Investigating the Moderating Effects of Age of Joint Venture in the Relationship between Relationship Characteristics and Degree of Inter-Firm Technology Transfer

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Abstract

The main objective of this paper is to empirically examine the moderating effect of age of joint venture in the relationships between relationship characteristics: relationship quality and mutual trust and two distinct dimensions of degrees of technology transfer: degrees of tacit and explicit knowledge within IJVs. Using the moderated multiple regression (MMR), the theoretical models and hypotheses in this study were tested based on empirical data gathered from 128 joint venture companies registered with the Registrar of Companies of Malaysia (ROC). The results revealed that age of JVs has significantly affected the relationship between relationship characteristics (relationship quality and mutual trust) and degree of tacit knowledge; where the relationship was found stronger for young JVs than old JVs. However, age of JVs did not significantly moderate the relationship between relationship characteristics and degree of explicit knowledge. The study has bridged the literature gaps in such that it offers empirical evidence and new insights on the moderating effect of age of joint ventures in the relationships between relationship characteristics and two distinct degrees of technology transfer: degrees of tacit and explicit knowledge using the Malaysian sample.

Keywords: Degree of inter-firm technology transfer, International joint ventures, Age of joint venture, Malaysia

1. Introduction

While technology transfers through international joint ventures (IJVs) have been acknowledged by many studies as the most efficient formal mechanism in internalizing the partner's technologies, knowledge and skills, the transfer process has frequently involved various facilitators, actors and complex relationship between partners which cause direct impact on degree of technology transfer. Since the current issue on inter-firm technology transfer (TT) in the developing countries is centered on the efficiency and effectiveness of the transfer process by the multinationals (MNCs); therefore the success is often associated with degree of technology transferred to local partners. Previous studies on intra-firm knowledge transfer have confirmed the significant influence of technology actors and facilitators (barriers) such as the characteristics of knowledge transferred, source, recipient and contextual/relational on knowledge transfer process (Szulanski, 1996, 2000, 2003; Gupta and Govindarajan, 2000; Minbaeva, 2007). In the context of inter-firm TT; where technology transfer processes involve more

complex relationship, the impending issue now is on the effects of relationship characteristics (RCHAR) on degree or level of technology transfer (TTDEG).

Relationship characteristics have increasingly become dominant factors in determining the success or failure of inter-firm technology transfer within IJVs (Pak and Park, 2004; Minbaeva, 2007). Based on a literature review, a large stream of literatures has identified the relationship characteristic (RCHAR); which include JV's characteristics, as 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 and Beamish, 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).

Although many studies have acknowledged the significant effect of knowledge transfer determinants on knowledge transfer outcomes, nevertheless, the effects of RCHAR on TTDEG in inter-firm TT could possibly have been influenced by other established moderating factors such as size of MNCs, age of JV, MNCs' country of origin, and MNCs' types of industry. In other words the variations in TTDEG could have been significantly influenced or moderated by these variables. Bulk of studies on knowledge transfer and acquisition in strategic alliance (Szulanski, 1996; Gupta and Govindarajan, 2000; Minbaeva, 2007; Pak and Park, 2004; Lin, 2005; Wang and Nicholas, 2005; Liao and Hu, 2007; Bresman *et al*., 1999; Mowery *et al*., 1996; Lyles and Salk, 1996; Kogut and Zander, 1993; Grosse, 1996: Dhanaraj *et al*., 2004; Hau and Evangelista, 2007) have not tested the impact (strength) of moderating variables on the linear (direct) relationships between relationship characteristics and technology or knowledge transfer. Nevertheless, a number of studies on inter-firm knowledge transfer (KT) and knowledge acquisition in strategic alliance and JVs have acknowledged the important role of moderating variables such as: 1) collaborative know-how, learning capacity and alliance duration (Simonin, 1999a), 2) collaborative experience and firm size (Simonin, 1999b), 3) organizational culture, firm size, alliance form, and competitive regime (Simonin, 2004), 4) age of JV (Mohr and Sengupta, 2002), 5) alliance origin and alliance experience (Yin and Bao, 2006), 6) age of JV (Tsang *et al*., 2004), and 7) environmental challenge (Hau and Evangelista, 2007). Following the recent approach in the strategic alliance literature (Simonin, 1999a, 1999b, 2004; Yin and Bao, 2006; Tsang *et al*., 2004) and based on the underlying knowledge-based view (KBV) and organizational learning (OL) perspectives, this study fills in the literature gaps by specifically examining the effect of age of joint ventures (old vs. young JVs) as a moderating variable in the relationships between the RCHAR and two distinct dimensions of degree of technology transfer: degrees of tacit (TCTDEG) and explicit (EXPDEG) knowledge. The primary objective is to provide new insights and information on the boundary conditions for RCHAR-TTDEG relationship (Aguinis, 2004).

2. Theory and Hypotheses

The organizational learning (OL) literature suggests that acquiring and transferring technology require frequent and effective interactions between the supplier and recipient as knowledge is firm-specific, embedded in firm organizational context, personal quality in nature and idiosyncrasy (Nonaka, 1994; Kogut and Zander, 1992, 1993; Bresman *et al*., 1999). Studies have also acknowledged relationship quality (RELQLTY) as the critical element of relationship characteristic (RCHAR) in both intra and inter-firm knowledge transfer (Szulanski, 1996; Gupta and Govindarajan, 2000; Lin, 2005; Gupta, 1987; Wang *et al*., 2004; Bresman *et al*., 1999). RELQLTY promotes intimacy of relationship between the source and recipient unit (Szulanski, 1996), informality, openness and density of communication (Gupta and Govindarajan, 2000), and increases openness of communication, spontaneous and open exchange of information between interacting parties (Gupta, 1987). In the context of strategic alliance, RELQLTY promotes greater opportunities to learn, share and access alliance partners' strategic knowledge and competencies. It also creates higher relationship openness which could directly affect the willingness of alliance partner to share information and communicate openly (Inkpen, 1998a).

Previous studies have suggested that mutual trust (MT) creates opportunities for a mutual inter-organizational learning when partners become more open and committed in sharing their knowledge and competencies, less protective of their knowledge, and develop free exchange of information between partners (Inkpen, 2000). When the level of transparency or openness between the alliance partners is high, the propensity for inter-partner learning is also high as knowledge is more accessible due to free exchange of information (Hamel, 1991; Doz

and Hamel, 1998; Inkpen, 2000). MT encourages partners to be more open and transparent in exchanging, sharing, and transferring knowledge and technology between them due to non-existence of opportunistic behaviors (Kale *et al*., 2000; Gulati, 1995; Uzzi, 1997; Child and Faulkner, 1998; Steensma and Lyles, 2000; Lane *et al*., 2001). MT is found to have reduced search cost, increased benefits and alliance's performance (Gulati, 1995), increased alliance's cooperation, improved flexibility, reduced the coordinating activities cost, and increased knowledge transfer and learning (Smith *et al*., 1995).

The IJV literature suggests that the longer the collaborative relationships the greater the opportunity for JV partners to share, learn and transfer technology and knowledge between them. This is because the duration of relationship is positively associated with frequency of communication and information exchange between partners (Kale *et al*., 2000; Hallen *et al*., 1991; Foss and Pedersen, 2002). Nevertheless, duration of JV could also increase the propensity of losing the valuable proprietary asset to the other JV partner (Kale *et al*., 2000). From the strategic alliance perspective, as an alliance sustains overtime; age of JV (JVAGE) provides several effects such as it intensifies inter-partner trust, changes the bargaining power between partners, and develops partners' personal attachment (Gulati, 1995; Yan and Gray, 1994; Inkpen and Beamish, 1997). Empirical studies have found that the moderating effect of JVAGE has inconsistent results. Few empirical studies on inter-firm knowledge transfer in IJVs find JVAGE is insignificant in relationship between 1) knowledge acquisition-performance relationship, and 2) organizational characteristics, structural mechanisms, contextual factors, and knowledge acquisition relationship (Tsang *et al*., 2004; Lin, 2005; Lyles and Salk, 1996). Nevertheless, empirical studies have also recorded significant moderating effect of JVAGE on 1) ambiguity-knowledge transfer relationship, and 2) knowledge characteristics-marketing knowledge transfer relationship (Simonin, 1999a, 1999b). Therefore, this study hypothesizes as follows:

H1: The relationship between relationship characteristics and degree of tacit knowledge in inter-firm technology transfer is moderated by age of joint venture.

H2: The relationship between relationship characteristics and degree of explicit knowledge in inter-firm technology transfer is moderated by age of joint venture.

3. Methods

3.1 Sample

The sample frame was taken from the IJV companies registered with the Registrar of Companies (ROC). As at 1st January 2008, the number of IJVs operating in Malaysia was 1038. Out of this, 850 IJVs were considered as active IJVs and 103 IJVs were either dormant or had ceased operation. Since the focus of this study is on inter-firm TT from foreign MNCs to local companies, 85 IJVs were further eliminated from the population frame because only IJVs that have operated more than 2 years and have at least twenty percent (20%) of foreign equity are eligible to participate in the survey. Therefore, based on the list provided by ROC, which is considered as the most official and original source of information on foreign investment in Malaysia, it was decided that all IJVs (850) be included in the survey. Data collection was conducted in the period from July 2008 to December 2008 using a self-administered questionnaire. The questionnaires were mailed to 850 active JV companies as listed with ROC using a cover letter. After one month from the posting date the response was found not encouraging. By mid July 2008 there were only 70 responses received from the respondents. Thus, in order to increase the response rate the researcher followed-up through numerous phone calls, e-mails, reminders via letters and personal visits to seek the respondents' cooperation in the survey. After intensive efforts were made, by mid November 2008 a total of 145 responses (17.05%) were received. Based on literature review, the response rates for mailed questionnaires are usually not encouraging and low (Newman, 2003; Sekaran, 2003). In the Malaysian context, however, a response rate of 15% to 25% is still being considered appropriate and acceptable (Mohammed, 1998; Rozhan, Rohayu and Rasidah, 2001). From 145 responses only 128 questionnaires were usable and 17 questionnaires were returned blank, returned incomplete, or replied but unable to participate in the study.

3.2 Instrument and Measurement

The main research instrument in this study is the questionnaire. Building on the previous TT and KT studies, the questionnaire adopts a multi-item scales which have been modified accordingly to suit the context of the study: inter-firm TT. Except for degree of technology transfer (TTDEG), all the variables are measured using ten-point Likert Scale (1 = strongly disagree to 10 = strongly agree). For TTDEG, this variable is measured using ten-point Likert Scale (1 = very low transfer to 10 = substantial transfer). The ten-point Likert Scale was selected because 1) the wider distribution of scores around the mean provides more discriminating power, 2) it is easy to establish covariance between two variables with greater dispersion around their means, 3) it has been well established in

academic and industry research, and 4) from a model development perspective, a ten-point scale is more preferred (Allen and Rao, 2000).

3.3 Dependent Variable - Degree of Technology Transfer (TTDEG)

Following Lyles and Salk (1996), Lane *et al*. (2001), Gupta and Govindarajan (2000), Dhanaraj et al. (2004), Pak and Park (2004), Yin and Boa (2006) and Minbaeva (2007), this study adopts "a multi-dimensional operationalization approach" in measuring this construct. This study operationalizes TTDEG as the transfer of technological knowledge from two dimensions: 1) tacit knowledge (TCTDEG) in terms of new product/service development, managerial systems and practice, process designs and new marketing expertise, and 2) explicit knowledge (EXPDEG) in terms of manufacturing/service techniques/skills, promotion techniques/skills, distribution know-how, and purchasing know-how. The respondents were asked to evaluate TTDEG from MNCs to local firms in terms of tacit and explicit dimensions of technological knowledge. The Cronbach Alphas for TCTDEG and EXPDEG were 0.96 and 0.97 respectively. The results of Cronbach Alpha were quite similar to that of Hau and Evangelista (2007) and Yin and Bao (2006).

3.4 Independent Variables - Relationship Characteristics (RCHAR)

This study focuses on two distinct elements of RCHAR: relationship quality and mutual trust; which have been extensively discussed by theoretical studies (Gupta, 1987; Szulanski, 1996; Kale *et al*., 2000).

3.4.1 Relationship Quality (RELQLTY)

This study operationalizes RELQLTY in terms of relationship informality, openness and communication density; which increases the exchange of information, technology and knowledge between partners (Gupta, 1987; Gupta and Govindarajan, 2000; Lin, 2005). To capture this construct, this study employs a four (4) items scale developed by Lin (2005) in which the items are designed to capture 1) the local JV partner efforts in maintaining frequent interaction with the foreign JV partner, 2) the adequacy of the interaction, 3) the local JV partner effort in maintaining an amiable climate for the interaction, and 4) the local JV partner's effort in ensuring that interaction is a constructive mode. As RELQLTY (informality, openness and communication density) is explained by the relationship strength, this study adopts a seven (7) items scale adopted from Cavusgil *et al*. (2003), Chua (2002), and Fryxell *et al*. (2002). RELQLTY is measured in terms of 1) the desire to maintain a good social relationship by the foreign and local JV partners, 2) the foreign and local JV partners can freely talk to each other about difficulties (in general) they encounter with JV and they know that their concern will be addressed, 3) the foreign and local JV partners are confident in each other's capabilities, 4) the foreign and local JV partners are free to share their ideas, feelings and hope with each other, 5) the foreign and local JV partners are supportive of each other and they respond constructively and caringly to their partner's concern about the JV, 6) the foreign and local JV partners share a sense of togetherness, and 7) the foreign and local JV partners share organizational myths and stories with each other. The Cronbach Alpha for RELQLTY was slightly higher (0.96) than that of Lin (2005).

3.4.2 Mutual Trust (MT)

This study employs a six (6) items scale developed by Dhanaraj *et al*. (2004) and five (5) item scales from Kale *et al*. (2000) to measure MT between JV partners which include statements whether 1) the JV partners can understand each other well and quickly, 2) the JV partners have the feeling of being mislead, 3) the JV partners make damaging demands, 4) the stronger JV partner pursues its interest at all costs, 5) the informal agreement are perceived as significant as formal agreement, and 6) the JV partners take advantage on the weakness of the other party (Dhanaraj *et al*., 2004). In addition, five (5) more items are adopted from Kale et al. (2000) with respect to statements whether the JV is characterized by close interaction, mutual respect, mutual trust, personal friendship, and reciprocity between the JV partners at multiple levels. The Cronbach Alpha was lower slightly lower (0.88) than Dhanaraj *et al*. (2004).

3.5 Moderating Variable - Age of Joint Venture (JVAGE)

In measuring JVAGE this study required the respondents to indicate the JV's number of years in operation based on items coded: 0 = old joint ventures (number of years > 10 years) and 1 = young joint ventures (number of years < 10 years) (Tsang *et al*., 2004; Lin, 2005; Simonin, 1999a; Luo, 2001).

3.6 Model and Analysis

The moderated multiple regression (MMR) analysis is described as an inferential procedure which consists of comparing two different least-squares regression equations (Aguinis, 2004; Aiken and West, 1991; Cohen and Cohen, 1983; Jaccard *et al*., 1990). Using the MMR analysis, the moderating effect of the variable (product term)

was analyzed by interpreting 1) the R^2 change in the models obtained from the model summaries, and 2) the regressions coefficients for the product term obtained from the coefficients tables. Prior to conducting the MMR analysis, preliminary analyses were conducted to ensure that there was no violation of the assumptions of normality, linearity, homoscedasticity, and homogeneity of error variance. The population data was carefully examined to avoid the occurrence of 1) Type 1 error; which is the error of rejecting the true null hypotheses at a specified α, and 2) Type 2 error (β); which is the error of failing to reject a false null hypotheses at a specified power (Aguinis, 2004). In this study, Equation 1 below was used to represent the variables in the ordinary least-squares (OLS) model:

$$\text{Equation 1 (OLS model):} \quad Y = \beta 0 + \beta 1X + \beta 2Z + e$$

To determine the presence of moderating effect, the OLS model was then compared with the MMR model which was represented by Equation 2 below:

$$\text{Equation 2 (MMR model):} \quad Y = \beta 0 + \beta 1X + \beta 2Z + \beta 3X*Z + e$$

where, Y = degree of technology of transfer (TCTDEG and EXPDEG as the dependent variables), X = relationship characteristics (relationship quality and mutual trust), Z = a hypothesized binary grouping moderator (JVAGE; old vs. young JVs), X*Z = the product between the predictors (RCHAR*JVAGE), β0 = the intercept of the line-of-best-of-fit which represents the value of Y when X = 0, β1 = the least-squares estimate of the population regression coefficient for X, β2 = the least-squares estimate of the population regression coefficient for Z, β3 = the sample-base least-squares estimates of the population regression coefficient for the product term, and e = the error term. The moderating variable (product term) is a binary grouping moderator; where the moderating variable JVAGE was coded using the dummy coding system; 0 = old JVs, and 1 = young JVs. This was done because of its simplicity and ease of interpretation of results when making comparisons between different groups (Aguinis, 2004).

4. Results

Table 1 and Table 2 show the model summary for both degrees of tacit (TCTDEG) and explicit (EXPDEG) knowledge. The coefficients for all variables for Model 1 and Model 2 (for both TCTDEG and EXPDEG) are presented in Table 3 and Table 4. Table 1 shows that for Model 1, $R = .571$, $R^2 = .326$ and [F (2, 125) = 30.248, $p = .0001$]. This R^2 means that 32.6% of the variance in the TCTDEG is explained by RCHAR scores and JVAGE. Model 2 shows the results after the product term (RCHAR*AGE) was included in the equation. Table 1 also indicates that the inclusion of the product term resulted in an R^2 change of .040, [F (1, 124) = 7.732, $p < 0.01$]. The results support the presence of a moderating effect. To put it differently, the moderating effect of JVAGE explains 4.0% variance in the TCTDEG above and beyond the variance by RCHAR scores and JVAGE. Thus, it can reasonably be concluded that hypothesis *H1* is supported.

Table 2 shows that for Model 1, $R = .609$, $R^2 = .371$ and [F (2, 125) = 36.803, $p = .0001$]. This R^2 means that 37.1% of the variance in the EXPDEG is explained by RCHAR scores and JVAGE. Model 2 also shows the results after the product term (RCHAR*JVAGE) was included in the equation. Table 2 above indicates that the inclusion of the product term resulted in an R^2 change of .002, [F (1, 124) = 0.302, $p > 0.05$]. The results show no presence of significant moderating effect. To put it differently, the moderating effect of JVAGE explains only 0.2% variance in the EXPDEG above and beyond the variance by RCHAR scores and JVAGE. Thus, it can safely be concluded that hypothesis *H2* is not supported. The coefficients table for TCTDEG as shown in Table 3 depicts the results of the regressions equation for Model 1 and Model 2. Model 1 indicates that RCHAR was statistically significant ($p < 0.001$; Beta value = 0.476); and JVAGE was statistically significant ($p < 0.001$; Beta value = -0.274). Equation 3 below shows that for a 1-point increase in RCHAR, the TCTDEG is predicted to have a difference by .102, given that the JVAGE is held constant. The regression coefficient associated with JVAGE means that the difference in TCTDEG between old and young JVs is -3.185, given that RCHAR is held constant.

$$\text{Equation 3:} \quad TCTDEG = 10.121 + .102RCHAR - 3.185JVAGE$$

The high-order of interaction effects of the MMR test was conducted to differentiate the extent of TCTDEG that was influenced by old and young JVs. Model 2 shows the results after the product term (RCHAR*JVAGE) was included in the equation. As indicated in Table 1 the inclusion of product term resulted in an R^2 change of .040, [F (1, 124) = 7.732, $p < 0.01$]. Model 2 shows RCHAR was highly significant ($p < 0.001$; Beta value = .655). Both JVAGE and RCHAR*JVAGE were also found to be significant ($p < 0.05$; Beta value = .809 and $p < 0.01$; Beta value = -1.100, respectively). The results support the presence of a significant moderating effect. Table 3

also reveals information on the regression coefficients after the inclusion of product term in the equation. The equation for Model 2 is as follows:

Equation 4: TCTDEG = 4.414 + .140RCHAR + 9.395JVAGE - .086RCHAR*JVAGE

As indicated above, the interpretation of the regression coefficients is based on the fact that the binary moderator was coded using the dummy code system. The result for Model 2 indicates that for a 1-point increase in the RCHAR, the TCTDEG is predicted to have a difference by .140, given that JVAGE is held constant. The interpretation of the regression coefficients for the product term in Equation 4 is that there was a -.086 difference between the slope of TCTDEG on RCHAR between old and young JVs. In other words, the slope regressing TCTDEG on RCHAR is steeper for young JVs as compared to old JVs. The RCHAR and TCTDEG relationship for old and young JVs is shown in Figure 1 below by creating a graph displaying the relationships for each of the groups (Aguinis, 2004). From the results of descriptive statistics, the value of the mean score for RCHAR is 6.68; and for the standard deviation (*SD*) is 1.23. Following Aguinis (2004), the value 1 *SD* above the mean is 7.91 and the value 1 *SD* below the mean is 5.45. Thus, using the value of 1 *SD* above and 1 *SD* below mean in Equation 4 yields the graph shown in Figure 1. Results based on Equation 4 led to the conclusion that there was a significant moderating effect of JVAGE. Figure 1 below shows that the RCHAR-TCTDEG relationship is stronger (i.e. steeper slope) for young JVs as compared to old JVs. The coefficients table for EXPDEG as shown in Table 4 depicts the results of the regressions equation for Model 1 and Model 2.

Model 1 indicates that both RCHAR and JVAGE were statistically significant ($p < 0.001$; Beta value = 0.564; $p < 0.001$; Beta value = -0.182, respectively). Equation 5 below shows that for a 1-point increase in RCHAR, the EXPDEG is predicted to have a difference by .112, given that the JVAGE is held constant. The regression coefficient associated with JVAGE means that the difference in EXPDEG between old and young JVs is -1.964, given that RCHAR is held constant.

Equation 5: EXPDEG = 10.372 + .112RCHAR - 1.964JVAGE

Model 2 shows the results after the product term (RCHAR*JVAGE) was included in the equation. As indicated in Table 2 the inclusion of product term resulted in an R^2 change of .002, [F (1, 124) = 0.302, $p > 0.05$]. RCHAR was found statistically significant ($p < 0.001$; Beta value = 0.599); whereas both JVAGE and RCHAR*JVAGE were not statistically significant (both at $p > 0.05$). The results did not show the presence of a significant moderating effect. Table 4 also reveals information on the regression coefficients after the inclusion of product term in the equation. The equation for Model 2 is as follows:

Equation 6: EXPDEG = 9.333 + .119RCHAR + .327JVAGE - .016RCHAR*JVAGE

The result for Model 2 indicates that for a 1-point increase in the RCHAR, the EXPDEG is predicted to have a difference by .119, given that JVAGE is held constant. The interpretation of the regression coefficients for the product term in Equation 6 is that there was a -.016 difference between the slope of EXPDEG on RCHAR between old and young JVs. The slope regressing EXPDEG on RCHAR is almost similar for old JVs and young JVs. The RCHAR and EXPDEG relationship for old and young JVs is also shown in Figure 1 below. The value of the mean score for RCHAR is 6.68 and for the standard deviation (*SD*) is 1.23. The value 1 *SD* above the mean is 7.91, and the value 1 *SD* below the mean is 5.45. Thus, using the value of 1 *SD* above and 1 *SD* below mean in Equation 6 yields the graph shown in Figure 1. Results based on Equation 6 led to the conclusion that there was no significant moderating effect of JVAGE. Although insignificant, Figure 1 below indicates that the RCHAR-EXPDEG relationship has almost similar strength (i.e. parallel slope) for young and old JVs.

5. Discussion and Conclusion

Building on the underlying KBV and OL perspectives, this study has bridged the literature gaps by providing empirical evidence and new insights on the significant moderating effects of age of JVs (JVAGE) in the relationships between relationship characteristics (relationship quality and mutual trust) and two dimensions of degree of technology transfer: degrees of tacit and explicit knowledge using the Malaysia sample. The results suggest that, in comparison, the inclusion of age of JVs (old vs. young JVs) in RCHAR-TCTDEG relationship has a significant moderating effect in changing the degree (volume) of tacit knowledge only ($p < 0.01$; *R*-squared change of 0.040) not degree of explicit knowledge ($p > 0.05$; *R*- squared change of 0.002). The moderating effect of JVAGE is shown to be capable of changing the nature of relationship and further explains under what conditions RCHAR causes TCTDEG. The presence of significant moderating effect of JVAGE (old and young JVs) exceeded the linear relationship between RCHAR and TCTDEG. The result are consistent with recent literature which has strongly supported the significant role of JVAGE (Foss and Pedersen, 2002; Kale *et*

al., 2000; Tsang et al., 2004; Simonin, 2004). The results further suggest that JVAGE; whether old or young JVs, has been established to provide a significant moderating impact in RCHAR-TCTDEG relationship in the JVs.

The results also provide critical information in such that although transferring tacit knowledge in IJVs requires the partners to 1) have frequent and effective interactions between partners, openness, spontaneous, and adequacy of communication; which could create potentials for numerous individual exchanges between the JV partners (Szulanski, 1996; Lin, 2005; Inkpen, 2000), and 2) reduce the existence of suspicious feelings between partners in JVs; which could create opportunities for close interactions, increase confidence that both partners would not take advantage on each other, and promote transparency (Kale *et al*., 2000); nevertheless, since tacit knowledge is regarded as strategic/valuable asset and main source of competitive advantage of the technology suppliers, notwithstanding whether the technology transfer takes place within old or young JVs, the propensity of transferring a higher degree of tacit technologies is unlikely to occur possibly because of the fear of losing the valuable proprietary asset to the recipient JV partners (Kale *et al*., 2000). Although a longer period of collaborative relationship in JVs could escalate the opportunity to share, learn, and transfer technologies between JV partners; which is resulted from the decrease of cultural distances, increase of inter-partner trust and personal attachment between partners (Gulati 1995; Yan and Gray, 1994), however, alliances and JVs have frequently been perceived as 'a race to learn' and associated with instability. Therefore a longer duration of JVs may cause a shift (increase) in the supplier partners' bargaining power thus eliminating their partner dependency on the recipient partners (Inkpen and Beamish, 1997).

On the other hand, the supplier partners in young JVs are normally reluctant to invest a higher degree of resources (both capital and human resources) in the newly formed JVs. Their attitude is closely associated with the skeptical feelings towards the recipient partners' true learning intent (whether competitive vs. collaborative) thus making them more protective of their valuable technologies from the recipient partners (Child and Falkner, 1998; Khanna *et al*., 1998; Hamel, 1991). Moreover, with less IJVs experience; especially in handling cultural differences, young JVs are most unlikely to undertake technology transfer of tacit knowledge as compared to old JVs especially if the transfer involves technologies which form the strategic valuable resources, competencies and main source of sustainable competitive advantage of the recipient partners (Porter, 1985; Barney, 1991; Peteraf, 1993; Wernerfelt, 1984; Pralahad and Hamel, 1990). This is consistent with the argument made by Dierickx and Cool (1989) who argued that acquiring tacit technologies are subjected to time-compression diseconomies; where to accelerate acquisition of tacit knowledge in a short period of time is rather challenging or perhaps impossible regardless how much efforts or resources have been invested in acquiring them. The results further support and extend the empirical findings by Simonin (1999a), Luo (2001) and Kale *et al*. (2000).

One of the major limitations encountered by this study was the resource constraints; where this study has mainly relied on responses obtained from the top management level of the IJVs. Thus, the scope of respondents could have been extended to include the response from middle and lower management levels in the JVs. Secondly, consistent with the literature, the subjectivity of nature of relationship is difficult to capture. Therefore, the nature of relationship between IJV partners could have tremendously affected the results if the respondents perceived that the IJVs were competitive in nature rather than collaborative. Thirdly, due to lack of awareness on academic research the response rate in terms of the number of usable questionnaires, though sufficient, was not encouraging. This has become a major challenge to many researchers who conduct organization studies in Malaysia. Finally, due to time constraints, the types of technology under investigation in this study were limited to tacit vs. explicit knowledge dimension.

This empirical study is a response to the need for statistical evidence that has typically been lacking in inter-firm TT literature. Since this study focuses on degree of inter-firm TT, future studies could be conducted to further examine the moderating effects of age of JVs in the relationships between other technology transfer characteristics such as the recipient, supplier and knowledge characteristics and degree of technology transfer. Secondly, the above relationship could also be extended to cover other formal and externalized inter-firm TT agents such as FDIs and licensing. Thirdly, it is worthwhile to extend the tacit and explicit dimension of technology to cover other dimensions of supply chain activities such as production, marketing, management, and distribution. Fourthly, since the IJV literature has highlighted the high instability rate of IJVs in developing countries, future studies could be directed to empirically examine the moderating effect of age of JVs in the relationships between degree of inter-firm TT and conflicts, learning outcomes, asymmetric bargaining power, stability of JV, and equity ownership. Finally, future studies could further investigate the effects of few other established moderating variables such as organizational culture, collaborative know-how, prior JV experience, and learning capacity on the above relationships to provide new insights and information on the boundary conditions for relationship characteristics-degree of technology transfer relationship.

Abbreviations

EXPDEG	Degree of Explicit Knowledge
IJV	International Joint Venture
JV	Joint Venture
JVAGE	Age of Joint Venture
KBV	Knowledge-Based View
KT	Knowledge Transfer
MMR	Moderated Multiple Regression
MNCs	Multinational Corporations
MT	Mutual Trust
OL	Organizational Learning
OLS	Ordinary Least Square
RCHAR	Relationship Characteristics
RELQLTY	Relationship Quality
ROC	Registrar of Companies
SD	Standard Deviation
TCTDEG	Degree of Tacit Knowledge
TT	Technology Transfer
TTDEG	Degree of Technology Transfer

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Table 1. Model Summary - Degree of Tacit Knowledge

Model Summary[c]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.571[a]	.326	.315	4.802	.326	30.248	2	125	.000
2	.605[b]	.366	.350	4.678	.040	7.732	1	124	.006

a. Predictors: (Constant), JVAGE, RCHAR

b. Predictors: (Constant), JVAGE, RCHAR, RCHAR*JVAGE

c. Dependent Variable: TCTDEG

Table 2. Model Summary - Degree of Explicit Knowledge

Model Summary[c]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.609[a]	.371	.361	4.302	.371	36.803	2	125	.000
2	.610[b]	.372	.357	4.314	.002	.302	1	124	.584

a. Predictors: (Constant), JVAGE, RCHAR

b. Predictors: (Constant), JVAGE, RCHAR, RCHAR*JVAGE

c. Dependent Variable: EXPDEG

Table 3. Coefficients[a] - Degree of Tacit Knowledge

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	10.121	2.421		4.181	.000	5.330	14.913
	RCHAR	.102	.016	.476	6.460	.000	.071	.133
	JVAGE	-3.185	.856	-.274	-3.720	.000	-4.880	-1.490
2	(Constant)	4.414	3.126		1.412	.160	-1.774	10.602
	RCHAR	.140	.021	.655	6.795	.000	.099	.181
	JVAGE	9.395	4.600	.809	2.042	.043	.289	18.500
	RCHAR*JVAGE	-.086	.031	-1.100	-2.781	.006	-.147	-.025

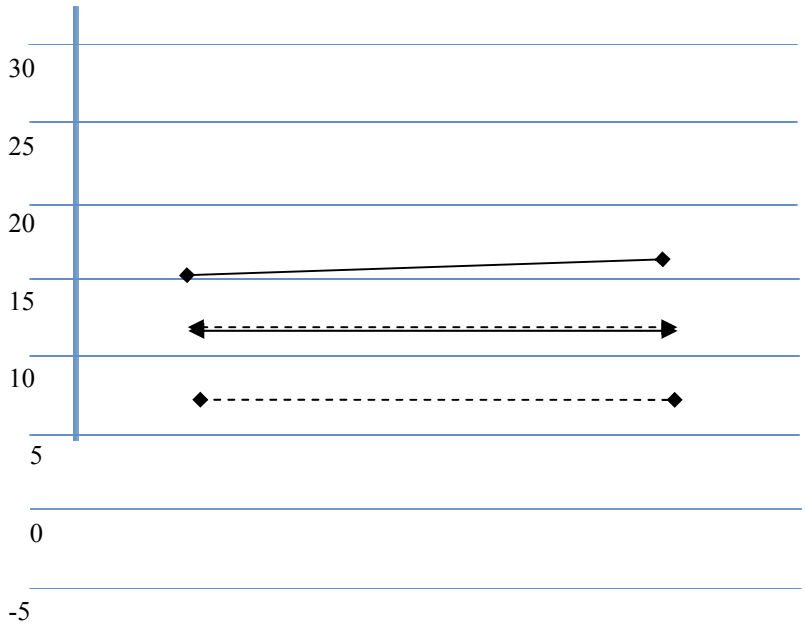
a. Dependent Variable: TCTDEG

Table 4. Coefficients[a] - Degree of Explicit Knowledge

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	10.372	2.169		4.782	.000	6.080	14.665
	RCHAR	.112	.014	.564	7.918	.000	.084	.140
	JVAGE	-1.964	.767	-.182	-2.560	.012	-3.483	-.446
2	(Constant)	9.333	2.883		3.237	.002	3.626	15.040
	RCHAR	.119	.019	.599	6.248	.000	.081	.156
	JVAGE	.327	4.243	.030	.077	.939	-8.071	8.725
	RCHAR*JVAGE	-.016	.028	-.216	-.549	.584	-.072	.041

a. Dependent Variable: EXPDEG



Low TCTDEG / EXPDEG (1 *SD* below mean) High TCTDEG / EXPDEG (1 *SD* above mean)

Young JVs (TCTDEG) Old JVs (TCTDEG)

Young JVs (EXPDEG) Old JVs (EXPDEG)

Figure 1. Slopes for both TCTDEG and EXPDEG on RCHAR for JVAGE

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