupta, P., & David, P., 2007. Toward a new Economic of science. *Research Policy*, 23 (5), 487-521.
- [20] Echols, A., Tsai, W., 2005. Niche and performance: The moderating role of network embeddedness. *Strategic Management Journal*, 26, 219-238.

- [21] Eisenhardt, K.M. & Schoonhoven, C.B. (1996). Resource-based View of Strategic Alliance Formation: Strategic and Social Effects in Entrepreneurial Firm. *Organization Science*, 7(2), 136-150.
- [22] Etzkowitz, H., & Leydesdorff, L., 2000. The dynamics of innovation: from National Systems and “Mode 2” to a triple helix of university–industry–government relation. *Research Policy* 29, 109–123.
- [23] Fontana, R., Geuna, A., Matt, M., 2006. Factors affecting university–industry R&D projects: the importance of searching, screening and signalling. *Research Policy*, 35, 309–323
- [24] Friedman, J., & Silberman, J., 2003. University technology transfer: do incentives, management, and location matter? *Journal of Technology Transfer* 28, 17–30.
- [25] Frost, T. S., Birkinshaw, J. M., & Ensign, P. C., 2002. Centers of excellence in multinational corporations. *Strategic Management Journal*, 23, 997–1018.
- [26] Glaister, K. W. and Buckley, P. J. 1996. Strategic Motives for International Alliance Formation. *Journal of Management Studies*. 33: 301-332.
- [27] Goerzen, A., 2007. Alliance networks and firm performance: The impact of repeated partnerships. *Strategic Management Journal*., 28: 487–509
- [28] Grant, R. M., 1996. Toward a Knowledge-Based Theory of the Firm. *Strategic Management Journal*. 17, 109-122.
- [29] Gulati, R. 1995. Does Familiarity Breed Trust? The Implications of Repeated Ties for Contractual Choice in Alliances. *Academy of Management Journal*. 38: 85-112.
- [30] Gupta, A. K., & Govindarajan, V. 2000. Knowledge Flows within Multinational Corporations. *Strategic Management Journal*. 21, 473-496.
- [31] Harryson, S., Kliknaite, S., & Von Zedtwitz, M., 2008. How Technology-Based University Research Drives Innovation in Europe and China: Leveraging the Power of Proximity. *Journal of Technology Management in China*. 3 (1), 12-46
- [32] Hall, B.H., & Ziedonis, R.H., 2001. The patent paradox revisited: an empirical study of patenting in the US Semicondustor industry, 1979-1995. *Journal of Economics*, 32, 101-128.
- [33] Hall, B.H., Link, A.N., Scott, J.T., 2001. Barriers inhibiting industry from partnering with universities: evidence from the advanced technology program. *Journal of Technology Transfer*, 26, 87–98.
- [34] Harryson, S., Kliknaite, S., & Von Zedtwitz, M., 2008. How Technology-Based University Research Drives Innovation in Europe and China: Leveraging the Power of Proximity. *Journal of Technology Management in China*. 3 (1), 12-46
- [35] Haunschild, P. R., & Miner, A. S. (1997). Modes of interorganizational imitation: The effects of outcome salience and uncertainty. *Administrative Science Quarterly*, 42, 472–500.
- [36] Hedges, L. V., & Olkin, I. (1985). *Statistical methods for meta-analysis*. Orlando, FL: Academic Press dalam Sanchez-Meca, J., Mari´n-Martínez, F., Chacó´n-Moscoso, S., 2003. Effect-Size Indices for Dichotomized Outcomes in Meta-Analysis. *Psychological Methods*, 8 (4), 448–467

- [37] Hennart, J.F. (1991). The Transaction Costs Theory of Joint Ventures: An Empirical Study of Japanese Subsidiaries in the United States. *Management Science*, 37, 483-497.
- [38] Hill, C. (2005). *International Business: Competing in the Global Marketplace* (5th). New York: McGraw-Hill Irwin.
- [39] Hunter, J. E., & Schmidt, F. L., 1990. Dichotomization of continuous variables: The implications for meta-analysis. *Journal of Applied Psychology*, 75, 334–349 dalam Sanchez-Meca, J., Mari'n-Martí'nez, F., Chaco'n-Moscoso, S., 2003. Effect-Size Indices for Dichotomized Outcomes in Meta-Analysis. *Psychological Methods*, 2003, Vol. 8, No. 4, 448–467
- [40] Inkpen, A.C., Tsang, E.W.K., 2005. Social capital, networks, and Knowledge transfer. *Academy of Management Review*, 30, 1, 146–165.
- [41] Hansen, M.T., 2002. Knowledge Networks: Explaining Effective Knowledge Sharing in Multiunit Companies. *Organization Science*, 13 (3), 232-248
- [42] Jelenik, M., & Markhum, S., 2007. Industry-university in relationship: integrating perspectives and policy solutions, *IEEE Transaction on Engineering Management*, 54 (2), pp. 257-67.
- [43] Kabanoff, B., Brown, S., 2008. Knowledge structures of prospectors, analyzers, and defenders: content, structure, stability, and performance. *Strategic Management Journal* 29, 149–171.
- [44] Kang, K, Kang, J., 2009. How do firms source external knowledge for Innovation? Analyzing effects of different knowledge sourcing methods. *International Journal of Innovation Management* 13 (1), 1–17
- [45] Kale, D., Singh, H. and Perlmutter, H. 2000. Learning and Protection of Proprietary Assets in Strategic Alliances: Building Relational Capital. *Strategic Management Journal*. 21: 217-227.
- [46] Kotabe, M., Martin, X., and Domoto, H., 2003. Gaining from vertical partnerships: knowledge transfer, relationship duration, and supplier performance improvement in the U.S. and Japanese automotive industries. *Strategic Management Journal*, 24: 293–316
- [47] Kogut, B., 1988. Joint venture: theoretical and empirical perspective. *Strategic Management Journal*, 9, 319-332
- [48] Kogut, B. & Zander, U. (1992). Knowledge of the Firm, Combinative Capabilities, and the Replication of Technology. *Organization Science*, 3(2), 383-397.
- [49] Kraatz, Matthew S., 1998. Learning by Association? Interorganizational Networks and Adaptation to Environmental Change. *Academy of Management Journal* 41 (6): 621- 643.
- [50] Laursen, K. and Salter, A. (2006). 'Open for innovation: the role of openness in explaining innovation performance among UK manufacturing firms'. *Strategic Management Journal*, 27, 131–50.
- [51] Lee, J., Win, H.N., 2004. Technology transfer between university research centers and industry in Singapore. *Technovation*, 24, 433-442.
- [52] Levin, R.D., Cross, R., 2004. The Strength of Weak Ties You Can Trust: The Mediating Role of Trust in Effective Knowledge Transfer. *Management Science*, 50 (11), 1477–1490.

- [53] Liao, S.H., Hu., T.C., 2007. Knowledge transfer and competitive advantage on environmental uncertainty: an empirical study of the Taiwan semiconductor industry. *Technovation*, 27, 402-411.
- [54] Lin, B., & Chen, C., 2002. The Effects of Formation Motives and Inter-Firm Diversity on the Performance of Strategic Alliance. *Asia Pacific Management Review*. 7 (2): 139-166.
- [55] Link, A.N., Scott, J.T., 2005. Opening the Ivory Tower's Door: An analysis of a determinants of the formation of US University spin-off companies. *Research Policy*, 34(7), 1106-1112.
- [56] Martin, B., & Etzkowitz, H., 2000. The origin and evolution of the university species. *VEST*, 13, 3-4.
- [57] Martinkeinaite, I., 2011. Antecedents and consequences of inter-organizational knowledge transfer: Emerging themes and opening for further research. *Baltic Journal of Management*, 6(1), 53-70.
- [58] McEvily, S. and Chakravarthy, B., 2002. The persistence of Knowledge-based Advantage: an Empirical Test for Product Performance and Technological Knowledge. *Strategic Management Journal*, 23, 285-305
- [59] Mowery, D.C., Oxley, J.E., Selverman, B.S., 1996. Strategic alliances and interfirm knowledge transfer. *Strategic Management Journal*, 17, 77-91
- [60] Monjon, S., Patrick W., 2003. Assessing spillover from universities to firms: Evidence from French firm level data. *International Journal of Industrial Organization*, 21, 1255-1270.
- [61] Morgan, R. M., & Hunt, S. D., 1994. The commitment-trust theory of relationship marketing. *Journal of Marketing*, 58, 20–38.
- [62] Nahapeit, J., & Ghosal, S., 1998. Social Capital, Intellectual Capital and the Organizational Advantage. *Academy of Management Review*. 2(1), 242-266.
- [63] Namasivayam, K., & Denizci, B., 2006. Human capital in service organizations: identifying value drivers. *Journal of Intellectual Capital*, 7 (3), 381-93.
- [64] Nelson, R.R., 2004. The market economy, and the scientific commons. *Research Policy*, 33 (3), 455-471
- [65] Pedersen, T., Petersen, B., Sharma, D., 2003. Knowledge Transfer Performance of Multinational Companies. *Management International Review*, 43 (3), 69-9
- [66] Penrose, E. T. (1959). *The Theory of the Growth of the Firm*. New York: Wiley.
- [67] Pogayo-Theotoky, J., Beath, J., Siegel, D.S. (2002). Universities and Fundamental Research: Reflections on the Growth of University-Industry Partnership. *Oxford Review of Economic Policy*, Vol 18 (1), 10-21 dalam Links , A.N., John T. Scottb, Donald S. Siegelc T he economics of intellectual property at universities: an overview of the special issue. *International Journal of Industrial Organization*, 21, 1217–1225
- [68] Powell, W., Koput, K., & Smith-Doerr, L., 1996. Inter-organizational Collaboration and the Locus of Innovation: Networks of Learning in Biotechnology. *Administrative Science Quarterly*. 41: 116-145.

- [69] Reed, R., & R. J. DeFillipi, 1990. Causal ambiguity, barriers to imitation and sustainable competitive advantage. *Academy of Management Review*, 15, 88-102.
- [70] Ramasamy, B., Goh, K.W., Yeung, M., 2006. Is Guanxi (relationship) a bridge to knowledge transfer? *Journal of Business Research*, 59, 130 – 139
- [71] Rossi, F., 2010. The governance of university-industry knowledge transfer. *European Journal of Innovation Management*, 13 (2), 155-171.
- [72] Rothaermel, F.T., Hess, A.W., 2007. Building dynamic capabilities: Innovation driven by individual, firm, and network-level effects. *Organizational Science*, 18 (6), 898-921.
- [73] Sampson, R. (2004). The Cost of Misaligned Governance in R&D Alliances. *Journal of Law, Economics, and Organization*, 20(2), 484-526
- [74] Santoro, M.D., Gopalakrishnan, S., 2000. The institutionalization of knowledge transfer activities within industry–university collaborative ventures. *Journal of Engineering Technology Management*, 17, 299–319
- [75] Simonin, B.I., 1999. Ambiguity and the process of knowledge transfer in strategic alliances. *Strategic Management Journal*, 20, 595-623.
- [76] Simonin, L.B., 2004. An Empirical Investigation of the Process of Knowledge Transfer in International Strategic Alliances. *Journal of International Business Studies*, 35 (5), 407-427
- [77] Sheremata, W. A., 2000. Centrifugal and centripetal forces in radical new product development under time pressure. *Academy of Management Review*, 25, 389–408.
- [78] Smith, K.G., Collins, C.J., Clark, K.D., 2005. Existing knowledge, knowledge creation capability, and the rate of new product Introduction in high-technology firms. *Academy of Management Journal*, 48 (2), 346–357.
- [79] Song, M., & Montoya-Weiss, M.M., 2001. The Effect of Perceived Technological Uncertainty on Japanese Product Development. *Academy of Management Journal*. 44(1):61–80.
- [80] Sung, TK., 2005. Firm size, network and innovative activity: evidence from the Korean Manufacturing firms. *Technological Innovation Studies*, 13 (3), 1-20.
- [81] Strach, P., & Everett, A.M., 2006. Knowledge transfer within Japanese multinationals: building a theory. *Journal of Knowledge Management*. 10 (1), 55-68.
- [82] Straub, D., Rai, A., & Klein, R., 2004. Measuring firm performance at network level: a nomology of the business impact of digital supply networks. *Journal of Management Information Systems*, 21 (1), 83-114.
- [83] Szulanski, G., 1996. Exploring internal stickiness: impediments to the transfer of best practices within the firm. *Strategic Management Journal*, 17, 27–44.
- [84] Szulanski, G., Capetta, R., & Jensen, R. J., 2004. When and how trustworthiness matters: knowledge transfer and the moderating effect of causal ambiguity'. *Organization Science*, 15, 600–613.
- [85] Tsai, W., 2002. Social structure of “cooperation” within a multiunit organization: Coordination, competition, and intraorganizational knowledge sharing. *Organization Science*, 13: 179–190.

- [86] Van Looy, B., Callaert, J., & Debackere, K., 2006. Publication and patent behavior of academic researchers: conflicting, reinforcing, or merely coexisting? *Research Policy*, 35, 596-608.
- [87] Van Wijk, R., Jansen, J.J., & Lyles, M.A., 2008. Inter and Intra Organizational Knowledge Transfer: A meta-analytic review and assessment of its antecedents and consequences. *Journal of Management Studies*, 45, 830-853.
- [88] Waterings, A., Koster, S., 2007. Inheriting knowledge and sustaining relationships: what stimulates the innovative performance of small software firms in the Netherlands? *Research Policy*, 36, 320-335.
- [89] Wernerfelt, B., 1984. A Resource-based view of the firm, *Strategic Management Journal*, 5(2). 171-180.
- [90] Westphal, J.D., Boivie, S., Chng, D.H.M., 2006. The strategic impetus for social network ties: reconstituting broken ceo friendship ties. *Strategic Management Journal*, 27: 425-445
- [91] Williamson, O. E., 1975. *Markets and Hierarchies*. New York: Free Press.
- [92] Williamson, O. E., 1985. *The Economic Institutions of Capitalism: Firms, Markets, Relational Contracting*. Free Press, New York.
- [93] Yli-Renko, H., Autio, E. and Sapienza, H. J., 2001. Social capital, knowledge acquisition, and knowledge exploitation in young technology-based firms'. *Strategic Management Journal*, 22, 587-613.