Knowledge Creation and Transfer in a Cross-Cultural Context

The Case of Tyco Flow Control Japan

INTRODUCTION

Bartlett and Ghoshal (2002: 3) start their seminal book on managing across borders with the statement that the world's largest companies are in flux and that "[n]ew pressures have transformed the global competitive game". Indeed, "[v]irtually all business conducted today is global business" (Thomas, 2002: 3), national economies have become increasingly deregulated and have opened up opportunities for international trade and competition so that it has "become the norm for organizations to compete for market share not only with their national competitors but also with international ones (Trompenaars & Woolliams, 2004: 27). Besides, in such "an era of ever faster innovation cycles combined with an increasing convergence of industries [...] and intense and global competition, advantages tend to erode quickly" (Ambos & Schlegelmilch, 2005: 23). These "[r]apid changes in the nature of global competition have driven international managers and management researchers to search innovative ways to approach new challenges, tackle problems and answer questions as to how to manage complex multinational corporations most effectively" (Tseng, 2006: 120). In this context, scholars and practitioners around the globe

have identified the capability of multinational companies (MNCs) to create and efficiently transfer and combine knowledge from different locations worldwide as an increasingly important determinant of competitive advantage, corporate success and survival (cf. e.g. Asakawa & Lehrer, 2003; Doz, Santos, & Williamson, 2001; English & Baker, 2006; Gupta & Govindarajan, 2000; Schulz & Jobe, 2001).

This paper aims at contributing to the field of transfer and creation of knowledge in a cross-cultural context by presenting and analyzing a case study of a US American MNC's Japanese subsidiary's efforts to transfer relevant – and often highly tacit – knowledge to a newly acquired production site in Taiwan. First, we will give a brief review of the extant literature on global knowledge creation, management and transfer and also take a look at cross-cultural management issues in this context. Then, the empirical study and research methodology will be introduced. Subsequently, we will depict the case of global market leader Tyco Flow Control's Japanese subsidiary's knowledge transfer to Taiwan. Finally, we will analyze and discuss the case within the theoretical framework given in the first part of the paper and highlight practical implications for managers and international corporations in a global business environment. Last but not least, limitations to the study as well as the need for further research will be indicated.

THEORETICAL FRAMEWORK

Transfer of Knowledge in MNCs

According to Bresman, Birkinshaw and Nobel (1999: 440), the process of knowledge transfer between business units is an essential aspect of knowledge management, and Tseng (2006: 121) notes that knowledge transfer capability is one of the most important advantages of MNCs and that "[t]hrough the transfer and adaptation of knowledge, subsidiaries of MNCs build and develop their competitiveness over local firms". Indeed, the management of knowledge flows is especially important for multinational companies because they operate in geographically and culturally diverse environments (Schulz et al., 2001). Since strategically important knowledge is geographically dispersed in the business environment of most global firms (Asakawa et al., 2003), MNCs can derive great competitive advantage by managing knowledge flows between their subunits with differences between local markets requiring adaptation of products and operations to local conditions (Haghirian & Kohlbacher, 2005; Schulz et al., 2001). Mindbaeva and fellow researchers (2003: 587) contend that the competitive advantage that MNCs enjoy is contingent upon their ability to facilitate and manage intersubsidiary transfer of knowledge and define knowledge transfer between organizational units as "a process that covers several stages starting from identifying the knowledge over the actual process of transferring the knowledge to its final utilization by the receiving unit". Doz et al. (2001: 219) point to the important fact that MNCs will have to shift from merely being global projectors of knowledge to so-called

metanational companies, which means “exploiting the potential of learning from the world by unlocking and mobilizing knowledge that is imprisoned in local pockets scattered around the globe”. However, while leveraging locally-embedded knowledge assets for global use is indeed a major challenge for multinational knowledge management, innovation by local units can also be leveraged for regional application (Asakawa et al., 2003).

Schulz (2001: 663) defines knowledge flows as “the aggregate volume of know-how and information transmitted per unit of time” and states that with this definition, he intends “to capture the overall amount of know-how and information transmitted between subunits in all kinds of ways, including via telephone, e-mail, regular mail, policy revisions, meetings, shared technologies, and reviews of prototypes”. He further distinguishes between three subunit learning processes, namely collecting new knowledge, codifying knowledge, and combining old knowledge, with collecting new knowledge occurring, “when a subunit is exposed to complex, uncharted domains of activity or to environments characterized by a high rate of innovation and change” (Schulz, 2001: 663). Gupta and Govindarajan (1991: 773) – who describe MNCs as a network of capital, product, and knowledge transactions among units in different countries, a perspective which is also consistent with the analyses of Bartlett and Goshal (2002) for example – use the term intracorporate knowledge flow and define it as “the transfer of either expertise (e.g., skills and capabilities) or external market data of strategic value”. In a further study, they were able to show that a complete mapping of the knowledge transfer process within MNCs

requires attention to all of the following five major elements: value of the knowledge possessed by the source unit, motivational disposition of the source unit regarding the sharing of its knowledge, the existence, quality, and cost of transmission channels, motivational disposition of the target unit regarding acceptance of incoming knowledge, and the target unit's absorptive capacity for the incoming knowledge (Gupta et al., 2000). In particular, "the context specificity of the knowledge has an effect on the extent of knowledge transfer, both because the more context specific the knowledge is, the smaller the absorptive capacity of the received and the less it can be used in other MNC units" (Foss & Pedersen, 2002: 64).

Minbaeva et al.'s (2003) most important finding of their study for instance, is that both aspects of absorptive capacity (ability and motivation) need to be present in order to optimally facilitate the absorption of knowledge from other parts of the MNC and that employee ability or motivation alone does not lead to knowledge transfer. Contrary to studies that blame primarily motivational factors, Szulanski's (1996) findings on internal stickiness in turn, show the major barriers to internal knowledge transfer to be knowledge-related factors such as the recipient's lack of absorptive capacity, casual ambiguity, and an arduous relationship between the source and the recipient (cf. also Szulanski, 2003; Szulanski & Cappetta, 2003). In fact, whether or not the evaluation of the knowledge results in its integration in the organizational knowledge base depends on the learning effectiveness or absorptive capacity of the organization. Inkpen (1998; 2000) describes three factors influencing the learning effectiveness – knowledge connections

(such as foreign assignments or visits by personnel) between the partner firms to build networks, relatedness of partner knowledge, and the cultural alignment between parent executives and alliance managers.

Moreover, knowledge is “simultaneously highly sophisticated (both tacit and explicit) and widely dispersed in the hands and minds of many, and is not easily produced or captured inside the boundaries of one or a few firms” (Ciborra & Andreu, 2001: 78). Nonaka (1990: 82) terms the cross-border synergistic process of joint knowledge creation as ‘global knowledge creation’ and sees it as the key process of globalization. Here again, “[t]acit knowledge, embodied in individual, group and organizational routines, is of critical strategic importance because, unlike explicit knowledge, it is both inimitable and appropriable” (Al-Laham & Amburgey, 2005: 251; Spender, 1996a).

Last but not least, inter-organizational trust also plays an important role for the accessibility of knowledge. In fact, only in a climate of trust, organizations will be ready to put their knowledge at the disposal of their partner organizations (Kasper & Haltmeyer, 2002). De Long and Fahey (2000) put it like this: “The level of trust that exists between the organization, its subunits, and its employees greatly influences the amount of knowledge that flows both between individuals and from individuals into the firm’s databases, best practices archives, and other records” (p. 119).

Cross-cultural Issues in Global Knowledge Management

According to Holden (2002: 81), "[o]ne of the problems in the knowledge management literature is that authors give the impression that knowledge management operates in a kind of unitary vacuum, in which diversity in terms of language, cultural and ethnic background, gender and professional affiliation are compressed into one giant independent variable, which is in any case pushed to the side". However, specifically considering the international or global transfer of knowledge, Bresman et al. (1999) have found certain factors like the lack of personal relationships, the absence of trust, and cultural distance all combine to create resistance, frictions, and misunderstandings in international acquisitions.

A recent study on the transfer of knowledge from Japanese MNCs to their subsidiaries abroad revealed the following three factors as especially influential on the knowledge flow: the experience of having lived in a foreign country by the knowledge receiver (negative), a high proficiency in Japanese (positive), and a low perceived cultural difference towards Japan (positive) (Haghirian et al., 2005). While the former two aspects can been seen as rather neglected factors in prior research (see e.g. Marschan-Piekkari, Welch, & Welch, 1999 for language), the latter aspect has been treated extensively (e.g. Hennart & Larimo, 1998; Shenkar, 2001; Williams, Han, & Qualls, 1998). However, results and conclusions on the actual impact of cultural distance vary greatly (e.g. Brouthers & Brouthers, 2001; Manev & Stevenson, 2001), with the mainstream arguing for a negative influence, even though some also make a strong

claim for a positive impact (e.g. Morosini, Shane, & Singh, 1998). Cultural distance has been defined as “the sum of factors creating, on the one hand, a need for knowledge, and on the other hand, barriers to knowledge flow and hence also for other flows between the home and the target countries” (Barkema, Shenkar, Vermeulen, & Bell, 1997: 427-428; Luostarinen, 1980: 131-132, cited in). Johanson and Vahlne (1977: 24) use the term psychic distance and define it as “the sum of factors preventing the flow of information from and to the market”, with examples being “differences in language, education, business practices, culture, and industrial development”.

From the above, it is obvious that cultural differences and the cross-cultural context play an important role for and influence global knowledge creation and management (cf. e.g. Holden, 2001, 2002; Holden & Von Kortzfleisch, 2004). Zhu (2004: 74) for instance questions the popular claim that KM is becoming a universal management concept and correctly notes that such a universal concept would not only be unrealistic but even counterproductive and thus undesirable as well. However, the problem how cross-cultural differences influence KM has received too limited research attention so far (Edwards & Kidd, 2003; Ford & Chan, 2003; Zhu, 2004) and “the literature is almost silent on knowledge management in its cross-cultural dimensions” (Glisby & Holden, 2003: 29).

Global Knowledge Creation, Management, and Transfer

From the above, it has become clear that internal knowledge transfer is not an easy task for MNCs and that "[they] need to apply different organizational mechanisms in order to facilitate knowledge transfer and depending on the specific characteristics of the knowledge" (Foss et al., 2002: 65). This might also be one of the reasons why many MNCs face difficulties in implementing proper KM structures and in coordinating their knowledge flows successfully (cf. e.g. Haghirian et al., 2005; Kasper, Haltmeyer, & Kohlbacher, 2005a, 2005b).

Despite the strong interest in and the large number of publications on the issue of knowledge flows within MNCs, the literature is "still in the early stages of understanding the central aspects, mechanisms, and contextual factors in the process of managing knowledge in MNCs" (Foss & Pedersen, 2004: 342). In fact, "rather little is known about the determinants of intra-MNC knowledge flows in spite of their obvious importance to theoretical arguments about the MNC" (Foss et al., 2002: 52). So far, the extant literature has mainly focused on the issues of transferring knowledge between different units in MNCs – i.e. the knowledge flows within in MNCs – and factors influencing it (e.g. Foss et al., 2002; Gupta et al., 1991, 2000; Martin & Salomon, 2003; Minbaeva et al., 2003; Mudambi, 2002). However, research on the process of knowledge creation within MNCs is still scarce.

Moreover, while considerable attention has been given to questions of knowledge transfer within a single company, knowledge transfer in alliances and joint ventures, and knowledge transfer

between independent firms, knowledge transfer in acquisitions has received very little attention (Bresman et al., 1999), and, if it has, mostly in the context of the potential of acquisitions as a means of gaining access to new knowledge (cf. e.g. Huber, 1991; Madhok, 1997).

This paper looks at the case of transferring knowledge from acquiring to acquired and aims at contributing important insights on knowledge creation and transfer within MNCs after acquisition of new units. In fact, we will describe and analyze the efforts of global market leader Tyco Flow Control's Japanese subsidiary to transfer relevant – and often highly tacit – knowledge to a newly acquired production site in Taiwan. Challenges and difficulties encountered in the process of global knowledge management – in this case the transfer of knowledge from Japan to Taiwan – as well as the creation of new knowledge locally and its feedback – are illustrated and carefully examined.

RESEARCH METHODOLOGY

The findings presented in this paper are derived from a current empirical research project on KM and the transfer of knowledge within MNCs. In order to analyze the process of knowledge creation and transfer in MNCs, this study adopted an exploratory research strategy. According to Spender (1996b: 72), "the objective of positivist research is the development of a coherent abstract representation of the world out there" while the focus of interpretive research is "on the ways in which we attach meaning to our experience". Cassell and Symon (1994) contend that

qualitative methods are more appropriate than quantitative methods to research questions focusing on organizational processes, as well as outcomes. One reason for this is that quantitative studies focus on the measurement and analysis of causal relationships between variables, not processes. Indeed, qualitative research, rather than traditional quantitative empirical tools, is particularly useful for exploring implicit assumptions and examining new relationships, abstract concepts, and operational definitions (Bettis, 1991; Weick, 1996). Many scholars distinguish between explicit and tacit knowledge (see above) and Nonaka and Takeuchi's (1995) spiral of knowledge illustrates the process of creating knowledge in organizations through the interaction between tacit and explicit knowledge. Spender (1996b) emphasizes the contrast between research methods appropriate to explicit types of knowledge and those appropriate to implicit types, which according to him is also the contrast between the positivist and interpretive methods.

Case Study Research

One important objective of the study is to conduct an analysis of different patterns and ways of knowledge creation and transfer within MNCs that helps to develop new hypotheses and build theory on how companies can efficiently and successfully do so and thus contribute to the theory of knowledge creation in an international context and to develop constructs that facilitate future hypothesis testing. As case studies have an important function in generating hypotheses and

building theory (cf. e.g. Eisenhardt, 1989; Hartley, 1994, 2004; Kohlbacher, 2005), we chose a case study research strategy.

According to Yin (2003: 2) "the distinctive need for case studies arises out of the desire to understand complex social phenomena" because "the case study method allows investigators to retain the holistic and meaningful characteristics of real-life events," such as organizational and managerial processes, for example. In fact, case studies seem to be the preferred strategy when "how or "why" questions are being posed, when the investigator has little control over events, and when the focus is on a contemporary phenomenon within some real-life context (Yin, 1981, 2003). Hartley (2004: 323) states that case study research "consists of a detailed investigation, often with data collected over a period of time, of phenomena, within their context," with the aim being "to provide an analysis of the context and processes which illuminate the theoretical issues being studied". Last but not least, case studies have been recognized as important and useful in knowledge creation (Remenyi, Money, Price, & Bannister, 2002) and for both theoretical and practical KM (Probst, 2002).

Data and Method

The research was conducted over a period of more than one year and involved triangulation among a variety of different sources of data including the conducting of both formal and informal on- and off-site interviews (Kvale, 1996; Rubin & Rubin, 1995) with manager as well as scholars

and other experts in the field, analysis of archival materials such company internal documents as well as articles in the business media (Forster, 1994; Hodder, 2000), and an evaluation of existing case studies and other relevant literature (Yin, 2003). Qualitative interviews with more than 80 top executives, middle managers and selected employees in more than 20 different MNCs – Japanese, European and US American – have been conducted in 2005 and 2006 mainly in Japan, but also in selected European countries. As for the Tyco Flow Control Japan case, one of the two authors was Chief Operating Officer (COO) of Tyco Flow Control Japan from July 2003 to December 2003 and Managing Director from January 2004 to December 2005. Additionally, interviews with the deputy division manager of the Manufacturing Division and the division manager of the Engineering Division were conducted since both were heavily involved in the project described below and could provide different points of view.

KNOWLEDGE CREATION AND TRANSFER IN A CROSS-CULTURAL CONTEXT: THE CASE OF TYCO FLOW CONTROL JAPAN

Cooperation Partner Background

Tyco International is a diversified American conglomerate with an annual turnover of $39.7 billion and approx. 250,000 employees in 2005. Tyco Flow Control (TFC) is a business unit of this

MNC and global market leader in industrial valve manufacturing. TFC supplies global companies such as Dow Chemicals, Shell, BASF and other with valves for chemical and petro-chemical processing plants and power generation to name the most prominent markets as example.

Tyco Flow Control enjoyed a period of substantial growth in terms of turnover and global presence between 1995 and 2000; not through organic growth but mainly because of a series of major merger & acquisitions of mid-sized valve manufacturers. In the late Nineties acquisition activities were extended to Japan and as a result Kitamura Valve Manufacturing Ltd. (KTM) was acquired in 2000. By this time TFC achieved a turnover of $2.5 billion, adding up to a world market share of approximately 15%.

In May 2001 Tyco additionally acquired a smaller Taiwanese ball valve manufacturer, Taiwan Valve Corporation (TVC) operating two production facilities in Taichung and Ta Chia. In contrast to KTM, TVC manufactured mid-range, mass produced ball valves, mainly as OEM products for Tyco's competitors based on their own designs. Subsequently it had a poor brand image and the company relied heavily on customer expertise in design and manufacturing as it had not fully developed its own engineering capabilities.

The Valve Manufacturing Industry

The industrial valve manufacturing business world comprises of about 2.000 mid-size and small

size companies located mainly in Europe, the US, Japan and China. Many of these companies have positioned themselves in niche markets by producing highly specialized products for international customers and particular applications. None of these companies has achieved a position of market dominance; neither can one of these companies offer a complete range of products to satisfy all customer requirements.

In today's valve manufacturing, almost all parts of a valve are sourced from specialized sub-suppliers. These parts include castings, machined metal parts, seats, sealings and gaskets made of engineered plastics as well as commonly available metal parts such as bolts and nuts.

Castings are the most critical part of a valve, the risk to produce batches of differing quality, even if the raw material is identical is substantial and as the quality of the casting can only be tested for leaks at the end of the assembly and production process, when the complete valve is subjected to internal pressure, poor casting quality can prove costly. When considering the quality level of sub-suppliers, the highest priority in terms of quality is put on the selection, training and quality control of the castings sub-supplier. Reliability is therefore the key word in the industrial valve market: Although in a chemical process plant, valves are a relatively small investment in terms of capital, their failure or leakage may lead to production stops and subsequent substantial loss of income.

Ball Valve Manufacture Restructuring Strategy

Generally, KTM ball valves were regarded in the market place as good but too expensive. Access to global markets was assured through local Tyco Flow Control sales organizations in major markets, which were operating independently from the manufacturing operations.

Nevertheless, the two Japanese manufacturing plants were running on low capacity. Production costs in Japan were too high to allow for a competitive position and this situation was further aggravated by a complete stop of capital investment in production equipment due to a lack of funds before the acquisition of Tyco. By 2002 the operational earnings of KTM became negative.

KTM's main competitors were already heavily engaged in shifting production of ball valves to low cost countries, notably China, Taiwan and India. KTM had established its own Chinese Chengdu (Sichuan Province) manufacturing plant in 1994, however due to a lack of concentrated engagement, production was limited to a small series of ball valves, which were only made available to the domestic Chinese market.

Tyco Flow Control decided to build on the brand image of KTM and utilize the abundant engineering capabilities of the company by continuing business operations in Japan. However in order return to profitability, it became the main target to achieve a better production cost position which had to be jointly executed with a downsizing of Japanese operations.

The current KTM product portfolio was categorized into three groups and for each group a

different strategy was devised to fully utilize its market potential. In this study we will focus on the product strategy that included a manufacturing shift to Taiwanese locations and will not discuss the other two product strategies in question.

The standard product range of KTM is a ball valve series called EB11 that accounted for 40% or 50.000 units of the total production unit output of the Japanese plants. The bulk of this product range is characterized by a low degree of variations and customizations, a high production volume and a low average unit production cost.

The devised strategy called for a relocation of the EB11 production to TVC as it was assumed that feasibility of reallocation would be high, completion fast and necessary capital investments low. The move would allow further for the closure of the smaller of the two Japanese manufacturing plants.

Knowledge Transfer Steps

In a first step, the codified knowledge in the form of the relevant drawings, specifications and bills of material (BOM) for the product range were made available by KTM and sent to TVC. TVC was asked to translate the engineering documents into Chinese and it was required that the drawings were drawn again by the Taiwanese engineering counterparts. Once a series of drawings of a product sub-range was completed in Taiwan, they were sent back to KTM in Japan

for review and approval. KTM Engineering checked the drawings for correctness and completeness and necessary corrections, additions and modifications were marked. The drawings were then sent back to TVC to be redrawn, resulting in a ‘re-codification’ within a different cultural and lingual context. Thereby and during the discussions that were held in Taiwan between KTM and TVC engineers, the detailed designs and the technical reasoning behind became clear to the TVC engineers.

This was extremely important, as many details were, in the opinion and based on the experience of TVC unnecessary for achievement of quality requirements and only seen as additional production cost adders. In return, the KTM Engineering staff became knowledgeable about the main design factors influencing manufacturing cost. Whereas KTM was traditionally focusing on quality requirements during a period when Japanese production cost was low compared to European or US American competitors and manufacturing cost was a lesser issue, TVC entered the market at a later stage and it was essential for its survival to mass produce ball valves at low cost to offset it’s competitive disadvantage due to its poor brand image.

Compared to the automated production of other industrial goods such as automobiles, semiconductors or pharmaceuticals for example, the production of industrial valves is a labor-intensive work that requires an experienced workforce with relevant tacit knowledge. Insofar in can be said that valve manufacturing can be categorized rather as `handicraft’ than production and that tacit knowledge of appropriate production techniques is key to achieve the

required quality level. Thus as a second step the identification, training and quality control of local Taiwanese subcontractors and suppliers was initiated.

In short, neither the engineering knowledge for the various parts, nor the production capabilities can be reasonably concentrated in full at a valve manufacturer. The valve producer is heavily depending on its sub-suppliers in terms of development of new materials and their supply.

A first choice of sub-suppliers was proposed by TVC based on previous supply experience and these sub-suppliers were audited to provide the necessary data for a first choice. The decision for one or the other sub-supplier was made jointly, not only on aspects of cost, quality management and production capacity, but also of supply reliability, long-term relationship and flexibility to special production requirements.

Therefore, whereas in the first step, codified knowledge was transferred across the units of a MNC, the second step included the transfer of selected portions of this knowledge to a variety of sub-suppliers outside of the MNC.

The involved engineers from TVC judged sub-suppliers mainly in terms of cost, whereas KTM engineers judged in terms of quality; this proved to be an interesting combination as the following discussions gave both sides an additional piece of knowledge in the puzzle of competitive ball valve manufacturing. For many younger KTM engineers, the visit to Taiwanese sub-suppliers was the first opportunity to get first-hand knowledge about casting production outside of Japan. For these engineers, the production methods of the Japanese KTM

sub-suppliers provided the scale on which to measure their Taiwanese counterparts. As they experienced a different method of production in Taiwan, the first reaction was naturally a position of defense and refusal. However, during the discussion with the TVC engineers, they were forced to logically substantiate their arguments.

As the KTM engineers stayed periodically for a week or more, they had sufficient time for these discussions, not only during working hours, but also in the evening when socializing with the TVC engineers. These ‘after-hours communications’ proved to be another fruitful opportunity to tacitly understand the position of both sides and it was easier for them to become convinced that in some of the open questions the opinion of the TVC engineers might provide the appropriate alternative to achieve both targets of the project: high quality and cost reductions.

On the other hand, the Taiwanese engineers had previous experience in dealing with the requirements of international customers as TVC had been involved in OEM manufacturing for international ball valve companies in the past. They were also heavily involved in cost reduction discussions with these international customers and subsequently were constantly looking for ways to further reduce costs by changing sub-suppliers and production methods. However, as the quality requirements in previous OEM manufacturing was much lower than for the KTM product range, they were looking for large cost reductions by supplying the minimum required quality. During the discussions with the Japanese engineers they were forced to abandon partly their tacitly understood position. The Taiwanese engineers proposed several minor modifications

of the product designs and production specifications that resulted in a further product quality upgrade suited to Taiwanese manufacturing environment. This new knowledge could then be transferred to upgrade other ball valve product ranges of TVC as well as of KTM in Japan..

Sample pieces of each part were provided by the sub-suppliers and the quality was checked against the required standards, first at TVC and then later at KTM. While the judgment about explicit part properties derivates from codified knowledge such as dimensions and their tolerances noted in drawings or material properties is simple, different judgments developed about other aspects of quality, which are not explicitly noted.

In a final step the assembly, pressure-testing, packing and shipping had to be designed for the production facility in Taiwan. As stated above, valve assembly is rather relying on tacit knowledge built up by experience or ‘handicraft’, than an automated industrial process. Once the assembly of the valve is completed, each valve is pressure tested for leaks.

Each of the assembly, testing and packing process steps had to be taught to the Taiwanese staff at the production location by experienced workers from KTM in Japan. For this purpose, qualified staff was dispatched from KTM for weekly assignments to Taiwan. In contrast to the KTM and TVC engineers who were communicating in English and on the basis of drawings and other engineering records, KTM and TVC workers were relying on mainly verbal communication, intermediate translation and direct presentation by hand. Once the trained worker leaves the organization, the knowledge is lost and must be re-trained or gained through experience or

knowledge transfer from other organizational units.

In case of the KTM work force, many of the workers were employed with KTM for a period of 20 years or more. Substantial knowledge is accumulated within this work force, a factor than is emphasized by the fact that valve innovation cycles are long and valve product lines are in production for ten to twenty years without major modifications. There is a strong communication link between production and engineering that ideally results in a production-oriented engineering and an engineering-oriented production.

In contract to this, the typical TVC worker was employed for a much shorter period and generally not loyal to the company for a longer period of time. He was subjected to periodical shifts of the workplace as the company needed to be flexible to cater for the various demands of their third party OEM customers. As the training to apply their trades was minimal and the link between engineering and work force was not strong and lacking the necessary engineering resources, the degree of knowledge was varying within the same production facility.

Even later, after production of ball valves was at 100% capacity at TVC and 50.000 to 60.000 production units were manufactured annually for KTM, product quality issues occurred which were related to a loss of organizational knowledge through a loss of experienced work force. However, as more TVC workers were trained and capacity was high, new workers could be trained mainly within the TVC organization and less assistance from KTM was required. For the Japanese workers involved, the excursions to Taiwan provided in the same way as for their

engineering counterparts, one of the few occasions during their employment with KTM to experience first-hand manufacturing operations outside of their Japanese environment. By combination of the knowledge gained in Taiwan with their Japanese manufacturing background, they could then later, upon return to Japan propose several modifications to the work organization within the manufacturing facilities. This new knowledge helped to streamline remaining manufacturing operations in Japan and proved to be of value after implementation.

Project Completion

Although the original project time schedule could not be met, the EB11 production started in April 2003. Initially, each production lot was checked before delivery at the TVC plant by KTM quality inspectors; however as less and less quality problems occurred, the requirement was dropped in 2004. Still, from time to time quality issues were detected, the most interesting one actually a KTM design mistake for smaller ball valves, which were not matching actual global customer requirements. Without the assistance of the Taiwanese engineers and their previous experience with Tyco's global competitors, this new knowledge about global product standards in its specific application for KTM ball valves could not have been created. Its detection led to a quickly implemented redesign. By 2005 all originally planned EB11 products were shifted from KTM to TVC manufacturing and all necessary parts for production could be procured by TVC from local sub-suppliers. The manufacturing was gradually increased at TVC, firstly due to the wider

product variations but mainly due through the better competitive position of KTM. Unit production increased from 12,000 units in 2003 to 46,000 units in 2004 and 54,000 units in 2005.

The higher contributions from EB11 sales combined with other strategic activities at TFC Japan turned the company into profitability and from 2004 onwards a positive EBIT result was achieved.

The success of this project resulted in other manufacturing reallocation projects, 15 in total, between KTM, TVC and Tyco Flow Control China, that operates the previous KTM manufacturing facility in Chengdu. While the original focus of this cooperation was on manufacturing re-allocation and the relevant knowledge transfer, the side-effects of new knowledge creation by communication of both cooperation partners and its combination and interpretation within their environment brought added value to both manufacturing operations.

In order to build on the project success, a 'Ball Valve Summit' with the managing directors of TFC Asia, Japan, Taiwan and China had been implemented which managed the manufacturing transfer projects and looked for further possibilities to either shift production to LCCs or to add new products at production facilities in LCCs. It can be assumed that this will be an ongoing process, as manufacturing cost conditions in LCCs deteriorate and new countries emerge as the most advantageous manufacturing location. Predictability the valve industry will see a shift of casting and valve supply from China to India, Vietnam and other countries.

This shift will require new techniques of knowledge transfer for KTM and its partner which are

adapted to the particular circumstances of each country and cooperation partner.

DISCUSSION

Knowledge Transfer to Taiwan and Local Knowledge Creation

According to Hansen and Nohria (2004: 22), the ways for MNCs to compete successfully by exploiting scale and scope economies or by taking advantage of imperfections in the world's goods, labor and capital markets are no longer profitable as they once were, and as a result, "the new economies of scope are based on the ability of business units, subsidiaries and functional departments within the company to collaborate successfully by sharing knowledge and jointly developing new products and services". Our case seems to underscore this statement as it shows that KTM sought Taiwanese sourcing for cost reasons but could not achieve a satisfactory level of quality at first. However, learning to efficiently transfer both tacit and explicit knowledge from Japan to Taiwan and later even benefit from the newly combined and created knowledge there, finally led to real improvements in efficiency and cost. In fact, the project provides an interesting case as from the beginning it was understood to all parties involved that due to nature of the products and its manufacturing process, it would be required to transfer codified as well as tacit knowledge from KTM in Japan to TVC in Taiwan. What was not understood but learned through the course of the project was the bi-directional flow of knowledge and the subsequent creation of new knowledge on both sides of the project partners. In further projects, the project targets

should include such spin-offs or side effects of knowledge transfer and new knowledge creation to be systematically transferred back into the loop of manufacturing operations for current product ranges that are not included in the intended product scope per se. We can see this as an impressive proof of Umemoto's (2002) pronouncement to the effect that managing existing knowledge alone is simply not enough.

Codification, Re-codification and interchange between different parts of the organization of both corporation partners, namely engineering and manufacturing provided an excellent basis on the agar plates of inter-organizational knowledge creation. The tool of constant repetition was used when it came to the issues of drawing translation. During the process of drawing – commenting – redrawing – rechecking etc a self-optimizing loop was created to constantly improve understanding of the relevant knowledge on the receiving end. Only by constant repetition this effect could be achieved.

In summary the knowledge transfer could not be limited to the 're-codification of knowledge' such as the transfer of drawings, but in addition every further step in the production process had to be managed and coordinated in interaction between KTM and TVC.

Hereby new knowledge was created to be brought back to Japan and to be discussed between KTM Engineering and their Japanese sub-suppliers which despite the manufacturing shift of one product range were still supplying KTM with parts of similar specifications for other product ranges. The knowledge of Taiwanese production methods was disseminated in Japan to these

suppliers and provided the basis to integrate Taiwanese production cost know-how into the environment of quality-focused manufacturing.

The knowledge transfer can be facilitated with the help of codified material, such as assembly descriptions, checklists and photos of the assembly process itself, however just by experience in the course of time; only the conduct of the work over a longer period provides the tacit knowledge to the individual to assemble valves with the required quality level.

Moreover, as Ichijo (2006) reminds us, "[t]he creation of knowledge is not simply a compilation of facts but a uniquely human process, one that cannot be reduced or easily replicated", which among other reasons is why "effective management of knowledge, that is, knowledge creation, sharing, protection, and discarding depend on an enabling context". Companies can generate such an enabling context for knowledge management and creation by using five knowledge enablers: (1) instilling a knowledge vision, (2) managing conversations, (3) mobilizing knowledge activists, (4) creating the right context, and (5) globalizing local knowledge (Ichijo, 2004; von Krogh, Ichijo, & Nonaka, 2000). We have already mentioned the context-specificity of knowledge and it is probably safe to say that the factors trust, absorptive capacity and motivation are central and integrative parts of the right – enabling – context. Obviously, this is all the more important in a cross-cultural setting and the case has shown that KTM and TVC have learnt how to generate such an enabling context and make use of these knowledge enablers in the course of the joint project.

A further point of interest is that within the organization of a MNC, cooperation partners cannot be freely selected based on their abilities to achieve the required project targets within the project time schedule. The selection is naturally limited to the organizational units available within the MNC unless alternatively the decision to outsource is made. The selection process is generally executed on a higher management level, which provides the initial general framework for the project, taking often not into account the motivational stance of both partners, cultural differences, psychic distances or mutual trust on both sides. In fact, the cross-cultural influences in our case manifested themselves mainly in language barriers and differing conceptions of quality and precision. Although this might not necessarily lead to failure of the complete project, it might be responsible for delays in the execution of the project and requires additional management resources to create an open und trustful atmosphere between both parties. This is strongly in accordance with Bresman et al.'s (1999: 442) finding from their study of knowledge transfer in international acquisitions: "individuals will only participate willingly in knowledge exchange once they share a sense of identity or belonging with their colleagues" and the transfer of technological know-how is facilitated by communication, visits and meetings, and by time elapsed since acquisition.

Besides, one of the four barriers to interunit collaboration in MNCs – inability to work together and transfer knowledge – identified by Hansen and Nohria (2004: 26-27) was applicable for the initial phase depicted in our case, as it shows that it seems to be true that "sometimes people are

willing to work together but can't easily transfer what they know to others because of the "stranger" problem" and that "transferring tacit or specific knowledge is likely to be more cumbersome, take longer and thus be more costly than transferring explicit or general knowledge". Yet, these problems can be alleviated if the two parties to a transfer have developed a strong professional relationship, a phenomenon we have also observed with KTM and TVC. In fact, in the end they had developed a shared communication frame in which each party understands how the other uses subtle phrases and explains difficult concepts (Hansen et al., 2004).

However, it would be wrong to assume that the management decisions in this case were solely based on logical, technical arguments exchanged between engineers from both sides as the project has to be seen as embedded in the organizational context of a MNC, involving not only engineers from both sides but also their commercial and organizational oriented managements.

Thus the selected strategy is not only influenced by the goals of cost reduction and restructuring, but also by the available organizational technical knowledge within different units of Tyco Flow Control and the judgment, which knowledge can be transferred from Japan to other organizations within this MCN. The judgment was based on the technical abilities of both sides to communicate and implement the valve manufacturing knowledge rather than on the motivational disposition of both sides to openly transfer, receive and share such knowledge. This shows that a high motivational disposition is not a necessary condition for successful knowledge transfer, even

though it might be a sufficient one in other cases.

As the project is considered a successful one by all parties involved, it provided the template for all further manufacturing projects within Asia for Tyco Flow Control and was used widely as best demonstrated practice within the global TFC organization. As such, the new knowledge created was not limited only to product related issues and manufacturing in particular, but also to the process of knowledge creation management itself.

Lessons Learned from Tyco Flow Control Japan: Practical Implications

In this section, we will briefly summarize the main points and practical implications of our case study for mangers and international businesses.

In accordance with its target to reduce manufacturing unit cost while keeping product quality at an acceptable level, TFC wanted to shift valve production from Japan to Taiwan within a short time, a minimum of capital investment and only with available resources. However, the magnitude of knowledge transfer required in order to start manufacturing was underestimated and the motivational stance of the cooperation partners was negative towards collaboration at first.

The project was divided into three steps to efficiently manage the knowledge transfer: 1) codification and re-codification of engineering documents between the engineering departments

of both partners; 2) selection of sub-suppliers and knowledge transfer outside of the MNC between Taiwanese engineering and Japanese quality engineers; 3) tacit assembly knowledge transfer between Taiwanese and Japanese workforce. Each step required the presence of different partners (Engineering – Engineering; Engineering – Quality Engineering; Workers – Workers) and vehicles or opportunities to transfer this knowledge (documents, dispatch to site, dinner socialization). However, difficulties arose due to the different focus in engineering: on quality in Japan, on cost in Taiwan. Interestingly, as an unexpected side-effect, new knowledge was created that was used in Japan and Taiwan for manufacturing of other product ranges.

The three steps above provide a template for the manufacturing transfer of completely engineered products to LCCs, not only for valve products. Steps have to be conducted in series one by one and not in parallel. Emphasis has to be made on the provision of appropriate resources, namely manpower of engineering and work force to be dispatched to site and general socialization. A platform for open discussion between staff of technical background needs to be provided, free of management influence based on ‘political issues’.

Last but not least, we want to emphasize once more the importance of global knowledge creation and that it needs time and commitment as well as an enabling context to be successful. Even though management emphasis might be shifting to focus on the achievement of overall short-term operational targets, the long-term gains of creating new knowledge and sharing it as well as of fostering organizational learning should not be neglected or forgotten. Such a

'knowledge management myopia' could have disastrous effects on a firm's competitive advantage and future survival in a global economy.

Limitations and Need for Further Research

Although carefully researched, documented and analyzed, our study is subject to some limitations. First of all, the insights gained were derived and concluded from one single – probably rather unique – case, even if this is exactly what case study research is basically about (Stake, 2000). Indeed, the common limitations of generalizability of such field research are well documented (cf e.g. Eisenhardt, 1989; Hartley, 2004; Yin, 2003), though analytic generalization – in contrast to statistical generalization – is possible (Hartley, 2004; Yin, 2003). Therefore, it would prove helpful to conduct further case studies of Tyco but also of other global players in order to analyze the process inter-organizational knowledge creation and transfer in different environments and under different conditions.

Moreover, our case presented a very new and recent project at Tyco. A follow-up investigation in the next couple of years – longitudinal case studies (Yin, 2003) – will show whether the knowledge transfer from Japan to Taiwan will deliver satisfactory results or not and help to gain additional insights into success factors for and inter-organizational knowledge creation.

Last but not least, within this case we have not discussed the role and influence of the regional

Anglo-American management to which both corporation partners reported to and which added further intercultural dimensions. The influence of strategic management on product-related technical knowledge transfer and creation within the cultural context of Japan, Taiwan and the US will be the topic of further research.

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