

# FACTORS THAT INFLUENCE THE DISSEMINATING OF KNOWLEDGE IN TECHNOLOGY TRANSFER AMONG MALAYSIAN MANUFACTURING EMPLOYEES

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*The meaning of technology transfer is so wide but mostly involving some form of technology-related exchange. However, in this particular paper, technology transfer is considered as a concept to examine the process of disseminating knowledge and skills that a person owned to another person in order to generate higher productivity with new approach of producing a particular product or service. Although, many researchers have explored the evolution of technology transfer, nonetheless some drivers are yet to be explored in a Malaysian manufacturing industry. This study, therefore attempts to determine the relationship between absorptive capacity, transfer capacity, communication motivation and learning intent and technology transfer performance. A survey methodology was used in a Japanese multinational company based in Klang Valley, Malaysia. A total of 117 questionnaires were received. Results show that absorptive capacity is the most significant to influence technology transfer performance.*

**Abstract**



*Keywords: technology transfer, absorptive capacity*

Undoubtedly, 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). In addition, technology transfer is not a new phenomenon and some more it has been recognized as an interest research topic for many professional groups such as government, multinational corporations and also education institutions.

However, this study will identify factors that influence technology transfer process among employees in Malaysia firm. Manufacturing sectors in MNCs have been growing since yesteryears.

Theoretically, multinational corporations (MNCs) are recognized as a key catalyst in encouraging the growth and development of manufacturing industry of Malaysia. Contributions from MNCs are undeniable and vital for added value, employment and the total

exports of the manufacturing sector as well as to improve the development of economy of Malaysia (Lai & Narayanan, 1997); (Siti Aishah, Ahmad and Shariman, 2009). Based on statistics which was given by Department of Statistics of Malaysia for year 2012, manufacturing sectors were contributed 25% for gross domestic product of Malaysia and 60% for total of exports and these allow manufacturing sectors to be as a pivotal channel for Malaysia's economy by attracting foreign direct investment (FDI) such as multinational corporations from different countries. Nonetheless, MNCs also bring in sophisticated technologies and transfer technological skills for their employees through the technologies. Whenever, employees were introduced with new and sophisticated technologies from foreign countries, it will cause difficulties for employees as they need to learn and familiarize themselves with those technologies.

Thus, issues such as communication barriers between employees and superiors of the manufacturing firms; little commitment of managers in transfer process, level of learning intent among employees in order to acquire technology knowledge and technology absorption capacity among local employees in the firm where will be occurred and raised a question among management teams of the firm and government whether the manufacturing firms have been on right track in terms of their knowledge management to facilitate the technology transfer successfulness in their firm. Hence, investigation will be conducted on these issues by using four potential drivers and identify the driver which has the highest tendency towards assisting

technology transfer among manufacturing employees in the firm.

## 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.

However, now technology transfer is not a new phenomenon for the business field. Most of the literatures on management have shifted their focus to be allied among enterprises and how alliances are crucial for the development of technology transfer (Zhao and Reisman, 1992). On par with this, the definition of technology transfer was well explained by Dias and Vergueiro (1998) whereby technology transfer can be classified into 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). However, according to Bozeman (2000), the definitions on technology transfer depend on how the user defines technology in their own context. The successfulness of technology can be identified through few drivers such as tacit knowledge, explicit knowledge and environmental context. In this study, we will use four drivers; absorptive capacity, communication motivation, learning intent and transfer capacity as to examine

technology transfer processes among manufacturing employees in one of multinational corporations in Malaysia.

### **Absorptive Capacity**

In recent years, many scholars have used the concept of absorption at different levels and came out with different results. Technology transfer successfulness is affected primarily by the employees in firm who enable them to acquire knowledge and skills about the technologies and imply without any errors. Szulanski (1996) defined absorptive capacity as business unit organization which without an excellent absorption capacity among workers, it perhaps affects business and the company's performance. In addition, Sazali et al., (2009) reiterated the expanding knowledge of the absorption level of employees in the company will affect the firm's performance. According to this, as mentioned by Davenport and Prusak (2000), Roshartini, Roshana and Abdul Hadi (2011) explained that employees can fulfill business objectives of the company, when they have the capacity to absorb, work, learn, acquire and apply new knowledge and technologies with the product and maintain the high level of production. Therefore, we would hypothesize;

Hypothesis 1: There more the employees have absorptive capacity, the better the technology transferred in the firm.

### **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 acquired 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. Thus, we would like hypothesize;

Hypothesis 2: The greater the communication among employees, the better technology transferred in the firm.

### **Learning Intent**

Learning intent is a process to accumulate member's knowledge so that it 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. Moreover, from the study of Szulanski (1996), without learning intention from employees, it will lead to slowness in the firm, affect firm's performance and there will be hidden sabotages whereby the foreign allies could refuse to share knowledge with employees and .

Hypothesis 3: There greater learning intent among employees, the better technology transferred in the firm.

### **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).

Hypothesis 4: The greater transfer capacity for employees, the better technology transferred in the firm.

### **Research Framework**

In this study, we focused on the four drivers (absorptive capacity, communication motivation, learning intent and transfer capacity) which assisted technology transfer processes among manufacturing employees in Malaysia. By examining relationship between four drivers and technology transfer should make us more understandable about variables that assist technology transfer among manufacturing employees in Malaysia.

The relationship between drivers and technology transfer is illustrated in Figure 1. In this theoretical framework, (absorptive capacity, communication motivation, learning intent and transfer capacity) are independent variables and technology transfer is the dependent variable. Thus, the present study attempts to fill the gap by providing useful insights for top managements and governments about importance of these four drivers in assisting technology transfer among manufacturing employees.

### **METHODOLOGY**

In this section, we discuss about research sample and data collection procedures and measurement scales for each variable in this study.

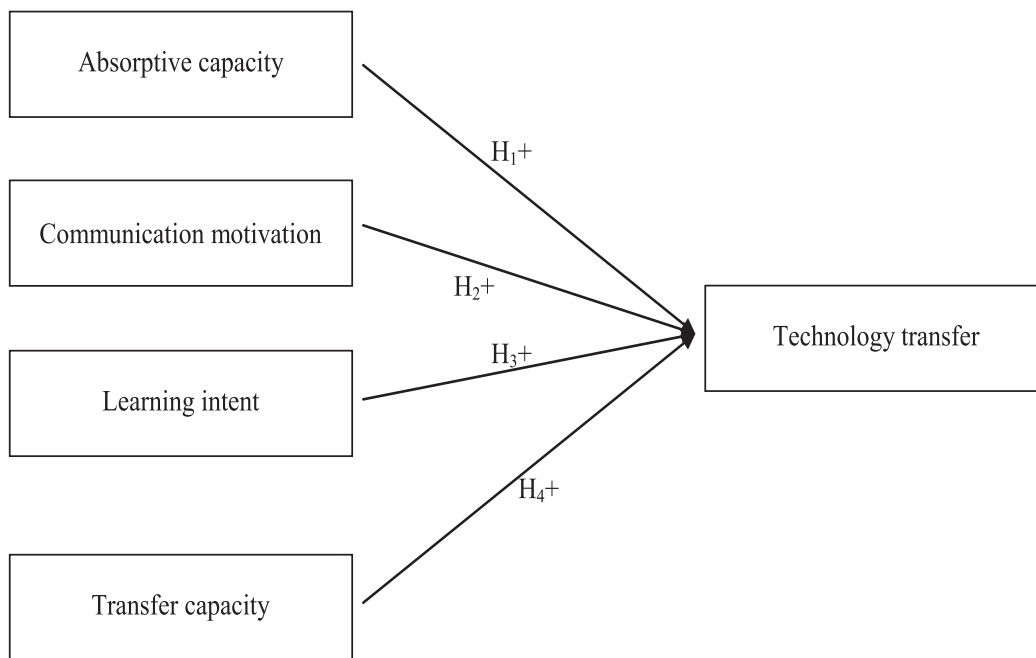


Figure 1. The Research Framework

### Sampling Procedure

We targeted local employees in the manufacturing firm as potential population for this study. The manufacturing firm is one of the well-established multinational corporations in Malaysia. The firm is well known for their expertise in assembling and exporting camera lens to worldwide. Drivers which were proposed in this study will be tested on local employees in the firm. We chose 80 local employees from manufacturing department and most of them are production workers and 40 local employees are from managerial group. Managerial group consists of middle and senior managers of the firm. We disseminate 80 sets of questionnaires to local employees and the rest 40 sets of questionnaires were distributed by Mr Nasim, senior manager of the firm as we are not allowed to enter the management area because of some restrictions set by headquarters of the firm. The questionnaire was administered while the staffs

are having lunch time in the manufacturing plant. All questions were asked using the five-point Likert scale from 1 strongly disagrees until 5 strongly disagree. We conducted face to face interview with employees in order to make employees more clear about the questions. Nevertheless, we are able to collect 80 sheets of questionnaires and after two weeks, Mr Nasim sent questionnaires to us through mail. At the end, out of 200 questionnaires distributed to local employees in the firm, 117 were usable, 3 of them were incomplete which represented a response rate of 58.5%. Based on Punch (2003) categorized response rate for the research as followed; 50% (adequate), 60% (good) and 70% (very good) and response rate for this study will be in adequate category.

### Measurement scales for each variable

All four variables items were adapted from different references. The mea-

Table 3.1. Measurement scales

Variable	Item	Sources
Absorptive capacity (AC)	5	Sazali et al., (2009); Pak and Park (2004); Lane et al.(2001)
Learning Intent(LET)	5	Yin and Bao (2006)
Communication Motivation (CM)	6	Fryhell et al.(2002); Chua (2002); Lin (2005)
Transfer Capacity (TC)	5	Hau and Evangelista (2007)
Technology transfer (TT)	4	Szulanski (1996)

Table 3.2. Reliability Analysis

Variables	Cronbach Alpha	Number of Items
Absorptive Capacity	0.882	5
Learning Intent	0.721	5
Transfer Capacity	0.829	5
Communication Motivation	0.867	6
Technology Transfer	0.811	4

surement scales for absorptive capacity were adapted from Sazali, Raduan, Jegak and Haslinda (2009), Pak and Park (2004), Lane et al. (2001). All five items that used by Sazali et al., (2009) were adapted and tested in this study. Meanwhile, learning intent scales used will be based on the 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.

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. 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. After that, 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.

Additionally, a reliability test was conducted resulting of all variables. 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 simplification of measurement scales are tabled at table 3.1 and table 3.2 shows reliability analysis of questionnaire.

### Correlation Analysis: Relationships between independent variables

The correlation matrix in Table 3.3 depicts coefficients between the four

Table 3.3. Means, Standard Deviations, Correlation Matrix for Independent Variables

	Mean	SD	1	2	3	4
Absorptive capacity	4.2752	.45161	1.000			
Communication motivation	4.4373	.41043	.731**	1.000		
Transfer capacity	3.8325	.48916	.526**	.507**	1.000	
Learning Intent	3.6462	.60934	-.176	-.168	-0.044	1.000

\*\*Correlation is significant at  $p < 0.01$  level (2-tailed)

variables in this study. The purpose of correlation coefficient measured is because to identify the strength between the variables and it will be considered as significant if the value is less than 0.05. Besides that, all correlation did not exceed 0.80 except learning intent (-0.176;-0.168;-0.044). This is because the Pearson's  $r$  between each independent variables should not exceed 0.80, if in case it exceeds, it demonstrate multicollinearity. However, in this research, the highest coefficient will be 0.731 which is below 0.80 and exhibit no collinearity problem (Bryman and Cramer, 1997, p257). Therefore, data problems in this research free from collinearity and multicollinerity (Gottschalk,1998).

## Findings

### 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 depicted at table 4.1.

### Regression Results

Regression is modeled to analyze the relationship between two variables by placing a linear equation in observed

data. A variable is considered to be an explanatory variable, and the other is considered to be a dependent variable. In this analysis, absorptive capacity, communication motivation, learning intent and transfer capacity were entered as independent variable meanwhile technology transfer was used as a dependent variable. The summary of regression analysis was depicted as in Table 4.2.

In Table 4.2, it can be remarked that out of four variables, absorptive capacity explicated 26.6% of the variation in technology transfer among manufacturing employees in Malaysia firm ( $F$  change =10.126,  $p < 0.01$ ), which was significant at 1% significance level (Sig . $F$  = 0.000), hence confirming the strength of the model. Meanwhile, the Durbin –Watson of 1.325 falls between the acceptable range ( $1.5 < D < 2.5$ ) which is identifying no autocorrelation problem in data which means error terms is independent. The results also demonstrated there is no multicollinearity problem or in the other word, show tolerance for absorptive capacity, communication motivation, transfer capacity and learning intent are all greater than 0.1, and Variation Inflation Factors (VIF) are lesser than 10. (Hair et.al., 1998). In a nutshell, the regression analyse indicates that four independent variables are statistically significant relationship with technology transfer.

Table 4.1. Proportion of frequency analysis

Demographic	Frequency	Percent (%)
<b>Age</b>		
-Under 20	3	2.5
-20-35	88	73.3
-36-50	23	19.2
-51-65	3	2.5
<b>Education level</b>		
-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
<b>Gender</b>		
-Male	44	36.7
-Female	73	60.8
<b>Marital Status</b>		
-Married	46	38.3
-Single	60	50.0
-Widowed	11	9.2
<b>Years worked at organization</b>		
-less than 1	26	21.7
-1-2	30	25.0
-3-5	49	40.8
-6-10	2	1.7
-over 10	10	8.3
<b>Working experiences</b>		
-none	55	45.8
-one	41	34.2
-two	16	13.3
-three	5	4.2
<b>Nationality</b>		
-Malaysian	80	66.7
-Non Malaysian	37	30.8
<b>Working Shift</b>		
-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
<b>Job Designation</b>		
-Top management	2	1.7
-Middle management	15	12.5
-First level Supervisor	30	25.0
-Non managerial	70	58.3

The results indicate that there is one driver; namely absorptive capacity (0.000) ( $p < 0.01$ ) is positively associated and directly assisting with technology transfer of manufacturing employees in the firm. Thus, hypothesis, H1 was supported. The three drivers namely transfer capacity; communication motivation and learning intent are not significantly associated with technology transfer in the firm. However, these variables have been beneficial as to develop technology transfer

processes in the firm but with indirect approaches. Thus hypotheses H2, H3, H4 were rejected at the significance level of  $> 0.01$ .

#### Future research and limitation

We realize that there are few limitations occurred in this research and have to be rectified in future investigation. The survey was done at only one multinational corporation. So, researchers in the future may conduct research on multinational corpora-



Table 4.2: Summary of Regression Analysis

Model	Standard Coefficients Beta	t	Sig	Collinearity Statistics	
				Tolerance	VIF
<b>Absorptive capacity</b>	<b>0.573</b>	<b>4.633</b>	<b>0.000**</b>	<b>0.429</b>	<b>2.333</b>
Transfer capacity	0.004	0.038	0.969	0.710	1.408
Communication motivation	0.087	-0.679	0.499	0.400	2.501
Learning intent	-0.011	-0.128	0.898	0.889	1.124
R squared	0.266				
Adjusted R <sup>2</sup>	0.239				
F change	10.126				
Durbin -Watson	1.325				

Note: Significant correlations = \*\*p<0.01 (2 –tailed)

tions with different sectors in order to have more comprehensible study about drivers that assisting technology transfer among local manufacturing employees. Besides that, data for this study were collected in a day and have a small sample size, in future research, we recommend increasing sample size and does longitudinal study on factors assist technology transfer. As aforementioned, future research should be carry on in other types of sectors such as construction, SMEs, and services sectors. By this, it will enrich study about technology transfer from various sectors of multinational corporations, firms and so on.

### 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 results depict that absorptive capacity as an influential driver to assist technology transfer among manufacturing

employees in the firm. There was a strong relationship between absorptive capacity and technology transfer and help the firm to improve performance and productivity.

Meanwhile, the findings also point that transfer capacity, communication motivation and learning intent were found no relationship between technology transfers in the firm. Therefore, the top management of the firm should be more attentive about their employee's absorptive capacity aspects such as provide their employees more training, informal meetings with their superiors either from local or foreign, so that they can have a space to exchange much information regarding latest updates of technologies as well as relevant information related for manufacturing employees and try to imply it on their job tasks. Having a good absorptive capacity will be a plus point for the firm because their employees can easily understand about their tasks and assimilate it without any assistance. Thus, the firm not needs to spend a fortune on improving their employee's job skills.

In short, the firm just need provide trainings as to improve the employee's performance as well as develop existing job skills. In addition, this study

has provided insights of drivers that assist technology transfer among local employees and dictate comprehensible guidelines for human resources department to structure potential programmes for local employees in order to develop their absorptive capacity skills. Besides that, whenever employees are trained to be well skilled, they

will feel more commitment towards their organization and strive to be more productive. By doing so, it will help the firm to impede success on technology transfer process and being competitively advantage compared to other multinational corporations in Malaysia.

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