A FRAMEWORK ON THE EFFECTS OF INTER-FIRM TECHNOLOGY TRANSFER CHARACTERISTICS ON DEGREE OF TECHNOLOGY TRANSFER IN INTERNATIONAL JOINT VENTURES

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Abstract

The inter-firm technology transfers (TT) in collaborative joint ventures (JVs) often involve tradeoffs between the willingness of technology supplier to transfer a considerable amount of technologies to technology recipient and degree of protection of the proprietary technology, knowledge and competencies as the source of the supplier's competitive advantage. Thus, technology transfers through JVs, although have been acknowledged in many studies as the most efficient mechanism in internalizing the partner's technology, knowledge and skill, have frequently involved various facilitators, actors and complicated relationship between partners that have direct impact on the degree or amount of technology transferred in JVs. Building on the integrated knowledge-based view and organizational learning perspectives, and previous TT models, this study proposes a holistic TT model in providing explanations on the relative and simultaneous effects of technology transfer characteristics (TTCHARS) on degree of technology transfer (TTDEG). Subsequently, the holistic TT model also conceptualizes the effect of TTDEG on local firms' performance dimensions namely corporate and human resource performance, and the moderating effects of MNCs' firm size, age of JV, MNCs' country of origin, and types of industries in the TTCHARS-TTDEG relationship.

Key Words: Inter-firm, technology transfer, international joint ventures, transfer characteristics

INTRODUCTION

As a developing country, Malaysia for the past thirty years has transformed its resource-based economy to industrial-based economy which resulted in a tremendous economic growth (Malairaja and Zawdie, 2004). The Malaysian government, through its intensified efforts, has turned the national economy from labor intensive to capital intensive. The early success in developing its industrial sectors was mainly owed to direct import of low technologies especially from United States (U.S), Japan and Europe.

The change in the economic policy has witnessed intense efforts made by the Malaysian's government in attracting foreign investment in industrial sectors through foreign direct investments (FDI) and international joint ventures (IJVs) formed between the multinational corporations (MNCs) and local companies. The total FDIs inflows for the period 1986-1995 have increased from RM73.4bn to RM121.8bn in 1996-2005 (The Third Industrial Master Plan). Therefore, in generating the economic growth, the FDIs will continue as the primary source of foreign technology. In another example, the FDIs for the manufacturing sector in 2006 have increased to RM14.7bn from RM13.5bn in 2005 (MIDA, 2007). Since technology has been acknowledged as an important catalyst of corporate success and national economic growth (Millman, 2001), Malaysia relied heavily on FDIs from MNCs as the primary source of technology (Lee and Tan, 2006) to enhance its technological capabilities and competitiveness of local industries. Like many of the developing countries, Malaysia has limited resource capacities in terms of research and development (R & D) base, limited investment in R&D, production and manufacturing capability, and weak infrastructure and technological advantage (Lado and Vozikis, 1996; Tepstra and David, 1985). The presence of MNCs in Malaysia as the technology supplier is crucial because not only they own, produce and control bulk of the world technology but they have also undertaken almost 80% of all private R&D expenditures worldwide (Dunning, 1993).

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In order to realize its aspiration of becoming a developed and industrialized nation in 2020, Malaysia has no alternative but to aggressively develop and sustain its own technology by embarking on appropriate technology transfer (TT) strategies and initiatives. Thus, as a way to build the technological capacity, strengthen their core competencies, and expend into technological field which are critical for maintaining and developing the market share, the Malaysian companies and industries greatly need foreign technologies to achieve this objectives (Wagner and Yezril, 1999). The important role of MNCs as the main source of technology has been affirmed by the previous studies. The presence of MNCs is regarded as the most efficient vehicle for transferring technology and knowledge across border through FDIs and IJVs (Tihanyi and Roath, 2002; Kagut and Zander, 1993).

Past studies have shown that foreign MNCs in Malaysia have successfully transferred their technology to local industries (Lai and Narayanan, 1997, Narayanan and Lai, 2000). Through technology transfers by MNCs the host country would benefits in achieving long term economic growth (Marton, 1986; Blomstrom, 1990), providing a higher potentials of innovation performance/capabilities (Guan et al., 2006; Kotabe et al., 2007)), increasing technological capabilities (Kumar et al., 1999; Madanmohan et al., 2004), enhancing the competitive advantage (Liao and Hu, 2007; Rodriguez and Rodriguez, 2005), enhancing the organizational learning effectiveness (Inkpen, 2000; Inkpen and Dinur, 1998), providing a positive effect on productivity (Caves, 1974; Xu, 2000; Liu and Wang, 2003), and increasing the technological development of local industry (Markusen and Venables, 1999). In addition, other studies have proposed TT as one mechanism by which developing countries can break vicious cycle of economic underdevelopment (Lado and Vozikis, 1996; Samli, 1985). However, few recent studies have concluded that the TT agent such as FDIs, JVs, and licensing operations have not succeeded in helping to develop indigenous capabilities even though they have significantly contributed to the impressive economic growth performance in Malaysia (Malairaja and Zawdie, 2004). During the Asian economic crisis in 1997-1998, which has brought the host country economy vulnerable to changes in investors' sentiment and foreign competitions, the international TT through FDIs do not sufficiently help to develop the indigenous capabilities (Lee and Tan, 2006). Thus, learning from past experience, the companies in the developing countries such as Malaysia should re-strategize their TT policies and strategies by not only understanding, identifying and examining the critical TT determinants' characteristics that may have significant effect on the TT outcome but also studying the boundary conditions for the relationship. TT should not only focus on TT as an efficient vehicle to generate economic growth performance but more importantly it must also be capable in developing indigenous capabilities and organizational competitiveness.

Before embarking on any TT strategies and policies, there is a need to critically examine the technology transfer characteristics (TTCHARS) that may have significant influence on the successful and effective implementation of TT particularly technologies transferred through IJVs. This is because TT success is determined by the substantial amount of technology transferred (level of TT) and the technological capacity to absorb, assimilate, improve and further develop the newly acquired technology (Madanmohan et al., 2004).

Based on a review of literature, bulks of the previous literature are concentrating more on the macro-economic or institutional factors (Contractor and Sagafi-Nejad; 1981, Marton; 1986). Due to the diverse environmental factors which impede TT success the factors that influence TT have become important (Cui et al., 2006). Since the TT literature is extensive and varied in perspective, this study has specifically focused on inter-firm TT across organizational boundaries via IJVs based on the underlying knowledge-based view (KBV) and organizational learning (OL) perspectives. Thus, while acknowledging the significance of other perspectives of TT they are indeed beyond the scope of this study.

The presence of the MNCs through various formal market channels such as direct exporting of capital goods and products, foreign direct investments, licensing, and IJVs with local firms have become the primary sources of technology for the local technological development and national economic growth. Many studies on intra and inter-firm TT have shown that TT involves a complex and difficult process even when it occurs across different function within a single product division of a single company. Thus, the current issue is centered on the effectiveness, efficiency and successful implementation of TT and no longer on whether MNCs are transferring their technologies to the Malaysian industries (Lai and Narayanan, 1997). TT success depends heavily on interactive communications between the technology supplier and recipient which requires both parties involvement (Gibson and Slimor, 1991).

Previous studies have also indicated that MNCs as the reluctant technology supplier have been slow in transferring technology and R&D expertise to local industries due to the risk of technology spillovers (Lai and Narayanan, 1997). The foreign MNCs often face a tradeoff between transferring their valuable technologies to their counterpart and protecting the technologies as the source of their competitive advantage. In this situation the MNCs have repeatedly claimed that it is not a question of their willingness to transfer technologies rather the transferring process is mainly hampered by low maturity level of the Malaysian industry which is largely due to insufficiency of skilled personnel and weak institutional support and business environment (Rasiah and Anuwar, 1998).

When compared to the U.S MNCs, the TT by the Japanese MNCs are found to be less intensive, slower, and technologies are normally been transferred within their 'keiretsu' (Raduan, 2002; Yamashita, 1991, Hamel 1991). In fact according to Taylor (1995) the Japanese MNCs, to some extent, have no intention to transfer key aspects of their technology in order to maintain their dominance in Southeast Asian economies.

From KBV perspective studies have acknowledged that MNCs tend to be more protective of their advance technology, knowledge and competencies in products, processes and management because these strategic valuable resources and competencies are their main sources of competitive advantage (Barney 1991; Peteraf, 1993; Pralahad and Hamel, 1990; Dierickx and Cool, 1989). On the other hand, studies from the OL perspective have suggested that the technology suppliers tend to protect their technology and knowledge from the recipient when they become opportunistic in the collaborative relationship (Inkpen, 1998a; Inkpen and Dinur, 1998; Child and Faulkner, 1998). Based on the above scenarios, a number of TT issues require further theoretical and empirical explanations.

Specifically, in the context of inter-firm TT through IJVs, the existing question is on the extent of TT by the supplier partner when transferring their advance technology to local recipient partners, especially the transfer of tacit knowledge which has a high content of ambiguity, complexity, and specificity. The current TT issue in JV thus focuses on the extent of degree of technologies that being transferred by the technology supplier to technology recipient partners in terms of tacit knowledge (new product/service development, managerial systems and practice, process designs and new marketing expertise), and explicit knowledge (manufacturing/service techniques/skills, promotion techniques/skills, distribution know-how, and purchasing know-how). Since JVs are frequently perceived as instable organization, the degree of technology transferred in JVs often involves a tradeoff between transferring technology and protecting proprietary technology/knowledge by the supplier. From the technology recipient's perspective, TT success includes the ability to learn, acquire, absorb and apply new external technologies and knowledge embedded in product materials, physical assets, processes and production, and management capabilities and not limited to possessing the ability to operate, maintain or repair the machineries in the production level.

Secondly, past studies on intra and inter-firm knowledge transfer have established the significant effects of technology actors and facilitators/barriers such as the characteristics of knowledge transferred, source, recipient and contextual/relational in the knowledge transfer process (Szulanski, 1996, 2000, 2003; Gupta and Govindarajan, 2000; Minbaeva, 2007). Thus, in the context of inter-firm TT in JVs, where TT processes are more complicated, difficult and involved the process of transferring technology between unaffiliated organizations, the remaining issue is on the extent of significant effects of technology transfer characteristics (TTCHARS) on degree or amount of technology transfer (TTDEG). To put it differently to what extent the TT characteristics have significantly affected TT outcomes?

Thirdly, since JVs is one of the formal and externalized mechanisms of TT which directly affect performance, the intriguing issue is on the extent of TTDEG in affecting the performance of local firms (LFP); specifically on how TTDEG helps to improve the local companies' corporate and human resource/competencies performance.

Finally, although previous studies have acknowledged the significant effects of knowledge transfer determinants on knowledge transfer outcomes, nevertheless the effects of TTCHARS on TTDEG in inter-firm TT through JVs could have possibly be moderated by other important factors such as size of MNCs, age of JV, MNCs' country of origin, and MNCs' types of industry. Thus, in other words the variations in TTDEG's outcome could have been significantly influenced by these variables.

Past studies have established that the issue of effectiveness and efficiency of inter-firm TT between foreign MNCs and local recipient's firm in JV with the facilitators/barriers that impede TT (the

transfer process) and knowledge acquisition (the absorption process) are primarily attributed to the critical TTCHARS such as knowledge transferred (knowledge attributes), technology-recipient (knowledge seeker attributes), technology-supplier (source attributes), and supplier-recipient relationship (relational attributes) characteristics (Leonard-Barton, 1990; Teece, 1977; Rogers, 1983; Szulanski, 1996).

In the strategic alliance set-up such as IJVs, these facilitators/barriers to transferability could facilitate or impede inter-firm TT and knowledge acquisition resulting in the higher/lower degree (amount) of technology transfer to the recipient. Since the co-existence of these determinants is interrelated with each other, therefore the ineffectiveness of any characteristic would cause inter-firm TT and knowledge acquisition in JVs to be less successful and effective. As inter-firm TT in JVs involves more complex and difficult processes as compared to intra-firm TT, these facilitators/barriers, which are attributed to the TTCHARS, require close theoretical explanations to describe the relative influence of each characteristic of TT and their combine/joint effects on TTDEG.

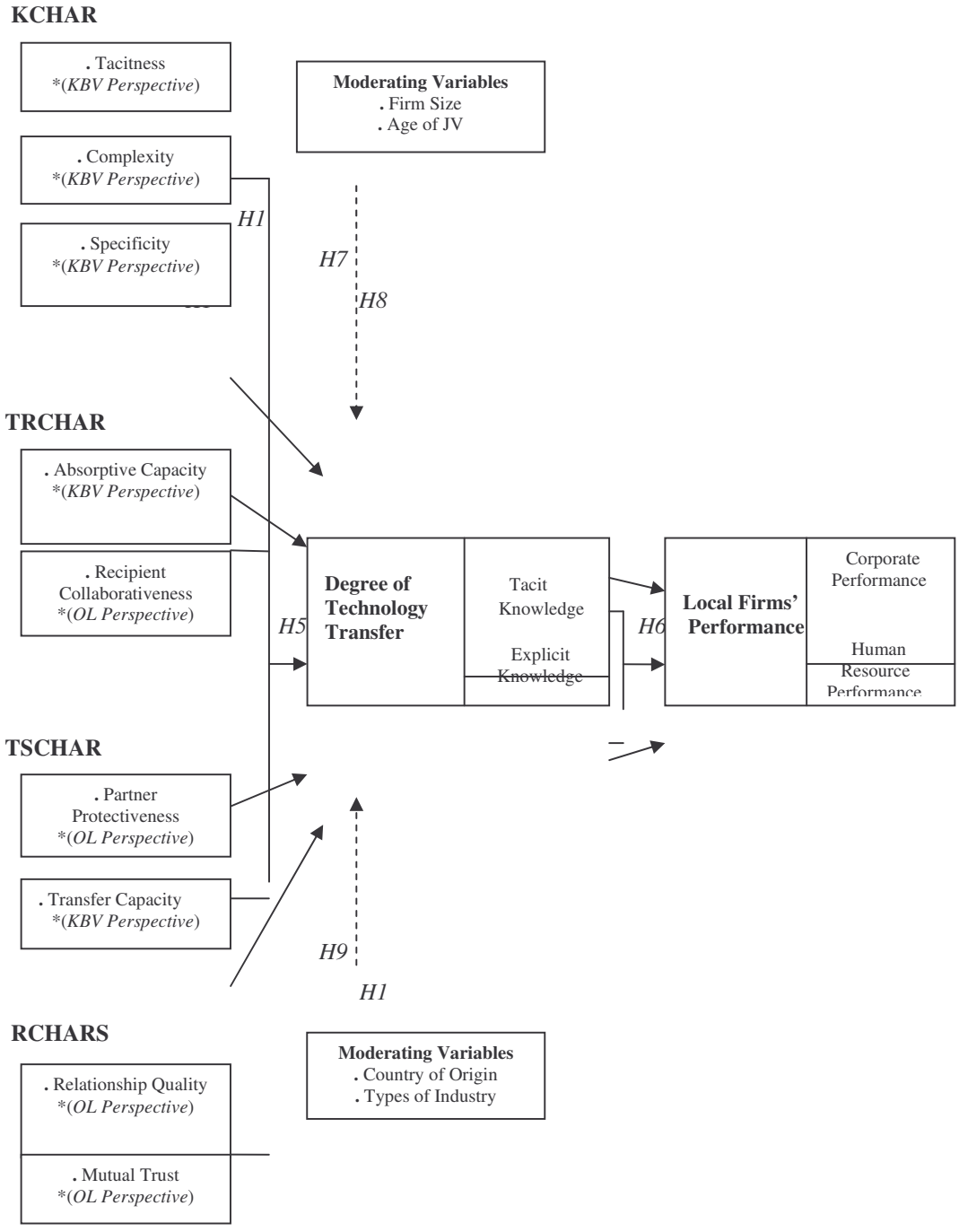
Through the conceptual explanations on the individual and joint effects of each TTCHARS characteristic on TTDEG the recipients' organizations/firms are unable to get first hand information and understanding before reviewing, designing and formulating new TT policies and strategies in order to achieve a higher level or amount of technology transfer in JVs, increase the overall local companies' competitiveness, productivity, and performance, enhance knowledge acquisition by the local companies, help to develop indigenous technological capabilities of the local work force, and stimulate local innovation capability. Thus, building on intra and inter-firm TT literature, this study advances a holistic model of TTCHARS-TTDEG by proposing that 1) all the TTCHARS, which include the knowledge transferred (KCHAR), technology recipient (TRCHAR), technology supplier (TSCHAR), and relationship (RCHAR) characteristics, are critical in affecting TTDEG in JVs, 2) TTCHARS-TTDEG relationship could possibly be moderated by certain factors, and 3) TTDEG affects the LFP.

In this conceptual study, inter-firm TT is defined as "the transfer of technological knowledge, information and know-how that are transferred across organizational border by the technology-supplier; where the technology recipients' firms have effectively acquired, learned and absorbed knowledge and technology embedded in product materials, physical assets, processes and production and managerial capabilities" (Kogut and Zander, 1992, 1993; Teese, 1976; Grant, 1996a; Szulanski, 1996; Inkpen, 1998, 2000; Inkpen and Dinur, 1998; Simonin, 1999a, 1999b, 2004). Since technology is an abstract subject, TTDEG is operationalized as the degree of technological knowledge from two dimensions: 1) tacit knowledge in terms of new product/service development, managerial systems and practice, process designs and new marketing expertise, and 2) explicit knowledge in terms of manufacturing/service techniques/skills, promotion techniques/skills, distribution know-how, and purchasing know-how. JVs are referred to as "a form of international collaborative/cooperative efforts which bring together two or more firms to engage in a joint activity to which each member contributes resources with expectation to extract resources of higher value, share their respective resources, skills and expertise" (Beamish and Bedrow, 2003; Ibrahim and Mcguire, 2001).

Theoretical Development and Hypotheses

The main theories underpinning the relationships of variables in the conceptual framework of this study are knowledge–based view (KBV) and organizational learning (OL) perspectives. The perspective of KBV underlies the relationships between the KCHARS and sub- independent variables: Tacitness (TCT), Complexity (COMPLX) and Specificity (SPEC), and dependent variable - TTDEG. Both KBV and OL perspectives underlie the relationships between the TRCHARS and sub-independent variables: Absorptive Capacity (ACAP) and Recipient Collaborativeness (RCOL) and TTDEG. The relationships between the TSCHAR and sub-independent variables: Partner Protectiveness (PPROTEC) and Transfer Capacity (TRANSCAP), and TTDEG are governed by both KBV and OL perspective. The OL perspective underlies the relationship between RCHAR and sub-variables: Relationship Quality (RELQLTY) and Mutual Trust (MT). Figure 1 below depicts the relationships between the variables in the study's conceptual framework.

Figure 1: A Holistic Model of TTCHARS-TTDEG-LFP in IJV



Knowledge Characteristics (KCHAR) and TTDEG

The first characteristic of TT this study investigates is knowledge characteristics (KCHAR). The KCHAR form the first group of TT characteristic in this study. Based on a literature review, KCHAR that

have been identified include tacitness, complexity, specificity (Kogut and Zander, 1993; Inkpen and Dinur, 1998, Simonin, 1999a, 1999b, 2004; Pak and Park, 2004; Inkpen, 2000; Minbaeva, 2007; Makhija and Ganesh, 1997; Lei et al., 1997; Inkpen, 1998a, 1998b, 2000; Parise and Handerson, 2001; Mohr and Sengupta, 2002), knowledge relatedness (Inkpen, 2000; Lyles et al., 2003), desirability (Pak and Park, 2004) and availability (Minbaeva, 2007). Knowledge tacitness, specificity and complexity have contributed significantly to knowledge ambiguity in imitation (Reed and DeFillippi, 1990), and knowledge migration (Szulanski, 1996). Building on the previous intra-firm knowledge transfer studies (Winter, 1987; Reed and DeFillippi, 1990; Szulanski, 1996; Zander and Kogut, 1995; Kogut and Zander, 1993; Minbaeva, 2007) and inter-firm knowledge transfer studies (Lyles and Salk, 1996; Mowery et al., 1996; Simonin, 1999a; Simonin, 1999b; Simonin, 2004; Inkpen, 1998a; Inkpen and Dinur, 1998; Pak and Park, 2004), this study conceptualizes that the three critical dimensions of KCHAR: Tacitness (TCT), Complexity (COMPLX) and Specificity (SPEC) have a significant negative impact on degree of technology transfer (TTDEG).

Knowledge has been classified using many different dimensions and the dimension that appears to be particularly relevant to TT is tacit vs. explicit dimension (Marcotte and Niosi, 2000; Grant, 1996a, 1996b, 1997). The concept of tacit knowledge (TCT) is derived from the famous work of Polanyi (1962) who asserts that "we can know more than what we can tell". Tacit knowledge is knowledge that is non-verbalizable, intuitive and unarticulated, developed through the transfer of context-specific knowledge, embedded in non-standardized and tailored process, and is difficult to acquire and exploit (Polanyi, 1967). Tacit knowledge derives from the accumulated experience, and is reflected in the expertise, skills and routines acquired by organizational members over time (Winter, 1987). Past studies have established that tacit knowledge, which includes insights, intuitions and hunches, rule of thumb, gut feeling, personal and organizational skills (Nonaka, 1994), managerial and marketing expertise (Lane et al., 2001), is difficult to codify: where it can only be observed through its application and acquired through practice. Thus, tacit knowledge transfer between individuals is slow, costly and uncertain (Kogut and Zander, 1992). Acquiring tacit knowledge is subject to time-compression diseconomies: which means to accelerate tacit knowledge learning is very difficult or perhaps not even possible no matter how much efforts or resources are invested to acquire them within a short period of time (Dierickx and Cool, 1989; Lin, 2003) because tacit knowledge is unique to the knowledge owner and not codifiable in formulas or manuals and cannot be reverse-engineered easily (Zander and Kogut, 1995). Tacit knowledge which is hard to formalize, often sticky and not easily visible, is difficult to communicate, transfer and share between the alliance partners as it involves 1) intangible factors embedded in the personal beliefs, experiences, and values in an organization (Inkpen, 1998a, 2000), 2) internal individual processes like experience, reflection, internalization or individual talents (Nonaka, 1994), and 3) high incremental cost of transferring the knowledge to a specified location in a form usable by a given party (von Hippel, 1994).

A number of literature has described complexity (COMPLX) from many dimensions for example: 1) COMPLX is closely associated with the amount of information required to characterize the item of knowledge in question (Winter, 1987), 2) COMPLX is "a result of the interdependent skills and assets: which arises from large numbers of technologies, organization routines and individual or team-based experience" (Reed and DeFillippi, 1990), 3) COMPLX as "the number of interdependent technologies, routines, individuals and resources linked to a particular knowledge or assets" (Simonin, 1999a), 4) COMPLX as "the number of critical and interacting elements embraced by an entity or activity" (Kogut and Zander, 1993), and 5) COMPLX as "an applied system whose components have multiple interactions and constitutes a non-decomposable whole" (Singh, 1997). COMPLX of human and technological systems produce higher levels of ambiguity which restrains imitation and impedes transferability (Reed and DeFillippi, 1990). It is argued that the higher the degree of COMPLX of the manufacturing technology, the more difficult for knowledge to be transferred or imitated (Kogut and Zander, 1993).

Specificity (SPEC) originally refers to transaction costs asset specificity as popularized by Williamson (1985). Asset SPEC which includes site, physical, dedicated and human assets refer to durable investments that are undertaken in support of particular transaction (Williamson, 1985). Building on Williamson (1985), Reed and DeFillippi (1990) define SPEC as "transaction-specific skills and assets that are utilized in production processes and provision of services for particular customers". Through firm-customer relationship, the business actions resulting from the resource and skill deployment (competencies) are highly specific and inter-dependent with the firm's internal or external transaction partners (Reed and

DeFillippi, 1990). Although sites or physical assets create limited ambiguity to imitation by rivals, dedicated assets such as the plants specifically designed for the production of goods and services for a specific customer, and human asset SPEC is linearly and significantly related to ambiguity as these types of asset SPEC create barriers to imitation and are protected by the security and exclusivity of the firm-customer relationship (Reed and DeFillippi, 1990). Simonin (1999a, 1999b) narrowly views SPEC as "durable investments in specialized equipment, facilities and skilled human resources". Asset SPEC is not only acted as a source of causal ambiguity and barrier to imitation, where technology is difficult to be explicitly articulated (Lippman and Rumelt, 1982), but also as a barrier to knowledge transferability (Simonin, 1999a). The firms' resources and competencies, which are highly specific, are difficult to imitate and transfer as they are embedded in context and idiosyncrasy to the firm (Kogut and Zander, 1993). Firms create sustainable competitive advantage by developing firms' assets and competencies that are firm-specific, produce complex social relationships i.e. firm-customer relationship, embedded in a firm's history and culture, generate organizational tacit knowledge and time consuming to develop (Lado and Wilson, 1994; Dierickx and Cool, 1989; Kogut and Zander, 1993).

H1: Knowledge characteristics, which comprise of tacitness, complexity, and specificity, have a negative effect on degree of technology transfer in JVs.

Technology Recipient Characteristics (TRCHAR) and TTDEG

The characteristics of technology-recipient (TRCHAR) have been affirmed by many studies as the important factors that affect knowledge transfer. The TRCHAR form the second group of characteristic of TT in this study. The recipient's characteristics that have been identified to influence TT and KT are absorptive capacity (Cohen and Levinthal, 1990; Hamel, 1991; Lyles and Salk, 1996; Mowery et al., 1996; Lane and Lubatkin, 1998; Lane et al., 2001; Gupta and Govindarajan, 2000, Minbaeva et al., 2003, Minbaeva, 2007; Pak and Park, 2004), experience (Simonin, 1999a, 1999b), prior knowledge and experience (Inkpen, 1998a, 1998b, 2000; Tsang, 2001), knowledge relatedness (Inkpen, 2000), learning capacity (Makhjia and Ganesh, 1997; Parise and Henderson, 2001), receptivity (Hamel, 1991; Baughn et al., 1997), learning intent or objectives (Beamish and Berdrow, 2003; Hamel, 1991; Simonin, 2004; Inkpen and Beamish, 1997; Baughn et al., 1997; Inkpen, 1998a; Mohr and Sengupta, 2002), managerial belief rigidity (Inkpen and Crossan, 1995), and recipient collaborativeness, readiness and method comprehensiveness (Yin and Bao, 2006). This study conceptualizes the two critical dimensions of TRCHAR: Absorptive Capacity (ACAP) and Recipient Collaborativeness (RCOL) to have a positive impact on TTDEG.

As TT involves the process of transmission and absorption of knowledge (Davenport and Prusak, 1998, 2000), the recipient firms' ability to absorb the knowledge transferred depends on the degree of their absorptive capacity (ACAP). Past studies have shown that a low degree of the technology-recipient's ACAP impedes both intra-firm and inter-firm knowledge transfer (Cohen and Levinthal, 1990; Hamel, 1991; Lyles and Salk, 1996; Mowery et al., 1996; Lane and Lubatkin, 1998; Lane et al., 2001; Gupta and Govindarajan, 2000; Minbaeva et al., 2003; Minbaeva, 2007; Pak and Park, 2004; Simonin, 1999a, 1999b). The concept of ACAP has been extensively examined in both theoretical and empirical studies. In their seminal paper, Cohen and Levinthal (1990) define ACAP as "the firm's ability to recognize the value of new external information, assimilate it, and apply it to commercial ends". ACAP of a firm is primarily a function of the recipient firm's level of prior related knowledge. Prior related knowledge is closely related to the individuals units of knowledge available within the organization. The accumulation of prior knowledge will increase the ability to make sense of, assimilate and use new knowledge (Kim, 1998). The firms' ACAP tends to be developed cumulatively, in which absorptive capacity is more likely to be developed and maintained as a byproduct of routine activity when the knowledge domain that the firm wishes to exploit is closely related to its current knowledge base (Cohen and Lavinthal, 1990). Prior related knowledge, which includes basic/minimal skills, a shared language, positive attitude towards learning, relevant prior experience and up-to-date information on knowledge domain, is critical for organization to assimilate and exploit new knowledge (Cohen and Lavinthal, 1990; Szulanski, 1996, 2003; Minbaeva, 2007). By possessing sufficient prior related knowledge, which is closely associated with new knowledge,

the organization will have adequate ability to absorb new technological and innovative competencies/capabilities (Cohen and Lavinthal, 1990).

The recipient collaborativeness (RCOL) is mostly involved inter-firm knowledge transfer between partners in collaborative relationship such as strategic alliances and joint ventures. In intra-firm knowledge transfer, firms are expected to encounter fewer problems when transferring technology to their own subsidiaries and affiliates within the organizational boundaries. Strategic alliances provide an ideal platform for organizational learning especially through IJVs where partners' firms can acquire, learn, create new knowledge, and transfer knowledge between them (Inkpen, 2000). Nonetheless, strategic alliances face a tradeoff between the opportunities for generating and sharing knowledge and the propensity that the partner may tend to behave opportunistically (Child and Faulkner, 1998). Building on the concept of inter-partner learning developed by Hamel (1991), RCOL is defined as "the recipient firms' willingness to establish a mutually beneficial and collaborative relationship: which requires the recipient firms' honest intention to create common benefits for both the supplier and recipient" (Yin and Bao, 2006). Thus, learning in the collaborative relationship greatly depends on the partners' intent; whether the partners' learning objective/intent is collaborative (complementary) or competitive (Child and Faulkner, 1998).

H2: Technology recipient characteristics, which comprise of absorptive capacity and recipient collaborativeness, have a positive effect on degree of technology transfer in JVs.

Technology Supplier Characteristics (TSCHAR) and TTDEG

The technology supplier characteristic (TSCHAR) is the third group of TT characteristics in this study. The two critical dimensions of TSCHAR under study are Partner Protectiveness (PPROTEC) and Transfer Capacity (TRANSCAP). A stream of studies has identified numerous TSCHAR such as motivation (Gupta and Govindarajan, 2000; Szulanski, 1996), partner protectiveness (Simonin, 1999a, 1999b, 2004; Szulanski, 1996, Inkpen, 1998a, 1998b, 2000), partner assistance (Lyles et al., 1999), partner transparency (Hamel, 1991), disseminative capacity (Minbaeva and Michailova, 2004), control (Lyles et al., 2003), prior experience (Subramaniam and Venkataraman, 2001), transferor's commitment (Tsang et al., 2004), articulated objective or goal clarity (Lyles and Salk,1996; Inkpen 2000) and source transfer capacity (Szulanski, 1996; Martin and Solomon, 2003) to have a significant influence on knowledge transfer. A review of literature shows that TSCHAR have been studied from many aspects of suppliers' behaviors. Previous studies on the suppliers' behaviors, which are largely theoretical and case-based, suggest different conclusions on the suppliers' behaviors because there have been no consensus on the appropriate definition and measure of the concept (Minbaeva, 2007). The technology-supplier, as a source of knowledge, must be knowledgeable to form a knowledge gap between the transferor and the transferee; where they are being perceived as reliable or valuable sources of knowledge (Szulanski, 1996), and must also be willing to support and co-operate with the local partner in transferring technological knowledge (Simonin, 1999a). This study conceptualizes that the two critical behavioral characteristics namely, PPROTEC and TRANSCAP, as the vital technology-supplier characteristics in facilitating inter-firm technology transfer.

The ability of a firm to acquire knowledge in the cooperative arrangement such as joint venture is not solely depending on its internal ACAP. The inter-firm learning opportunity provided by strategic alliance is also subjected to degree of willingness of the technology-supplier to cooperate or engage in sharing knowledge i.e. to reduce the level of protectiveness (Simonin, 1999a; Steensma and Lyles, 2000). One of the critical elements of technology-supplier characteristic is partner protectiveness (PPROTEC) which is beyond the technology-recipient's control. PPROTEC has been found to have a significant impact on both intra and inter-firm knowledge transfer (Simonin, 2004; Szulanski, 1996). PPROTEC refers to as "the extent of protections/hurdles, intentionally or unintentionally, imposed by the foreign partner on the local partner in an IJV which restrict the accessibility to proprietary technology/knowledge" (Hau and Evangelista, 2007). PPROTEC is significantly relates to the degree of transparency. Transparency is thus defined as "the degree of openness of one partner (technology-supplier) and their willingness to transfer knowledge to the other partner (technology-recipient)" (Hamel, 1991). In the context of intra-firm, openness is referred to as "the degree to which relationship between business unit managers and corporate supervisors is open and informal which promotes spontaneous and open exchange of information and

ideas" (Gupta, 1987). Many theoretical studies have indicated that partners in the collaborative relationship such as JV are expected to mutually exchange their valuable or proprietary assets, resources, information, knowledge and technology between them in order to achieve mutual benefits (Inkpen, 2000; Khanna et al., 1998; Child and Faulkner, 1998). These proprietary competencies are the sources of sustainable competitive advantage of the supplier partner; and for fear of losing ownership, a position of privilege and superiority of their valuable assets they tend to protect their hard-won success and competencies from the opportunistic behaviors of the recipient partner (Parkhe, 1993; Steensma and Lyles, 2000; Szulanski, 1996). The foreign parent firm may intentionally restricts knowledge flow to the JV because cooperation through JVs is viewed as a low cost approach for the local firms to gain competencies (Hamel et al., 1989; Simonin, 1999a, 2004; Steensma and Lyles, 2000) unless they have sufficient incentive to mitigate the cost typically associated with the transfer (Dyer and Singh, 1998). Partners in the strategic alliance, due to the risk of knowledge spillover/leakage, tend to be more protective of their valuable knowledge resources as their competitiveness is very much depending on these valuable resources (Barney, 1991). Valuable knowledge resources of the firm, if not well protected will leak to potential competitors or competitors which eventually will enable competitors to gain competitive advantage and use it against the proprietor or supplier firms (Cohen and Lavinthal, 1990; Hamel et al., 1989; Simonin, 1999a, 2004; Steensma and Lyles, 2000). Knowledge spillover to an alliance partner tends to shift the balance of bargaining power between partners which lead to the initiation of changes in the partner relationship (Inkpen, 2000). Due to asymmetries of knowledge between the alliance partners, PPROTEC and knowledge accessibility will be correspondingly asymmetrical in which partners in an alliance can be less transparent or open than the other partner (Hamel, 1991).

As technology and knowledge transfer involve the absorption and transmission of knowledge (Devanport and Prusak, 1998, 2000), the ability of the technology-supplier to efficiently transfer knowledge and technology to the recipient becomes critical in inter-firm TT. Several studies have suggested that while firms differ in their ability in knowledge creation, they also differ in their ability to transfer knowledge (TRANSCAP) within or outside of the organizational boundary (Kogut and Zander, 1992, 1993; Szulanski, 1996). The efficiency in transmitting technology or knowledge by the supplier is important in both intra and inter-firm knowledge transfer as it affects the TT outcomes. The firms' ability to transfer knowledge to their subsidiaries efficiently and effectively can serve several objectives such as: 1) to facilitate their expansion in foreign countries, 2) to maintain the firms' competitiveness, and 3) to safeguard their competencies from the competitors (Martin and Solomon, 2003). In the context of strategic alliance, the firms' ability to transfer knowledge facilitates the organizational learning process and justifies their commitments in the collaborative relationship: where all partners are expected to mutually contribute their knowledge, technologies, skills and competencies to the JVs to gain mutual benefits (Inkpen, 1998a, Inkpen 2000; Khanna et al., 1998; Child and Faulkner, 1998). Past studies have described TRANSCAP from many dimensions for example: 1) the source (supplier) 'not perceived as reliable' (Szulanski, 1996), 2) the firms' ability to articulate uses of their own knowledge, assess the needs and capabilities of the potential recipient, and transfer knowledge to different location (Martin and Solomon, 2003), 3) a disseminative capacity of the knowledge sender in terms of the source's ability and willingness to share knowledge (Minbaeva and Minhailova, 2004), 4) the sender's ability to articulate and communicate knowledge to the recipient (Minbaeva, 2007), 5) the parent firms' capacity to knowledge transfer (Wang et al., 2004), and 6) the source's motivational disposition (Gupta and Govindarajan, 2000).

H3: Technology supplier characteristics, which comprise of low degree of partner protectiveness and transfer capacity, have a positive effect on degree of technology transfer in JVs.

Relationship Characteristics (RCHAR) and TTDEG

A stream of literatures on intra and inter-firm knowledge transfer has identified many aspects of RCHAR. The RCHAR form the fourth group of TT characteristic in this study. From a review of literature among the RCHAR that have been identified are organizational distance (Simonin, 1999a, 1999b), cultural distance (Lyles and Salk, 1996; Mowery et al., 1996; Choi and Lee, 1997; Inkpen, 1998a, 1998b, Liu and Vince, 1999), organizational context (Kogut and Zander, 1993; Zander and Kogut, 1995), knowledge connection (Inkpen, 2000), organizational structure (Inkpen, 1997), ownership type (Kogut, 1988; Mowery

et al., 1996), ownership equity (Pak and Park, 2004), relationship openness (Hamel, 1991; Inkpen, 2000), partners attachment (Inkpen and Beamish, 1997), inter-partner trust (Baughn et al., 1997; Morrison and Mezentseff, 1997; Love and Gunasekaran, 1999, Inkpen, 2000), empathy (Buckley et al., 2002), relationship quality and strength (Szulanski, 1996; Lin, 2005), relational openness (Wathne et al., 1996), relational capital (Kale et al., 2000), informal relationship (Clarke et al., 1998), articulated goals and management commitment (Choi and Lee, 1997; Morrison and Mezentseff, 1997), and legal, political and technical differences (Marcotte and Niosi, 2000). The present study conceptualizes that the two important aspects of RCHAR: Relationship Quality (RELQLTY) and Mutual Trust (MT) are expected to have a positive impact on TTDEG.

In order to facilitate intra and inter-firm TT, both technology-supplier and technology-recipient are expected not only to establish a close relationship between them but also develop relationship quality (RELQLTY). For firms which have differences in terms of the organizational structures, cultural backgrounds, experiences, capabilities, learning intent and technological resources, transferring technology is rather a challenging process (Argote, 1999; Hamel, 1991). As knowledge is a firm-specific, embedded in firm organizational context, personal quality in nature and idiosyncrasy (Nonaka, 1994; Kogut and Zander, 1992, 1993), acquiring and transferring technology require frequent and effective interactions between the supplier and recipient (Bresman et al., 1999). The importance of numerous individual exchanges in transferring tacit knowledge within organization is achievable through "ease of communication and intimacy of relationship" between the source and recipient unit and thus a problematic relationship between the source and recipient will lead to hardships in transferring knowledge (Szulanski, 1996). Gupta and Govindarajan (2000) argue that the existence and richness of transmission channels as an important determinant of knowledge flows within MNCs. The richness of communications links is captured and or operationalized as "informality, openness and density of communications". Informality, openness and communication density are closely related to relationship quality as they indicate higher degree of involvement and interaction frequency between the sender and receiver, increase the openness of communication, spontaneous and open exchange of information and ideas between the interacting parties, and the potential for numerous individual exchanges (Szulanski, 1996; Nonaka, 1994; Lin, 2005; Gupta, 1987). Wang et al. (2004) suggest that effective transfer of managerial knowledge by MNCs to Chinese subsidiaries is not only depending on the adequate presence of expatriates but also productive interaction between the expatriates and their Chinese counterpart. From the inter-firm transfer context, Lin (2005) categorizes quality interaction in terms of its frequency, adequacy, amiability and constructiveness. Bresman et al. (1999) argue that communication involves two distinct but overlapping stages. First, the post integration process: which is largely depending on an effective, extensive and intensive communication between the acquirer and acquired units; and second, the tacit knowledge transfer process: which requires intensive communication and frequent interaction between the transmitting and receiving parties. Strategic alliance literatures have explicitly indicated that RELQLTY or quality of interaction between alliance partners promotes greater opportunity to learn, share and access to the alliance partners' strategic knowledge and competencies. RELQLTY creates higher relationship openness which directly affects the willingness and ability of alliance partners to share information and communicate openly (Inkpen, 1998a, 2000).

Inter-partner mutual trust (MT) is critical in the collaborative relationship as MT: 1) develops a sense of openness and shared understanding between partners (Dyer and Nobeoka, 2000), 2) facilitates greater accessibility to the alliance knowledge and knowledge acquisition (Inkpen, 1998a, 2000), 3) creates opportunities for a mutual inter-organizational learning: when partners become more open and committed in sharing their knowledge and competencies (Inkpen and Dinur, 1998; Inkpen and Beamish, 1997), 4) reduces the partners' protectiveness of their knowledge and promotes free exchange of information between partners (Inkpen, 2000), 5) creates higher propensity of inter-partner learning as knowledge is more accessible due to free exchange of information (Hamel, 1991; Doz, and Hamel, 1998; Inkpen, 2000), 6) reduces the fear of opportunistic behaviors of the learning partner and promotes greater transparency between the exchange processes (Gulati, 1995), 7) promotes knowledge acquisition and inter-organizational learning (Glaister et al., 2003; Inkpen and Tsang, 2005), and 8) fosters norms of reciprocity (Nahapiet and Ghoshal, 1998). MT reduces the fear of opportunistic behaviors of the learning partner, promotes greater transparency between the exchange processes (Gulati, 1995) and may mitigate partner

protectiveness (Inkpen, 1998a). The partners' openness or transparency which determines the willingness to exchange, share and transfer knowledge between alliance partners is primarily hindered by a mutual suspicion of opportunistic behaviors between them (Kale et al., 2000). In the cooperative ventures such as IJVs mutual trust, which derives from the existence of personal attachment, contributes to more willingness to transfer knowledge between alliance partners (Luo, 2001). High degree of MT indicates that the partners in a collaborative relationship accept each other as an ally not as competitor (Powell et al., 1996), signifies the partners' commitment not to take advantage on the other partner's weaknesses and or vulnerabilities (Steensma and Lyles, 2000), and contributes to information learning and sharing: when partners are less suspicious of the other partner's opportunistic behaviors (Child and Faulkner, 1998). Trust allows potential access to the alliance valuable resources and a willingness to solve problems through mutual problem-solving (Uzzi, 1997). A collaborative alliance with low degree of trust will reduce the partners' openness or transparency in knowledge sharing and learning, and limit the information's accuracy, comprehensiveness and timeliness (Zand, 1972; Kale et al., 2000) as the partners are unwilling to face the risk associated with sharing more valuable information (Hedlund, 1994). A lack of inter-partner trust may also generate inter-firm conflicts, increase partners' opportunistic behaviors and eventually erode mutual trust (Tsang et al., 2004). The inter-partner trust acts as an ongoing social control mechanism and risk reduction device as it determines the extent of knowledge exchange in IJVs and the efficiency with which it is exchanged (Lane et al., 2001). Trust is also crucial in alliances and joint ventures as no contracts/agreements can cover all the variations and conditions that can occur (Dhanaraj et al., 2004).

H4: Relationship characteristics, which comprise of relationship quality and mutual trust, have a positive effect on degree of technology transfer in JVs.

Technology Transfer Characteristics (TTCHARS) and TTDEG

Building on intra and inter-firm knowledge transfer literature, TTCHARS which formed the study's conceptual framework, are viewed as both the critical facilitators/determinants of TT and barriers to TT (Szulanski, 1996). The TTCHARS are inter-dependent, co-exist and closely related to each other where failure to manage any of TT characteristic will affect the TT outcomes. Previous studies on intra and inter-knowledge transfer have acknowledged the significant influence of these facilitators on TT's success or failure (Szulanski, 1996, 2000, 2003; Gupta and Govindarajan, 2003; Minbaeva, 2007; Hamel, 1991; Inkpen, 1998, 2000).

For technology acquisition to happen in IJVs, technology must be first accessible by the learning partner. In a collaborative/cooperative learning environment as opposed to competitive learning, the transferring partner is more transparent and willing to share/transfer their proprietary knowledge, competencies and skills although they are organizationally embedded in the organization's routines and processes (Hamel, 1991; Inkpen, 2000; Child and Faulkner, 1998). As a result, this will reduce the degree of PPROTEC to allow for freer and greater flow of information to the learning partner particularly the accessibility to tacit knowledge (Inkpen, 2000; Yan and Luo, 2001; Hamel, 1991; Doz and Hamel, 1998).

Relationship openness thus is influenced by the learning intent of the learning partner and inter-partner MT (Inkpen, 2000; Inkpen and Beamish, 1997). If competitive overlap exists and for fear of losing their proprietary technology/knowledge and risk of spillovers, the transferring partner is likely to be less transparent, more protective of their technology either through explicit or active measures, and restrict the information flow to the opportunistic partner who perceives JV as a low cost approach to internalize partner's competencies (Hamel, 1991; Simonin, 1999a, 2004; Steensma and Lyles, 2000). The JV partner's learning intent also determines the TRANSCAP of the transferring partner in terms of motivation to transfer technology.

MT between IJV's partners is important in reducing the fear of opportunistic behaviors of the learning partner, promotes greater transparency which may contribute a higher degree of accessibility to partner's technological knowledge, and motivate the transferring partner to share and transfer higher technology (Inkpen, 1998; 2000). As a result of the collaborative learning intent, RELQLTY promotes a higher degree of MT and openness between partners resulting in a higher degree of knowledge sharing and transfer of tacit knowledge (Inkpen, 2000; von Hippel, 1998; Marsden, 1990; Kale et al., 2000).

On the other aspect, learning capability (ACAP) promotes higher TTDEG if the learning partner has the capacity to recognize, absorb, assimilate and apply new technology/knowledge to ensure a higher TTDEG (Cohen and Lavinthal, 1990; Lane and Lubatkin, 1998). ACAP is closely related to knowledge connection and knowledge relatedness between JV partners (Inkpen and Dinur, 1998; Inkpen, 2000). Acquiring tacit knowledge involves various organizational levels and personal interactions between individuals and groups. Thus, knowledge connection and knowledge relatedness between JV partners are capable in creating potentials for the sharing of more personal observations and experiences (Von Krogh, 1994; Inkpen 2000).

Although TCT, COMPLX and SPEC contribute to technology ambiguity and barriers to TT, these barriers to technological gap between JV partners may be reduced or eliminated if the learning partner has adequate prior related knowledge and intensity of learning efforts (Hamel, 1991; Inkpen, 2000; Szulanski, 1996; Kim, 1998). Building on the previous theoretical and empirical studies, this study proposes the following hypotheses:

H5: Technology transfer characteristics, which comprise of knowledge transferred, technology recipient, technology supplier and relationship characteristics, have a positive effect on degree of technology transfer in JVs.

Degree of Technology Transfer (TTDEG) and Local Firms' Performance (LFP)

A review of literature reveals that most of the empirical studies on inter-firm technology and knowledge transfer in strategic alliance, particularly IJVs, are limiting their focus on the performance of the IJVs (for example Lyles and Salk, 1996; Lane et al., 2001; Tsang et al., 2004; Dhanaraj et al., 2004; Steensma and Lyles, 2000). On the other hand, the performance of the MNCs' subsidiary and affiliate in the host countries has become the primary focus of intra-firm knowledge transfer literature (for example Chen, 1996; Chung, 2001; Ofer and Potterovich, 2000; Cui et al., 2006; Lin, 2003). Most of the studies on strategic alliance and IJVs have recorded positive impact of knowledge acquisition or transfer on IJVs' performance for example: 1) knowledge acquisition has a positive impact on the IJVs' human resource, general and business performance (Lyles and Salk, 1996), 2) knowledge acquisition as a better predictor for human-resource related performance than the general and business performance (Lyles and Salk, 1996), 3) knowledge acquisition from parent firms has a significant positive effect on IJVs' performance (Lane et al., 2001; Tsang et al., 2004), and, 4) tacit and explicit knowledge acquisition have a positive impact on IJVs' performance (Dhanaraj et al., 2004). However, there have been inadequate studies on direct effect of technology or knowledge transfer on LFP. Only Yin and Bao (2006) find tacit knowledge acquisition has significantly affected LFP.

H6: Higher degrees of technology transfer in JVs, which comprise of degree of tacit and explicit knowledge, have a positive effect on local firms' performance.

On the Moderating Effect of Size of MNCs (MNCSIZE)

Past studies have acknowledged the effect of MNCSIZE on both intra and inter-firm knowledge transfer due to asymmetries in the availability of the firms' resources (Kogut and Zander, 1992, 1993; Simonin, 1997, 1999a, 2004; Bresman et al., 1999; Minbaeva et al., 2003). Large firms, because of the availability of high number of resources and expertise, are capable to transfer more/higher technology and knowledge than small firms. Hagedoorn and Schakenraad (1994) find a strong positive effect of MNCSIZE on the intensity of strategic partnering and technological cooperation because large firms have substantial administrative, organizational and monitoring supports to form an alliance. Generally, small firms do not have adequate resources and are likely to transfer knowledge and technology through arm's length licensing agreements (Stobaugh, 1988). MNCSIZE affects the propensity of the firm to develop competitive advantage and achieves the above-average performance (Porter, 1980). The strategy literatures also regard MNCSIZE as the important contingency variable with respect to governance, levels of diversification and resistance to organizational change (Hoskisson et al., 1994), influence intra-firm knowledge transfer, and as an impediment to organizational learning (Marquardt and Reynolds, 1994). In

the context of strategic alliance, MNCSIZE has been considered as: 1) a determinant of alliance participation, intensity of strategic partnering and technological cooperation (Berg et al., 1982; Hagedoorn and Schkenraad, 1994), 2) a differentiating factor in the motives for alliance formation (Glaister and Buckley, 1996), and 3) a source of asymmetric bargaining power between partners in the alliance relationship (Khanna et al., 1998).

H7: The relationship between technology transfer characteristics and degree of technology transfer is moderated by size of MNCs.

On the Moderating Effect of Age of JV (JVAGE)

JVAGE or JV's duration is expected to influence the relationships between TTCHARS and TTDEG (Foss and Pedersen, 2002). The longer the collaborative relationship, the greater opportunity for JV's partners to share, learns, and transfer technology and knowledge between them (Kale et al., 2000). However, Kale et al. (2000) caution that longer duration of JV relationship could increase the propensity of losing the valuable proprietary asset to the JV's partner. Gomez-Mejia and Palich (1997) posit that the subsidiary' maturity in the local market provides capabilities in overcoming the negative impacts of cultural difference through deliberate strategies. From the strategic alliance context, studies have shown that age of alliance as an important variable because, as the alliance sustains over the years, cultural distances tend to decrease (Meschi, 1997), the inter-partner trust intensifies (Gulati, 1995), relative bargaining power between partner changes (Yan and Gray, 1994), alliance partners develop personal attachment (Inkpen and Beamish, 1997), partner becomes more familiar with each other's expertise and idiosyncrasies (Simonin, 1999a), and older IJVs are likely to leverage the acquired knowledge and convert it to competitive advantage (Tsang et al., 2004). However, few researchers have cautioned that as alliances are perceived as 'a race to learn'; where alliances are being regarded as unstable organizational forms (Porter, 1990; Hamel, 1991; Inkpen and Beamish, 1997, Inkpen, 1998a; Yan and Gray, 1994), age of JV thus may contribute to a shift in the partners' bargaining power associated with the acquisition of knowledge and skills that allows a firm to eliminate a partner dependency (Inkpen and Beamish, 1997). JVAGE moderates the relationship between knowledge acquisition and performance for two reasons: 1) when a JV can survive within a considerable period, firms become more practiced and more efficient at what they already do, and 2) studies have shown that the relationship duration in JV is positively associated with frequency of communication and information exchange between partners (Tsang et al., 2004; Hallen et al., 1991). As the relationship develops, shared experience is able to resolve inter-firm conflicts through open problem solving and compromise (Lin and Germain, 1998).

H8: The relationship between technology transfer characteristics and degree of technology transfer is moderated by age of JV.

On the Moderating Effect of MNCs' Country of Origin (MNCCOO)

Many empirical studies have established that MNCCOO (nationality) has a significant impact on: 1) the propensities of MNCs' choice of global strategies, 2) organizational structures and control system, 3) internal corporate cultures (Bartlett and Ghoshal, 1989; Egelhoff, 1984; Franko, 1976; Porter, 1990; Yip et al., 1994), 4) expected outcomes (Harrigan, 1988b), 5) alliance outcomes and performance (Parkhe, 1993), 6) partners' learning and protection of proprietary assets in an alliance (Kale et al., 2000), and 7) the way how the MNCs operate (Gupta and Govindarajan, 2000). Problems related to cultural differences, opinions, beliefs, and attitude tend to accelerate due to alliance partners' nationality (Kale et al., 2001). The differences in culture, language, educational background and distance with cross national partners; which act as barriers to inter-organizational learning, impede the inter-partner learning and knowledge transfer (Mowery et al. 1996). However, Yin and Bao (2006) find nationality of alliance's partners (the U.S, Japan and Western firms) has no significant effect on the relationships between the supplier and recipient factors and tacit knowledge acquisition.

H9: The relationship between technology transfer characteristics and degree of technology transfer is moderated by MNCs' country of origin.

On the Moderating Effect of MNCs' Types of Industry (MNCIND)

Based on the economic theory, MNCs have become increasingly important due to ineffectiveness and inefficiency of the external market to facilitate intra-knowledge transfer (Caves, 1982; Hymer, 1960; Kindleberger, 1969). Empirical examination of the economic theory has consistently found that industries characterized by greater degrees of knowledge intensities (industries with higher R&D-to-sales-ratios and/or higher advertising-to-sales ratios) have the propensity to become more global than other industries (Gupta and Govindarajan, 2000; Goedde, 1978; Grueber et al., 1967; Horst, 1972). Asymmetries in the industries characteristics indicate that certain industries are more global and require a higher level of knowledge transfer than other industries (Minbaeva et al., 2003). Past studies have categorized MNCIND in terms of: 1) fixed asset intensity and advertising intensity industries (Gupta and Govindarajan, 2000), 2) metal and electronic; food, pulp and paper; chemical; finance service; wholesale and retail; and hotel and transportation industries (Minbaeva et al. 2003), 3) electronics, machinery and metals, and chemical products industries (Cho and Lee, 2004), 4) biochemical and non-biochemical industries (Lane and Lubatkin, 1998), 5) service and manufacturing industries (Lane et al., 2001), and 6) industry sales growth (Luo, 2001).

H10: The relationship between technology transfer characteristics and degree of technology transfer is moderated by MNCs' types of industry.

CONCLUSION

Building on intra and inter-firm KT literature (Szulanski, 1996; Gupta and Govindarajan, 2000; Minbaeva, 2007; Tiemessen et al. 1997; Inkpen 2000), the present study extends the literature by conceptualizing the effects of four critical dimensions of TTCHARS (KCHAR, TRCHAR, TSCHAR, and RCHAR) on TTDEG in a single holistic model to identify the relative and simultaneous influence of each group of TTCHARS on degree of inter-firm TT in IJVs.

Secondly, this study also extends the literature by responding to the limitations highlighted by the researchers in the area that studies on inter-firm TT and KT, and knowledge acquisition require more hypothesis development and testing (Huber, 1991; Fiol, 1994), the cross border TT and KT from MNCs to local firms has not been extensively researched (Pak and Park, 2004), and fewer studies adopt the local firms or recipient's perspective (Yin and Bao, 2006).

Thirdly, previous studies on KT are limited to selected functional expertise such as technological learning (Lin, 2007), managerial knowledge (Si and Bruton, 1999; Tsang 2001; Luo and Peng, 1999; Liu and Vince, 1999; Lin, 2005), managerial skills (Wong et al., 2002), technology or manufacturing know how (Lam, 1997; Bresman et al., 1999), business environment and product market knowledge (Geppert and Clark, 2003), marketing knowledge (Simonin, 1999b; Wong et al., 2002), and research and development (Cummings and Teng, 2003; Minbaeva, 2007). Thus, since technology is an abstract subject, this study has further extended the literature by operationalizeing TTDEG from two distinct dimensions namely degree of tacit and explicit knowledge and conceptualized the effect of TTCHARS on TTDEG and its two dimensions.

Fourthly, based on a review of literature, except for Yin and Boa (2006) who examined the effect of tacit knowledge acquisition on local firms' performance, very few intra and inter-firm studies have examined the impact of TT, specifically the effect of TTDEG on organizational performance. For example empirical studies by Szulanski (1996), Minbaeva et al. (2003), Pak and Park (2004), Hau and Evangelista (2007) and Minbaeva (2007) are mainly focusing on KT outcomes. This study extends the inter-firm TT and KT literature by conceptualizing local firms' performance from two dimensions namely corporate (CPERF) and human resource (HRPERF) performance. In specific this study has contributed to the expansion of TT literature by conceptualizing the effects of TTDEG on LFP in terms of corporate performance, and 2) human resource/competencies performance.

Finally, from a review of literature there have been limited studies that have included moderating variables in the previous TT frameworks. Thus, this study conceptualizes the moderating effects of MNCSIZE, JVAGE, MNCCOO, and MNCIND on TTCHARS-TTDEG relationship. Since the effects of TTCHARS and their dimensions on TTDEG and its dimensions have never been previously examined, thus

the inclusion of moderating variables (MNCSIZE, JVAGE, MNCCOO, and MNCIND) in the framework also has extended inter-firm TT literature by providing new plausible explanations on the boundary conditions of the TTCHARS-TTDEG relationship.

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