

Influence of Subsidiary Business Networks on the Performance of Inter-Subsidiary Innovation Transfer in MNCS

Abstract

This research aims to understand inter-subsidiary innovation transfers from a fine-grained perspective. Having transfer performance as the key outcome variable, we examine this issue with particular interest in the influence of subsidiary business networks, i.e. internal network in MNCs and external networks with local counterparts. The significance of subsidiary business networks, though has been identified in IB literature, is still under-scrutinized at project-level performance. Utilizing the data of 129 inter-subsidiary transfer projects, the results suggest that the counterparts from different subsidiary business networks affect transfer performance distinct moderating patterns.

Keywords

Innovation transfer, subsidiaries, business networks, transfer performance

Introduction

The main purpose of the study is to examine the performance of inter-subsidary innovation transfer with particular regard to the influence of subsidiary business networks in innovation development processes. Extant literature on knowledge transfer has discussed in considerable detail of how knowledge characteristics and absorptive capacity could influence the transfer process in general. Attention has also been paid to the organisational context as highly relevant to knowledge management of MNCs. Thus subsidiary autonomy and a cooperative knowledge-sharing atmosphere are suggested to improve intra-firm knowledge transfer. These studies have provided us with a robust background to investigate the innovation transfer from an alternative subsidiary perspective. By subsidiary innovation we mean the development and economic utilization of new products, processes or services by a foreign subsidiary. In this study we build on existing knowledge on inter-MNC knowledge transfer, and particularly on inter-subsidary knowledge transfer to better understand factors affecting the performance of the transfer process specifically involving subsidiary innovations.

Foreign subsidiaries operate in a host country environment and, at the same time, they are still a unit in an MNC network (Hewett *et al.*, 2003). A foreign subsidiary is engaged in business relationships with other units within as well as outside the MNC. The context subsidiaries embedded in comprises external network at local host country and internal network under MNC structure (Holm *et al.*, 1995). In particular their knowledge creating and innovative activities are significantly affected by their engagements in such networks (Andersson *et al.*, 2007; Forsgren *et al.*, 2005). Although both internal and external networks are important source of support vis a vis subsidiary knowledge development, the two networks are likely to differ in how they influence subsidiary innovations. Our study is particularly interested in how the performance of inter-subsidary innovation may be affected by its network context. Specifically, whether innovations derived from different networks are also expected to vary in terms of transfer performance.

Prior literature on knowledge transfer has paid scant attention to the impact of a subsidiary's innovation development process on the performance of the transfer process. The literature does acknowledge that the innovation development process is highly related to the characteristics of knowledge created (Foss *et al.*, 2002; Hansen *et al.*, 2005). However how or whether the development process also affects the performance of the transfer process has not been subject to investigation. Therefore, this research aims to enhance the current understanding of innovation transfer by incorporating subsidiary innovation development process in examining transfer performance. It is expected that this study will provide a more comprehensive perspective in scrutinizing the performance of innovation transfer at subsidiary levels.

This study aims to contribute to this research stream by taking the identified factors of innovation transfer as control variables and further examining in what ways subsidiary-embedded networks influence the transfer outcome. Both direct and indirect influence will be tested to demonstrate how development counterparts from the two subsidiary networks may have influence transfer performance in different ways. Our research approach focuses on how a subsidiary's engagement in internal and external networks with respect to its innovation development moderates the efficiency and effectiveness underlying transfer dyad between it and recipient subsidiaries.

Literature Overview and hypotheses

In this section we aim to utilise existing literature to derive hypotheses linking the development of a subsidiary's innovation within external and internal networks to the performance aspects of the transfer of innovation to sister subsidiaries. We first consider two key dimensions of transfer performance: efficiency and effectiveness. We then combine insights from the extant literature on knowledge transfer and subsidiary business networks to

formulate hypothesis: how the innovative inputs sourced by the subsidiary from its internal and external networks can moderate the effects efficiency and effectiveness outcomes of the transfer process

Transfer Performance

Whilst MNCs are often assumed to be relatively cost-efficient and instant to transfer knowledge across subunits, many studies indicate that internal knowledge transfer are still costly (Teece, 1977). Innovation transfer between subsidiaries takes time, costs money and consumes resources of both source subsidiary and recipient (Reagans *et al.*, 2003; Teece, 1977). As MNCs counts on innovation transfer, lowering the costs associated with transfers is of considerable importance. Subsidiaries encounter difficulty in handling the dual tasks of developing new knowledge and transferring knowledge (Andersson *et al.*, 2006). There is a potential trade-off between resources deployed in knowledge transfer and those deployed in creating innovation due to the time and cost of both tasks (Adenfelt *et al.*, 2006; Forsgren *et al.*, 2000). This challenge may result in focusing on the task of transferring knowledge at the expense of developing new knowledge. Transfer performance is hence particularly important in this research as we target at the innovation transfer from the innovation developer. The innovation transfer performance not only affects the transfer of innovation but also the activities of innovation development.

Though the best performance for a transfer project conceivably is efficient and effective, in many situations managers need to prioritize one aspect over others. Therefore the evaluation of several aspects of transfer performance will allow a more detailed analysis of relevant factors (Brown *et al.*, 1995; Szulanski, 1996). Transfer performance is conceptualized from two dimensions: efficiency and effectiveness (Szulanski, 1996). Innovation transfer performance can be measured by the efficiency and effectiveness of delivering a piece of innovation from the source to a targeted recipient. Daft (1992) argues

that effectiveness can be evaluated in terms of the extent to which the goal is reached or the task is completed. Hence, each transfer case can be evaluated by its effectiveness, i.e. the degree of completeness and satisfaction. Efficiency, according to Daft (1992), refers to the resource cost incurred during the transfer process. The cost incurred by the providing subsidiary gives critical information about how much personnel and resources has been devoted. Transfer efficiency is measured in terms of its cost and speed of adoption.

Innovation Transfer in MNCs

MNCs are important in the world economy partly due to their role in diffusion technology and knowledge from one area to another through their integrated network of subsidiaries. From perspective of the headquarters, it is important whether a subsidiary's innovation efforts has a wider implication for the group as a whole as this sort of cross unit applicability provides a potential for significant scope economies in product development for the MNC as a whole (Yamin, 1999). By internally transferring an innovation, an MNC can employ it on a larger scale and the profit from it can be multiplied. Thus, the capabilities to create and to transfer innovations at the corporate level constitute the essence of the innovative MNC and are the basis of its competitive advantage.

Innovation in this study is defined as the development and economic utilization of new products, processes or services (OECD, 1999; Schumpeter, 1934; Thompson, 1965). It consists of knowledge on how to do things better than the current state of the art (Teece, 1986). Innovation is a relatively newly-developed knowledge. Due to the newness and novelty of innovation, recipients may perceive a greater potential benefit and may have an incentive to adopt this innovation from the innovative subsidiary. Innovation transfer refers to the process whereby a piece of innovation is delivered, by means of selected mechanisms (e.g., face-to-face communication, personal exchange, project team), from the source unit to a specific and distinct unit. It is a targeted process between subsidiaries, which excludes

involuntary diffusion, where the source subsidiary transfers it to one or several other subsidiaries within the MNC boundaries.

Characteristics of knowledge

The characteristics of knowledge itself have long been a major focus of knowledge transfer studies. Hamel et al. (1989) indicate that knowledge transfer depends on how easily that knowledge can be transported, interpreted, and absorbed. In the knowledge transfer literature there are several constructs/features that have frequently been adopted to measure the degree to which a piece of knowledge can be easily communicated and understood and thus applied. Among them, tacitness and complexity are the two key attributes most referred (Hansen, 1999; Szulanski, 1996; Zander et al., 1995, etc). Tacit knowledge is deeply rooted in action and in individual's involvement within a specific context (Nonaka, 1994). Complexity arises from large numbers of technologies, organization routines, and individual- or team-based experience (Zander & Kogut 1995). Knowledge tacitness and complexity generate ambiguity and act as a powerful block on imitation (Lippman et al., 1982). Although the codification of knowledge may smooth the progress of knowledge transfer, it also runs a higher risk of imitation by competitors. The deliberate transfer of tacit and complex knowledge to other subsidiaries is thus a relatively difficult process. To transfer a tacit and complex knowledge, a source-recipient dyad often needs more frequent and intensive interactions to improve the comprehension by the recipient.

Source-recipient dyadic relationship

Cohen and Levinthal (1990) define absorptive capacity as one's ability to recognize the value of new information, assimilate it, and apply it to commercial ends. This study is particularly concerned about the dyadic absorptive capacity which develops along with previous "partner-specific" experience of collaboration and understanding (Dyer et al., 1998;

Lane *et al.*, 1998). A source subsidiary's transfer of a specific knowledge to two distinct subsidiaries may produce different results as there may be dyadic-specific influences on the outcomes. Therefore it is important that the absorptive capacity is examined for each transfer pair, i.e. source-recipient dyad.

Prior related knowledge shapes the filters through which the units differentiate and value the incoming information. Familiarity with the incoming technical knowledge influences the recipient unit's ability to internalize and assimilate the more valued signals (Cohen *et al.*, 1990). When both the source and recipient subsidiaries operate from the same knowledge bases, the cost of transferring knowledge is substantially lower (Cho *et al.*, 2004). Previous collaborative experience facilitates recipient subsidiaries to fill in the gaps left by codified descriptions with their prior knowledge. Activities performed by source-recipient dyad, through their relationship, can be adapted to each other so that their combined efficiency will improve (Anderson *et al.*, 1994).

MNC's organizational context

Literature in knowledge management often relates autonomy to knowledge creation and suggests that subsidiary autonomy will improve subsidiary innovativeness. Autonomy allows subsidiary to tap into local networks and thus create more innovations. In highly centralized MNCs, subsidiaries are left with limited slack resources to carry out research and development activities. A subsidiary with more autonomy tends to develop more innovation and therefore diffuse more (Ghoshal *et al.*, 1988; Venaik *et al.*, 2005, etc). A positive effect is proposed between subsidiary autonomy and knowledge transfer (Foss *et al.*, 2002; Ghoshal *et al.*, 1988). Greater autonomy is likely to motivate subsidiary managers to take initiatives, which may result in more innovations being developed (Birkinshaw *et al.*, 1998; Venaik *et al.*, 2005). This study conceptualized subsidiary autonomy by its authority (relative to headquarters' authority) to make decisions on certain issues.

Subsidiary strategic behaviour is also greatly influenced by performance evaluation criteria. The criteria employed by MNC headquarters to evaluate subsidiary performance have a huge impact on what subsidiaries pay attention to and to what extent (O'Donnell, 2000). The greater importance attached to innovation transfer when evaluating subsidiary performance, the more innovation is transferred from subsidiary to other MNC units.

Though headquarters are neither source nor recipient in inter-subsidiaries innovation transfer, they may still affect the innovation transfer process as an influential third party. The authority position to some extent grants headquarters power to give orders to subsidiaries. The commands from headquarters are believed to be important in influencing subsidiaries' attitudes toward knowledge out-flow and also the performance of transfer between subsidiaries (Ghoshal *et al.*, 1994; Holm *et al.*, 1996).

Subsidiary business networks

Innovation transfer is the transfer of a specific type of knowledge – newly developed and utilized knowledge. Thus the factors that have been highlighted as influences on knowledge transfer – discussed in previous sections – are certainly relevant for innovation transfer as well. However the development process of the innovation is likely to affect the transfer process and performance and this aspect has long been neglected in the literature. Thus in this section we focus on a subsidiary internal and external business networks as influences on the knowledge development process and infer implications for the transfer process. The two idiosyncratic business networks of a subsidiary are unique and critical to subsidiary business activities but often left out in relevant research.

Subsidiaries are related to sister subsidiaries and headquarters in MNC network and local customers and suppliers in host market. Some subsidiaries may have more interdependent

activities with fellow subsidiaries and less with local counterparts whilst some may be the opposite. Even a focal subsidiary has direct linkages with both fellow subsidiaries and local counterparts the importance of such linkages varies as the more interdependent linkages are expected to influence the focal subsidiary's activities to a larger extent. Because the content of linkages differs an indirect important relationship may be more critical than an unimportant direct one. Thus, business network perspective suggests that the extent to which a subsidiary is embedded in the business network is more critical to its network position.

Holm & Pedersen (2000) indicate that the subsidiary's set of demanding external business relationships stimulates the subsidiary's ability to develop specialized and unique competence. The interaction with counterparts in host market reinforces subsidiary's ability to innovate and create new knowledge (Forsgren *et al.*, 2000). Meanwhile the close relationship with MNC units provides subsidiary with the necessary support, financial and technical resources for instance, to develop knowledge. Therefore to analyse a subsidiary's ability to create knowledge, the researcher should not only examine the network position of the focal subsidiary but also scrutinize its business network and the depth of each relationship to identify the source of key influence.

Source of knowledge inputs

To a subsidiary there are primarily two sources of knowledge inputs when developing innovations: external network in host market and internal MNC network. Both networks often provide subsidiaries with relevant ideas, technology, know-how and financial support to develop knowledge. By knowing how a source of knowledge influences the innovation transfer process and transfer performance, headquarters and subsidiaries may adjust their strategies of knowledge acquisition and/or innovation development approach.

With more individual and direct contacts with local business counterparts and the advantage of geographic vicinity, subsidiaries are more aware of the host market information and tend to grasp innovative opportunities in a timely manner. Their abilities to assimilate newly acquired information are largely dependent on the closeness of existing relationships with local business partners (Hakanson *et al.*, 2001). The frequent and long-term interactions and collaboration experience with these external business counterparts often provide subsidiaries a source of novel ideas and help develop subsidiary capabilities (Almeida, 1996; Andersson *et al.*, 2000; McEvily *et al.*, 1999, etc). Innovative ideas and new product development are therefore to a large extent locally driven.

The subsidiaries that are more closely linked to external counterparts (relative to parent and sister units in MNC networks) are more likely to be the source of somewhat more novel and possibly more strategically valuable new knowledge for the MNC (Yamin, 2005). In terms of Hansen's analysis of knowledge sharing across organizational subunits, 'weak-coupling' between sub units has the advantage of offering greater 'search' opportunities for identifying novel ideas, concepts and practices useful in product development and innovative activities of the searching subunit (Hansen, 1999; Hansen, 2002). Inputs from external counterparts tend to add fresher content into generated knowledge, which other fellow subsidiaries may not be familiar with. Thus, externally sourced knowledge may trigger higher interests in MNC network and provide greater incentive to carry out the transfer process. Therefore the external source of knowledge inputs is proposed to moderate the significance of dyadic relationship to transfer performance. We hypothesize:

*Hypothesis 1a: External source of knowledge inputs have positive moderating effect
between dyadic willingness and transfer efficiency*

*Hypothesis 1b: External source of knowledge inputs have positive moderating effect
between dyadic willingness and transfer effectiveness*

*Hypothesis 2a: External source of knowledge inputs have negative moderating effect
between dyadic absorptive capacity and transfer efficiency*

*Hypothesis 2b: External source of knowledge inputs have positive moderating effect
between dyadic absorptive capacity and transfer effectiveness*

Meanwhile, internal network with parent companies and fellow subsidiaries should not be undervalued as they may be of great assistance to offer technical support. Though subsidiaries have evolved to undertake more knowledge creating activities, they are less likely to devote great amounts of resource in basic research. Basic research is still mostly carried out at headquarters' level or with the finance and technology support from headquarters. Headquarters may not be as familiar with subsidiary local market demand or not as innovative as local counterparts, but they are often superior in their knowledge of core technology and advanced in basic research.

Innovation with more internally-sourced knowledge inputs is suggested to be the knowledge most easily transferable in the MNC network. This is because such knowledge is primarily derived from the MNC core technology/know-how. Because a similar knowledge background is shared across MNC units the absorptive capacity of a target recipient subsidiary is likely to be relatively higher. Moreover, it is plausible that the MNC units are willing to take part in the knowledge development process because of the potential to transfer to fellow units. For example if fellow subsidiaries perceive the knowledge-to-be-developed as transferable, applicable and beneficial to their local market they will be more motivated to support and participate in the development process.

Moreover the knowledge is path dependent on the developer's earlier technological and organizational trajectories (Nonaka *et al.*, 1995; Rugman *et al.*, 2001). External business partners tend to hold distinctive trajectories from those of units in MNC networks. The innovation developed with inputs from external partners may be unfamiliar to the other

subsidiaries. On the contrary similar technology background and organizational culture is shared within MNCs. The recipient subsidiaries share greater similarity in technology to the knowledge developed with MNC units compared to that sourced primarily from external business counterparts (Foss *et al.*, 2002). Hence the internally-sourced knowledge can be easily understood and adopted by recipient subsidiaries. Existing transmission channels may be sufficient for the transfer between subsidiaries. Here we propose the following hypotheses:

Hypothesis 3a: Internal source of knowledge inputs have negative moderating effect between dyadic willingness and transfer efficiency

Hypothesis 3b: Internal source of knowledge inputs have negative moderating effect between dyadic willingness and transfer effectiveness

Hypothesis 4a: Internal source of knowledge inputs have negative moderating effect between dyadic absorptive capacity and transfer efficiency

Hypothesis 4b: Internal source of knowledge inputs have negative moderating effect between dyadic absorptive capacity and transfer effectiveness

Figure 1 illustrates the research hypothetical framework.

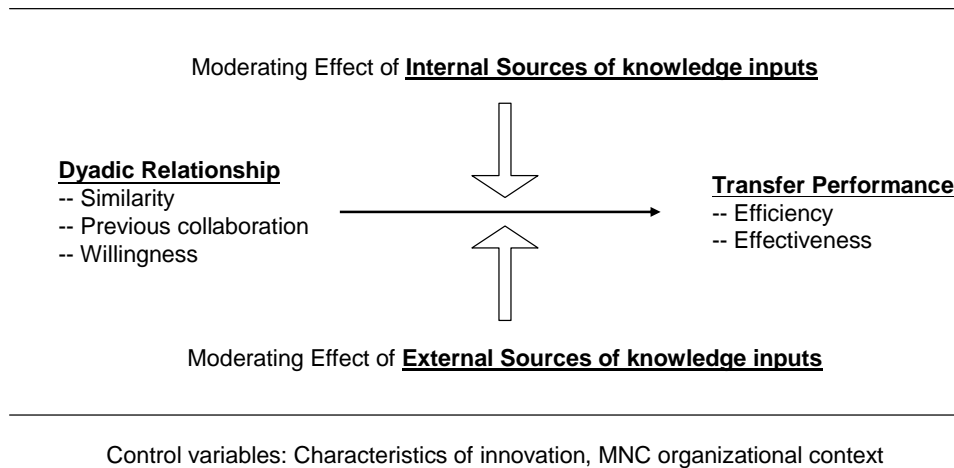


Figure 1: Research Framework

Methodology Synopsis

There are several criteria for the selection of innovation to further identify the target populations: i) they were of significance to the subsidiary; ii) they had the potential to be transferred; and iii) they had been completed no earlier than ten years ago and no later than one year prior to the interview. After the innovation is identified, this study focuses on those innovations that were initially developed at subsidiary level and later transferred to other fellow subsidiaries. Other types of innovation transfer, i.e. vertical transfer from headquarters to subsidiaries, reverse transfer from subsidiaries to headquarters, are excluded in the research population. Those innovations that were firstly spilled-over from headquarters were also not included in the research as the source subsidiary only serves as an intermediate in the knowledge flow chain and has limited influence in the transfer process.

The sample population is drawn from European- and US-based MNCs which are heavily involved in technology development and active in the manufacturing industry. Convenient sampling has been adopted owing to the lack of comprehensive list of innovations in MNCs.

The sampling of innovation was done at initial stage in cooperation with MNC managers (e.g. CEOs, heads of divisions, and R&D directors). MNC managers were provided with the selection criteria of innovation transfer cases and the list of innovation transfers was identified jointly with the researchers. This first stage interview at MNC or regional headquarters often provided the researcher with access to subsidiary-level managers after a list of transferred innovations was decided. At second stage of data gathering, subsidiary managers, rather than headquarters, were the key respondents. Subsidiary managers were directly involved in the development process and the transfer process, are hence more familiar with the process that the research is interested in. Thus face-to-face interviews were conducted at subsidiary site to administer a standardized questionnaire to key personnel who had been involved in the processes of development and transfer of the investigated innovations.

Face-to-face interviews provide a better basis for explaining the collected data and resulted in a very high response rate. The researchers' understanding of the respondents' answers was increased by the ability to discuss questions with the respondent and consequently they developed a deeper knowledge about the phenomenon in question (Sapsford *et al.*, 2006). An important advantage of collecting quantitative data face-to-face is that the researcher can be certain that the interviewee is the most knowledgeable person about the transfer project. Because the researchers were present, interviewing the respondents, we can make sure that the interviewees are the appropriate people to interview. This is what cannot be achieved by mail survey. Beside, face-to-face interview minimizes respondents' difficulties in understanding the exact meaning of a question, quantifying their answers, or agreeing on the terminology used. It also allows interviewers to supply immediate support and explanation of the questions. It could reduce the possibility of misunderstanding and misinterpretation of research indicators. Also the presence of the researcher while respondents are answering the questions is expected to decrease the number of items

omitted (Webster, 1997). Thus, the data collected is assumed to yield better quality than through mail survey.

A total of 83 innovations developed by subsidiaries and involved a total of 162 innovation transfer cases were collected from 2003 to 2006. Amongst 162 transfers, 33 cases are reverse transfers which were sourced from subsidiaries back to home countries thus are eliminated in the further analysis. In total, the sample is composed of 60 different innovations from 35 locations of 19 MNCs yielding 129 studied transfer projects.

Analysis and Findings

Previous literature has suggested that factors of different levels are attributed to the critical determinants of transfer performance: i) characteristics of innovation-being-transferred (i.e. explicitness, complexity); ii) relationship of source-recipient dyad; iii) MNC's organizational context (i.e. MNC centralization versus subsidiary autonomy and evaluation criteria in MNCs). Substantial empirical evidence can be found to support the relationship. In this study, these are treated as control variables in the study while the primary focus is on the influence of subsidiary business networks on transfer performance. Model 1 and 2 give detail of the direct influence from the commonly-identified variables on transfer efficiency and effectiveness respectively. Consistent with previous studies, most of the variables are significantly related to efficiency and/or effectiveness. Dyadic similarity is the only factor that has no significant direct impact on either of the performance indicators.

Table 1: Direct impact on transfer performance

Model	1	2
Dependent	Efficiency	Effectiveness
Innovation explicitness	.26 **	.20 **
Innovation complexity	-.08	-.10 **
Dyadic similarity	.04	.01
Dyadic collaboration experience	.06	.20 **
Dyadic willingness	.53 **	.61 **
Subsidiary autonomy	.18 **	.08
Evaluation Criteria	.16 *	.19 **
HQ involvement	-.25 **	-.06
R square	.42	.49
Adjusted R square	.37	.45
F-value	9.23 **	12.65 **

Note: The bolded figures are the ones with p-value below .10

* represents the p-value is below .10

Table 2: Moderating effects from external knowledge inputs on transfer performance

Model	3	4	5	6
	Direct	Full	Direct	Full
Dependent Variable	Efficiency		Effectiveness	
Dyadic similarity S	.18 *	.19	.09	.40 **
Dyadic collaboration experience C	.02	-.01	.20 **	-.00
Dyadic willingness W	.37	-.03	.46 **	.47 **
External source of knowledge inputs E	.08	-.87 *	-.03	.33
E x S		-.18		-1.07 **
E x C		.06		.50 *
E x W		1.09 **		.27
R square	.22	.27	.35	.42
Adjusted R square	.20	.23	.33	.39
F-value	8.44 **	6.11 **	15.83 **	12.03 **

Note: The bolded figures are the ones with p-value < .10

* represents the p-value of regression coefficients is below .10

** represents the p-value of regression coefficients is below .05

Table 2 and Table 3 illustrate the results of moderating regression analysis of subsidiary business networks. In Table 2, Models 3 and 5 are the models that examine direct impact from dyadic relationship and moderator (i.e. external source of knowledge input), whilst Model 4 and 6 are the ones with moderating product terms added to the equation. The results suggest that regardless of the extent of knowledge inputs from external sources, dyadic willingness and similarity are the two key independent variables of transfer performance (coefficient = .37 and .18, respectively). The results from the full model (5) indicate the proportion of variance in transfer efficiency has increased 5%. A significant F-value of full model (6.11, sig < .001) also suggests significance of moderating effect from external counterpart involvement exists.

One of the regression coefficients of three moderating product terms is statistically significant, i.e. dyadic willingness (coefficient = 1.09, sig < .01). In addition, the influence of dyadic similarity has reduced to an insignificant level. But the significance of dyadic willingness has been even stronger to these externally-sourced innovations. To sum up, there is significant moderating effect (5%) from external counterpart involvement. The external input strengthens the significance of dyadic willingness. Therefore Hypothesis 1a is supported but not Hypothesis 2a.

Similarly, Model 6 estimates the direct effects on transfer effectiveness ($F = 15.83$, sig < .01). The results suggest that dyadic willingness and previous collaboration experience have the most direct impacts on the effectiveness of transfer (coefficient = .460 and .196, respectively). External source of knowledge inputs does not have substantial direct impact. Examining the moderating effects, the moderating regression coefficient of dyadic similarity and collaboration experience are both statistically significant. However, they show different directions of impact. External source of knowledge inputs weakens the impacts of dyadic

similarity to effectiveness but strengthens the impacts of dyadic collaboration experience to effectiveness. Thus Hypothesis 1b is partly supported and Hypothesis 2b is not

The results of moderating regression analysis of internal source of knowledge input are presented in Table 3. Models 7 and 9 show the direct impact from dyadic relationship on transfer performance, while Model 8 and 10 have internal source of knowledge inputs as moderator. Again dyadic willingness is the key factor with strongest direct impact (coefficient = .37, sig < .01) to transfer efficiency in the direct effect Model 15 ($F = 8.48$, sig < .01).

After the moderating effect of internal source of knowledge inputs added into consideration in Model 16, the explained variance has increased by a small 3% (.25 – .22). In addition, how transfer efficiency is influenced by various factors has also changed. Firstly, dyadic similarity, rather than willingness, has become the most influential (coefficient = .61, sig < .05) to transfer efficiency. Secondly, the significantly negative product term of internal source of knowledge input with similarity (coefficient = -.877, sig < .100) also suggests that the more knowledge is sourced from MNC internal network, the less influential dyadic similarity is to transfer efficiency. On the contrary, for the innovation that has little knowledge inputs from internal network, the dyadic similarity will be vital to the transfer performance. Thus there is significant moderating effect of 3% from internal knowledge inputs on transfer efficiency. More specifically, internal source of knowledge inputs weakens the significance of dyadic similarity on transfer efficiency. The results support Hypothesis 3a but not Hypothesis 4a.

Model 9 estimates the direct effects on transfer effectiveness ($F = 15.84$, sig < .01). The results suggest that dyadic willingness and previous collaboration experience have the most direct impacts on the effectiveness of transfer (coefficient = .47 and .19, respectively). Internal source of knowledge inputs does not have substantial direct impact.

After the moderating effect of internal source of knowledge inputs added into consideration in Model 10, the explained variance has only increased by a small 2% (.37–.35). Though Model 10 has a significant F-value (9.50, sig < .01), there is no significant product terms. The results indicate that internal source of knowledge inputs has no moderating effect on effectiveness. Hence Hypothesis 3b and Hypothesis 4b is rejected.

Table 3: Moderating effects from internal knowledge inputs on transfer performance

Model	7	8	9	10
	Direct	Full	Direct	Full
Dependent Variable	Efficiency		Effectiveness	
Dyadic similarity S	.16 *	.61 **	.09	.42 *
Dyadic collaboration experience C	.01	-.06	.19 **	.18
Dyadic willingness W	.37 **	.12	.47 **	.17
Internal source of knowledge inputs (I)	.08	.25	.03	-.09
I x S		-.88 *		-.62
I x C		.12		.03
I x W		.51		.67
R square	.22	.25	.35	.37
Adjusted R square	.20	.20	.33	.33
F-value	8.48 **	5.34 **	8.48 **	5.34 **

Note: The bolded figures are the ones with p-value < .10

* represents the p-value of regression coefficients is below .10

** represents the p-value of regression coefficients is below .05

The influence on transfer performance comes largely from the relationships of transfer dyad. The transfer dyad is the source and recipient subsidiaries that are actually involved in the transferring activities. Literature of organizational learning has suggested that the absorptive capacity of the recipient is decisive to the transfer performance. Specifically, any similarity the dyad shares and prior experience of collaboration are the two key factors that capture the capability of the source to transfer and of the recipient to absorb. Further to two capability-related factors, the willingness of the dyad is the other important factor that has

been discussed greatly in the literature. The attitude of the dyad and the provision of sufficient resources are indispensable to the success of transfer performance.

Moreover, the key contribution this study wishes to make is bringing in the innovation development process under scrutiny. For subsidiary innovation development, internal MNC network and external host network are the two primary sources of knowledge inputs. It has been argued that inputs from different networks would bring in different elements to the knowledge developed. In addition, the concept of two business networks that the subsidiary is embedded in has been discussed extensively in the literatures on business embedded network perspective. Yet, how this could affect innovation development and subsequent transfer have seldom been investigated together in past studies. Hence, this study has identified the source of knowledge inputs as a key factor to transfer performance that deserves more attention.

The results imply that the lack of technical/organizational similarity or prior experience of collaboration could be remedied by strong willingness to carry out transfer. Besides, the source of knowledge inputs influences transfer performance indirectly, but not directly. The influence is made through the dyadic relationship to the performance. This moderating effect to some extent answers why this issue has not been picked up more widely in the past studies.

Implications and Contributions for Research and Practice

This research aims to understand inter-subsidary innovation transfers from a fine-grained perspective. Having transfer performance as the key outcome variable, we examine this issue with particular interest in the influence of subsidiary business networks, i.e. internal network in MNCs and external networks with local counterparts. To achieve this, we started off from knowledge transfer literatures to identify the variables that are of significance to

general knowledge transfers. Then we put this topic into the context of multinational companies. Theories of business embedded network are then brought into the research to enhance the understanding of the context or network where subsidiaries are situated. Then this study further proposed the different knowledge inputs could have substantial influence on the units involved and also the ultimate transfer performance.

This study contributes primarily in the following areas. Firstly, the prior stage of innovation development is put into consideration. The research emphasis of this study is focused on the subsidiary level in MNCs, i.e. how innovation was developed at subsidiary level and later transferred to other fellow subsidiaries. From this perspective, studies of business embedded networks have provided some useful insights regarding the two dynamic networks that subsidiaries are part of: internal network within MNC and external network in the host country. Both networks serve as important sources of novel ideas, technical/financial supports, etc. when it comes to innovation development. In spite of their equivalent importance to subsidiaries, the different partnerships in developing new knowledge tend to change the innovation created and also how innovation is exploited afterwards (Foss *et al.*, 2002). Yet, this is an area that receives only limited attention and would requires more clarification on how innovation development process is to link with subsequent inter-subsidiary transfers.

To achieve this, this study investigates how innovation was developed at subsidiary level in terms of who they worked with, what the counterparts contribute and to what extent. These indicators may not portray the development process entirely but serve effectively to understand who the key contributors are in terms of the provision of novel ideas, financial support, technical assistance, etc. The research findings highlight that the source of knowledge inputs does not have direct impact on performance indicators, but significantly moderates how transfer dyad treats the transfer and hence influences the performance. Specifically, to successfully transfer more externally-sourced innovation, dyadic willingness

is more important than other factors; for internally-sourced innovation, dyadic similarity becomes the key impact factor.

The results provide some valuable theoretical implications to international business literature especially in relation to innovation transfers. Despite the obvious significance of knowledge characteristics and transfer dyadic relationships that have been commonly referred to, the distinctive context of multinational companies should be paid more emphasis. Subsidiaries in particular are developing closer connections with local counterparts through frequent collaborations and transactions. These external relationships are a strong driver of innovation. The innovation subsidiaries developed with these external counterparts often contain more novel ideas. On the contrary, in the MNC networks, subsidiaries often share higher similarity both in technical background and organizational culture and hence less novel ideas in developing new knowledge. The findings are consistent with the above argument and indicate that variance in dyad attributes is necessary to transfer differently sourced innovation. The influence of innovation development process may not seem obvious at the first point, but the finding implies that it has changed how transfer dyad perceived the importance and the nature of knowledge. Therefore, it is highly suggested that the innovation development process should not be neglected in knowledge transfer studies and needs to be scrutinized further in the MNC contexts.

The other contribution this study made is the addition of dyadic willingness to absorptive capacity when examining the relationship between transfer dyad. Previous studies of organizational learning in general suggest the absorptive capacity of the recipient is of salient influence to the transfer performance (e.g. Cohen *et al.*, 1990). Two primary elements that capture the capability of the source to transfer and of the recipient to absorb are: similarity the dyad shares and prior experience of collaboration (Gupta *et al.*, 2000; Minbaeva *et al.*, 2003; Phene *et al.*, 2005). It is argued that they are decisive to the transfer outcome. Yet, little was mentioned about the willingness of the dyad in related literature.

This study recognizes the importance of dyadic willingness toward the innovation transfer and adopts it as the third attribute to examine dyadic relationship. The empirical evidence highlights the significance of dyadic willingness to both transfer efficiency and effectiveness. Its influence to transfer performance even exceeds that of dyadic similarity or previous collaboration experience.

The findings provide useful managerial implications to headquarters and subsidiaries in MNCs. The lack of previous collaboration experience or technical similarity may pose the down side for innovation transfer between subsidiaries. But that should not put off the initiatives to carry out innovation transfers. The problem could be effectively remedied by strong willingness between the dyad. The resources and support that subsidiaries receive could counteract the hurdle of dissimilarity and unfamiliarity.

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