Exploratory Study of Process Development in Technology Transfer Evidence from Automotive Firms

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Abstract: The topic of technology transfer is important in the context of developing and emerging economies as successful technology transfer and local technological development efforts can play a crucial role in the economic development of a recipient country to value added its products or activities. Technology transfer process is an integration process which involved the technology provider, receiver, object of transfer and transfer mechanisms. However, previous researches showed that the failure of technology transfer mainly caused by several factors. This research explored the development process of technology transfer from the joint venture companies of the automotive firms in Malaysia. Technology transfer process development will be assessed in a holistic way beginning with the in depth understanding on the process of technology transfer and key challenges during the development process that contributed to the success in the perspectives of Organizational Learning, Knowledge Based View and Resource Based View. These theories were important point of view to categorize the process that contributed to the success of technology transfer development. This research contributed several theoretical, empirical and methodological (modified Delphi method) values to the literature on the factors related to technology transfer success, and evolutionary process of technology transfer. Instead of development process, this research also identified the key challenges during the process and recommendation on how to overcome them. Semi-structured interviews were conducted among 12 participants from automotive firms, consisted of R&D staffs, Top Management, Designers, Engineers and Technicians, including the experts from government agencies related to technology transfer activities. This study will present relevant contributions to the company’s top management, technology transfer practitioners, policy makers, along with the researchers who were interested to get involved directly in the process of technology transfer. This research originality lies in the proposed framework of a technology transfer process development in joint venture as a business strategy.

Keywords: Technology transfer effectiveness, Technology transfer key challenges, Organizational Learning, Knowledge Based View and Resource Based View

1. Introduction

This concept paper explored technology transfer development process, focusing in the automotive sector. Technology is very crucial to the industry in the modern world (Jagoda, 2007) and become an important business strategy for firms in rapidly changing and dynamic environment of the business world today (Chen and McQueen, 2010). Technology is also an important aspect for every country, in order for them to survive in economic growth and become competitive in the modern world today (Tan, 1996). One of the methods to acquire technology was through the technology transfer activities.

Strategic alliances is one of the important strategy for a firm to acquire outside knowledge in order to improve its competitive advantages (Chen et al., 2014). From this activity, the firms can gain knowledge and share experiences with their partners. However, previous studies showed that the technology transfer in Malaysia was not fully succeed due to certain circumstances. Even though a lot of activities have been carried out for technology transfer in the industries and academics, the success rate was still very low. It will be a loss to the firms involved when they have to spend a lot of efforts to acquire the technology, but at the end they were unable to use that technology and fail to get the benefits from it. There were a few factors contributed to the success of a technology transfer. A successful technology transfer process means the transferee can utilize and assimilate the transferred technology effectively (Kumaraswamy and Shrestha, 2002; Ramanathan, 2011).

Successful technology transfer can be measured in several ways. In the industry, for example, technology transfer can be considered success when the firms successfully acquired the technology and get benefits from it. Some of the researchers equated technology transfer success in terms of cost, budget and time, technology deemed useful to transferee, amount of knowledge has been transferred and the values it created from the technology. The benefits gained by the company can be divided into two types; tangible and intangible benefit. In order to ensure the success in acquiring the technology, it is important for the practitioners to understand the process development in the technology transfer. In this research, the researcher has explored how the development process of technology transfer evolved in the automotive sector based on the perspective of Organizational Learning (OL), Resources Based View (RBV), and Knowledge Based View (KBV) towards the contributions to
the technology acquisition. It is also important to understand the key challenges and how to overcome them. This study was conducted at the tools and die maker for automotive industries which implemented the technology transfer activity from the international joint venture with another firm. There were different points of view that we will go through in order for the local firms to acquire the technology.

2. Research Background

Based on previous studies, technology is unquestionably has become a major provider of economic, social and cultural development (Alvarado and others, 2013). Firms were dramatically depending on the transfer of technology to improve their products and increasingly fulfilling the complex customer requirements. However, most of the technology transfer projects failed to produce results which were probably caused by a lack of careful planning (Kumar et al., 2007). In order to decrease the risks of failures in the technology transfer process, firms should have better understanding on the challenges faced in the process (Van Horne and Dutot, 2017). According to previous study, in the Small Medium Enterprise (SME) sector, the technology transfer projects were often regarded as commodity project purchased and frequently overlooked some important technology transfer activities which were critical in order to rapidly use the new technology that has been successfully transferred (Jagoda et al., 2010).

Evidence from researches in various firms from other countries have made clear that, the appreciation of the ability to acquire the technology in the long term and capability to manage and create technology change as factors to compete and grow has increased (Guan et al., 2006). New technology from another source such as other international companies will contribute to the firms’ success significantly if the firm managed to acquire and utilize it effectively (Kumar and Palvia, 2002). The main purpose of implementing the international technology transfer was to improve the local firm’s technology capability which were the activities that need improvement and constant upgrading (Putranto et al., 2003; Saad et al., 2002).

Some of the scholars recognized that effective technology transfer is critical in a very competitive and unclear environment (Bhagat et al., 2002; Hansen, 2002; Pérez-Nordtvedt et al., 2008) due to the implementation of technology towards commercialization needed the strength and competitiveness in the firm’s level. As acknowledged by the scholars, technology transfer is very critical in highly competitive and uncertain environment (Bhagat et al., 2002; Hansen, 2002; Pérez-Nordtvedt et al., 2008). Even though the technology transfer process implemented accordingly based on schedule, it might not be helpful to develop transferee technology capabilities. Therefore, every firm was required to have a proper approach of technology transfer process planning in order to achieve the technological acquisition successfully. The current situation in automotive sector moved very fast, as new model launched with a short lead time and variety of models launched together, so that the process of technology acquisition was becoming more important for the industry to remain competitive.

However, planning and managing the transfer of technology especially for those involved in the international technology transfer projects was not easy. Instead of development process, it is also important to understand the key challenges in the process of technology transfer. It is essential to realize that technology transfer was more complex than just transferring the technology easily from one place to another. The ability to understand the new and developed technologies is very critical (Kamoda, 1986). Technology transfer can build a nation’s technological capability by acquiring the knowledge in production (Chen, 1996). Also according to Chen, the difficulty was in defining the technology transfer’s main elements from the insights that the technology was not the product but the knowledge. Therefore, there were many aspects of the transfer process that needed to be considered and several potential “barriers” to overcome.

This research aimed to explore the main factors related to RBV, KBV and OL such as technological content, transfer mechanism, firms’ internal and external resources that contributed to the best practice of technology transfer activities. This research will deeply investigate the outcomes of the technology transfer on transferee effectiveness. Therefore, this study will explore certain factors of technology transfer in a specific study to a certain extent which it will determine the factors that contributed to the success of technology transfer.

The main objectives of this research were to study the development process towards the best practice of technology transfer in automotive firms. The specific objectives were as follows:

1. To study the evolving process of technology transfer from transferor to transferee.
2. To describe the key challenges in the technology transfer process.
3. Literature Review

In order to acquire the technology, there were a lot of methods and mechanisms used by the firms. For instance, in a non-market channel, the firms used the methods of imitation, movement of personal, data in application, communication media and temporary migration. One of the methods in acquiring the technology was through companies joint ventures. Both companies will get the benefits from the joint venture activities.

Better understanding towards the theories of technology transfer is important for the concerned parties such as researchers, academics, private sector, and government related departments, which is related to the practical and empirical aspect of technology transfer issues, challenges, mechanism, and model (Wahab and Rose, 2012). This research can stimulate and generate ideas to further identify the understanding and conceptualize the development process in principle theories and perspectives of the technology transfer framework. Firms were motivated to acquire the technology for some reasons. According to Ford and Probert (2010) there were four main reasons for firms to acquire the technology: 1) developing technological capabilities, 2) Developing strategic options, 3) Gaining efficiency improvement and 4) As a response to their competitive environment.

Technology transfer to the advanced industrialized countries consists of patented high-level technology while for the developing countries it was mainly to modernize the experiences and skills related to the standardized production method. Technology transfer includes the production, management and marketing.

This paper will discuss the main concept of knowledge and theories related to technology transfer process in order to give better understandings of the concept which became the main item for this research. To understand the efficacy of technology transfer with the joint venture firms, it was very significant to have a proper understanding on a few elements associated with the technology transfer. First, the conceptual model of technology transfer process. Second, the key challenges and how to overcome them during the process of technology transfer.

4. Technology Transfer Process

Technology transfer is the interaction among more than two entities and process oriented with the objective to increase or stabilize the transfer technology or knowledge (Argote and Ingram, 2000). The technology transfer process consists of interactions among parties at the stage where important impact was made with the relational context. The transfer object could be in various forms such as knowledge, technology and know-how that came with different characteristics and properties. Channel and mechanism were the important dimensions to analyze. Specifically, it is possible to differentiate between the process and output mechanism (Battistella et al., 2016).

As defined by Argote and Ingram (2000), knowledge transfer is a process through one party which is affected by the expertise of another, where a unit can be referred to an individual, group, or department. The main objective of knowledge transfer, according to Bou-Llusar and Segar-ra-Ciprés (2006) was to abide to a smooth and efficient flow of knowledge within and across the companies. Actual knowledge was not the main item in the technology transfer, but the ability of the technology receiver to utilize the potential of new knowledge at their place (Fazal et al., 2016).

Technology transfer’s success in certain technology was subjected to the understanding of the process, or ability to accurately forecast the future performance of the process (Schmidt and Uydess, 2011). In order to succeed in technology transfer, there were factors that needed to be considered. In the context of technology transfer, Purushotham et al., (2013) has summarized that successful technology transfer concerned with several factors such as the satisfaction of the individual entrepreneur or a company, the predicted outcome of implementing the project variables such as launch of product in the market, commencement of commercial production, attractive returns on investment and socio economic development. Other than that, the success of the technology transfer process can be determined by the comparison of actual and expected benefits through the operation and maintenance of the acquired technology (Saad et al., 2002).

As proposed by Bolatan (2016), there were eight stages in the process of technology acquisition; 1) Identify the technological requirements, 2) Get the information on substitute sources of the technology, 3) Diffusion of information, 4) Evaluate and select appropriate technology, 5) Unpacking the technology packages, 6) Negotiation for the best condition of terms and conditions, 7) Adaptation and absorption of the imported technology, 8) Optimize the exploitation and maximize the utilization of the technology.
Other scholars proposed that the technology transfer process was consisted of three main stages. 1. Build up the strategy or planning, 2. Negotiate and 3. Implement which will give a successful technology transfer’s outcome. Technology transfer was not only exchanging information between the transferor and transferee(Farizah and Shashazrina, 2012). Technology transfer was also an alternative way for developing and acquiring technology from other parties (Rahimi et al., 2013). Meanwhile, another researcher (Chiranjibi et al., 2005) considered technology transfer as a dissemination of information, synchronizing technology with the needs and adapting the innovations creatively. Minbaeva et al., (2003) stated that the process initiated when the technology receiver start to utilize the technology that has been transferred to them. The main component in technology transfer is not the actual knowledge transferred, but the extent of receiver’s potential in utilizing the new transfer knowledge in its operation instead.

Technology transfer was difficult to implement due to the complexity of the process. Normally, the technology transfer was based on the adaptation and absorption of technology currently existed in the firms. Ramanathan (2011) figured out the different stages of transfer mode for the recipient of the technology and the transferor of the technology. There were four transfer modes used by transferor to transfer the technology, 1) sales intensive, 2) manufacturing intensive, 3) development intensive, and 4) research intensive. Meanwhile, different mechanism to link the modes such as OEM, licensing, and International Joint Venture (IJV) were used to spread the technology.

Technology transfer process is an important element in order to ensure the success of technology acquisition. Failure in the process development will cause ineffectual in technology transfer.

5. Key Challenge

Based on the previous researchers, there were a lot of challenges which faced by the firm during the process of technology transfer, depended on the nature of the industry. For example, in the context of Japanese MNC’s, they faced two major challenges, 1) the type of technology that they transferred is soft or in other word in a tacit form and 2) the Japanese and American transferee did not share the same language. Other author proposed their own classification of technology transfer barriers, 1) technical, 2) organizational-economic, and 3) system barriers (Mazurkiewicz and Poteralska, 2015). Apart from that, financial, competence, communication and market related were also contributed as the barrier during the technology transfer process (Sunaoshi et al., 2005).

According to Gunawansa and Kua (2011), common main challenges to technology transfer will be; 1) an inadequate technical expertise and know-how in the firm; 2) the incapability of the firm involved to negotiate a suitable transfer agreement and the reluctance of the technology provider to transfer the technology. Automotive sector might be different in terms of the key challenges faced by the practitioners and different solutions should be used to overcome them in the industrial context. The previous researcher will become references for this research to study the related key challenges and solutions required to overcome the problems.

Key challenge was an important aspect to understand by the practitioner for them to overcome the challenges and ensure the success of technology transfer implementation. Based on the previous study, the researcher has proposed some solutions to overcome the key challenges face by the practitioners during the activities. This research perhaps will find out the new challenges that became major obstacles during the development process. Proposed solution for each barrier was important for the future practitioners in order to sustain the firms and be competitive in the market.

6. Methodology

Specific steps in qualitative methodology based on the case study will be used for this research. To achieve a stronger result, this study will apply a semi-structured qualitative method. Studies showed that the understanding on the circumstances were still lacking, especially when there was no information available on how many similarities developed by the problems or issues related to studies that have been finalized in the previous studies. Two phases of data collection method will be used; Modified Delphi method for expert opinions and semi-structured interviews with the informants from the automotive sector involved.

In such cases, the initial preparation work needed to be done in advance in favor of familiarizing with the situation prevailing to the phenomenon and understanding what is happening before developing a model and implementing an appropriate design for a comprehensive study. This research will be conducted at the automotive firms which acted as a research field. Qualitative research was selected as the aim was to understand the phenomenon in depth on the development process of technology transfer towards to success of technology.
acquisition. This study aims to provide clearly understandings on the phenomenon of the transfer technology development process from the perspective of the researcher in the transferee firm. Due to the nature of this question was to understand the phenomenon in depth, gather the experiences of participants in real situations, and look instead of testing the variables, by using qualitative research paradigm fit. Additionally, according to Eisenhardt (1989) this case study will offer a dominant tool to create a concept.

Based on the study conducted by Yin (2003), the case study strategy is the most suitable tool when the research involved why or how questions. Deductive research integrated a large amount of general information in this field which consolidate and confirm the knowledge, then combined them into a single framework. It began with the literature review, which was the most appropriate start for deductive research (Christensen and Sundahl, 2001) in order to establish the knowledge in this research area. Going through a sample of practitioners to establish the concept was also a good idea if there were significant lacking in the literature or practice. Focused questions will be an appropriate form of empirical data obtained (McBeath, 2012).

7. Conclusion

Knowledge of technology has emerged as a critical resource for achieving a company’s sustainability and always conserved in the competitive rivalry. Frequently, policy makers which occurred initially in the process from the beginning of the economic preferred the joint venture with another Company as the advanced technological package, techniques of marketing, along with classified and tacit deal with the knowledge management, were the formulas for the fast and easy progress of economic development. The transfer of technology among organizations indicated a huge challenge for the management team which aimed for a fruitful transfer technology.

The transfer of technology will spur to develop effective capacity, improvement in achievements and innovations for the transferee of the technology. Literature review will give the position of the theory on the information which then exposed the overview of the technology transfer process development based on the theory Resource Based View, Knowledge Based View and Organizational Learning.

This research aimed to explore the main factors related to RBV, KBV and OL such as technological content, transfer mechanism, firms’ internal and external resources that contributed to successful technology transfer. This research will deeply investigate the outcomes of the technology transfer on transferee success. Therefore, this study will explore certain factors of technology transfer in a specific study and to a certain extent where it will be able to determine the factors that contributed to the successful technology transfer. This approach will be adapted with a clear understanding on qualitative method to get more in-depth information about the topic of the study on the efficacy of a complex transfer of technology.

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