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An Empirical Study of the Role of Knowledge Characteristics and Tools on Knowledge Transfer in China-Based Multinationals

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ABSTRACT

This article describes how technology—i.e. the infrastructure of tools, systems, platforms—enhances knowledge transfer. The effect of tools on the relationship between knowledge characteristics and knowledge transfer effectiveness is under-researched. This article attempts to address the interplay of knowledge characteristics and transfer tools within multinational corporations (MNCs). Based on the structural equation modelling, this research proposes and tests a basic model that captures knowledge characteristics and transfer tools at 125 Japanese subsidiaries operating in China. Drawing on the literature, this article argues that the role of knowledge characteristics and transfer tools need to be considered for effective knowledge transfer between MNCs and their subsidiaries. Knowledge characteristics and transfer tools play differing roles in knowledge transfer. This article also extends the existing studies by focusing on knowledge characteristics and transfer tool constructs simultaneously in a model to understand the notion of knowledge transfer effectiveness in the global business context.

KEYWORDS

China, Japan, Knowledge Transfer Tools, Knowledge Transfer, Structural Equation Modelling

INTRODUCTION

Knowledge is recognised as a vital organisational resource that is at the heart of corporate success, be it a domestic or multinational (Kogut & Zander, 1992; Nonaka & Taekuchi, 1995). The successful transfer of knowledge within or among organizations is a strategic imperative (Li, 2008). Knowledge transfer in global environment, particularly in multinational corporations (MNCs) is a popular area of research (Lu, Leung, & Koch, 2006). Knowledge can be transferred across the companies involved in foreign investment; particularly it flows from MNC to its subsidiaries and affiliates (Schulz & Jobe, 2001). Since local Chinese firms often lack technical and managerial knowledge necessary for global competitiveness, they attempt to get access to this valuable resource, particularly from Western MNCs (Steensma & Lyles, 2000). Knowledge transfer is critical in developing and enhancing the competitive advantage of firms. Reflecting this view, Argote and Ingram (2000) contend that knowledge transfer is a basis for competitive advantage in firms. Since knowledge resides in different individuals, departments or divisions, in a competitive environment, successful transfer of knowledge within or among organizations help to integrate a firm's knowledge pools. Knowledge that is transferred is the critical component of the value that a firm creates. Accordingly, knowledge transfer provides new opportunity for better performance of firms in competitive environment. This helps us to establishing how knowledge transfer contributes to the competitiveness of the firm.

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Knowledge transfer is a dyadic exchange in which a source (MNC) transfers knowledge and a recipient (subsidiaries) learns and applies it (Ko et al., 2005; Slaughter. & Kirsch, 2006; Zhang & Jasimuddin, 2012). Drawing on the work of Grant (1993) and Hansen et al. (1999), the paper addresses knowledge transfer from the Japanese MNCs to their subsidiaries in China. There has been research on tacitness feature of knowledge (Polanyi, 1962; Dhaanaraj et al., 2004; Li, 2008; Cummings & Teng, 2003; Ambronisi & Bowman, 2001), According to the knowledge-based view of the firm, the degree of tacitness of knowledge has an influence on knowledge transfer. Several authors (e.g. Zander & Kogut, 1995; Li, 2008; Cummings & Teng, 2003; Dixon, 2000) argue the nature of knowledge affects the knowledge transfer by MNCs. Dixon (2000) suggests that one of the important factors that influence in intra-firm knowledge transfer is the nature of knowledge, especially where the knowledge has embeddedness and tacitness. This view is echoed by Cummings and Teng (2003) who contend that the knowledge context includes the transferred knowledge's embeddedness and articulability. Several authors have incorporated knowledge characteristics, especially tacitness or codifiability of knowledge as control variables (e.g., Bjorkman et al., 2004; Hansen, 2002; Monteiro et al., 2008; Persson, 2006).

Similarly, the existing literature on knowledge transfer investigates various issues surrounding knowledge transfer tools (Gupta & Govindaranjan, 2000; Storey & Barnett, 2001; Earl, 2000; Hansen et al., 1999; Zhang & Jasimuddin, 2012). According to the theory of knowledge transfer strategy two broader alternative knowledge approaches are available to use for knowledge transfer: personalisation and codification strategies. Personalisation strategy is employed where the knowledge is closely tied to a person who created it and is shared mainly through direct face-to-face contacts. On the other hand, codification strategy is effective where knowledge is carefully articulated and stored in databases, and can be accessed and used easily by anyone within the company. Parallel to this, Gorovaia and Windsperger (2013) argue that personalisation and codification approaches are not mutually exclusive strategies but firms tend to favour one over the other.

Despite the recent proliferation of various papers surrounding knowledge transfer by MNCs, no previous work has investigated the role of knowledge characteristics in knowledge transfer in China using mediating effect of transfer tools. Recently, China adopted an aggressive investment policy to facilitate industrial development and knowledge transfer. Since China lacks product and process technology and managerial, technical, and marketing skills, it has made an effort to acquire knowledge and technology from MNCs. There has been limited research on the way in which China acquires or receives knowledge from Western MNCs, particularly how a China-based subsidiary acquires knowledge from a Japanese parent. The paper intends to address fills an important gap by addressing a question: How knowledge characteristics influence the selection of an appropriate knowledge transfer tool, which in turn facilitates knowledge transfer in the Chinese context.

To the best of our knowledge, our study is one of the first to conceptualize and empirically investigate knowledge transfer effectiveness. We begin by elaborating the basic dimensions of knowledge characteristics and transfer tools for knowledge transfer that is available in the extant literature. We then develop a model, proposing hypotheses to link knowledge characteristics, transfer tools, and knowledge transfer. A LISREL model is used to study these latent variables based on data sampled from 125 Japanese firms operating in China. Finally, managerial implications are discussed and a brief conclusion is presented.

LITERATURE REVIEW

Researchers in global business and information management have shown interest in various issues surrounding knowledge transfer. This section reviews the literature that is relevant in developing a research model which posits that the knowledge characteristics and the transfer tools employed facilitate or inhibit knowledge transfer from a MNC to a subsidiary. The framework draws on the knowledge characteristics, knowledge transfer tools, and knowledge transfer.

Knowledge Characteristics

There is much debate over knowledge characteristics, arising from the early distinctions made between tacit and explicit knowledge (Polanyi, 1966; King (2006). Knowledge characteristics, as a general concept, reflect the accessibility or understanding of knowledge, descriptions, or skills (Jasimuddin et al., 2012). Several researchers (e.g. Hendriks, 1999; Huber, 2001; Hislop, 2002; Kalling, 2003; Jasimuddin et al., 2005) argued that knowledge characteristics (e.g. complexity and ambiguity) have a great influence on the knowledge transfer process.

The paper addresses the fundamental issues of knowledge that facilitate or inhibit knowledge transfer in international subsidiaries from the knowledge-based view of the firm. The main concern of the knowledge-based view of the firm is to identify key features of knowledge to knowledge transfer. The relevant literature has provided sufficient support for the fact that knowledge characteristics influence knowledge flows in one way or another (Mikhailovich & Mustafa, 2011; Zhang & Jasimuddin, 2012). Dixon (2000), for example, identifies several factors that influence knowledge transfer, including the nature of knowledge. Zander and Kogut (1995) are mainly concerned with the influences on knowledge transfer from the knowledge characteristic perspective. Baughn et al. (1997) point out that the key influencing factors for knowledge transfer include the learning ability and absorptive ability of the receiver, knowledge tacitness and knowledge embeddedness, etc. As noted earlier, Simonin (1999) examines the role played by the casually ambiguous nature of knowledge in knowledge transfer between strategic alliance partners. Similarly, Li (2008) suggests that knowledge characteristics affect the knowledge transfer among organisations in strategic alliances.

The previous research mostly focuses on the knowledge typology, that is, the dichotomy between tact and explicit knowledge (Storey and Barnett, 2001; Alavi & Leidner, 2001; Huber, 2001; Carbonara, 2005; Jasimuddin et al, 2005; Ambronisi & Bowman, 2001). Knowledge can be characterised along various dimensions using different terms (Foss & Mahnke, 2003). A few prior studies have focused on knowledge characteristics (e.g. Zander & Kogut, 1995; Li, 2008; Cummings & Teng, 2003) while discussing the determinants of knowledge transfer.

Dixon (2000) identifies three features of knowledge: knowledge embeddedness, tacitness and complexity. Similarly, Cummings and Teng (2003) explain embeddedness and articulability of the transferred knowledge as the knowledge characteristics. Parallel to this, others (e.g., Simonin, 1999) indicate that knowledge transfer depends on the knowledge characteristics such as complexity of knowledge being transferred. Likewise, Baughn et al. (2001) point out knowledge tacitness and knowledge depth (the degree of embeddedness of knowledge) etc as principal features of knowledge.

Knowledge Transfer Tools

Knowledge characteristics dictate how knowledge will be transferred (i.e., mechanisms of knowledge transfer) and eventually affect the efficiency and effectiveness of knowledge transfer in an organisation. Hislop (2002, p. 166) contended that 'different features of knowledge (e.g. tacitness) significantly influence the ways in which the knowledge transfer can take place'. Organisational knowledge cannot be transferred without the employment of a transmission tool. Knowledge transfer tools play a crucial role in knowledge transfer. A transmission tool is identified as key to MNC knowledge transfer (Bartlett & Ghoshal, 1989**).** For the purpose of the present study, a knowledge transfer tool can be defined as the transmission media that is used for transferring ideas and knowledge between a MNC and its subsidiaries. The terms tools, mechanisms, medium, approach, and means are used interchangeably. MNCs rely on various tools to ensure the effective transfer of knowledge. It is interesting to explore the various media devised by MNCs to transfer their knowledge to the host country operations and to see how this is put into practical use (Hong & Nguyen, 2009; Inkpen & Dinur, 1998).

There are various tools that exist for transferring knowledge from one firm to another (Easterby-Smith et al., 2008). Previous research has almost exclusively focused on the mechanisms used in knowledge transfer (Hansen et al., 1999; Earl, 2000; Jasimuddin et al., 2012). Scholars have classified knowledge transfer media in many different ways. Some examples of knowledge transfer tools include

training, observation of experts, tooling assembly line layouts, training subsidiary employees, planned socialising activities, transferring experienced personnel, and providing documents, blueprints or hardware, routines and meetings (Thomas-Hant et al., 2003; Birkinshaw et. al., 2002; Argote & Ingram, 2000).

However, there is a lack of a comprehensive understanding of how knowledge gets transferred from a knowledge characteristics perspective (Goh (2002; Decker et al., 2009). There is no consensus on the appropriate channels to transfer knowledge. One of the factors that has been suggested as important in determining an appropriate tool is the type knowledge being transferred (Decker et al., 2009; Jasimuddin et al, 2014). Organizations need to recognize the knowledge characteristics at the time of knowledge transfer, and develop support structures that promote knowledge transfer (Goh, 2002).

Ccontemporary literature suggests that the knowledge transfer mechanisms consist of two dominant groups based on the tacit-explicit dichotomy. According to scholars (e.g., Ambos & Ambos, 2009; Schulz & Jobe, 2001; Hansen et al., 1999), the mechanisms are broadly classified into two categories: the technology-driven approach and the people-focused approach. Although there has been a debate whether the two mechanisms are substitutes or complements, there is a general consensus that both are instrumental in transferring knowledge within the MNC (Ambos & Ambos, 2009). Buckely and Carter (2004) argue that the variety of means by which knowledge can be transferred might be classified in three broad forms: personal communication (talking, meeting, email etc.), codified communication (report, drawings etc.) and embodied transfer (e.g., as product or equipment).

Communications theory (Daft & Lengel, 1986; Krone et al., 1987), suggests that transmission channels can be both formal and informal. Decker et al (2009) contend that knowledge transfer using tools can use both formal and informal transfer channels, Knowledge transfer channels can be informal or formal, personal or impersonal (Karlsen & Gottschalk, 2003). Others (e.g., Inkpen & Dinur, 1998) suggest the formal and informal sharing of meaningful and timely information reflects the quality of inter-partner communications. Parallel to this, Pan et al. (2007) also classify knowledge-transfer channels into formal and informal mechanisms. In this context, Sammarra and Biggiero (2008) suggest that different mechanisms are available in supporting both formal and informal interactions between a MNC and its subsidiary in order to transfer knowledge of different characteristics.

In this regard scholars argue that effective knowledge transfer is dependent, in part, on repeatedly using a combinations of tools rather than relying on the use of a single mechanism (Argote & Ingram, 2000; Slaughter & Kirsch, 2006). There is no 'one size fits all' approach when it comes to adopting the most effective tool to transfer knowledge at MNC. Reflecting this view, Hansen et al, (1999) suggest the use of more than one type of knowledge transfer tool and caution against the use of a single tool only. Some organizations may use a dominantly personalisation approach, while others may find it impossible to ignore the technical aspect of knowledge transfer (Hansen et al., 1999). Accordingly, transmission channels are represented in terms of two approaches: formal (viz., formal integrative mechanisms) and informal (viz., corporate socialisation mechanisms). In the interest of expanding our understanding of the knowledge transfer tools, the mechanisms that are discussed in this study are grouped under three categories, From the diversity of the knowledge transfer media which include technology focused (formal) tools, human focused (formal) tools, and non-official (informal) mechanisms. Firstly, focusing on knowledge-as-a-category as mentioned earlier, two very different mechanisms have emerged, i.e., technology focused (formal) tools, human focused (formal) tools in order to formally transfer knowledge. Again, there is a need to have another type of mechanism to facilitate knowledge transfer in an informal environment what we call non-official tools, depending on the level of social ties and trust. The classical examples of the informal mechanisms of knowledge transfer are unscheduled meetings, informal gatherings, and coffee break conversations.

Knowledge Transfer Effectiveness

Knowledge transfer ranks as one of the top activities in the hierarchy of organizational tasks. Knowledge transfer is critical in enhancing the competitive advantage of firms (Li, 2008). Knowledge transfer is defined as the process by which knowledge flows from knowledge sources to knowledge

recipients (Decker et al., 2009). Knowledge transfer can include the exchange of product and process technology, or the transfer of managerial, technical and marketing skills through various tools (Giroud, 2000). Knowledge transfer facilitates the availability of potentially useful know-how, which involves a dyadic relationship between the source (i.e., MNC) and the recipient (i.e., subsidiaries) (Danis & Shipilov 2012).

For the purpose of the study, knowledge transfer effectiveness is defined as the level of transferring necessary knowledge, technology and know-how from a MNC to its subsidiary, using an appropriate transfer tool that can augment organizational efficiency in terms of absorptive capability, performance and quality improvement. Knowledge transfer effectiveness is measured by "employee's quality improvement", "knowledge sharing culture", "active participation", and so on. These items reflect the successful knowledge transfer, which in turn create value to the firm's competitiveness. From this working definition, we can see that knowledge characteristics influence the selection of an appropriate transfer tool that facilitates effective transfer of knowledge which helps organisational members to take purposeful actions and decisions (Machlup, 1980; Jasimuddin, 2005 HIICs).

However, empirical studies on knowledge transfer effectiveness in MNCs have focused on various issues including the characteristics of organisational knowledge at MNCs (Zander & Kogut, 1995; Szulanski, 1996; Simonin, 2004), knowledge actors (Lyles & Salk, 1996; Szulanski, 1996; Gupta & Govindarajan, 2000), knowledge transfer tools used by MNCs (Szulanski, 1996; Simonin, 1999; Bresman et al., 1999; Gupta & Govindarajan, 2000), etc. Specifically, the characteristics of organisational knowledge and knowledge transfer tools are important components of knowledge transfer at MNCs (Buckley et al., 2009; Jasimuddin et al., 2006; Jasimuddin et al., 2012).

RESEARCH MODEL AND HYPOTHESES DEVELOPMENT

Here we propose a research model which posits that knowledge characteristics and transfer tools facilitate knowledge transfer between Japanese MNEs and their subsidiaries based in China. Figure 1 displays the research model that guides the execution of the study. The theoretical framework suggested in this study draws on the knowledge characteristics and the transfer tools employed, and their relationship to knowledge transfer effectiveness. In addition, potential casual relationships between knowledge characteristics and transfer tools are also explored. This study sets out eleven hypotheses and tests them empirically.

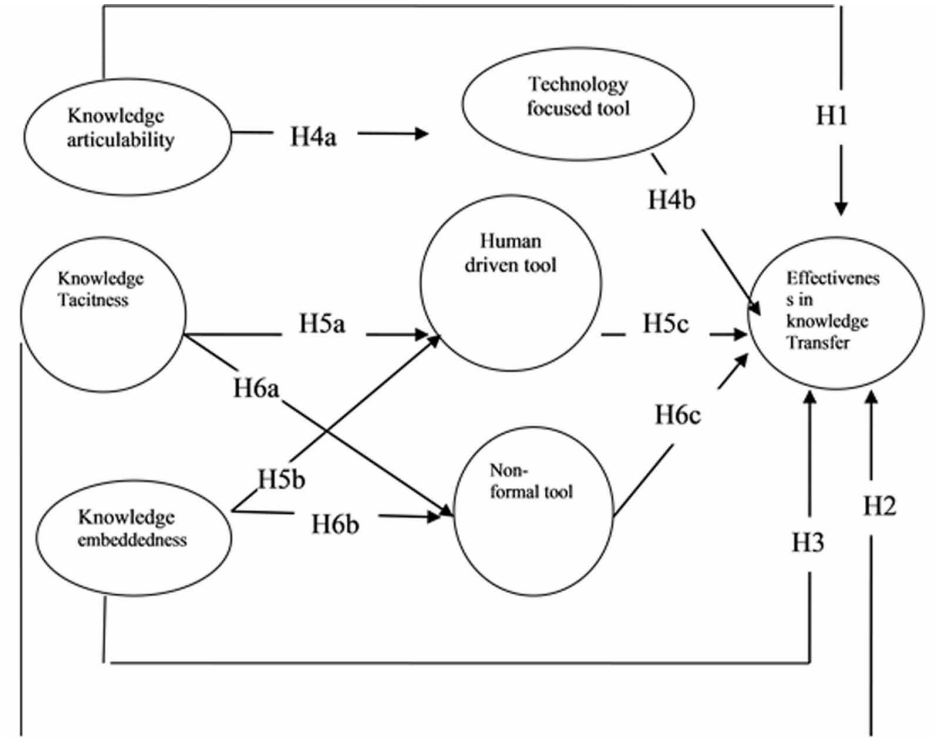
Knowledge Characteristics

Drawing on from the existing literature, three constructs surrounding knowledge characteristics are developed for this research: knowledge articulability, knowledge tacitness, and knowledge embeddedness. Articulability, tacitness, and embeddedness seem to reflect the accessibility of knowledge. Knowledge characteristics have mostly been examined in relation to knowledge transfer (Michailova & Mustaffa, 2011). Since the impact of knowledge characteristics on knowledge transfer cannot be ignored, empirical studies argue that the successful transfer of knowledge in MNCs depends on the features of that knowledge (Zander & Kogut, 1995; Szulanski, 1996; Simonin, 1999; Dixon, 2000). Zander and Kogut (1995) examine the influences of knowledge transfer from the knowledge characteristic perspective. From the knowledge characteristics perspective, orgnisational knowledge can be classified based on three constructs, namely knowledge articulability, knowledge tacitness, and knowledge embeddedness. We generally theorize knowledge articulability, knowledge tacitness, and knowledge embeddedness as knowledge characteristics.

Knowledge Articulability

An important differentiation criterion which seems suitable to discuss about knowledge characteristics is knowledge articulability. Knowledge articulability is identified in the literature as critical for the knowledge transfer processes (Cummings & Teng, 2003; Decker, Landaeta & Kotnour, 2009).

Figure 1. A framework linking knowledge characteristics to knowledge trasfer effectiveness



Articulability refers to the extent to which knowledge can be verbalised, written, drawn or otherwise articulated (Bresman et al., 1999). Several studies have re-labled it in various ways: articulability (Hokanson & Nobel, 2000), demonstrability (Sunaoshi, Kotabe, & Murray, 2005), teachability, (Riusala & Smale, 2007) of knowledge- all of them referring to the extent knowledge can be transformed into an articulated form to be articulatable.

Cowan, David and Foray (2000) discuss knowledge articulability labelling articulated (and therefore codified), unarticulated and unarticulable. Highly tacit knowledge is generally not very articulated, while explicit knowledge is articulated (Li, 2008). Nonaka (1994) argues that knowledge of rationality tends to be explicit, metaphysical, and objective. Such knowledge is treated as codifiable in relatively easy to retrieve (Michailova & Mustaffa, 2011). Knowledge articulability often affects knowledge transfer success. In this regard, Cummings and Teng (2003) state that there is a positive relationship between the degree to which knowledge is articulated and the accomplishment of knowledge transfer. It is argued that the extent of knowledge transfer between a multinational company and its subsidiaries increases as knowledge articulability increases Based on this argument we have formulated the following hypothesis:

Hypothesis 1 (H1): The greater the degree of knowledge articulability, the higher the level of knowledge transfer between a multinational company and its subsidiary.

Knowledge Tacitness

Knowledge in MNCs can appear somewhat tacit (Marshall, Nguyen & Bryant, 2005; Hong & Nguyen, 2009). Hedlund (1994) defines tacit knowledge as non-verbalised and intuitive, which depends on the experience of the individual. Parallel to this, Nonaka (1994) states that knowledge of experience

tends to be tacit, physical, and subjective. Examples of tacit knowledge include beliefs and emotions (Nonaka & Takeuchi, 1995), personal skills and acquired knowledge (Bennett & Gabriel, 1999), and personal expertise, insights, and intuitions (Nonaka & Konno, 1998). Several scholars have acknowledged the criticality of tacitness (Simonin, 2004; Kogut & Zander, 1992; Zander & Kogut, 1995), ambiguity (Simonin, 1999; von Hippel, 1994; Kogut & Zander, 1992, 1993; Szulanski, 1995). In this regard, Buchel and Raub (2001) maintain that tacit knowledge is ambiguous as a result of the diverse interpretations of the members of an organisation.

Few have examined empirically its exact importance in light of other key theoretical constructs related to knowledge transfer (Simonin, 1999; Simonin, 2004). Since tacit knowledge is sticky (Szulanski, 1996), it is difficult to formalise and transfer. Similarly, other authors (e.g., Bresman et al., 1999; Nonaka, 1994) contend that tacit knowledge is not easy to express, and thereby the transfer of such knowledge is limited. Reflecting with this view, Nielsen and Nielsen (2009) point out that tacitness is negatively related to learning as it impedes the relative capacity to transfer knowledge. The more tacit the partner's knowledge, the greater the degree of knowledge transfer. It is argued that the extent of knowledge transfer between a multinational company and its subsidiaries increases as knowledge tacitness decreases. This leads us to our second hypothesis:

Hypothesis 2 (H2): The greater the degree of knowledge tacitness, the lower the level of knowledge transfer between a multinational company and its subsidiary.

Knowledge Embeddedness

Another inherent feature of knowledge is its embeddedness which is critical for the knowledge transfer processes (von Hippel, 1994; Szulanski, 1995; Decker, Landaeta, & Kotnour, 2009). Blackler (1995) defines embedded knowledge as the knowledge residing in the systematic routines of a firm; adding such knowledge is the systematic relationship between technology, roles, formal procedures and emergent routines. Knowledge is contextually embedded in the work environment (Demirbag et al., 2007). Knowledge in MNCs can appear somewhat socially embedded in the home country environment (Hong & Nguyen, 2009; Lam, 1997). The fact that knowledge is deeply embedded within and inseparable from practices and activities that people undertake.

Knowledge is embedded in values, actions, practices and behaviors and is not readily accessible, available and transferable (Michailova & Mustaffa, 2011). Knowledge is embedded in standardized procedures (Martin & Salmon, 2003). For example, management and marketing skills are embedded and are not easily codified in formulas or manuals (Zander & Kogut, 1995).

Knowledge in MNCs appears to be locally embedded in the technical and social environments in organizations (Hsiao et al., 2006). Knowledge in MNcs is diverse and contextually embedded in MNCs to transfer the local environment (Hong & Nguyen, 2009). Parallel to this, Cummings and Teng (2003) argue that knowledge can be embedded in many different structural elements of an organisation, such as in the technical tools, the routines and systems used by the organisation, as well as in the networks formed between and among these elements (Argote & Ingram, 2000).

Since scholars (e.g. Hendriks, 1999; Huber, 2001; Hislop, 2002; Kalling, 2003; Jasimuddin et al., 2005) believe that the embedded feature of knowledge has a great impact on the knowledge transfer process. Such characteristic also dictate how such knowledge will be transferred (i.e. tools), which eventually affect the effectiveness of knowledge transfer in an organisation. The transfer of embedded knowledge is generally complicated. Cummings and Teng (2003) support this, arguing that knowledge is hard to be transferred because it is embedded in organisational routines within a specific context. The transfer of highly embedded knowledge is expected to be more difficult than the transfer of less embedded knowledge. It is argued that the extent of knowledge transfer decreases as knowledge embeddedness increases. Hence, the following hypothesis is proposed:

Hypothesis 3 (H3): The greater the degree of knowledge embeddedness, the lower the level of knowledge transfer between a multinational company and its subsidiary.

Knowledge Transfer Tools

Three knowledge transfer tools are used in the proposed model. It is to be noted that the primary factors that influence the choice of knowledge transfer tools are knowledge characteristics. Accordingly, multiple tools may be used simultaneously, and are adopted by MNCs according to knowledge characteristics (Buckely & Carter, 2004). The knowledge transfer tools also have mediating effects on the linkage between the three knowledge characteristics (i.e., knowledge articulability, knowledge tacitness, and knowledge embeddedness) and knowledge transfer.

Technology Focused Tools of Knowledge Transfer

Technology refers to the infrastructure of tools, systems, platforms, and automated solutions that enhances the transfer of articulated knowledge (Chong et al, 2010). Organizations need to recognize the differences between tacit and explicit knowledge transfer, and develop support structures that promote the transfer of both types of knowledge (Goh, 2002; Decker et al., 2009). Some companies focus heavily on the use of people-to-documents methods of knowledge transfer. Often, this method is used when employees of a company rely mainly on explicit knowledge to accomplish their tasks. IT artefacts play a great role in codifying and storing information in databases, whereas where it can be accessed and used by anyone in the organization.

The technology-driven tools represent transfers of explicit knowledge using technology. In order to build explicit knowledge transfer capabilities, a MNC has a comprehensive technology infrastructure. (Ryan et al., 2010). A variety of tools are available by which articulated knowledge can be transferred such as email, reports, drawings etc. by using technology (Buckely & Carter, 2004). Moreover, a variety of other computer-mediated mechanisms, including Instant Messaging and electronic bulletin boards, are employed to manage knowledge that is articulable. Explicit knowledge is highly codified and is transmittable in formal, systematic language (Polanyi, 1966; Nonaka & Takeuchi, 1995). Explicit knowledge is more easily transferred through technology-driven, structured processes (Decker, et al (2009).

During the past decade, MNCs invested heavily in such technology to increase their use in transferring articulated knowledge. It is appropriate for organisations to use an ICT tool, such as Lotus Notes, knowledge repositories, databases, electronic bulletin boards, intranets and email for knowledge transfer. As knowledge articulability and technology focused tools are related, technology could play a central role in the transfer of articulated knowledge of an organisation.. Based on this, we propose the following hypotheses:

Hypothesis 4a (H4a): Knowledge articulability is positively related to a formal technology focused tool in knowledge transfer between a MNC and its subsidiary.

Hypothesis 4b (H4b): The more a MNC employs a formal technology focused tool to transfer articulated knowledge, the greater the level of knowledge transfer between them.

People Focused Tools of Knowledge Transfer

MNCs face critical challenges to transfer its complex and socially embedded knowledge (Hong & Nguyen, 2009; Blackler, 1995; Szulanski, 2005). Tacit knowledge is generally personal and more complex. Its transfer often requires more interpersonal means, using processes that are less structured (Decker et al., 2009). Tacit knowledge is abstract and can be communicated only through active involvement of the manager (mentor) (Polanyi, 1966; Nonaka & Takeuchi, 1995). Tacit knowledge resides in the human brain, and may be ambiguous, which requires more interpretation. Gupta and

Govindaranjan (2000) suggest that the ability to transfer tacit knowledge requires rich transmission channels, such as face-to-face communication and the transfer of experts.

Hong, and Nguyen (2009) explore different mechanisms adopted by MNCs to transfer embedded knowledge. People-to-people methods of transfer are effective at transferring knowledge that cannot be easily codified (Jasimuddin 2014). Typical processes include brainstorming and face-to-face conversations (Hansen et al, 1999).

It is impossible to transfer knowledge that is embedded without direct interaction. Hence, F-2-F conversation is the effective way to transfer such knowledge. Conversations and the movement of people are efficient mechanisms, which are labeled human driven tools, for formally sharing tacit knowledge. The ways through which such knowledge can be transferred is through soft mechanisms. The most powerful [effective] mechanism of knowledge transfer seems to be formal face-to-face interaction. Parallel to this, several other scholars (e.g., Lam, 1997; Storey & Barnett, 2001) suggest active direct communication between individuals as a means of sharing tacit and embedded knowledge. That is, the transfer of an expert from one unit to another is an efficient mechanism for sharing tacit and embedded knowledge. We expect that the relationship between human driven tools and knowledge transfer will hold for both tacit and embedded knowledge. So, the following hypotheses can be proposed:

Hypothesis 5a (H5a): Knowledge tacitness is positively related to a formal human driven tool in knowledge transfer between a MNC and its subsidiary.

Hypothesis 5b (H5b): Knowledge embeddedness is positively related to a formal human driven tool in knowledge transfer between them.

Hypothesis 5c (H5c): The more a MNC employs a formal human driven tool to transfer tacit and embedded knowledge the greater the level of knowledge transfer between them.

Non-Official Tools of Knowledge Transfer

While considering non-official tools, the emphasis is to share tacit and embedded knowledge between individuals in an informal manner. Non-official human technology is organised voluntarily by those who have the same feeling or common interest (Guan, 2005). A culture allowing people to talk while using water coolers or in places like talk rooms, and picnics is an example of non-official mechanisms to transfer tacit and embedded knowledge (Davenport & Prusak, 1998).

Knowledge that is embedded does not always remain embedded; a large portion of such knowledge is articulated in some way and subsequently stored for future use so that it becomes easier to transfer and use. Some scholars (e.g., Argote & Ingram, 2000) identify other mechanisms for transferring such knowledge. These include stories, the observation and performance of an expert, and feedback sessions. We expect the relationship between non-official mechanism and effectiveness knowledge transfer will hold for both tacit and embedded knowledge. Based on these arguments, we have formulated the following hypotheses:

Hypothesis 6a (H6a): Knowledge tacitness is positively related to a non-official tool in knowledge transfer between a MNC and its subsidiary.

Hypothesis 6b (H6b): Knowledge embeddedness is positively related to a non-official tool in knowledge transfer between them.

Hypothesis 6c (H6c): The more a MNC employs non-official tools to transfer tacit and embedded knowledge, the greater the level of knowledge transfer between it and a partner.

Hence, we develop a model to investigate the linkages and impact between knowledge characteristics and transfer tools on knowledge transfer effectiveness using structural equation modeling. Hence, all of them have both a direct and indirect effect on knowledge transfer effectiveness.

RESEARCH METHODOLOGY

Research Design

Our research uses a survey questionnaire for data collection, through which we examined the research model and hypotheses using LISREL 8.5 technique. The structural equation modeling (SEM) approach is a multivariate statistical technique for testing structural theory (Tan, 2001). The SEM technique by utilising the maximum likelihood method examines the relationships between constructs, and determines the predictive power of the model for Japanese subsidiaries in China. The SEM approach allows us to examine complex models with several independent variables collectively (Gefen et al., 2000**).**

Research Setting

As part of its economic reforms, China adopted a favorable foreign investment strategy in order to facilitate industrial modernization and knowledge transfer. Knowledge transfer by MNCs is a particularly crucial phenomenon in host economies such as China (Park & Ghauri, 2011). Since China lacks knowledge and technology, MNCs are a source from which it can enrich its knowledge and technology base (Steensma & Lyles, 2000). The inflow of knowledge from the MNCs to their subsidiaries is seen as a valuable way to develop China's own knowledge base (Sumelius & Sarala, 2008). This study surveyed a sample of Japanese MNCs investing and operating in a Chinese industrial zone. There are four reasons for undertaking research in the Chinese context:

1. China is the leading foreign investment recipient in the world (Li and Park, 2006);
2. Japanese firms are its second largest foreign investor.
3. China is geographically close to Japan and is the second-largest economy in the world (Luo, Luo, & Liu, 2008):
4. The companies in this study had in place strategies to promote learning and the sharing managerial, marketing, technical know-how.

Data Collection

This study surveyed a sample of 125 subsidiaries of Japanese MNCs operating in China. These companies were in manufacturing or service industries, having minimum 200 employees. These companies had at least 1 million RMB as registered capital and were wholly (subsidiaries) or partially owned (joint venture) by Japanese companies, whose strategies were to promote learning and share knowledge.

This study used a questionnaire, which was administered through the mail. The questionnaire was designed to obtain the data required and tested to ensure that the survey form was a suitable instrument. Moreover, the questionnaire was piloted using 20 respondents from subsidiary firms to increase the clarity of the questions and to avoid interpretation errors. The questionnaire was translated and back-translated to ensure that the Chinese translation accurately reflected the meaning of the English version, thereby reducing comprehension problems (Sperber et al., 1994).

The questionnaires were mailed directly to appropriate executives, who were requested to task a respondent to complete the survey who had the most knowledge about the operational interactions between the MNC and its subsidiary. A letter was attached explaining the purpose of the questionnaire. Each company received one questionnaire to answer. Multiple follow-up phone calls and emails were used to encourage the targeted individuals to respond. A total of 169 survey forms were circulated and after one follow-up letter, 145 surveys were returned. Of these 20 were dropped because of missing data, and 125 questionnaires were valid for analysis. The response return rate was 73.97 percent.

It is important to test potential non-response bias, which was assessed using Armstrong and Overton's (1977) procedure. Since the late responders are argued to be representative of non-responders

(Churchill, 1979), the *t*-tests was performed in terms of industry, registered capital, sales revenue, and number of employees. There were no significant differences ($p < .05$) in terms of any item, which suggest that non-response bias was not a problem in this study. Hence our sample was representative of the population satisfying our criteria.

Sample Description

All respondents had similar backgrounds and were likely to participate in knowledge sharing activities in their firm. Most respondents were university educated (69.1%), male (74.4%), and in the 40 and above age group (79.2%). The study particularly targeted the middle and top management personnel wit 89.6% of the respondents being mid-ranking managers or technical supervisors while the remainder were senior executives (10.4%).

In total, 55 (68.0%) of the companies were in the manufacturing sector. The size of the companies they worked in ranged from 200-500 employees (68.8%) to over 500 (31.2%). The companies under study ranged from less than 10 million RMB to 50 million RMB in registered capital.

Survey Instrument

The questionnaire concentrated on relevant questions and issues surrounding knowledge transfer, which drew on other studies on knowledge management, information systems and international business. That is, most of the measurement items of the variables were adopted from the existing scales. Following this effort, multiple indicators (observed items) of all constructs (latent variables) of interest were developed so as to address the research questions. The latent variables in the model were measured by multiple indicators. The use of multiple-item measures enhances confidence that the measurement of the research construct will be consistent (Churchill, 1979).

In this study, all measures were assessed via a seven-point interval scale ranging from '1 = strongly disagree' to '7 + strongly agree'. This format was used for all the scales described below. The final version of the questionnaire contained 30 items about knowledge characteristics, knowledge transfer mechanisms, and knowledge transfer, plus 11 items for background information. Tables 1 and 2 identify descriptive statistics along with the items used in each construct, Cronbach's alpha and the composite reliability.

Knowledge Characteristics

As mentioned earlier, knowledge characteristics consist of three dimensions: knowledge articulability, knowledge tacitness, and knowledge embeddedness. Items about each dimension relating to knowledge characteristics included four items to measure knowledge articulability, four items to measure knowledge tacitness, and four items to measure knowledge embeddedness.

Knowledge Articulability

Several studies (e.g., Cummings & Teng, 2003; Simonin, 1999; Dixon, 2000; Simonin, 2004) indicate the existence of an important underlying latent construct - knowledge articulability – that needs to be explicitly recognised and integrated in research undertakings. Articulability refers to the extent to which knowledge can be verbalised, written, drawn or otherwise articulated (Bresman et al., 1999). Previous studies (e.g., Simonin, 1999; Dixon, 2000; Cummings & Teng, 2003) have applied different ways to measure knowledge articulability. David and Foray (2000) discussed knowledge articulability labelling articulated (and therefore codified), unarticulated and unarticulable. We used a four-item scale to measure knowledge articulability. For this research, items were adapted from the work of Bock and Kim (2002) and Schulz and Jobe (2001), which included knowledge learnt by reading documents, knowledge learnt by talking to personnel, knowledge learnt through education and training, and knowledge learnt by proper mentoring (composite reliability = 0.66).

Knowledge Tacitness

The degree of tacitness is an appropriate criterion for understanding the feature of organisational knowledge. Highly tacit knowledge is generally not easily articulated, while explicit knowledge is articulated (Li, 2008). Knowledge tacitness was assessed using a four-item scale (composite reliability = 0.61). Items included codifiability, teachability, complexity, and ambiguity, which were adapted from Kogut and Zander (1992).

Knowledge Embeddedness

There are different instruments to measure knowledge embeddedness (Hedlund, 1994; Kogut & Zander, 1992; Argote & Ingram, 2000; Mcdermott &O'Dell, 2001). Knowledge embeddedness was also operationalised using a four-item scale, following the measures used in earlier research. Items included the knowledge embedded in personnel, knowledge embedded in tools, knowledge embedded in rules and practices, and knowledge embedded in networks; all of which are used in our model (composite reliability = 0.75).

Knowledge Transfer Tools

Knowledge transfer tools consist of the three forms of mechanisms: technology driven tools (four items), human focused tools (five items), and non-official human-technology interaction (two items).

Technology Focused Tools of Knowledge Transfer

The four items were used to capture hard mechanism measures. The operationalization of this construct was adopted from Ambos and Ambos (2009), and four items were used to measure the technology focused tool. These included document exchange, tools to map knowledge, team collaboration tools (electronic bulletin board), and repositories of best practices (job manuals) (composite reliability = 0.73).

Human Driven Tools of Knowledge Transfer

We used a five-item scale to measure human driven tool, following the measures used in earlier research (Gupta & Govindarajan, 2000). Items included frequent visits, face to face meetings, employee rotation, cross-department teamwork, and technical cooperation and exchange (composite reliability = 0.76).

Non-Formal Tool of Knowledge Transfer

Following Davenport and Prusak (1998) and Gupta and Govindranjan (2000), this was assessed using a two-item scale, focusing on social ties and informal gatherings (composite reliability = 0.**70**).

Knowledge Transfer Effectiveness

Empirical evidence suggests that knowledge transfer is a multidimensional construct but its effectiveness can be measured in multiple ways. Accordingly, effectiveness of knowledge transfer can be measured by looking at desirable outcomes such as productivity, task completion time, organizational learning and innovativeness (Argote & Ingram, 2000). This study relied on seven items that were developed to measure effectiveness of knowledge transfer and operationalised by adapting from others' work. Drawing on a variety of studies (Nonaka, 1994; Bresnan et al. 1999; Kostova, 1999; Goh, 2002), the dependent variable was evaluated, focusing on acquisition of new knowledge, enhancement of absorptive capability, improvement of performance, employee's quality improvement, ownership of new knowledge, favourable knowledge sharing culture, and more involvement in knowledge transfer activities (active participation). As mentioned earlier, this was assessed using a seven-item scale (composite reliability = 0.87).

Table 1. Survey structure and description of statistics for dimensions

Dimensions	Number of Items	Mean	Standard Deviation	Cronbach's Alpha
Knowledge articulability	4	5.68	1.02	0.72
Knowledge tacitness	4	4.44	1.30	0.75
Knowledge embeddedness	4	5.14	1.91	0.74
Technology driven tool	4	5.14	1.07	0.74
Human focused tool	5	4.77	1.03	0.81
Non-formal tool	2	4.17	1.78	0.75
Knowledge transfer effectiveness	7	4.51	1.21	0.85

DATA ANALYSIS

In order to analyse and interpret or findings, Anderson and Gerbing's (1988) two step procedure is followed. Firstly, the reliability and validity of the measurement model is evaluated, by carrying out Confirmatory Factor Analysis (CFA). Following Campbell and Fisk's (1959) criteria, the CFA was undertaken to assess the convergent and discriminant validity which will be discussed below.

Secondly, the proposed research hypotheses were tested using Structural Equation Modelling (SEM) to determine the significance of the paths amongst the constructs. This sequence of the two stage procedure ensures that the construct measures are valid and reliable before attempting to draw conclusions regarding the relationships among constructs (Kiessling et al., 2009).

Results: The Measurement Model

After the questionnaires were returned, CFA was performed to assess the psychometric properties of scaled items for the constructs. The CFA was used to establish the measurement of the constructs in the model. Reliability and validity tests were then conducted for each of the constructs with multivariate measures. The internal reliability of the measurement model was tested using Cronbach's alpha (Fornell & Larcker, 1981). Cronbach's alpha (α) reliability estimates were used to measure the internal consistency of these multivariate scales (Nunnally, 1978). Table 1 summarises the variables used in this study along with displaying the means, standard deviations and the Cronbach's α.

Cronbach's α. indicates strong reliability for our questionnaire content. Table 1 depicts that all the Cronbach alpha scores are above 0.7. According to Nunnally (1967), a suitable criterion for instruments in the early stages of development is regarded as between 0.5 and 0.6, although for established scales it would typically be about 0.7. The smallest Cronbach's alpha in this study is 0.72 which shows an acceptable degree of consistency for the survey instrument. It was thus decided to include all dimensions in the further analysis.

In order to evaluate the validity of the measurement model, scholars think of two types of validity (i.e., content validity and construct validity). Hence, content validity and construct validity were assessed to validate the measurement model.

Content Validity

Straub (1989) argues that an instrument can be claimed to be valid on the grounds of the content of the measurement items. Content validity can be established by ensuring consistency between the measurement items and the extant literature (Kang et al., 2010). In this regard, Bock and Kim (2002) suggest that content validity is related to how representative and comprehensive are the items that are used to create a scale. As noted earlier, most of the items were adopted from the existing scales, which were revised through a pilot survey (pre-testing) before the final version of the questionnaire was distributed.

Construct Validity

Construct validity is some sort of operational issue (Chatzoglou & Vraimaki, 2009). Straub (1989) argues that construct validity of an instrument can be tested through the evaluation of convergent validity and discriminant validity, which is done in turn.

Convergent Validity

Convergent validity was assessed by examining the average variance extracted (AVE), the composite reliability, factor loading on its latent construct, and critical ratio, using Confirmatory Factor Analysis (Fornell & Larcker, 1981). Table 2 depicts these values. Several scholars (e.g., Chin, 1998; Bock et al., 2005) suggest that the composite reliability values should be greater than 0.7, while Bagozzi and Yi (1988) recommend a cut-off value of 0.6. In this study, composite reliability values ranged from 0.609 (knowledge tacitness) to 0.870 (knowledge transfer). All composite reliability values of our research model exceeded the recommended threshold value (0.6).

When it comes to examine average variance extracted (AVE), the AVE values should be greater than 0.5 to validate convergent validity (Hair et al., 1998; Fornell and Larcker, 1981; Chin, 1998), and to indicate that the majority of the variance is accounted for by the construct. In this study, AVE measures ranged from 0.519 (knowledge transfer) to 0.847 (soft mechanism). All AVE values of our research model exceeded the recommended threshold value of 0.5.

Similarly, each of the measurement items should significantly load on its latent construct (Gefen et al., 2000). In this study, factor loadings ranged from 0.491 (codability of knowledge) to 0.877 (social ties), all of the items exceeding the recommended cut-off value of 0.5, as suggested by Straub (1989), with an exception of codability item which was marginally below 0.5.

Furthermore, several scholars (e.g., Hair et al., 1998, Ruy et al., 2003; Chatzoglou and Vraimaki, 2009) recommend 0.35 as an acceptable threshold for the *t*-values for the loadings of measurement items, while Kang et al. (2010) suggest 2.58 as a cut-off value. The *t*-values for the loadings of measurement items were well above 2.58 (2.641-4.168), demonstrating adequate convergent validity.

Discriminant Validity

Finally, discriminant validity was verified by using the square root of the average variance extracted (AVE). Table 3 depicts the correlation between latent variables, which provides the correlation coefficients in the off-diagonal elements of the matrix and the square root of AVE values for each construct along the diagonal. For adequate discriminant validity, the square root of every AVE value should be greater than the off-diagonal elements in the corresponding row and column of the correlation table (Fornell & Larcker, 1981). Results also show adequate discriminant validity. Most specifically, the comparison using the values in the table confirms the items' discriminant validity.

In essence, the adequacy of the measurement model was evaluated based on the criteria of convergent and discriminant validity of constructs and the reliability of the constructs. As shown in Tables 2 and 3, all the critical ratios of the indicators of constructs satisfy this criterion. Hence, the convergent validity of the measurements is demonstrated and the proposed relationships between indicators (observed items) and constructs (latent variables) verified (see Figure 2).

The bolded numbers in the diagonal row are the square root of the average variance extracted. Off-diagonal terms represent inter-correlations of the latent constructs.

Since both independent and dependent measures were self-reported and obtained from the same source, there is the potential for the existence of the common method variance (CMV) problem. Following Podsakoff and Organ (1986), the Harman's one-factor test was conducted on the items in the conceptual model so as to measure the extent of common method bias in the data set. According to Harman (1960), the threat of such bias is high if a single factor accounts for more than 50 percent of the variance. Having entered all constructs into an unrotated principal components factor analysis,

Table 2. Confirmatory factor analysis for the measurement model fit

Dimension	Items	Composite reliability	Average variance extracted	Standard Factors Loading	Critical Ratio (*t*- values)
Knowledge articulability (KA)		0.657	0.703		
	blueprints, documents etc **(KA1)**			0.791	4.168
	talking to experienced personnel **(KA2)**			0.572	2.816
	training (KA3)			0.596	2.914
	mentor-mentee interactions **(KA3)**			0.569	3.614
Knowledge tacitness (KT)		0.609	0.753		
	codability of knowledge **(KT1)**			0.491	2.641
	ambiguity **(KT2)**			0.704	3.378
	teachability of knowledge **(KT3)**			0.664	3.292
	Tacitness proportion **(KT4)**			0.511	3.359
Knowledge embeddedness (KE)			0.751	0.719	
	knowledge embedded in personnel **(KE1)**			0.654	2.682
	knowledge embedded in tool **(KE2)**			0.678	4.126
	knowledge embedded in rule and practice **(KE3)**			0.764	2.711
	knowledge embedded in personnel and tool **(KE4)**			0.724	2.754
Technology driven tool (TDT)			0.729	0.533	
	Document exchange **(TDT1)**			0.713	3.482
	Exchange tools to map knowledge **(TDT 2)**			0.731	3.985
	Collaboration tools **(TDT3)**			0.656	3.682
	Repositories of best practices (job manual) **(TDT4)**			0.605	3.983
Human focused mechanism (HFT)			0.755	0.847	
	Frequently visit **(HFT1)**			0.627	4.156
	Face to face meeting **(HFT2)**			0.674	2.644
	Employee rotation **(HFT3)**			0.668	3.313
	Cross-department teamwork **(HFT4)**			0.710	3.459
	Technical cooperation& exchange **(HFT5)**			0.727	2.892
Non-formal mechanism (NFM)			0.694	0.804	
	Social ties **(NFM1)**			0.877	2.816
	Informal gatherings **(NFM2)**			0.843	2.914
Knowledge transfer effectiveness (KTE)			0.870	0.519	
	Acquisition of new knowledge **(KTE1)**			0.625	3.568
	Enhancement of absorption capability **(KTE2)**				0.807 2.711
	Improvement of performance **(KTE3)**				0.748 2.853
	Employee's quality improvement **(KTE4)**				0.652 3.168
	Ownership of new knowledge **(KTE5)**			0.729	2.951
	Knowledge sharing culture **(KTE6)**				0.754 3.153
	Active participation (more involvement) in knowledge transfer activities **(KTE7)**				0.712 3.552

Table 3. Correlation matrix between constructs (latent variables)

Dimensions	1	2	3	4	5	6	7
1. Knowledge articulability	**0.84**						
2. Knowledge tacitness	-0.14	**0.87**					
3. Knowledge embeddedness	-0.45	0.24	**0.85**				
4. Technology driven tool	0.46	-0.25	-0.23	**0.73**			
5. Human focused tool	-0.16	0.37	0.25	0.26	**0.92**		
6. Non-official mechanism	-0.25	0.48	0.46	0.24	0.25	**0.89**	
7. Knowledge transfer effectiveness	0.36	-0.18	-0.14	0.41	0.48	0.32	**0.72**

no single predominant factor emerged, which were more than 50 percent of the variance. Therefore, the CMV does not appear to be present in our study.

Additionally, an effort is made to check for multicollinearity. The correlations that are above the standard threshold (i.e., $r > 0.5$) indicate the possibility of multicollinearity (Hair et al., 1995). If we look at the correlation coefficients among the dependent and independent variables in the model, none of the correlations were above the standard threshold. Hence, there were no high correlations among the latent variables. Another method to check the extent of multicollinearity among the constructs is to calculate the variance inflation factor (VIF). The VIF values for all of the variables were less than 1.41 (Kang et al., 2010), which shows that multicollinearity is not a serious issue in this study.

Overall Model Fit

Scholars (e.g., Hair et al., 1998; Ruy et al., 2003) recommend three perspectives i.e., absolute fit, incremental fit, and parsimonious fit, for the validation of overall model fit. The overall model fit was assessed using six measures from the three perspectives. In more detail, the absolute fit measures used in the evaluation of CFA (measurement) model were X^2/df, the root mean square error of approximation (RMSEA), and Goodness of fit index (GFI). Comparative fit index (CFI), Adjusted goodness of fit index (AGFI), Normed fit index (NFI), and Non-normed fit index (NNFI) were used to measure incremental fit. Additionally, parsimonious fit was used to measure the parsimonious goodness of fit index (PGFI).

The overall chi-squared (χ^2) value was 52.5, with a degree of freedom equal to 41. The χ^2 statistic divided by the degrees of freedom also indicates a reasonable fit at 1.27. We looked at these indices to identify model. Fit indices (e.g., GFI = 0.93, CFI = 0.98, AGFI = 0.98, NFI = 0.92, NNFI = 0.98) also pointed to a good fit. It is to be noted that Browne and Cudeck (1993) suggest that the RMSEA < 0.05 is deemed to be a good fit. Similarly, Hu and Bentler (1999) recommend that CFI > 0.95 can be considered a close fit. Parsimonious fit measure was used to calculate the parsimonious goodness of fit index (PGFI) which was 0.56, above the cut-off point of 0.5.

Table 4 summarises the overall model fit indices of the CFA model. The CFA indicated that the measurement model fitted the data to a satisfactory level, as all fit indices were above commonly accepted levels. That is, the validation values showed a good fit, supporting the measurement model we proposed.

Results: Structural Model

After the measurement model was confirmed, the proposed research model needed to be evaluated (Lu et al., 2006). The structural equation modeling approach was applied to test the proposed model and hypotheses. Figure 2 shows the structural model, along with factor loadings, significant path coefficients, t-values, and explained variances (R^2) as produced by LISREL 8.5.

In the proposed model (Figure 1), knowledge transfer effectiveness is considered the dependent variable, and the three components of organisational knowledge (i.e., knowledge embeddedness, knowledge articulability, and knowledge tacitness) are considered independent variables. The knowledge transfer tools (i.e., technology driven tools, human focused tools, soft, non-official tools) serve as both dependent variables (to knowledge characteristics) and independent (mediating) variables (to knowledge transfer effectiveness).

Structural Model Fit

As recommended by Hair et al. (1998), the three types of fit measures: absolute, incremental, and parsimonious fit measures were computed to test the model fit. The chi-squared statistic was significant ($X^2 = 405.73$ df = 353). The χ^2 statistic divided by the degrees of freedom also indicated a reasonable fit at 1.15. Given the medium size of sample (Cudek and Henley, 1991), multiple fit indices were assessed to check the overall model fit.

Table 4. Fit test of the model

Fit indicator	Recommended value	Validation value
Absolute fit measures/indicators		
χ^2 / df	$1<\chi^2/df<2$	1.27
p	>0.05	0.099
Goodness of fit index (GFI)	>0.9	0.93
Root mean square error of approximation (RMSEA)	<0.05	0.047
Incremental fit measures		
Adjusted goodness of fit index (AGFI)	>0.9	0.98
Comparative fit index (CFI)	>0.9	0.98
Normed fit index (NFI)	>0.9	0.92
Non-normed fit index (NNFI)	>0.9	0.98
Parsimonious fit measures		
Parsimonious goodness of fit index (PGFI)	>0.5	0.56

Table 5 shows the overall fit indicators. Among the absolute fit indicators, the goodness-of-fit index (GFI) value of this model was 0.92, and root mean square error of approximation (RMSEA) value was 0.032, all within an acceptable range, as suggested by scholars. In this regard, Huang (2004) suggests that if the RMSEA value is between 0.05 and 0.08, it implies a good fit.

As far as incremental fit indicators are concerned, the adjusted goodness of fit index (AGFI) value of this model was 0.98, normed fit index (NFI) value was 0.92, comparative fit index (CFI) value was 0.96, and non- normed fit index (NNFI) value was 0.98. All the values reached the standards suggested in literature. Meanwhile, among the parsimonious fit indicators, the parsimonious goodness of fit index (PGFI) value was 0.67. They were both greater than 0.5, reaching the standards suggested by previous scholars. It is said that the higher the model fit, the higher usability the model has, as far as the model fit assessment is concerned (Shih et al., 2010). This also means that the parameter estimates are more meaningful.

Results: Hypotheses Testing

In order to examine the validity of the hypothesised paths, the statistical significance of each structural parameter estimate was examined. The structural equation modeling was used to estimate parameters of the structure model in Figure 2, which specified knowledge characteristics (i.e., knowledge tacitness, knowledge embeddedness, and knowledge articulability) and transfer tools (i.e., technology driven tools, human focused tools, non-official tools) as the exogenous constructs, and the endogenous construct (knowledge transfer effectiveness). Knowledge tacitness, knowledge embeddedness, and knowledge articulability were selectively related to the mediating constructs of transfer tools, which were in turn related to the endogenous construct (knowledge transfer effectiveness). Table 6 summarises the structural parameter estimates, significance levels and hypotheses test results.

Hypothesis 1 suggests that knowledge articulability will have a strong effect on knowledge transfer effectiveness between a MNC and its subsidiaries. That is, knowledge articulability is directly and positively associated with knowledge transfer effectiveness. The standardised coefficient of knowledge articulability and knowledge transfers effectiveness is 0.53, and a t-value of 4.43, $p < 0.01$, reaching

Table 5. Overall model fit of path analysis

Fit Measures	Validation Value	Results
Absolute fit measures		
X^2 / df	1.15	Complaint
P	0.07	Complaint
Goodness of fit index (GFI)	0.92	Complaint
Root mean square error of approximation (RMSEA)	0.032	Complaint
Incremental fit measures		
Adjusted goodness of fit index (AGFI)	0.98	Complaint
Comparative fit index (CFI)	0.96	Complaint
Normed fit index (NFI)	0.92	Complaint
Non-normed fit index (NNFI)	0.98	Complaint
Parsimonious fit measures		
Parsimonious goodness of fit index (PGFI)	0.67	Complaint

statistical significance. The results indicate that knowledge articulability has a positive influence on knowledge transfer effectiveness. Thus, Hypothesis 1 is fully supported.

Hypothesis 2 suggests that knowledge tacitness will have a negative effect on knowledge transfer effectiveness between a MNC and its subsidiaries. The standardised coefficients of knowledge tacitness and knowledge transfer effectiveness are -0.69, and the t-value is -3.56, $p < 0.001$, reaching statistical significance. These numbers suggest that knowledge tacitness has a strong negative influence on knowledge transfer effectiveness. Thus, Hypothesis 2 is supported.

Hypothesis 3 suggests that knowledge embeddedness will have a negative effect on knowledge transfer between a MNC and its subsidiaries. The standardised coefficients of knowledge embeddedness and knowledge transfer effectiveness are -0.50, and the t-value is -3.24, $p < 0.05$, reaching statistical significance. This result also indicates that knowledge embeddedness has a negative influence on knowledge transfer effectiveness. Thus, Hypothesis 3 is fully supported.

Table 6. Structure model estimates

Hypotheses		Hypothesised path		Path coefficient	Standard Error	T-value	Standardised path coefficient
Direct Effect							
H1	KA	→	KTE	0.47 **	0.21	4.43	0.53**
H2	KT	→	KTE	-0.67***	0.13	-3.56	-0.69***
H3	KE	→	KTE	-0.42*	0.15	-3.24	-0.50*
H4a	KA	→	TDT	0.18 *	0.11	8.12	0.24*
H5a	KT	→	HFT	0.39*	0.24	4.12	0.45*
H5b	KE	→	HFT	0.57 **	0.28	5.13	0.60**
H6a	KT	→	NFT	-0.20 *	0.08	-4.24	-0.26*
H6b	KE	→	NFT	0.36 **	0.11	3.25	0.41**
Direct Effect with mediator							
H4b	TDT	→	KTE	0.39 **	0.10	6.78	0.42**
H5c	HFT	→	KTE	0.59*	0.11	6.42	0.67*
H6c	NFT	→	KTE	0.63 *	0.17	6.18	0.71*

Notes: KA, Knowledge articulability; KTE, Knowledge transfer effectiveness; KT, Knowledge tacitness; KE. Knowledge Embeddednes; TDT, Technology driven tool; HFT, Human focused tool; NFT, Non formal tool. Note: *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$, $P < 0.10$

Hypothesis 4a predicts that knowledge articulability is positively related to a technology driven tool of knowledge transfer between a MNC and its subsidiaries. The standardised coefficients of knowledge articulability and a technology driven tool of knowledge transfer are 0.24, and t-value is 8.12, $p < 0.05$, reaching statistical significance. This result suggests that knowledge articulability and a technology driven tool of knowledge transfer are, albeit weakly, related. Thus, Hypothesis 4a is supported.

Hypothesis 4b suggests that the more a firm employs a technology driven tool, the greater will be the positive effect of knowledge articulability on its knowledge transfer with its subsidiaries. The hypothesis predicts a positive relationship between a technology driven tool and knowledge articulability as far as knowledge transfer effectiveness is concerned. The standardised coefficients of knowledge articulability and knowledge transfer effectiveness are 0.42, and t-value is 6.78, $p < 0.01$, reaching statistical significance. These numbers suggest that knowledge articulability and knowledge transfer effectiveness are strongly related, taking a technology driven tool as a mediator. In other words, the result indicates that, when the technology driven tool (mediator) is introduced in the model, the significant direct effect of knowledge articulability (β 0.53) on knowledge transfer effectiveness is reduced considerably to β 0.42. This significant drop indicates mediation according to the Baron and Kenny (1986) approach. Thus, Hypothesis 4b is fully supported.

Hypothesis 5a predicts that knowledge tacitness is positively related to a human focused tool of knowledge transfer between a MNC and its subsidiaries. The standardised coefficients of knowledge tacitness and knowledge transfer effectiveness are 0.45, and t-value is 4.12, $p < 0.05$, reaching statistical significance. These numbers suggest that knowledge tacitness and a human focused tool of knowledge transfer are related. Thus, Hypothesis 5a is supported.

Hypothesis 5b predicts that knowledge embeddedness is positively related to a human focused tool in knowledge transfer between a MNC and its subsidiaries. The standardised coefficients of knowledge embeddedness and the human focused tool are 0.60, and t-value is 5.13, $p < 0.01$, reaching statistical significance. These numbers suggest that knowledge embeddedness and the human focused tool are strongly related. Thus, Hypothesis 5b is supported.

Hypothesis 5c suggests that the more a firm employs a human driven tool, the greater the positive effect will be of knowledge tacitness and embeddedness on its knowledge transfer with its subsidiaries. The hypothesis predicts that a human driven tool has a positive relationship in transferring knowledge (tacitness and embeddedness). The standardised coefficients of such knowledge and knowledge transfer effectiveness are 0.67, and the t-value is 6.42, $p < 0.01$, reaching statistical significance. These numbers suggest that knowledge (tacitness and embeddedness) and knowledge transfer effectivenssare are related, taking a human focused tool as a mediator. The result indicates that, when the human focused tool (mediator) is introduced in the model, the significant direct effect of tacitness and embeddedness knowledge (β -0.69 and β -0.50 respectively) on knowledge transfer effectiveness is not reduced considerably. Rather the direct effect of knowledge (tacitness and embeddedness) on knowledge transfer effectiveness is increased to β 0.67. Thus, Hypothesis 5c is not supported. That is, the human focused tool does not mediate the linkage between knowledge (tacitness and embedded) and knowledge transfer effectiveness.

Hypothesis 6a predicts that knowledge tacitness is positively related to a non-formal tool in knowledge transfer between a multinational company and its subsidiaries. The standardised coefficients of knowledge tacitness and a non-formal tool transfer are -0.26, and the t-value is -4.24, $p < 0.01$, reaching statistical significance. These numbers suggest that the linkage between tacit knowledge and non-formal tools of knowledge transfer is surprisingly negative. Thus, Hypothesis 6a is not supported.

Hypothesis 6b predicts that knowledge embeddedness is positively related to a non-formal tool of knowledge transfer between a multinational company and its subsidiaries. The standardised coefficients of knowledge embeddedness and knowledge transfer effectiveness are 0.41, and t-value is 3.25, $p < 0.01$, reaching statistical significance. These numbers suggest that knowledge embeddedness and a non-formal tool of knowledge transfer are related. Thus, Hypothesis 6b is supported.

Hypothesis 6c suggests that the more a firm employs a non-formal tool, the greater the positive effect of knowledge tacitness and embeddedness on its knowledge transfer will be with its subsidiaries. The hypothesis predicts that there will be a positive relationship between non-formal tool and transfer of tacit and embedded knowledge. The standardised coefficients of knowledge embeddedness and knowledge transfer effectiveness are 0.71, and the t-value is 6.18, $p < 0.01$, reaching statistical significance. These numbers suggest that non-formal tools mediate the linkage between knowledge (tacitness and embedded) and knowledge transfer effectiveness. These numbers suggest that knowledge (tacitness and embeddedness) and knowledge transfer effectiveness are related, taking the non-formal tool as a mediator. But the result indicates that, when the non-formal tool (mediator) is introduced in the model, the significant direct effect of tacitness and embeddedness knowledge (β -0.69 and β -0.50 respectively) on knowledge transfer effectiveness is not reduced. As noted earlier, this significant drop indicates mediation according to the Baron and Kenny (1986) approach. The direct effect of knowledge (tacitness and embeddedness) on knowledge transfer effectiveness is increased to β 0.71. Thus, Hypothesis 6c is not supported. That is, the non-formal tool does not mediate the linkage between knowledge (tacitness and embedded) and knowledge transfer effectiveness.

DISCUSSION

Given the rising interest in knowledge transfer by MNCs, the lack of research on the linkage between knowledge characteristics and knowledge transfer in the Chinese context seems to be a significant gap in our knowledge. In response, we have conducted what we believe to be the first study on the relationship between knowledge characteristics and knowledge transfer. We see a great potential in examining how the characteristics of knowledge are transferred in relation to different transfer mechanisms. The paper contributes to the conceptualisation of knowledge characteristics by emphasising a MNC's technical and managerial knowledge in tacit or articulated form as the important aspect of knowledge transfer. This paper also extends the existing studies by exploring the type of transfer mechanisms that mediates knowledge transfer. This research focuses on the both constructs in a model in order to understand the notion of knowledge transfer in the global business context (i.e., Japanese subsidiaries in China).

The final result of our LISREL analysis is shown in Figure 2. The paper confirms the findings from numerous studies (Hansen et al., 1999; Ambronisi and Bowman, 2001) that knowledge characteristics, particularly articulability, tacitness, and embeddeness, have strong impact on knowledge transfer effectiveness. For example, Inkpen and Dinur (1998) suggest that knowledge is embedded in organizational structures, processes, procedures, and routines, it is not easy to separate knowledge from the context in which it has been created. Similarly, when knowledge is highly tacit, it is difficult to transfer without moving the people who have the knowledge. When knowledge is deeply embedded in a unique culture and context, its transfer becomes very difficult (Szulanski, 1996). This research supports this view.

Unfortunately, this important insight in itself does not provide much guidance to understanding how knowledge characteristics affect knowledge transfer without taking the role of the characteristics of knowledge on the transfer tool that, in turn, facilitates knowledge transfer. The fact is that the influence of knowledge characteristics on knowledge transfer effectiveness is of little value if the effect of the selection of transfer tools is not specified in this context. Moreover, by limiting the discussion only on knowledge characteristic and knowledge transfer will fail to address the importance of transfer tools. For instance, the question of how articulated or embedded knowledge can be transferred will remain unexplored.

Therefore, the paper has gone beyond this conventional finding by providing insights on the transfer tool that acts as a mediator. We propose and test an integrated framework in which articulability, tacitness, and embeddeness are the key features of knowledge that influence the selection of transfer tools, which eventually mediates knowledge transfer.

Our findings shed some light on the employment of tools (i.e., formal technology driven tools, formal human focused tools, non-formal tools) which influence the relationship between knowledge characteristics and knowledge transfer effectiveness. If a firm selects a technology driven tool due to knowledge articulability, then knowledge articulability has a significant and a positive effect on knowledge transfer effectiveness ($\beta = 0.24$, $t = 8.12$). Similarly, if a firm selects a formal human focused tool due to knowledge tacitness and embeddedness, then knowledge characteristics have significant and positive effect on knowledge transfer effectiveness ($\beta = 0.67$, $t = 6.42$).

In addition, if a firm selects non-formal tools due to knowledge tacitness and embeddedness, then knowledge characteristics have significant and positive effect on knowledge transfer effectiveness ($\beta = 0.71$, $t = 6.18$). Non-formal tools provide opportunities for more informal and frequent interactions, which are critical to subsidiaries in building trust and pursuing knowledge, transfer Burrows et al. (2005, p. 74) argue that 'the Chinese tend to manage knowledge more informally and personally than their American and Japanese counterparts'. Guan (2005) finds that the non-official groups in Chinese firms play a very crucial role in interpersonal communication and information spreading. *Guanxi* (a relationship) and *Mianzi* (save face) are indigenous concepts in Chinese culture that emphasis the people's preference for non-official mechanisms to transfer tacit and embedded knowledge (Chow & Ng, 2004; Yang, 2005).

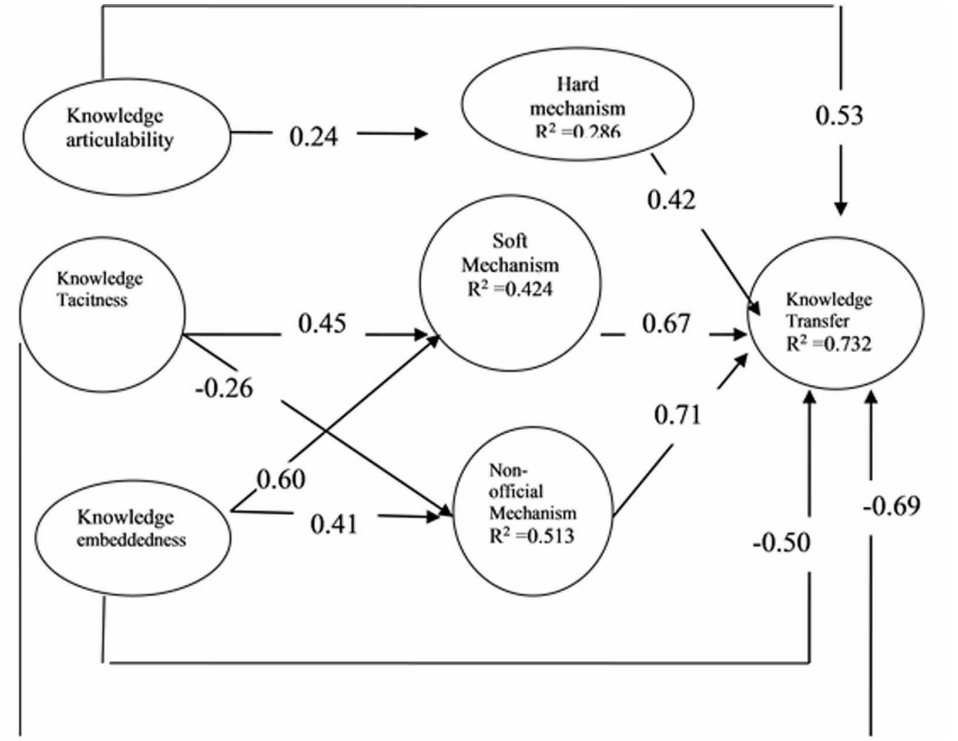
Three hypotheses (H4b, H5c and H6c) of this study proposed the mediating role of KM capability in the relationships of knowledge-oriented leadership with inbound and outbound open innovation. In the interests of rigor, we followed the traditional Baron and Kenny (1986) approach to test for mediation. Table 6 shows the related results. The results indicate that, when the three different types knowledge transfer tools, i.e., of technology driven, human focused and formal (mediators) are introduced in the model, the significant direct effect of knowledge articulability (β 0.53) on knowledge transfer effectiveness is reduced considerably to β 0.42. This significant drop indicates mediation according to the Baron and Kenny (1986) approach. However, the direct effect of knowledge tacitness (β -0.50) and knowledge embeddednes (β -0.69) on knowledge transfer effectiveness is increased to β 0.67 and β 0.71 respectively. Since there is no drop when it comes to the direct effect of knowledge tacitness and knowledge embeddednes on knowledge transfer effectiveness that indicates no mediation of knowledge transfer tools according to the Baron and Kenny (1986) approach. In addition, the direct effect of the predictor variable (knowledge characteristics) on the outcome variable (knowledge transfer effectiveness) was found to be significant in one case when the knowledge is articuable. But the the direct effect of knowledge tacitness and knowledge embeddednes on knowledge transfer effectiveness was found to be the insignificant (not strongly significant) when the mediator was introduced. This study focused on the causal relationships between knowledge characteristics, knowledge transfer and, knowledge transfer effectiveness and ignored the possible recursive relationships.

R^2 indicates the fraction of total variance in the endogenous construct accounted for by those exogenous constructs (Chin, 1998; Mathieson, Peacock & Chin, 2001). Thus, the bigger the R^2, the greater the model's predictive power (Weinfurt, 1995). Overall, a substantial amount of variance is explained in the endogenous variable (knowledge transfer effectiveness). Since the R^2 value of 0.73, (which is very respectable), indicates that a substantial proportion of variance of knowledge transfer effectiveness is indeed predicted by the variables considered.

Although it is difficult to transfer knowledge within firms in global business (Szulanski, 1996), our study is one of the first to conceptualize and empirically investigate knowledge transfer in China. The aim of this study was to advance our understanding of the notion of knowledge transfer effectiveness in the MNC environment at both the conceptual and empirical levels. This study extends the existing knowledge transfer theory insights of Grant (1993) and Hansen et al. (1999) inspired by the theoretical foundation of this study.

This paper makes several contributions to the literature. Firstly, we contribute to the conceptualization of the knowledge characteristics by emphasising knowledge articulability, tacitness, and embeddeness as the important aspects of knowledge transfer. While many studies have focused

Figure 2. Analytical results of the structure model



solely either on the importance of knowledge articulability (Cummings & Teng, 2003; Decker et al.,2009), or knowledge tacitness (Marshall et al., 2005; Hong & Nguyen, 2009; Nonaka & Takeuchi, 1995), or knowledge embeddeness (Cummings & Teng, 2003; Decker et al., 2009; (Hong & Nguyen, 2009; Lam, 1997; Demirbag et al., 2007; Hsiao et al., 2006) in knowledge transfer, this paper brings them together to explain their linkage, and quantifies the relationship.

Secondly, we extend these studies by exploring appropriate transfer tools that mediates knowledge transfer. Knowledge transfer tools have been used as a mediating factor in the structural equation model (SEM). Prior studies have examined knowledge characteristics or transfer mechanism in isolation when discussing the idea of knowledge transfer (Grant, 1993; Hansen et al., 1999). This paper focused on both constructs in order to understand knowledge transfer in the global business context. The study offers further understanding by establishing an argument that transfer tools are the first outcome of knowledge characteristics in the knowledge transfer process. In addition, the study also offers unique findings by examining the direct and indirect effect of knowledge characteristics on knowledge transfer. The research reveals that knowledge characteristics have direct impact on knowledge transfer. Similarly, the results by which the links between knowledge characteristics and knowledge transfer are partially mediated by transfer tools (as shown Figure 2).

Thirdly, with the use of a SEM approach, this paper has focused on the knowledge transfer between a Japanese MNC and its subsidiary based in China. We proposed and tested a comprehensive model that explained the role of various key constructs (e.g., knowledge characteristics, transfer tools) that in past research received only partial and independent attention. Rather than focusing on any one specific relation between knowledge characteristics and knowledge transfer or between transfer tools and knowledge transfer, it is the simultaneity of all the hypothesized relationships that confers integrity and relevance to the model.

Moreover, this study makes contextual contributions, because it was conducted in China, which has not been the focus of many previous studies. Thus, this study tested and validated the instrument of Western knowledge transfer tools in the Asian context. The psychometric properties and dimensionalities of knowledge transfer instruments differ in this research setting. For example, employees in Asia consider the use of informal tools as more effective for knowledge transfer which contrasts with that in the West, where the formal tools are preferred.

The paper also provides some practical insights and implications for the understanding of MNCs and their ability to transfer knowledge effectively to their subsidiaries. Currently, managers of MNCs and other subsidiaries have little knowledge of the effect of knowledge characteristics on the selection of transfer tools that facilitates knowledge transfer. This study assists managers with guidelines on the role of transfer tools in line with knowledge characteristics to facilitate knowledge transfer. This paper helps practitioners to understand how knowledge characteristics can impact on the selection of a knowledge transfer. Hence, the model developed in this paper is not only a response to the need to understand what causes the variation in knowledge transfer from the knowledge characteristic perspective, it is also a response to practitioner needs to use an appropriate transfer tool for knowledge transfer taking into account the various characteristics of organisational knowledge.

LIMITATIONS, ADDITIONAL RESEARCH, AND RECOMMENDATIONS

Although this study presents strong evidence regarding the relationships between knowledge characteristics, transfer tools, and knowledge transfer, the implications of this study, however, should be evaluated in light of several limitations.

First, this research did not cover a comprehensive list of potential factors that may influence knowledge transfer because it focused only on the effects of knowledge characteristics on the selection of an appropriate transfer tool to improve knowledge transfer.

For example, culture is considered as a critical dimension in technology/ human interaction (Jasimuddin, 2005) and international business (Hofstede, 2001). Culture is an important variable that should be controlled. A major challenge faced by MNCs is how to manage knowledge transfer between headquarters and subsidiaries located in dissimilar cultural contexts (Qin & Ramburtuh, 2008). As mentioned earlier, the data were collected from China which is geographically close to Japan. Further research may consider the organizational context such as geographical distance, cultural differences, and the knowledge recipient's characteristics to understand the effectiveness of knowledge transfer. The knowledge characteristic is best depicted as a continuum (Michailova & Mustaffa, 2011). This paper concentrates on knowledge-as-a-category; future research may focus on knowledge-as-a-category.

The study is based on the cross-sectional data. Longitudinal research can be conducted in future using longitudinal data to investigate the dynamic features of knowledge transfer, including expanding their samples to increase the validity. Future research can triangulate in-depth qualitative case studies and quantitative research so as to provide robust results. As noted earlier, one of the findings contradicts previous studies. That is, tacit knowledge and non-official tools of knowledge transfer is surprisingly negative. Certainly, this is a fruitful area for future studies.

The paper did not measure how successful knowledge transfer is in terms of organisational levels (low and top), customer satisfaction, innovation, improving decision making etc. Hence, future research should be undertaken to address these issues. Finally, the samples were restricted to the subsidiaries of Japanese MNCs based in China. Since the samples were drawn only from MNCs originated in a single country, the results are limited to Japanese MNCs in China. Hence the results of the study may not be generalisable to other settings. To overcome this limitation, comparing the constructs of interest in other countries (e.g., emerging economies) would be an interesting topic for future research.

CONCLUSION

This paper links information management, international business, and knowledge management. This study has focused on the knowledge characteristics and transfer tools that are needed to facilitate knowledge transfer, and then to contribute to an organisation's competitiveness. While the research is derived from the knowledge-based view of the firm (Ambronisi & Bowman, 2001) it has demonstrated that knowledge characteristics have a critical role in transfer tools and knowledge transfer. Previous research has focused on identifying the nature of knowledge that promotes knowledge transfer in general without adding the role of knowledge transfer tools in that process. Therefore, it is essential to understand the effect of knowledge characteristics on knowledge transfer using transfer tools as a mediator.

Our model tests the often-assumed direct relationship between knowledge characteristics and knowledge transfer effectiveness while attempting to understand the effect of knowledge characteristics on knowledge transfer effectiveness using transfer tools as a mediator. That is, this study extends the relationship between knowledge characteristics and knowledge transfer effectiveness by adding knowledge transfer tools that mediate their linkage. Knowledge transfer tools serve as both a dependent variable (to knowledge characteristics) and independent (mediating) variable (to knowledge transfer). By testing eleven hypotheses, this study finds that knowledge characteristics have statistically significant effect on transfer tools and knowledge transfer. The paper is conceptually grounded in the relevant literature supported by an empirical work. It will definitely motivate scholars to engage with the issues in different ways than they had in the past.

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