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A GROUNDED THEORY FOR ICT-MEDIATED TACIT KNOWLEDGE TRANSFERABILITY IN MNCS

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ABSTRACT

Aim/Purpose	A vital business activity within organizations is tacit knowledge (TK) transfer. This work aims to propose a novel framework for TK transferability in multinational corporations (MNCs) from the information and communication technology (ICT) perspective.
Background	In the past two decades, researchers have developed several frameworks for TK transfer based on humanistic, business, and educational perspectives. However, a review of the existing work revealed that TK transfer has seldom been examined from an ICT perspective.
Methodology	A qualitative method was adopted because it was considered the most appropriate for the research requirements. A grounded theory approach was employed to generate the items that potentially affect the transferability of TK. Face-to-face semi-structured interviews were conducted to collect data, along with observations when possible. The study sample consisted of 20 expert interviewees in Malaysia. An inductive ongoing data analysis process based on grounded theory via open, axial, and selective coding was used as the primary analysis method. In addition, comparative and frequency count analyses were used to examine the collected data.

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Contribution	The main contribution of this study is its use of the grounded theory approach, which resulted in the generation of items that affect the transferability of TK, not all of which had been identified by previous researchers. This paper reports one of the few inductive studies conducted on TK transferability among MNCs and, therefore, makes distinct contributions to the literature on TK management, specifically bringing to the fore the intricacies involved in TK transferability.
Findings	Information and communication technology plays a crucial role in and has a positive impact on TK transfer in MNCs. This study evaluated the potential of various ICT channels to facilitate TK transfer. The findings show that ICT tools cannot completely substitute for face-to-face contact. Tacit knowledge that has a high degree of complexity requires sophisticated channel features for its transfer. From this standpoint, virtual face-to-face communication is the richest communication medium in the ICT hierarchy. On the other hand, email and voicemail are less effective channels for TK transfer, while synchronous groupware is an intermediate communication medium. The findings highlight the importance of utilizing an appropriate mix of channels to improve TK transferability.
Recommendations for Practitioners	It is recommended that practitioners consider the diverse aspects of TK and the potential of a range of ICT channels for the TK transfer process in order to increase the efficiency of TK transfer. The analytic categories developed in this study may give managers new insights into and a better understanding of how TK can be supported in a modern organization and how to overcome the barriers to TK transfer.
Keywords	tacit knowledge, transferability, information and communication technology, multinational corporations

INTRODUCTION

In the highly competitive global economy of the 21st century, tacit knowledge (TK) transfer mediated culture of excellence appeared as a crucial determining factor for efficient organizational performance. Currently, both manufacturing and service sectors are inclined toward the implementation of TK transfer in order to secure competitive advantage for sustainable organizational development (Supartha & Ratih, 2017). Thus, in order for companies to compete on the world stage and to confront the effects of globalization, knowledge management (KM) needs to be integrated and fused into organizational culture and strategies. Furthermore, it is widely accepted among multinational corporations (MNCs) that "knowledge is power" in that it provides a competitive advantage and will play an increasingly significant role in the global business economy (Al-Obaidi, Fahmi, & Al-Hadrawi, 2018; Halawi, McCarthy, & Aronson, 2006; Ragsdale, 2014; Rahimli, 2012; Torabi & El-Den, 2017). Moreover, organizations are placing a growing emphasis on harnessing their employees' experience and improving their knowledge. Many organizations are undertaking major KM initiatives to capture the benefits they can offer in both local and global markets (Alajmi, Marouf, & Chaudhry, 2016). Thus, knowledge creation, transfer, and utilization will be highly crucial to the existence and success of organizations in the coming years (Nonaka & Hedlund, 1991). However, companies face several challenges when attempting to create a systematic way of acquiring, storing, organizing, transferring, and making knowledge accessible to their employees. One of the ways in which these challenges can be surmounted is to invoke the concept of KM (Ras, Memmel, & Weibelzahl, 2005). Knowledge management refers to the practice and techniques used by an organization to identify and disseminate knowledge and expertise. Ultimately, it assists in the leveraging, reuse, and transfer of knowledge and learning in all units of an organization (Iandoli, 2007).

For geographical, socio-political and demographic reasons, the resources of MNCs are scattered around the world in many different countries. Thus, workers in those companies, who are considered "knowledge carriers," need to be able transfer and take advantage of these dispersed resources in order to gain a sustainable competitive advantage (Claver-Cortés, Zaragoza-Sáez, Úbeda-García, Marco-Lajara, & García-Lillo, 2018; Gevorgyan & Ivanovski, 2009).

It is a given that people rely unconsciously on TK. Furthermore, TK is very important for organizations when it comes to improving the quality of decision-making. Organizations often face a risk when decision-makers lack the requisite TK for making good decisions (Jantunen, 2016). According to Handzic (2011), organizations need to be able to recognize worthwhile knowledge and must enable it to flow throughout the organization. However, TK has been described as sticky, slow to move and hard to imitate (Szulanski, 2003). A significant amount of research in the area of international business indicates that MNCs possess the most widely dispersed and greatest variety of TK (C.-Y. Lin, 2006; Minbaeva, 2007; O'Sullivan, 2008; Riege, 2007). Thus, MNCs are important platforms for cross-border knowledge transfer (Perez-Nordtvedt, Kedia, Datta, & Raheed, 2008).

Knowledge is multifaceted and therefore can be categorized in many ways. Perhaps the most widely accepted knowledge taxonomy among both researchers and practitioners is the dichotomous classification of knowledge into explicit and tacit, which was introduced by Polanyi (1967) and popularized by Nonaka and Takeuchi (1995), and adopted by many subsequent studies (e.g., Chen & Zhang, 2010; Collins, 2010; Guan-Lin, Wei-Yu, Shu-Chen, Shung-Ming, & Wan-Chen, 2011; Haldin-Herrgard, 2003; Juhana, 2005; Lifeng, 2009; Wilson, 2002).

There are many definitions of TK in the literature, but they have an essentially similar meaning. Polanyi (1967) defined TK as something that we do unconsciously and oftentimes we are not aware of its existence. According to Chen and Zhang (2010), TK can only be sensed, observed, or experienced. As mentioned above, Nonaka and Takeuchi (1995) expanded on Polanyi's concept of TK. They added cognitive and technical dimensions: The technical dimension, which is developed over years of experience, is quite subjective and based on personal insights, while the cognitive dimension consists of beliefs, perceptions, values, and emotions, and it is this dimension of TK that shapes the way in which people perceive the world around them (Nonaka & Konno, 2005).

Numerous research studies have acknowledged that TK relies on the cognitive dimension (truths, beliefs, values, and insights) to a large extent. Moreover, compared to explicit knowledge, TK can only be processed in the human mind and cannot easily be transferred due to its complexity and ambiguity (Chen & Zhang, 2010; Chennamaneni & Teng, 2011; Choo, 2003; Davenport & Prusak, 2000; Juhana, 2005; Nonaka, Toyama, Boysiere, 2001; Ribeiro, 2013; Wig, 1993; Wilson, 2002). However, despite the many studies published thus far, the mechanism of TK transferability is little understood. Table 1 shows the complexity of tacit knowledge compared with explicit knowledge in terms of acquisition, transfer and storage.

Over the recent decades, the emergence of the Internet and the widespread usage of information and communication technology (ICT) have brought about a revolution in the way human beings communicate and interact with each other. Furthermore, the type of ICT tools that MNCs use to transfer TK has changed from tools for data/information management to tools for KM.

Taking into account the problems associated with the transfer of TK via traditional methods such as the movement of experts as well as the rapid developments in the ICT industry, which have created new channels of communication, this study attempts to contribute to the existing research on TK management by adopting an ICT perspective. The remainder of this paper is organized as follows: First, a review of the related literature is presented. This is followed by a description of the methodology adopted for this research. Then the results are presented and discussed and a framework for TK transfer is proposed. The paper then concludes with some observations regarding lessons learned and the limitations of the study that suggest future directions for research in this area.

Table 1. Explicit vs. Tacit Knowledge*

CHARACTERISTICS	TACIT KNOWLEDGE	EXPLICIT KNOWLEDGE
Property	Personal, context based	Compiled, expressed
Modality	Nonstructural, difficult to articulate in clear language	Structural, verbal or written and expressed in certain language
Site of occurrence	In a person's brain, soul and behaviors	In files, databases, webpages, e-mails, books, tables, charts, etc.
Conversion process	Transforms tacit knowledge into explicit knowledge through the movement of experts	Transforms explicit knowledge into tacit knowledge through understanding, assimilating and imbibing
Sustainability via technology	Difficult to manage, share or sustain with information technology	Able to sustain with information technology
Transfer channel	Information and communication technology, multimedia	Electronic

*: Adapted from studies by Al-Qdah and Salim (2013b) and Beijun and Jian (2010).

LITERATURE REVIEW

A critical review of the literature indicates that MNCs face difficulties in transferring TK because they operate in multiple environments. In addition, changes in personnel and in employment practices are strongly influenced by local requirements, laws, and cultures. These variations, which are often tacit, are a potential source of advantage at the local level and can therefore provide an overall global advantage to the MNC as a whole, especially if this TK is leveraged appropriately (Hsueh, Ling, Yen, & Hwang, 2016; C.-P. Lin, 2008).

KNOWLEDGE TRANSFER

The concept of knowledge transfer was first proposed by Teece (1977). Later, Szulanski (2000) defined knowledge transfer as a process of integrated dual exchanges of knowledge between the sender and the receiver. Knowledge transfer is a process of donating and gathering knowledge between the different knowledge units in a company. It has also been described as the behavior of employees in sharing their insights and expertise (Hoof & De Ridder, 2004; Nonaka & Hedlund, 1991). Over the years, numerous terms, such as knowledge sharing and knowledge exchange, which are conceptually similar to knowledge transfer, have been used in the literature. Indeed, researchers often use knowledge sharing and knowledge transfer interchangeably (Y.-S. Hsu, 2012).

Hedlund (1994) suggested that one of the foremost features that makes a company unique is its capacity to share TK among units. Furthermore, because no single person possesses all the TK required for all global markets, TK that is divided and dispersed among individuals must be integrated to achieve success (Björkman et al., 2004).

However, it is extremely difficult to spread TK by using traditional methods because of the high cross-border cost (Boonyarith, 2012; Gevorgyan & Ivanovski, 2009; Lam, 2011; Riege, 2007). Also, Rice and Rice (2005) acknowledged that conducting empirical research on TK is challenging because it requires a deeper understanding of knowledge that defies articulation. Hence empirical evidence on the challenges of TK is lacking (I.-C. Hsu, 2008; C.-P. Lin, 2008). Therefore, some researchers have chosen to scrutinize the challenges associated with TK transfer in MNCs qualitatively in order

to gain an in-depth understanding of this phenomenon (Irick, 2007; Mahroeian & Forozia, 2012; Sanchez & Heene, 2012).

Earlier studies focused on knowledge transfer from two perspectives: the movement of experts and the change in communication model. Knowledge transfer via the movement of experts from one branch of a company to another is often found to be less effective, time consuming, and more expensive than using a communication process. In the movement of experts, it is social interaction and cultural and individual behavior that are crucial factors in the successful transfer of TK, whereas in the communication model proposed by Shannon and Weaver (1949), the act of communication itself is the key factor (Fiske, 2010). Minbaeva (2007), in her work on communication models, identified several determinants that affect the knowledge transfer process, which she classified into four groups: characteristics of knowledge, disseminative capacity, absorptive capacity, and characteristics of the relationships between senders and receivers.

Finding a way to select appropriate organizational mechanisms to improve knowledge transfer is one of the main problems faced by top management in MNCs. However, there is little research to date that has examined the impact of organizational mechanisms on knowledge sharing inside MNCs (Björkman et al., 2004). The past research that has been conducted on this issue has uncovered a number of barriers to intra-MNC knowledge transfer and, in particular TK transfer, that are associated with communication channels. Several researchers have argued that it is not only the communication channels, but also the richness of the communication links that impede or facilitate the transfer of complex knowledge (Chennamaneni & Teng, 2011; Delen & Al-Hawamdeh, 2009; Gupta & Govindarajan, 2000).

ICT and Knowledge Transfer

According to Stajic (2009), ICT refers to any type of information and communication device, such as personal computers, tablets, smart phones, and audio and video transmission devices, as well as a range of software applications and services that run on such devices. Communication systems are software solutions that enable people and organizations to communicate and share their data, information and knowledge.

The last decade has seen a revolution in the field of ICT that has transformed the modes in which people communication and exchange information. Evidently, ICT is offering huge potential because it can provide significant advantages to different industry sectors. Thus, the deployment and use of ICT has been recognized by many MNCs as a good way in which to decrease the gap between headquarters (HQs) and their subsidiaries.

In fact, ICT has increased the authority and control capabilities of HQs mainly by facilitating transparent knowledge flows between HQs and subsidiaries and by enabling HQs to monitor activities in their subsidiaries remotely (Ghoshal & Bartlett, 1990; Stajic, 2009). On the other hand, Hansen (1999) stated that ICT can have a negative effect on the exchange of TK, for instance when employees e-mail each other rather than have a face-to-face meeting.

According to C. Mason, Castleman, and Parker (2008), evidence is emerging to support the proposition that moving from the physical to the virtual domain increases the capacity for innovation via the sharing of TK across boundaries and utilizing the power of weak 'bridging' links.

Previous Frameworks for Knowledge Transfer

Several frameworks and models for knowledge transfer have been proposed and they have been developed by utilizing a variety of perspectives. For instance, Novins and Armstrong (1998) introduced a framework for knowledge classification that focused on the transferability and applicability of TK and was intended to be beneficial to business in terms of assisting organizations to manage their TK. However, the role of ICT in terms of its potential to transfer TK in MNCs was not addressed.

Moreover, the framework did not include the influence of TK tacitness and complexity on transferability.

On the other hand, Szulanski (2000) proposed a four-stage model of the knowledge transfer process that considered the transfer of an individual piece of knowledge and that addressed the "stickiness" or difficulty of the knowledge transfer process.

Later, Chini (2004) proposed a conceptual model of the knowledge transfer process across geographically separate units of MNCs from a cultural perspective; the aim was to examine ways in which to maintain and/or enhance the competitive advantage of MNCs. It was shown that organizational and cultural differences have important moderating effects on knowledge transfer and that knowledge transfer can be hindered or aided by these contingency factors. In other words, knowledge transfer not only needs to take place, it has to be effective so that MNCs can maintain their competitive advantage over time in response to a changing business environment.

From another stand point, Minbaeva (2007) introduced some fundamental components of knowledge transfer by referring to the communication model in which she considered the features of knowledge senders and those of knowledge receivers, as well as the relationship between the knowledge sender and receiver as significant factors in knowledge transfer.

Some years later, Y.-S. Hsu (2012) created a three-dimensional framework that comprises structural, relational, and cognitive social capitals, with the aim of determining ways in which locally based and expatriate employees could surmount their intrinsic differences to establish good working relationships and thereby enhance knowledge transfer. The researcher looked specifically at how the characteristics of the employees themselves as well as the practices of the organization could mobilize the social capital needed for effective knowledge transfer.

More recently, Al-Qdah and Salim (2013a) proposed a conceptual framework to facilitate the effective transfer of TK based on media richness theory. However, this framework was not validated by experts and did not explain the whole process of transferring TK between employees in MNCs.

In the past, the aspects of the acquisition and transfer of TK in KM have been examined from behavioral and managerial perspectives. The literature has seldom looked at TK transfer from the ICT viewpoint (Ye & Huirong, 2010). However, Venkitachalam and Busch (2012) acknowledged that it would be worth exploring the impact of TK transfer in MNCs from the ICT standpoint. The primary obstacle that prevents the successful transfer of TK between different units in an organization is associated with the inexpressibility of TK. Thus, this study attempts to examine whether TK can be transferred effectively within MNCs through the use of ICT.

Analysis of Gaps in the Literature

The review of the literature on TK and especially that on transferring TK was undertaken in the initial stages of the current research revealed many knowledge gaps. These gaps are summarized in Table 2. It is these gaps that motivated and revealed the direction of this research.

Table 2. Gaps in the Literature on Tacit Knowledge and Tacit Knowledge Transfer

AUTHOR/YEAR	GAP
Asakawa and Lehrer (2003)	The challenge of mobilizing such knowledge is frequently illustrated as a trade-off between the global view from MNC headquarters and the better knowledge of local conditions possessed by national subsidiaries.
C.-Y. Lin (2006); Novins and Armstrong (1998)	Classifying knowledge in terms of transferability and applicability yields much clearer guidance for managing tacit knowledge.
Irick (2007)	The main challenge in organizational research has been whether it is possible to manage tacit knowledge in a way that will be transferable to other individuals, and how MNCs can manage this.
Yajun, Jinsheng, Deyong, & Zhaohui (2008)	MNCs face problems in transferring and applying tacit knowledge because they operate in multiple environments.
Bechina and Ndlela (2009); Gevorgyan and Ivanovski (2009)	There are many perspectives on the role that ICT plays in the tacit knowledge transfer process and hence the nature of its role is still debated.
Lifeng (2009)	Organizations need to take a holistic approach to managing tacit knowledge in their organizational structure.
Ye and Huirong (2010)	Unfortunately, the majority of past research has studied aspects of knowledge management from the behavioral and managerial perspectives and seldom from the perspective of ICT.
Lam (2011)	The sharing and transfer of knowledge across organizational and national borders is difficult. The problem is even greater in the case of tacit knowledge.
Boonyarith (2012)	There is a lack of research on the knowledge transfer process among professionals working for short periods of time on certain international projects as a personnel movement mechanism.
Pfeffer and Sutton (1999); Venkitachalam and Busch (2012)	One of the less encountered topics in past research studies, and which therefore demands more attention, is the examination of how tacit knowledge may be better transferred and utilized.
Venkitachalam and Busch (2012)	One of the most interesting yet unexplored research issues with regard to tacit knowledge creation and particularly the transfer of that knowledge is the impact that ICT has in an organization.

AUTHOR/YEAR	GAP
Al-Qdah & Salim (2013a)	A conceptual framework to facilitate the effective transfer of tacit knowledge has been proposed based on media richness theory. However, this framework has not been validated by experts, and does not explain the whole process of transferring tacit knowledge between employees in MNCs.

METHOD

In line with the major studies on TK (e.g., Ambrosini & Bowman, 2002), this study employed a qualitative methodology because it seemed best suited to an examination of the complex nature of TK and TK transfer. The approach involved the administration of a survey among MNC experts and practitioners involved in organizational TK transfer who move from location to location in the recipient offices.

RESEARCH APPROACH

According to Creswell (2012), qualitative research can be conducted by adopting one or more approaches, including the case study, phenomenological, ethnographical, biographical, clinical, historical approach as well as grounded theory. This study employed grounded theory, which was proposed by Glaser and Strauss (1967) in their book, entitled "The Discovery of Grounded Theory." Through their work on grounded theory Glaser and Strauss established a new trend that revolutionized the approach to qualitative research (Bryant & Charmaz, 2007). Oktay (2012) stated that grounded theory is one of the pioneering types of qualitative research; applying grounded theory benefits because it is grounded on reality. In this regard, grounded theory is capable of providing additional value when such value cannot be found in the literature (Haron, Noordin, & Alias, 2010).

Specifically, grounded theory is a set of procedures utilized to determine categories and concepts stemming from textual data and to link them to substantive and formal theories (Bernard, 2006). Oktay (2012, p. 5) stated: "Because grounded theory creates theories that are derived directly from the real-world setting, it has potential to produce theories that can be used by social workers to guide practice." Moreover, in grounded theory, to create a logical paradigm design, one must use different aspects including open, axial, and selective coding in a systematic research design (Strauss & Corbin, 1998).

SAMPLE AND DATA COLLECTION

In grounded theory, observational notes and interviews are the primary sources of data, while information from books, journals and surveys may be used as supplemental information (Glaser & Strauss, 1967). Various techniques can be used for qualitative data analyses.

A total of 20 face-to-face semi-structured interviews were conducted in Malaysia to elicit feelings, intuitions, insights, and experiences regarding TK transfer. Only those with over 10 years' work experience were selected because it was judged that such participants would have reasonable insights into the ways in which TK is transferred in their working environment. The interviewees were chosen through purposeful and theoretical sampling in order to gather diverse experiences and examples of the phenomenon. This helped in the accurate identification and recruitment of information-rich interviewees (Barbour, 2001), which included practitioners, professors, and consultants from different areas, including IT, healthcare, petroleum, agriculture, engineering, building materials, training, and academia. Every interview was conducted in a time span of 90–320 minutes upon reaching saturation point.

In addition to the semi-structured interviews, observations were made whenever possible, for instance during tea breaks and formal meetings, (see Appendix C). The activities and interactions that occurred during these breaks and meetings were documented. Subtle factors such as changes in attitude and the ways in which the experts overcame problems were also noted. In addition, documents such as meeting minutes, PowerPoint presentations about the company, company website pages, and project activities were examined as supplementary information.

Data Analysis Techniques

The data gathered from the semi-structured interviews, observations, and documentation were analyzed and interpreted through open, axial and selective coding procedures in line with grounded theory and through a frequency count analysis technique. The coding process involved a comparative analysis by comparing various experts' opinions, agreements, and disagreements about specific points. Frequency count analysis was carried out to determine the number of interviewees in each category of the data. In addition, the thematic technique was used to group together those elements

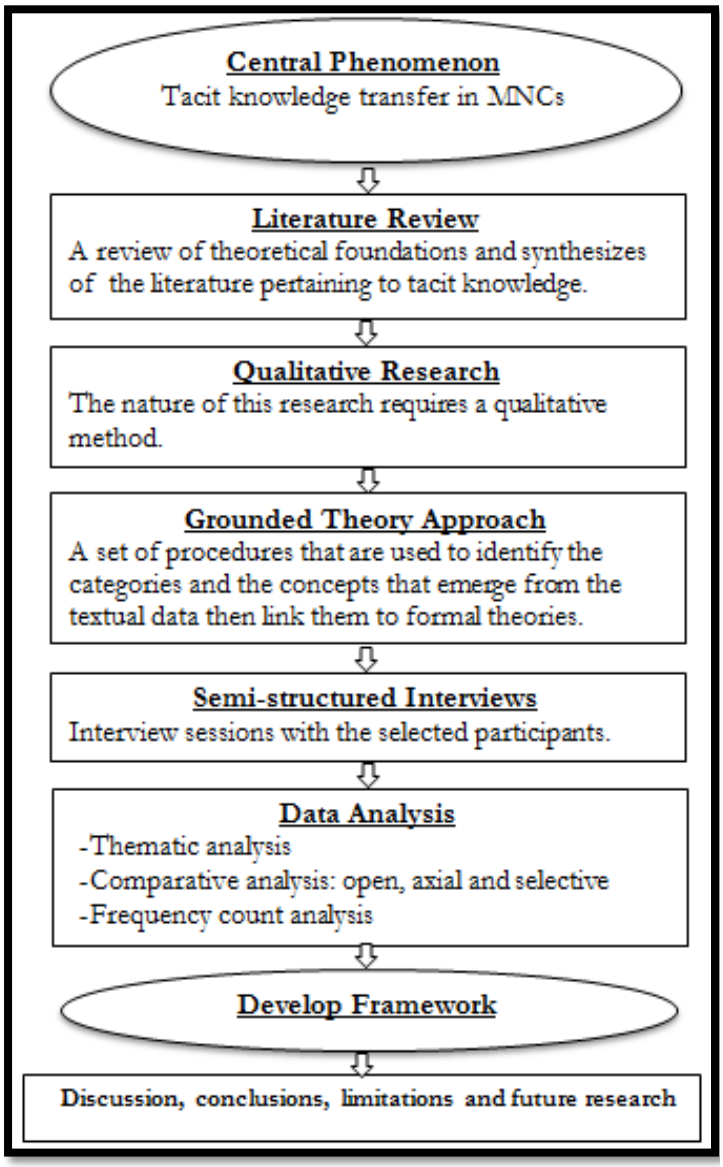

Figure 1: Flowchart of research process.

with the same properties. A total of 53 initial codes were obtained to which clustering and theming techniques were applied until a number of central or core categories arose from the data. Appendix A provides details of the initial coding list, while Figure 1 illustrates the research process.

RESULTS

The ICT-mediated TK transfer in Malaysian MNCs was determined by developing a framework for KM. The main findings are discussed, interpreted, and compared with those in the literature in the following subsections.

SALIENT ATTRIBUTES OF TACIT KNOWLEDGE

Based on the interview sessions with experts in MNCs in Malaysia, TK is perceived as a very important asset in companies. It is considered a core cog in the current economy. The future success of the business economy depends on how effectively MNCs acquire, use, and leverage TK. Tacit knowledge is fundamentally significant because expertise relies upon it. It is context based and deeply rooted in action and critical to daily management activities. However, the experts affirmed that a long period of time is needed to absorb the cognitive effects and behaviors of TK.

These general findings are in good agreement with those of other research reports on TK transfer in MNCs (Ambrosini & Bowman, 2002; Brockmann & Anthony, 1998; Coppedge, 2011; Foos, Schum, & Rothenberg, 2006; Nonaka & Hedlund, 1991; Nonaka & Konno, 2005; Venkitachalam & Busch, 2012).

TACIT KNOWLEDGE TRANSFER

The results reveal that TK involved skills, expert opinions, intuitions, judgments, behaviors, procedures, values, norms, and experiences are difficult to transfer. The effective transfer of TK requires peer-to-peer communications through long-term mentoring, expert consultation, observation, coaching, and community of practice (CoP) programs. The majority of the experts interviewed disagreed with the idea that it is possible to share all the TK accumulated in an expert.

Unlike explicit knowledge, which can be stored in books and databases and thus disseminated and accessed, TK must be processed by human minds and not by machines. It is, first and foremost, a human issue involving mental processes that take place in the mind and in interaction with others. This finding is still debated by many researchers (Al-Hawamdeh 2002; Juhana, 2005; Nonaka, 1994; Wilson, 2002). The findings also show that companies that have good and proper mechanisms can easily manage TK, which supports the conclusions drawn in other studies (Al-Hawamdeh, 2002; Chen & Zhang, 2010; Foos et al., 2006).

IMPROVING TACIT KNOWLEDGE TRANSFER

It is worth mentioning that accessing accurate information from the person possessing the right knowledge at the right time is vital for TK transfer. Companies in the medical, fuel, computer, and system development sectors are attached to resource people via its standardized services. The results show that a subject matter expert system and yellow pages are often helpful in improving TK transfer. Thus, the managers of a company must facilitate the flows of resources in order to transfer TK. In short, companies must create a KM unit for efficient TK transfer.

Furthermore, identification of TK helps an organization to build its own knowledge map. In order to foster knowledge sharing, an organization has to determine the experiences and skills of its personnel. The first step in improving TK sharing is the identification of the knowledge and skills that are essential for the successful operation of the company or specific activities of the business. It is also essential to identify whether any knowledge and skills are at risk of being lost. The analysis reveals that the issue of loss of power during TK transfer appeared to be a great concern to many

companies. However, the majority of the participants agreed that transferring TK does not cause any loss of power. In fact, the majority of experts were of the opinion that successful people share their knowledge with others with only one expert agreeing that the sharing of TK would lead to loss of power. Despite the differences in opinion on knowledge transfer and loss of power, the majority of experts agreed that companies can create an environment to motivate employees to share knowledge by offering motivating career paths and giving them the opportunity to change jobs via promotions. The majority of experts also agreed that companies considered the coach/coachee relationship, CoP programs attended by employees, and continuing professional development records as means of capturing skills, knowledge, and experience to cultivate TK transfer.

Barriers to Transferring Tacit Knowledge

The results reveal that the companies encountered several difficulties when TK is transferred, in particular between the headquarters (HQ) and its subsidiaries. Factors responsible for such complexity are the intricate nature of TK, outlook and trustworthiness of top management as well as workers, ineffective mechanisms, time restriction, absence of proper planning, scarcity of human resource, cultural diversity, lack of peer-to-peer transfer, cost of knowledge transfer, and politics.

In order to overcome those barriers, the findings highlight the importance of regular, formal or informal meetings in order to share values, the organization's vision and to complete tasks. The findings indicate that team members meet together to explore and brainstorm ideas, solve problems or take decisions, allocate resources, and share tacit knowledge. In addition, they indicate that barriers can be overcome through offering a training system for new employees for a certain time and giving all staff the opportunity to attend workshops and seminars.

Degree of Tacitness

Complex TK involves high degree of tacitness and, conversely, some TK is less complex and has a lower degree of tacitness. It was established through the interviews conducted that different types of TK with different levels of complexity can enhance the degree of TK transfer upon the selection of suitable mechanism. This result is in good agreement with the findings by Winter (1998), Simonin (1999) and Beijun and Jian (2010). Table 3 provides some examples of TK with high/low tacitness that were identified by the interviewees.

Table 3. Examples of Different Types of Tacit Knowledge Based on Complexity

COMPLEX TACIT KNOWLEDGE (HIGH DEGREE OF TACITNESS)	LESS COMPLEX TACIT KNOWLEDGE (LOW DEGREE OF TACITNESS)
Programming skills, pricing items, production quantities, medical judgment, stitching the wound after operations, disease diagnosis, understanding X-ray reports and medical laboratory results, sewing the heart valve after open-heart operation, running the ovens in the factory, pest control, propagation and pollination of plants, fertilization and irrigation techniques, grafting of roses, nanomaterial synthesis, root cause analysis, identifying harvesting stages in rose production	Naming methods and functions in programming languages, maintenance of equipment in factories, best clinical practice in hospitals, the successive steps used in strategic planning, how to deal with soil salinity and soil pH value, cooling roses under specific temperatures to increase the life of roses in plantations, operating machinery.

Role of ICT in Tacit Knowledge Transfer

Impact of ICT

The results show that ICT plays a crucial role in and positively influences TK transfer in MNCs as proposed by all the experts interviewed. It decreases the geographical distance between the HQ and offshore subsidiaries, makes the transfer of TK faster, and reduces the cost of transmission.

In particular, the findings reveal that half of the experts believe that ICT tools cannot totally substitute face-to-face contact, primarily because current ICT channels cannot replace the important facets of body language and eye contact between individuals in a face-to-face meeting. However, half of the participants agreed that technology could substitute face-to-face meetings if the receivers had enough data to simulate realism. For instance, simulator machines (animations created using computer graphics) could incorporate accurate physical motions by using pragmatic movements and facial expressions, as well as other sensory experiences to replicate exact conditions. Thus, if a receiver had a good background in the transferred knowledge, ICT could substitute the face-to-face meeting. On the other hand, even the experts in favor of using ICT instead of face-to-face meetings agreed that face-to-face meetings cannot be substituted by ICT when the receiver is an apprentice or relative novice. This finding is in disagreement with the observation of Derks, Fischer, and Bos (2008), who concluded that ICT is not a less present or less emotional medium compared to face-to-face interaction.

As regards the transfer of different types of TK, one expert (a specialist in open and distance learning) did agree that ICT is a possible substitute for face-to-face meetings in relation to the cognitive side of TK transfer. In contrast, some experts believe that the technical side of TK necessitates face-to-face contact, especially in medical fields such as those that require an individual to complete rigorous training to perform surgical operations. Two experts agreed that there are a number of interfering factors in medical diagnostics. For instance, some diseases require the medical professional to physically touch the skin in case of a human body and to touch the leaf tissue of plants to distinguish between viral and bacterial disease. Moreover, a manager and R&D expert in the agricultural sector elaborated that, in analyzing and judging the organoleptic attributes, particularly the olfactory, gustatory, tactile, and kinesthetic attributes of olive oil, the scents and perfumes cannot be transferred via ICT. Currently, this finding cannot be fully substantiated because there are no previous studies, except the work of Chennamaneni and Teng (2011) that mentioned this issue. However, as Chennamaneni and Teng cautioned, the result of their work also needs to be further validated through an assessment by a panel of experts in the future.

Potential of ICT channels

According to the results derived from the expert interviews, TK can be transferred easily when a proper mechanism based on ICT is available along with well-built ICT infrastructures. Moreover, the deployment and use of ICT is recognized by many MNCs as a good solution to increase the authority and control capabilities of HQs. In addition, the possibility of remotely monitoring the activities of subsidiaries by HQs is remarkably enhanced due to the implementation of ICT. These findings are consistent with the observations of Ghoshal and Bartlett (1990), Gevorgyan and Ivanovski (2009), Kock (2005), and Stajic (2009).

There was a consensus among all the interviewees that the categorization of TK into several levels in terms of its complexity makes its transfer via ICT easier. In addition, the findings affirm the importance of having proper ICT tools in place in order to transfer TK in MNCs that are based on the potential of the communications attributes. All the experts strongly agreed that TK with a high degree of tacitness requires sophisticated channel features to transfer it, such as video recording, whereas TK with a low degree of tacitness requires simpler media such as e-mail. Continuously matching the features of the transfer channel and the degree of tacitness will increase the efficiency of TK transfer because the quality of knowledge transfer depends on the richness of the communi-

cation channels, where each channel has different characteristics of facilitation and enablement in terms of knowledge transfer. These features must be taken into consideration in order to determine the communication strategies that will maximize knowledge transfer. The results in this study show that the transfer quality and the richness of channels are positively correlated, which supports the findings of Gupta and Govindarajan (2000), Delen and Al-Hawamdeh (2009), Venkitachalam and Busch (2012) and Chennamaneni and Teng (2011).

Our findings further reveal that the transfer of TK is more effective and efficient whenever the media is able to transfer the largest number of senses. From this standpoint, face-to-face (video-conferencing) communication is the richest communication medium in the ICT hierarchy. Conversely, other media such as e-mail, voicemail, letters, and notes, which send fewer cues and have slower feedback, are poorer in terms of TK transfer. Synchronous groupware and the telephone are considered by all the experts to be intermediate between richer and poorer communication media. These results are in accordance with those of Daft, Lengel, and Trevino (1987), Credé and Sniezek (2003), Guo, D'Ambra, Turner, and Zhang (2009) and Chennamaneni and Teng (2011), and imply that video-conferencing enables a virtual team to talk and handle tasks in a similar manner as face-to-face teams with high clarification among the members of the team via video media. In addition, rich media assists in overcoming the hindrances encountered due to the time zone differences and long distances that are inherent in large organizations. Thus, video-conferencing is capable of bringing about synchronous interactions between team members, where data manipulation in real time is feasible. In addition, such technology also allows team members to cooperate visually and verbally. Consequently, video-conferencing appears to be an effective media for collaboration to accomplish complex TK transfer that transcends borders. In short, it enriches the context of interactions and plays a crucial role in facilitating TK transfer.

Mapping the Degree of Tacitness with ICT Channel Features

The findings highlight the importance of identifying and mapping suitable knowledge transfer mechanisms, i.e., determining the appropriate communication media types for various levels of TK. Classification and mapping schemes depend on various levels of tacitness and the potential of ICT-based media richness theory. The proposed framework established that successful TK transfer depends on the selection of suitable knowledge transfer mechanisms and the nature of the communication media. Table 4 lists the ICT tools that are most often used by MNCs to enhance productivity.

Table 4. Efficient ICT Tools Used in MNCs

ICT TOOL	FREQUENCY	RICHNESS OF CHANNEL
Telephone	20	Intermediate
E-mail	20	Low
Video-conferencing	18	High
Social networks	14	Intermediate
Document-sharing system	14	Intermediate
Synchronous groupware	10	Intermediate
E-forum	10	Intermediate
Others	7	Varies depending on tool
Chat rooms	3	Low
Voicemail	3	Low

It is clear from Table 4 that the ICT tools most frequently used to transfer TK in organizations are the telephone and e-mail due to their inexpensiveness and efficiency in routine and simple tasks, as pointed out by all the experts. These two tools are followed by video-conferencing, which is a richer form of media but often expensive when using a satellite connection rather than free video-calling providers such as Skype. (However, although Skype is cheaper, it is poorer in quality and rife with technical problems). Video-conferencing is followed by social networks and document-sharing systems in terms of frequency of use. The least-utilized ICT tools are chat rooms and voicemail, which were mentioned by only three participants.

FRAMEWORK DEVELOPMENT

The essential idea in discovering a grounded theory is to find a core category at a high level of abstraction but one that is also grounded in the data (Punch, 1998). This can be done in three stages: (i) finding conceptual categories in the data, (ii) finding relationships between these categories, and (iii) conceptualizing and accounting for these relationships through finding a core category (Robson, 2002).

Open coding and axial coding are used to enhance the development of the relationships between categories/concepts in order to distinguish between them, (see Appendix B). The final stage of the process of coding in grounded theory analysis is selective coding. In this process, the central theme of the research from which the theory stems is specified. Selecting the central category representing the main research theme assists in the integration and development of the story concerning the phenomenon (Benaquisto, 2008). The three coding procedures used in the data analysis are in sequential order. It is actually an iterative process for determining relationships. Table 5 outlines the selective coding procedures in grounded theory in the context of this study.

Table 5. Selective Coding Procedures Used in Grounded Theory

OPEN CODING	AXIAL CODING	SELECTIVE CODING
Management procedures; Attitudes and beliefs; Culture; Technical capacity; Complexity of tacit knowledge; Poor motivations; Process and Political factor	Nature of tacit knowledge and problems affect tacit knowledge transfer	Conceptualization of tacit knowledge encompassing nature and complexity of tacit knowledge, managerial and technical problems that affect tacit knowledge management
Determining the tacit knowledge that the company needs to transfer and knowing if some knowledge and skills are at risk of being lost are very important factors in improving knowledge sharing	Determine who owns experiences and skills and who needs to know such skills	Identification of tacit knowledge
Classifying tacit knowledge into many levels according to its complexity makes the transfer of tacit knowledge from HQ to subsidiaries easier	Classifying tacit knowledge into high, medium and low degree of tacitness	Categorizing tacit knowledge based on degree of tacitness
Tacit knowledge meetings; Trainings and workshops; Documentation of tacit knowledge; Planning; Infrastructure development; Evaluation; Create tacit knowledge department; Management; Increase resources; Research & Development	Improving tacit knowledge transfer in companies	Employing mechanisms for improving tacit knowledge transfer

OPEN CODING	AXIAL CODING	SELECTIVE CODING
Video-conferencing, Groupware; Social network; Document sharing; Networking; SCADA communication channels; Skype and telephone; HyTechPro software; Asynchronous groupware; Chat rooms; E-mail; Voice mail; E-forum; Social networks	Variety of ICT tools with different potentials to foster tacit knowledge transfer	Choosing appropriate types of ICT tools to transfer tacit knowledge

The results show that the developed framework consists of three phases: (1) conceptualizing tacit knowledge, (2) employing mechanisms for improving TK transfer and (3) utilizing transfer mechanisms. Figure 2 illustrates the proposed framework.

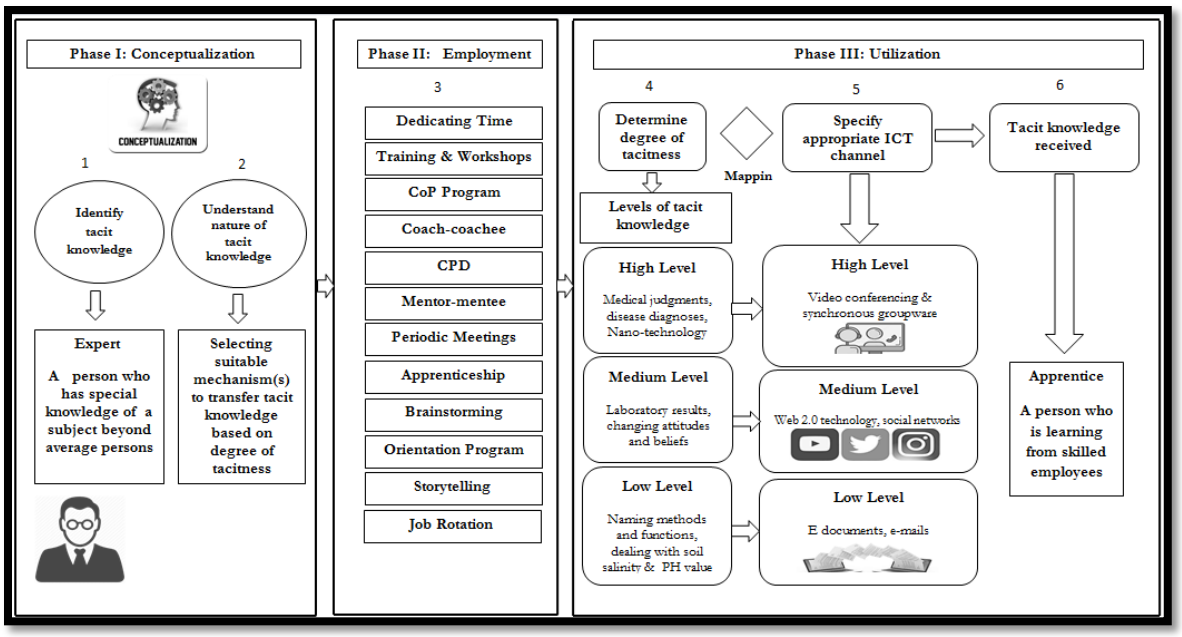

Figure 2: Framework for transferring tacit knowledge from the ICT perspective

The first phase consists of two steps. The first involves identifying the types of TK that a company needs to transfer, which is a very important factor in improving knowledge sharing. This step identifies the types of TK that help an organization to build its own knowledge map in order to foster knowledge sharing through determining who owns the experiences and skills and who needs to know such skills. The second concerns understanding what aspects of the acquired TK to transfer to the apprentice or novice employee. An understanding of this TK enables the expert to choose the proper mechanism(s) in order to transfer it in the most effective way. A misunderstanding of this TK leads to poor knowledge transfer and utilization.

The second phase involves employing mechanisms to improve TK transfer. In this phase many mechanisms can be used to enhance the amount and the quality of TK and thereby improve its transfer within companies. These mechanisms include, for example, attending periodic meetings, training and seminar sessions, CoP programs, and medical clubs, as well as establishing coach/coachee relationships and mentor\mentee programs.

The third phase involves utilizing the transfer mechanisms. The findings of this study imply that TK is transferred effectively from expert to apprentice by classifying it based on the three levels or degrees of tacitness (high, medium, and low) in accordance with the expert's experiences. In other

words, the type, nature, and complexity of TK determines how easy it is to impart to others. After the expert has determined the level of tacitness based on experience, the most suitable ICT medium is selected in order to transfer it effectively.

DISCUSSION

This study employed an inductive method and was not theory-driven. Therefore, the items were generated by asking the participants to describe their perceptions and behaviors in relation to transferring TK in organizations. The aim of this study was to develop a framework for transferring TK using ICT. In order to generate the core themes, the study investigated the nature and complexity of TK, the barriers affecting its transfer and mechanisms used to improve transferability in order to gain a deeper understanding of the TK transfer phenomenon. As a result, five core categories were identified: (i) conceptualization of TK encompassing the nature of TK and the managerial and technical problems that affect TK transfer, (ii) TK identification, (iii) TK categorization, (iv) the utilization of mechanisms to improve TK transfer and (v) choosing appropriate types of ICT tools to transfer TK. These were then connected and integrated with other major categories out of which a theoretical scheme arose for transferring TK among team members working in the subsidiaries of MNCs. A grounded theory approach was used in order to overcome the complexity resulting from the ambiguous nature of TK that affects its transferability. In addition, the utilization of grounded theory approach expanded the true understanding of the nature of TK.

It is worth noting that the complexity level of the various types of TK is altered during transfer via ICT. Also, the potential of ICT varies in terms of its ability to convey knowledge efficiently. Thus, the appropriate mapping of the different levels of TK complexity (from high to low tacitness) with the different levels of ICT tool potential (from high to low richness) will improve ICT-mediated TK transfer. For instance, TK with high degree of tacitness (complex skills) requires sophisticated channel features to transfer it efficiently. Moreover, the matching of the transfer channel features and the degree of tacitness is necessary for efficient TK transfer. For instance, the study of employees' behaviors is an example of TK with a high degree of tacitness, which requires an observation mechanism through a proper medium such as video-conferencing. Indeed, all complex skills necessitate rich ICT, including video-conferencing and synchronous groupware, for effective transfer. Alternatively, if an expert wants to transfer TK with low level of tacitness such as occupational safety and health in a factory, the most suitable ICT medium is asynchronous groupware, voicemail, and e-mail. Therefore, the knowledge can be received and clearly understood as there is a reduced ambiguity level, enabling the TK receiver to move from the transferability phase to applicability phase.

The specific findings reported herein should provide further motivation to organizations to offer training to their employees, including orientation programs, mentorship programs, and workshops, and to expend effort and time in inculcating the TK transfer in their employees. This is due to the fact that TK transfer can only be achieved by linking people (physically or virtually) and enabling them to think together. In addition, the results of this study can be used as a guide to help top management remove the barriers that inhibit the successful transfer of TK.

In considering the results of this study, a number of limitations should be borne in mind. First, this study chose a grounded theory approach which is full of risks. For example, this approach would confuse the researcher before finding the ways to generate concepts and categories. In addition, it requires a longer time to get deep in data analysis and discussion. Moreover, the researcher should expect newly emerging evidence that may change the way he or she thought about the topic. Second, this study used a qualitative approach, which is not common in the field of ICT research. Thus, many challenges were encountered during the research evaluation process. Third, not all of the experts were familiar with KM terminology. This made it time-consuming to explain the terms and what they meant in the MNC context, especially given the fact that the experts worked in a range of different areas. Finally, it is suggested that future research on TK transfer through ICT channels should consider the potential of artificial intelligence.

CONCLUSION

This study aimed to develop a framework for fostering TK sharing in MNCs from the ICT perspective, which was identified as a gap in the literature on TK transfer. There is a vital role to be played by ICT channels in bridging the space between individuals in HQs and those in subsidiaries who would otherwise not be able to connect with each other, which would be of significant benefit to these organizations. This study claims that TK transfer can be achieved primarily by classifying tacit knowledge into distinct levels and matching these levels to the most appropriate ICT channel. Moreover, it asserts that the difficulties encountered by professionals and practitioners in MNCs when transferring TK among employees can be partly resolved through the effective utilization of ICT tools. The findings of this study complement and support those of previous studies regarding TK sharing and the role of ICT in transferring TK. The qualitative understanding of TK transfer that has emerged from this study may provide MNC managers with new insights and enable them to manage TK in a more efficient manner. Also, the systematic method developed in this study may contribute to the development of efficient and accurate TK transfer mechanisms in MNCs through the informed exploitation and mixing of ICT tools.

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APPENDICES

APPENDIX A: INITIAL CODING LIST

1. Meeting	27. Skills/ability
2. Relationship	28. Clarity
3. Communication	29. Feedback
4. Top management	30. Solve problem
5. Authority	31. Brainstorming
6. Participate	32. Discussion
7. Senior	33. Informal meeting
8. Culture	34. Place
9. HQ and subsidiaries – distance	35. Office environment
10 .Team working	36. Privacy
11. Similar expertise	37. Willingness
12. Change resistance	38. Expectation
13. Involvement	39. Committed
14. Share knowledge	40. Support
15. Provide help	41. Responsibility
16. Trust	42. Duty/task
17. Urgency	43. Methodology
18. Group	44. Mechanisms
19. Workshop	45. Expert
20. Visit to HQ	46. Skype
21. Familiar	47. Time
22. Telephone call	48. Training
23. Understanding	49. Awareness
24. E-mail	50. Complexity
25. Language problem – technical	51. Attitudes
26. Motivation	52. Perception
	53. Human Resources

APPENDIX B: SAMPLE OF OPEN CODING OF PROBLEMS IN TRANSFERRING TACIT KNOWLEDGE

Open coding	Properties	Particpants' statements
Management	Inadequate time	- Absence of adequate time for transferring tacit knowledge - Time constraints when employees have many tasks. - Participating in tacit knowledge transfer requires more effort and time
	Limited number of human resources	- Limited number of human resources
	Resistance to change	- Resistance to change/knowledge sharing because it causes loss of power/influence
	Poor awareness	- Poor awareness among top management - Benefits of transferring tacit knowledge do not appear immediately
	Lack of communication	- Managerial problem in that top management does not facilitate communication between HQ and subsidiaries
Attitudes and beliefs	Lack of awareness and belief	- Lack of awareness and belief among top management
	Negative perceptions and beliefs	- Attitudes/beliefs among workers do not encourage transfer of expertise and knowledge due to perceived loss of influence/power. - Perceptions and beliefs among top management needed to encourage tacit knowledge transfer process - Low turnout on knowledge in general - Perception among workers that if they share their tacit knowledge they will lose their power/influence - Sometimes it is easier to do the task oneself rather than to transfer knowledge and teach others to do it (beliefs) - A belief among workers that it does not directly affect their own performance - Poor awareness of workers about the benefits of transferring tacit knowledge
Technical capacity	Lack of existing mechanisms	- Lack of existing mechanisms to transfer knowledge from HQ to subsidiaries, e.g., through virtual classes
Complexity of tacit knowledge	Complexity	- Difficult to transfer some experiences to beginners; it requires peer-to-peer communication - Complexity of tacit knowledge - Absence of awareness of the complexity of tacit knowledge transfer
Political factor	Political barriers	- Politics could prevent transfer of some high-tech tacit knowledge - unstable political relations between the country of the HQ and the countries of the subsidiaries negatively affects knowledge transfer

APPENDIX C: SAMPLE OF OBSERVATION CHECKLIST

Observation Checklist
Company: Healthcare Center
Activity: Peer-to-Peer Socialization **What was observed:** The researcher observed the method that was used to transfer tacit knowledge in the medical club, especially when some experts presented a case study about how to sew the heart valve after an open-heart operation to prevent movement of the valve. **Knowledge captured:** Peer-to-peer interaction helps organization to share insights, experiences and create common practices among a group of experts in the same field. **Photograph taken: -**

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