



DRIVERS TO ASSIST TECHNOLOGY TRANSFER AMONG MANUFACTURING EMPLOYEES IN MALAYSIA

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Abstract

Technology transfer is undeniable pivotal channel to upgrade development and spur growth in economies. Many drivers contributed to the performance of the transferred technology, yet few attempts were made to conduct research on a single holistic model towards the transferred technology. This study, therefore attempts to determine the relationship between absorptive capacity, transfer capacity, communication motivation and learning intent and technology transfer performance. The study used survey method. Questionnaires were used to obtain feedback from the respondents. The sample was conducted in a Japanese multinational company based in Klang Valley, Malaysia which has been established for 25 years in the making of the camera and lens. A total of 117 valid questionnaires were received. Findings showed that communication motivation is the most influential driver to assist technology transfer performance in the manufacturing firm.

Key words: technology transfer, absorptive capacity, drivers

1.0 Introduction

Technology transfer is an area of interest which is not only for business field, economists and technologists but it also reliable for other disciplines such as anthropology and sociology (Zhao and Reisman, 1992). Theoretically, multinational corporations (MNCs) are recognized as an important catalyst in the spurring growth and development of Malaysia's manufacturing sector. This is in tandem and undeniable with MNC's contributions which is significantly to value-added, employment and total exports of the manufacturing sector and thus improves the growth of Malaysia economy (Lai & Narayanan, 1997). In addition, technology transfer is not a new phenomenon and some more it has become considerable interest to many groups such as government, multinational corporations and education institutions because of the undeniable close relationship between technology transfer and economic growth (Siti Aishah, Ahmad and Shariman, 2009). However, the empirical results on the effectiveness of technology transfer to developing countries are inconsistent due to different learning capacities and situations (Lyles & Salk, 1996; Marcotte & Niosi, 2000)

Thus, issues such as lack of communication between employees and managers, supervisors and so on, little commitment of managers in transfer process, level of learning intent among employees in order to acquire technology knowledge and technology absorption capacity have raised the question whether the manufacturing firm have been on track in terms of their knowledge to facilitate the



technology transfer successfulness. Hence, this research will examine the drivers that have higher tendency towards influence the technology transfer among manufacturing employees based on a single holistic model.

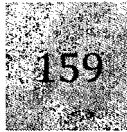
2.0 Literature Review

Our extensive review of the literature reveals that there is substantial interest in the broad issues of technology transfer among manufacturing employees. Interest in technology transfer has spread widely among researchers. As cited from Ramanathan (1989) and Bozeman (2000) reiterated that during colonial era, colonial powers used technology transfer as a tool to production entities in their colonies which were mainly in the primary sector such as mining, plantation and agriculture. Technology transfer is not a new phenomenon for the business field. However, the prior literature on technology transfer which was emerged over the years really meets hurdles to provide it. This is because defining technology transfer is not an easy task due to the complexity of the technology transfer process (Spivey et al, 1997). Besides that, according to Bozeman (2000), the definitions on technology transfer depend on how the user defines technology in what context.

However, it was argued by Dias and Vergueiro (1998) whereby he said that technology transfer can be of two types which are production of new product (product or embodied technology transfer) and more efficient production of existing products (process or disembodied technology transfer). Most of the literatures on management have shifted their focus to alliance among enterprises and how alliances are crucial to the development of technology transfer (Zhao and Reisman, 1992). In a nutshell, technology transfer can be described in several ways and approaches and it is also can be as impetus for sustainability of the organization. Thus, this study examines four main factors that are absorptive capacity, transfer capacity, communication motivation and learning intent and their influences on technology transfer among manufacturing employees.

2.1 Technology transfer

Technology transfer is not a new phenomenon for the business fields. Most of multinational companies and other institutions such as public international bodies, non-profit organizations and others bodies involved in such activities with intention to improve their living conditions by producing goods which can be sold in the local market (Bozeman,2000). According to Ramanathan (1994), he defined that technology transfer as the process of movement of technology from one entity to another. The success of transfer can be said if the receiving entity, the transferee can utilize the technology transferred by absorb and practice it well without any errors. In the other word, if the employee has a high absorptive capacity level, he/she can handle the tasks without any hurdles and as a result, it will ease technology transfer activities in the organization and spur the production growth of the organization. This is in tandem with Maskus (2003), whereby the technology transfer concept is not only concern about the transfer of technological knowledge or information but also the technology recipient's capability to learn and absorb technology into the production function.



The importance of communication and frequent interactions with superiors and colleagues were supported by prior studies such as Nonaka (1994), Bresman, Birkinshaw and Nobel (1999) and Gupta (1987) agreed that frequent interactions among employees and also with superiors will antecede more knowledge for them and thus enhance the technology transfer performance.

Based on a study of Easterby-Smith et al., (2008) posit that qualifications of the technology provider and the human capital of employees in multinational firms will enhance willingness to share the knowledge and stimulate the technology transfer process in the organization. Meanwhile, firms with employees that have strong learning intents would be create a suitable learning environment during the process of collaboration. On the other hand, strong learning intent implies that employees are more capable of manipulating the process and outcome of knowledge integration and application, which in turn advances the performance of technology transfer in the organization.

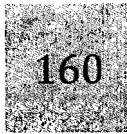
2.2 Absorptive Capacity

Technology transfer successfulness mostly influenced by the employees within firms whereby they able to reap and gain benefits from technology transfer. In line with this, as cited from Davenport and Prusak, (2000), Roshartini, Roshana and Abdul Hadi (2011) explained that employees can fulfill those requirements when they have ability to absorb, operate, learn, acquire and apply new external technologies and knowledge with product and sustain high level production. It was supported by a study from Sazali et al.,(2009) whereby they posit that level of transferred knowledge absorption of recipients in the firm will influence degree of their absorptive capacity. In recent years, many scholars have used the concept of absorptive capacity in different levels and came out with different outcomes. As for example, Cohen and Levinthal (1990) did a study about individual's absorptive capacity and organization, meanwhile, Szulanski (1996) focused absorptive capacity as a business unit in the organization and Lane and Lubatkin (1998) combined the both elements and proved that absorptive capacity is largely an instrument of the organization's prior related knowledge and argued that it is critical to the organization's innovative capabilities. Therefore, we would hypothesize:

Proposition 1: There is a significant relationship between absorptive capacity and technology transfer.

2.3 Communication Motivation

Communication motivation refers to openness of the communication which encourages exchange of information between parties. Parallel to this, it will motivate the parties to learn and share each other the information and apply it into organization and enhance the performance of the technology transfer. Kale, Singh and Perlmutter (2000) mentioned that the partners' openness and transparency will smooth the process of exchange, share and transfer knowledge between partners and eliminate the opportunistic behavior between them. As a result, the gained knowledge will enhance the technology transfer performance in the organization. Frequent interactions and openness in sharing knowledge also will allow accessing the alliance valuable resources and also solving problems through mutual problem solving (Uzzi, 1997). It is on par with as Lane et al., (2001) whereby



partner's trust is a risk reduction device and determines the extent of knowledge inflows within MNC and as well as the efficiency of the knowledge transferred.

Proposition 2: There is a significant relationship between communication motivation and technology transfer.

2.4 Learning Intent

Learning intent is a process accumulating member's knowledge that can be converted and embodied within the organizations' knowledge repository and further improves organizational activities (Huber, 1991). This is in tandem with Kogut and Zander (1992) whereby they stated that an organization with employees that have eagerness to learn, it not only has the advantage of recombining organization's existing knowledge, but also enhances its ability in combining external and existing knowledge, which consequently improves the creation and accumulation of organization's knowledge base and lead to the organization's sustainability. In the prior studies such as Inkpen and Dinur (1998); Gupta and Govindaranjan (2000), learner characteristics can be further distinguished into two kinds. They are learning intent and capacity. Basically, learning intent with strong intention can avoid syndrome which is called as "Not-Invented-Here" syndrome. Moreover, it will help the learning process of employees in organization. It was supported from a study of Szulanski (1996), without motivation to learn among employees, it will lead to slowness in the firm, hidden sabotage whereby the foreign allies refuse to share knowledge with employees.

Proposition 3: There is a significant relationship between learning intent and technology transfer.

2.5 Transfer Capacity

The technology providers' ability to transfer knowledge which accordance with requirements of the organizational learning process and also contribute and share their knowledge on skills, technologies and competencies to the MNCs. Easterby-Smith et al., (2008) posit that qualifications of the technology provider and the human capital of employees in multinational firms will enhance willingness to share the knowledge and stimulate the technology transfer process in the organization. Past studies have described transfer capacity from many dimensions for example, the source 'not perceived as reliable' (Szulanski, 1996), the firms' ability to transmit their own knowledge to different location and peoples (Martin and Solomon, 2003), the parent firms' capacity to knowledge transfer (Wang et al., 2004), and the source's motivational disposition (Gupta and Govindarajan, 2000).

Proposition 4: There is a significant relationship between transfer capacity and technology transfer.

3.0 Methodology

A cross sectional survey was used to determine how the independent variables influence the technology transfer among manufacturing employees. The measurement scales for absorptive capacity were adapted from Sazali, Raduan, Jegak and Haslinda (2009), Pak and Park (2004) and Lane

et al. (2001). Five items that used by Sazali et al., (2009) were adapted and tested in this study. It was shown in table 3.1. Meanwhile, learning intent items are based on study by Yin and Bao (2006). Our study will look into willingness of employees to acquire knowledge from their superiors. Hence, we will employ five scales that specifically examine willingness to learn by employees, thus, influence technology transfer successfulness. Table 3.2 lists the items at below. One of the popular studies that focused on the importance of interaction among employees was conducted by Fryxell et al. (2002) and Chua (2002). We add further two items from Lin (2005). We selected these two items because the research discusses about communication between employees and foreign partners and local superiors. Table 3.3 lists out the items. The measurement scales for transfer capacity were adapted from Hau and Evangelista (2007) and Lyles et al. (1999). All five items that used by Hau and Evangelista (2007) and Lyles et al. (1999) were adapted and tested in this study. Table 3.4 shows the five items for the transfer capacity variable and the measurement scales for technology transfer were adapted from Szulanski (1996). There are four items that used by Szulanski (1996) which were adapted and tested in this study. Szulanski (1996) tested at the stages of technology transfer.

A reliability test was tested on each variable. The Cronbach Alpha for absorptive capacity (AC) was higher (0.882) compared to Simonin's (2004) Cronbach Alpha (0.81). The Cronbach Alpha for learning intent is (0.72) than Yin and Bao (2006) Cronbach Alpha which is 0.71. Meanwhile, Cronbach Alpha for transfer capacity is 0.829 which is higher than Minbaeva's Cronbach Alpha (0.66). Apart from that, communication motivation Cronbach Alpha is 0.867 is slightly lower than Lin (2005) Cronbach Alpha which is 0.96.

The study was conducted in a Japanese manufacturing firm that located in Klang valley, Selangor in Jun 2012. The firm was contacted by telephone and e-mail to participate in the study. The questionnaire was administered while the staffs are having lunch time in the manufacturing plant. We managed to collect 117 usable questionnaires. All questions were asked using the five-point Likert scale from 1 strongly disagrees until 5 strongly disagree.

Table 3.1 Absorptive capacity

Item	Original Version	Adapted Version	Adapted From
ACAP1	Have technical capacity	I am able to interpret new knowledge that I received	Sazali et al.(2009) , Pak and Park (2004)
ACAP2	Ability to understand knowledge	I am able to understand new knowledge and implement it into best practice.	Lane et al. (2001)
ACAP3	Ability to assimilate	I am able to assimilate value of new knowledge in my job	Sazali et al., (2009)
ACAP4	Able to identify problems based knowledge received	I am able to identify and solve technical problems with new knowledge	Pak and Park (2004)

ACAP5	Able to apply new knowledge	I am able to apply new knowledge to work effectively	Lane et al. (2001)
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Table 3.2 Learning intent

Item	Original Version	Adapted Version	Adapted From
LET1	the local partner's commitment not to compete directly with the foreign partner in the future	I am willing to co-operate with top management after acquired new knowledge	Yin and Bao (2006)
LET2	the local partner's desire, determination	I am willing to learn continuously and upgrade my skills	Yin and Bao (2006)
LET3	local partner's commitment in sharing with the foreign partner the benefits of the critical knowledge	I am willing to share my knowledge with other colleagues	Yin and Bao (2006)
LET4	the technology-recipient's willingness to allow foreign partner to inspect and monitor the use of knowledge acquired from JV	I am willing to allow top management to share knowledge that I acquired	Yin and Bao (2006)
LET5	willing to learn from foreign partner	I am willing to attend courses and training to develop my skills	Yin and Bao (2006)

Table 3.3 Communication motivation

Item	Original Version	Adapted Version	Adapted From
CM1	Maintain amiable environment	I always to create friendliness environment when interact	Fryhell et al. (2002)
CM2	Ensure the interaction in positive mode	I always want to create a positive mode interaction	Fryxell et al. (2002)
CM3	Desire to maintain good relationship	I always want to maintain frequent interaction	Chua (2002)
CM4	Foreign partners supportive each other	I always want to discuss about my problems and hope the concerns be addressed	Lin (2005)
CM5	Share ideas, feelings and hope	I always want to freely share my ideas, feelings and opinions	Lint(2005)
CM6	Confident each other capabilities	I always want management to be confident with my capabilities and skills	Chua (2002)

Table 3.4 Transfer capacity

Item	Original Version	Adapted Version	Adapted From
TC1	Provide materials and guidelines for decision making	I have received sufficient procedures and materials in handling technology	Hau and Evangelista (2007)
TC2	Often have formal training program	I have attended many courses and training programs organized by foreign managers	Hau and Evangelista (2007)
TC3	Training very helpful	I have gained beneficial knowledge from those training programs and seminars.	Hau and Evangelista (2007)
TC4	Easily approached the superiors	I have experienced an easy and comprehensive environment while learning	Lyles et al. (1999)
TC5	Can understand through teachings and guides	I have applied the technology easily based on teachings and guides	Lyles et al. (1999)

Table 3.5 Technology transfer

Item	Original Version	Adapted Version	Adapted From
TT1	The firms expectation during practice have been met	I have met the firm's expectation in the technology transfer	Szulanski (1996)
TT2	The firms personnel are content to play their roles in the practice	I have a qualified technology provides in this firm	Szulanski (1996)
TT3	The transfer of practice from technology provider amply justified	I have received knowledge that our firm needs	Szulanski (1996)

TT4	There are mistakes in the technology performance	I have not found any mistakes in technology knowledge	Szulanski (1996)
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4.0 Findings

4.1 Proportion of demographic data

Frequency analysis was used in this study to analyze about the demographic data of the respondents such as age, education level, gender, marital status, working years in the organization, working experiences, nationality, working shift in the organization and job designation. The proportion of frequency analysis is shown at table 4.1.

Table 4.1: Proportion of frequency analysis

Demographic	Frequency	Percent (%)
Age		
-Under 20	3	2.5
-20-35	88	73.3
-36-50	23	19.2
-51-65	3	2.5
Education level		
-Elementary school	31	25.8
-High school	53	44.2
-College degree	20	16.7
-Graduate degree	11	9.2
-Other (SKM)	2	1.7
Gender		
-Male	44	36.7
-Female	73	60.8
Marital Status		
-Married	46	38.3
-Single	60	50.0
-Widowed	11	9.2
Years worked at organization		
-less than 1		
-1-2	26	21.7
-3-5	30	25.0
-6-10	49	40.8
-over 10	2	1.7
	10	8.3
Working experiences		
-none	55	45.8
-one	41	34.2
-two	16	13.3
-three	5	4.2
Nationality		
-Malaysian	80	66.7
-Non Malaysian	37	30.8
Working Shift		
-First (07:00 until 15:15)	30	25.0
-Second (15:00-23:15)	60	50.0
-Third (23:00-07:15)	27	22.5
Job Designation		
-Top management	2	1.7
-Middle management	15	12.5
-First level Supervisor	30	25.0

Non managerial	70	58.3
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4.2 Correlation Results

In this section, the focus is on determining whether independent variables can influence technology transfer among manufacturing employees in Malaysia. Pearson correlation test was used to set the association between the variables.

Table 5.2 The Mean distribution for independent variables

	Mean	Std. Deviation	N
Communication motivation	4.3903	.42388	117
Absorptive capacity	4.2752	.45161	117
Transfer capacity	3.7812	.48635	117
Learning Intent	3.7658	.66035	117

5.3 Correlation Results

		Absorptive	Communication	Transfer	Learning	Technology
Absorptive	Pearson Correlation	1	.731	.526	-.176	.512
	Sig. (2-tailed)		.000	.000	.057	.000
	N	117	117	117	117	117
Communication	Pearson Correlation	.731	1	.507	-.168	.343
	Sig. (2-tailed)	.000		.000	.071	.000
	N	117	117	117	117	117
Transfer	Pearson Correlation	.526	.507	1	-.044	.257
	Sig. (2-tailed)	.000	.000		.638	.005
	N	117	117	117	117	117
Learning Intent	Pearson Correlation	-.176	-.168	-.044	1	-.032
	Sig. (2-tailed)	.057	.071	.638		.735
	N	117	117	117	117	117
Technology	Pearson Correlation	.512	.343	.257	-.032	1
	Sig. (2-tailed)	.000	.000	.005	.735	
	N	117	117	117	117	117

*, Correlation is significant at the 0.01 level (2-tailed).

Table 5.3 shows learning intent is negatively related to technology transfer and was found not significant with correlation coefficient of $r = -0.032$. This significance value tells us that the probability of this correlation is very low. However, absorptive capacity, communication motivation, transfer capacity were found to be positive and significant. Absorptive capacity positively related to the technology transfer with a coefficient of $r = 0.512$. Meanwhile, communication motivation also positively related with technology transfer whereby the coefficient is $r = 0.343$. Similarly to transfer capacity also has significant relationship with technology transfer.

Overall, based on table 5.2, it shows that communication motivation has highest mean which is 4.39, followed by absorptive capacity with 4.27 and transfer capacity with 3.78. Whereas the lowest mean is learning intent with 3.76. As a conclusion, absorptive capacity, communication motivation and transfer capacity have a positive relationship with technology transfer. For this study, communication motivation is most significant driver that influences technology transfer in the organization. Therefore it is clear that proposition 1, 2 and 4 are supported. However, proposition 3 was not supported.

5.0 Discussion and Conclusion

The study focused on the local employees who are consisted of top management, middle management, first level supervisor and non managerial staffs. They were tested by using four variables which are absorptive capacity, transfer capacity, learning intent, and communication motivation. Initially, correlation test was used in order to identify relationship between absorptive capacity, transfer capacity, communication motivation, and learning intent with technology transfer. The result shows that the first variables were positively related with the technology transfer. Whereby, absorptive capacity shows $r = 0.512$. Meanwhile, communication motivation shows which is significant at the 0.01 level which is $r = 0.343$ and transfer capacity shows significant at 0.01 levels with value $r = 0.240$. However, in this study, learning intent shows no relationship with technology transfer. This shows that employees in the firm received sufficient knowledge for the job and it is remain same until it did not aroused learning intent among employees. It is believed that most of the tasks involved in the manufacturing are basically routines and clearly understand by the workers. Another reason could be due to their designation as supervisors which have limited roles in making decisions and empowerment in their work tasks.

Meanwhile, the descriptive statistics in correlation test, the highest mean shows for communication motivation, followed by absorptive capacity, transfer capacity and learning intent. This shows that whenever the employees communicate frequently each other and it allows them to gain more knowledge and indirectly ease the process of transfer knowledge from their superior unconditionally. Other than that, it shows that whenever the employees often communicate with their superiors and colleagues, it helps them to boost their knowledge and skills and implement it in their job tasks. In short, we can reiterate that technical attainments of manufacturing employees in the firm are triggered through frequent communication and mutual trust among themselves and superiors in the firm and constantly contribute to the technology transfer performance of the firm. In short, communication plays a vital role as a mechanism to transfer knowledge among manufacturing employees. Based on this, the firm able crafts new strategies as to be more competitively advantages than other manufacturing firms.

Firm should be more concerned on the needs of their employees as to improve their skills in absorbing knowledge capacity and transfer capacity from the superiors which is also help their employees to improvise their skills and contribute to technology transfer performance. In a nutshell, the research findings are able to assists our Malaysian manufacturing firms to understand better on various critical drivers so that action can be taken to overcome unwarranted gaps. Furthermore, this study may provide insights to manufacturing firms on how to properly frame their technology transfer activities in the right perspective. Thus, successful technology transfer will ensure the sustainability of the organization with proper strategies and approaches for more successes in the future.

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