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A Review on Technology Transfer in Context of Multinational Corporations

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ABSTRACT

Since the world has evolved as a Global Village, new technological innovation has become crucially important for sustaining market competition and gaining competitive edge irrespective of size and sector of any organization. Multinational Corporations mostly enjoying technologically advanced positions play vital role in disbursing technological knowledge throughout firms globally. This paper would enrich existing literature by observing different aspects related to technology transfer and outlining the relationship between multinational corporations and technology transfer that is, the role played by MNCs in relocating technological knowledge worldwide. This review would stimulate plots for prospective researchers to recognize and explain technology transfers by multinational corporations specially focusing on the parties and the process involved in intra inter-firm and intra-firm transfer of technology at the same time.

Keywords: Multinational corporations, technology transfer, intra-firm.

1. INTRODUCTION

Technology plays the role of a vital mechanism in economic achievement and national income expansion (Millman, 2001). Doz, Santos and Williamson (2001) found escalating knowledge and technology based competition coupled with the capability of multinational corporations to outperform their expertise across diverse affiliates is progressively more significant basis of aggressive performance. According to Dunning, (1993) MNCs not only own, but also manufacture and manage most of technology worldwide. They are responsible for almost 80% of non-government Research and Development (R&D) spending globally.

The main interest of MNCs has always revolved around technology transfer from developed countries to the emerging markets (Tihanhi & Roath, 2002) since emerging nations highly rely on FDI (Foreign Direct Investment) from different multinational firms as the developing nations lack basics in resource capabilities

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(Example: poor R&D foundation, inadequate R&D investments, limited invention and industrialized capacity, fragile transportation, communications and technology) (Tepstra & David, 1985; Lado & Vozikis, 1996). Emerging economies consider Multinational Enterprises (MNEs) as their major resource for technology in order to improve their technological competence and competitive edge of industries operating locally (Lee & Tan, 2006). On the other hand multinational corporations are believed to exist merely because MNCs are effective medium for transmitting knowledge globally (Kogut & Zander, 1993).

Multinational Corporations (MNCs) are corporations that comprises of a group of physically isolated affiliates that combine different technical expertise along with efficient product marketing liabilities (Nohria & Ghoshal, 1997; Galunic & Eisenhardt, 2001). MNCs are established not only as major manufacturers of technology but also as channel for transferring technology. MNCs can transmit its technology to foreign associates in both tangible and intangible forms, royalties and license fees paid to MNCs can be termed as evidence for the intangible technologies transferred whereas exported goods for further processing from the MNCs can be established as proof of tangible technologies (Nune, 2012).

Technology: The concept of technology ranges from tangible to intangible continuum. According to Nonaka (1994) intangible technology may include patents, know-how or trade secrets whereas equipments, components assembly parts or final products may be tagged as tangible technology. Interestingly, a third category of technology also exists, which is a mixture of both tangible and intangible technology. For example, production procedure or techniques that entail specific abilities to perform various processes required for production. Technology can also be determined by its non-reproductive and non-transferable qualities; like in case of tacit knowledge or firm-specific secrets.

2. TECHNOLOGY TRANSFER

In the era of Globalization Technology Transfer is one of the solutions to the issue of dispersed resources, such as capital, human, or material which are spread out globally in search of highest worth. Transfer of technology across borders has been defined by Fransman (1986) as “a process whereby knowledge relating to the transfer of inputs into outputs is acquired by entities within a country from sources outside that country”. This process of technology transfer between organizations depends on the way technology is defined. The intangible quality of technology often makes technology transfer management very complex (Chen, 1996). The technology transfer process may be as simple as shifting codified information from one organization to another or may be complex because of the fact that the ability to understand and use information varies. Transfer of

technology may take place directly, when the receiver licenses the technology from the MNC, or indirectly, when the affiliate imports intermediate goods with embodied technology. Technology transfer is a vital factor that affects long-term cross-country income, economic growth and convergence of countries (Nune, 2012).

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2.1 Significance and Effect of Technology Transfer

Both policy makers and researchers have hiked importance in R&D and Transfer of Technologies internationally by MNCs (Branstetter et al., 2006). This significance of technology transfer lies in the symbiotic relationship (complimentary relationship) enjoyed by both transferor and transferee. According to Dunning (1993) and Kobrin (1991) various factors determine why organizations enter global market but the level of technology can be held as an important determinant for foreign direct investment that occurs when multinationals reproduce their production in emerging nations to expand both market admission and market share (Markusen 1984). Technologically advanced corporations constantly enter foreign markets in order to increase their market share, prevent product obsolescence and equalize their high R&D investments (Harris & Ravenscraft, 1991). Knowledge based relationships characterized by substantial transmission of technology, are clearly related with the existence of international consumers along with the domestic market, coupled with the hard work of MNEs to adopt technology according to local perspective, joined with the technological abilities of local businesses (Federica & Antonello, 2007). Simultaneously technologies received by host countries from MNCs benefit them in attaining economic growth and development in the long run as well (Marton, 1986; Blomstrom, 1990).

Technology Diffusion Effect of multinationals would be responsible for an affirmative consequence on the increase in yield of the host nation in case even a portion of the technologies transferred by the MNCs reach the general people of the receiving nation and are immersed by domestic researchers (Bin, 2000). This influences many governments to offer R&D related tax subsidies and encourage the development and use of new technologies within their jurisdictions since the positive correlation between local economic affluence and the presence of technologically advanced industries imply that the use of new technologies enhances overall productivity and simultaneously benefit the local firms' R&D development rather than the MNC(s) (James, 1994). Soft technology is also observed as an efficient tool to carry forward the stream of technical progress in the economy of developing countries (Kumar, U. et al., 2007). Few studies have even identified transfer of technology as a mechanism by means of which emerging nations may recover from their everlasting financial deficit (Samli, 1985; Lado & Vozikis, 1996). Simultaneously the host nations would also be beneficial in context of enhancing living standard for its citizens, attaining

technical evolution by means of R&D, along with escalating revenue from tax and successful technology transfer would mean local workers with improved technological capabilities that would in turn contribute significantly to economic growth of host country.

And as for the MNCs, their benefit from technology transfer is in the form of additional profitable business contracts, international growth, enlarged market revenue and admission into new economies (Madu, 1989). Analyzing motives for technological advancement Hobday (1996) revealed most MNEs were economically impelled into technology transfer and industrial diversion and overseas growth relied on the improvement of local industries. To be particular reduced industry start-up time, lesser working expenditure after set-up, condensed manufacturing lead-time, minimized machinery down-time, gradual and constant development, and increased production, are some of the many reasons that motivate MNCs to go for technology transfer. Additionally innovation of oversea affiliates by means of absorbing continuously from domestic atmosphere persuades their understanding and contributes backward towards the parent companies as a chain reaction, is another benefit enjoyed by MNCs through technology transfer. (Mu et al., 2007)

3. TECHNOLOGY TRANSFER MECHANISMS

James (1994) stated that multinationals transfer technologies to countries they invest by two methods. Firstly, by producing technology locally through R&D and secondly by importing technologies produced elsewhere. Buckley (1985) mentioned a number of transfer mechanisms including wholly-owned facilities, licensing and franchising, and contracting in order to facilitate technology transfer to host firms. Other studies (Shujiro et al., 2006) also endorsed that International technology transfer occurs through various modes including procuring of technology from overseas in different forms like licensing, importing published materials, engaging foreign experts, FDI, and others.

The selection of a particular mechanism would depend on the amount of governance and the risk the transferring firm is keen to acknowledge for achieving its long term goals. Other factors influencing the choice of channels by the MNCs would include nature of technology, its maturity, density, traits of host state, skills and level of education of human assets involved, technology transfer requisites and domestic competition involved (Sinani & Meyer, 2004). The technology of MNCs is also revealed to foreign affiliates by means of copyrighted documents, national manufacturing, and by the work force hired (Bin, 2000).

The medium of transferring technology in tangible against intangible type has a discrepancy force on gaining existing information and financial development, innovation, financial interests, and convergence (Nune, 2012). In a separate study it was established that the channel of transferring technology relies on the different features of technology (example: implicitness, systematic arrangement and reproducibility (Kogut & Zander, 1993). Sazali et al. (2012) categorized the different channels for transferring technology into two major sectors. The first one, formal market channel include exporting technology directly, (FDI), IJVs (International Joint Ventures) and licensing. One the other hand the later (informal channels) consists of replication, personnel relocation, patent data, data in tests, and migrating temporarily (Maskus, 2003). Apart from the said Kriengkrai (2003) claimed inter-firm technology transfer as another channel in the manufacturing sector for transferring technology.

4. INTER-FIRM AND INTRA-FIRM TECHNOLOGY TRANSFER

Transfer of Technology can be classified into two types in context of MNCs. The first one is where technology from parent companies of MNCs transfer to their foreign associates and the other is where the technology transfer from foreign partners of MNCs transfers to local organizations. Kriengkrai (2003) defined Inter-Firm Technology as the relationship between large foreign and smaller locally based firm in the manufacturing sector that lacks formal agreement making it difficult to be identified. Intra-firm technology transfer on the other hand is presumed to be an interactive process and can be defined as a scenario where the liability of top management, human resource management, and sales is bestowed to the local associate instead of the foreign technology providing firm. MNCs emphasis much on intra-firm technology transfer because the performance of their overseas affiliates relies significantly on the accomplishment of intra-firm technology transfer, which would lead to efficient management and production (Shujiro et al., 2006). Bastos (2001) established by investigating the outcome of inter-firm partnership and intra-firm R&D expenses, that in case of intra-firm technology transfer performance increases with increase in R&D spending, whereas no such transparent conclusions could be stated in regards to the results of inter-firm joint ventures. In fact previous study endorsed that Research & Development along with Intra-Firm transfer of technology equally contributes to increased productivity and initiates innovative and enhance technologies by means of cross-border intra-firm competence transfer and the adjustment and expansion of the same using R&D operations of the host country that are crucial for the foreign associates of multinational corporations to gain competitive advantage (Rene et al., 2006).

5. FACTORS AFFECTING TECHNOLOGY TRANSFER

Formal organization structure is one of the determinants of technology transfer (Galbraith, 1973). The technology receiving local firms' ability (Example: set of skills that is required to be possessed by transferee in order to operate equipment or adapt the procedure of production) to integrate latest knowledge and processes plays a vital role in the technology transfer process (Benhabib & Rustichini, 1991). According to Dosi (1995) institutional context also known as "national innovation system" is the other set of external factors that influence the technical evolution and financial growth. Productivity patterns of host firms' affects the type of technology transferred, as study revealed MNEs prefer to distribute technological competencies to countries associated with additional productivity, whereas they transfer intermediary goods to nations with lesser amount of production capacity (Nune, 2012). Bin (2000) furthermore agreed that a state requires attaining a least human resource standard to take advantage from the transfer of technology. Morten and Bjorn (2004) found that established informal relations also affect transfer of technology by neutralizing the harmful consequences of expanded geographical distances as teams tend to steer far from physically remote affiliates possessing relevant technological abilities and usually chose to approach known people for their technology needs instead of unfamiliar ones who held required technological expertise.

External environment variables which include laws of the land, rules and regulations, systems and policies, customs, traditions and norms of the host community, are also factors considered by MNCs before transferring any technology to the developing markets (Chesbrough, 1999). Shujiro et al., (2006) stated that FDI supportive environment that influences MNCs to stay in host nations for a longer period which in turn improve the quality of human resources by means of training and education plays important role in intra-firm transfer of management technology. Other factors include higher royalty taxes associated with the R&D intensity (James, 1994) and geographical distance and communication costs as explained by Krugman, (1991), and the accurateness and depth of knowledge transfer, decreases with expanding geographical distance and mounting communications' expenditure, such as time required to travel or troublesome meetings.

6. BARRIERS TO TECHNOLOGY TRANSFER

Along with the complexity related with the concept of technology, technology transfers concern two or more nations with different social, economic and technological backgrounds, which make barriers inevitable part of the process. According to Radosevic, (1999) the intangible aspect of technology deep-rooted in firm customs is a major setback in the transfer process as it requires a gradual

learning process coupled with high transfer costs. The transfer costs not only include the technological and managerial expertise but also include marketing and R&D assistance for both existing and conceptual generation and application of technology (Teece, 1977) along with the amount of tax imposed by the Government of host countries on cross-border royalty payments that make technology import expensive (James, 1994). The quantity of innovative technology used by MNC affiliates in host countries potentially depends on the spending power of the affiliates (Bin, 2000). Research also revealed that physical remoteness, for example geographical distance, traditions or culture, and national discrimination between workforces may hinder working collectively and can prevent transfers of soft technology (example: skills or know-how) (e.g., Kogut & Singh, 1988; Kriengkrai 2003; Zaheer, 1995). A separate study Szulanski's (1996) also pointed out the difficulties associated with intra-firm knowledge transfers and brought into light issues such as: motivation deficiency; insufficient absorbing capability; inadequate retaining ability of beneficiaries; formal systems and structures; less frequent individual interactions; along with strenuous (i.e. laborious and distant) relationship between the transfer partners.

7. CONCLUSION

The key foundation of competitive strength for firms and countries is technology and innovatory capabilities and since technology does not originate in any fixed nation consistent economic growth depends on effective adaption of technology by means of technology transfer especially for the developing countries where technology transfer plays major driving force for economic development. The most important support brought by multinational corporations to host countries is perhaps Technology Transfer. In regards to this review it can be concluded that much research has not been done on technology transfer by MNCs among international management literatures. In terms of stimulating ideas for future research it may be stated that areas concerning the impact of technology transfer especially on the foreign affiliates need to be explored. Also areas focusing on the financial return from investment or business opportunities related to technology transfer need to be examined. The analysis of technology transfer remains incomplete without defining the relationship between technology transfer against profitability or productivity. Extent of technology transfer by MNCs in different countries may also be studied in order to understand the similarities and differences between them. Lastly the amount and type of risk if any associated with the technology transfer process has not been revealed by existing literature which can facilitate MNCs while considering technology transfer.

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