Level of Technological Knowledge Management Adoption And Its Relation to Firm's Innovativeness

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Abstract

In era of the Internet age, firm's economic strength has shifted towards knowledge-based activity. This is reflected through the organizational capability in translating its knowledge resources into innovative products, processes and service. This capability is widely acknowledged to be one of firm's major competitive advantage. Realizing the importance of knowledge resources, knowledge management (KM) and firm's innovativeness, this study is undertaken to identify the extent of technological knowledge management adoption and its relation to firm's innovativeness. There is extensive research literature describing how large companies are successfully practicing KM. However, there are limited reports on the critical success factors for KM adoption and its impact on innovativeness in organizations. Further to his, the study explores the influential linkages between knowledge management adoption and innovativeness. It is empirically important for firms to recognize and learn the fact that technological KM adoption has significant relationship with being innovative. Therefore, 90 questionnaires have been administered and distributed to three manufacturing companies (Fujitsu Component Malaysia, Sharp Corp. (M) and Itami Plastic Corp. (M)) which engage in overseas technology transfer in the area of Batu Pahat, state of Johore. The finding suggests that the level of technological knowledge management adoption in these manufacturing firms to be moderate and there is significant relationship between the level of technological knowledge management and firm's innovativeness. It can be concluded that even with moderate level of technological KM adoption, there is influential impact of KM towards firms' innovativeness.

Keywords: Knowledge base, knowledge innovative, competitive advantage, knowledge management, technology transfer.

1. INTRODUCTION

Nowadays, the value of knowledge even surpasses the tangible material capital and the intangible resources which compose main parts of a corporation. Thus, the capability to share and transfer knowledge within a firm more speedily than one's competitors is widely believed to be a major source of competitive advantage. The increased focus on KM leads organizations to introduce new roles and implement various KM technologies [1]. New roles and positions start to emerge like chief knowledge officer, knowledge management officer and knowledge workers [2]. The number of organizations realizing the importance of KM increases in today's global driven business environment. This is driven by fear of negative effect they may face if they neglect KM practices. Some of these organizations adopt KM approaches just because most big firms are getting immersed in this activity and they do not wish to be left behind. As a consequence, some of the KM implementation just lay in the surface without even proper understanding of the concept, prior effective implementation.

2. BACKGROUND OF THE STUDY

This research is executed in three manufacturing companies; Fujitsu Component Malaysia Sdn. Bhd., Sharp Manufacturing Corporation (M) Sdn. Bhd. and Itami Plastic Corporation (M) Sdn. Bhd. Fujitsu Component Malaysia (FCM) Sdn. Bhd. is a Malaysian based subsidiary of Fujitsu Component Limited, Japan. Established in October 1980, FCM began commercial production of electromagnetic relay coils thereafter assembled by Fujitsu (Singapore) Pte. Ltd. Today, FCM's product focuses on two key areas of electromechanical components such as Relays, Keyboards/Mouse/Pointing Devices, and their parts. Sharp Manufacturing Corporation (SMM) Sdn. Bhd. is based in Batu Pahat, Johor. SMM was established in 1989 and engages in state-of-the-art manufacturing technology. This Japanese company manufactured VTR, VCD and DVD players. Today, SMM assembles LCD TV for both the domestic and international markets. Itami Plastic Corporation (M) Sdn. Bhd. is a vendor to SMM Sdn. Bhd. supplying precision plastic products for final product assembly. It is a subsidiary of Itami Denki Kogyo Co. Ltd. Japan.

These foreign companies are regarded as having been transferring most of their manufacturing technologies from Japan to Malaysia. Due to the awareness of the importance of knowledge transfer during technology transfer process, there has been growing realization that successful technology flows in relation to supporting technology transfer and sustaining a firm's competitive advantage depends on the way in which knowledge is generated, articulated and shared within the organization [3]. Moreover, a study on International Joint Ventures Projects in China reports that without knowledge transfer, technology transfer does not take place, as knowledge is the key to control technology as a whole. It must be highlighted here that knowledge transfer is one of the main themes of knowledge management which involves the use and creation of value from organizational knowledge [4]. Overall, it can be deduced that adoption of technological knowledge management is crucial in the process of technology transfer and these act as the impetus for this study as this study is undertaken in manufacturing firms which employ technology transfer in its operation. Thus, this study is undertaken to identify the level of technological knowledge management adoption in firms that engage in technology transfer.

Most studies on technology transfer show that firms are more focused on 'hard' forms of technology associated with artifacts. Thus, 'softer' technologies and more tacit forms of knowledge activities associated with technology transfer have remained neglected despite their importance [5]. A study by the National Agriculture Research Organization in 1998 and two studies conducted by Uganda National Council of Science and Technology in 2000 and 2001 which assessed the impact of foreign direct investment on technology transfer revealed that the soft side of technology transfer, absorption of organization and management practices as well as tacit knowledge that refer to the kind of instinct values, personal beliefs, individual actions and experience that resides in people's minds was neglected [6].

This suggests that firms employing technology transfer neglects the importance of knowledge management implementation. What most organizations fail to realize is that 'wealth will be centralizing to the corporate which can participate positively and be good at using knowledge' [7]. Hence, knowledge elements have to be identified at the outset of a knowledge management implementation [8] and organizations must also be able to identify the gaps between what they have and what they need [9]. In order to identify these gaps, they need to measure the current level of knowledge management adoption in their organization. Measures should be set up to identify what is deemed as valuable knowledge that merits knowledge sharing and what is not valuable knowledge [10]. The focus should be on knowledge that is critical to the business [11]. However, most companies do not investigate the implementation of knowledge management [12].

Hence, this study is undertaken to fill this gap by identifying the level of technological knowledge management practices adoption in manufacturing firms that engage in technology transfer. Moreover, this study approach is more essential rather than the need for knowledge held in many companies to be regularly updated and renewed. Keeping up with competition and achieving competitive advantage require constant

alertness to new external developments, employees sharing experiences with problem solving and systematic innovation processes. These expectation and requirement apply particularly to technology oriented companies [13]. However, in spite of the importance of innovation towards organizations, empirical research on this area seems not only limited but also neglected in Malaysian context. There is lack of information concerning innovation and innovative companies in Malaysia [14]. Thus, this study is conducted to help filling this gap by determining the innovativeness of manufacturing firms that employ technology transfer.

3. RESEARCH QUESTIONS

This research is conducted in order to answer the following questions based on the study background:

3.1 What is the level of technological knowledge management adoption in firms employing technology transfer?

3.2 What is the extent of innovativeness in firms employing technology transfer?

3.3 What is the relationship between the level of technological knowledge management adoption and firm's innovativeness in organization employing technology transfer?

4. OBJECTIVES

In line with the research questions, the objectives of this study are:

4.1 To determine the level of technological knowledge management adoption in firms employing technology transfer.

4.2 To determine the extent of innovativeness in firms employing technology transfer.

4.3 To determine the relationship between the level of technological knowledge management adoption and firm's innovativeness in organization employing technology transfer.

5. RESEARCH FINDINGS

5.1 RESPONSE RATE

This research involved 2 groups of employees who are deemed as adopters of knowledge transfer, namely engineers and technicians. As many as 30 sets of questionnaires are being distributed to each of these companies. Thus, the total number of distributed questionnaire sets is 90. The response rate for the questionnaire is high as all the distributed questionnaires were returned and can be used for the study. Thus the overall response rate is 100 percent.

Table 5.1: Questionnaire response rate

Questionnaires	Total
Number of distributed sets	90
Number of returned sets	90
Percent of return (%)	100

5.2 RELIABILITY TEST

Reliability of a measure that indicates the stability and consistency with which the instrument is measuring the concept and helps assesses the 'goodness' of a measure. Stability of measures refers to the ability of a measure to maintain stability over time, despite uncontrollable testing conditions and the state of the respondents themselves. Meanwhile, consistency indicates how the items measuring a concept hang well together as a set [15]. Cronbach's alpha is a reliability coefficient that reflects how well the items in a set are positively correlated to one another. It is computed in terms of the average inter-correlations among the items measuring concept. The closer the value of Cronbach's alpha to 1, the higher the internal consistency reliability. It was used as it was a good indicator of inter item reliability of both dependent and the independent variables. As for this research, reliability test is performed twice; first, for the pilot test and the second for the real study. The Cronbach's alpha value for the pilot test is 0.835. This value is closer to one, this shows that questionnaire is reliable and thus, can be used for the real study. Meanwhile, for the real study, the Cronbach's alpha value is 0.802. This shows that the questionnaire used is consistent and possess the capability to maintain stability over time which is obtained via Statistical Package for Social Science (SPSS).

5.3 DEMOGRAPHIC ANALYSIS

The subsequent section reports the basic findings of the research in terms of demographics of the respondents. It consists of respondent's gender, age, years in the organization and level of education. These demographic parameters are considered as independent variables in the study.

5.3.1 GENDER

In terms of gender, table 5.3.1 indicates that in the surveyed companies where this research takes place, female outnumbered male counterpart. There are 51 female employee respondents compared to 39 male employee respondents. Converted into percentage, the percent of female respondents is 56.7 percent while respectively for male is 43.3 percent.

Table 5.3.1: Respondent's gender distribution

Gender	Frequency	Percent
Male	39	43.3
Female	51	56.7
Total	90	100.0

5.3.2 AGE

In terms of age, most respondents are having age between 31 to 40 years, as shown in Table 5.3.2. They account for 60 percent from the whole sample. Followed by people aging between 21 to 30 account for 23.3 percent. While the least is people aging between 41 to 50 who account for 16.7 percent. The company might prefer people aged between 31 to 40 because by this age people are usually more matured, possess the ability to make better decisions due to their wide range of experience.

Table 5.3.2: Respondent's age distribution

Age ranges	Frequency	Percent
21-30	21	23.3
31-40	54	60.0
41-50	15	16.7
Total	90	100.0

5.3.3 YEARS IN THE ORGANIZATION

Table 5.3.3 indicates that most respondents in the organization have been working for 6 to 15 years. As many as 35.6 percent of employees have been working from 6 to 10 years while 34.4 percent have been working from 11 to 15 years. Further, 16.7 percent of employees have worked for less than five years while the rest 13.3 percent employees have been with the organization for more than 16 years. This suggests the turnover rate for the organization to be low.

Table 5.3.3: Respondent's year in the organization distribution

Working years	Frequency	Percent
Less than 5 years	15	16.7
6 – 10 years	32	35.6
11 – 15 years	31	34.4
16 years and above	12	13.3
Total	90	100.0

5.3.4 LEVEL OF EDUCATION

In terms of education level, based on table 5.3.4 indicates that, 53.3 percent of employees are certificate holder. This means half of the workforce who works as the engineers and the technician are certificate holder. Further, the next 28.9 percent of employees are diploma holder, 10 % are bachelor's degree holder while others are 7.8 percent.

Table 5.3.4: Respondent's level of education distribution

Education level	Frequency	Percent
Certificate	48	53.3
Diploma	26	28.9
Bachelor's Degree	9	10.0
Others	7	7.8
Total	90	100.0

5.4 DESCRIPTIVE ANALYSIS

Descriptive statistics refers to statistics that describe the phenomena of interest. These include frequency of certain event occurring, the average score when a set of figures is involved, as well as the extent variability in the set (the central tendencies and dispersions of the independent and dependent variables). There are three measures of central tendency, the mean, median and mode. Meanwhile, measure of dispersion includes the range, standard deviation and the variance. As for this research, the phenomena of interest are both mean and standard deviation and thus these two will be elaborated further in the next section.

5.4.1 MEAN SCORE DISTRIBUTION AND STANDARD DEVIATION

The mean or the average is a measure of central tendency that offers a general picture of the data without unnecessarily inundating one with each of the observation in a dataset. Mean analysis is widely acceptable method for analyzing dataset convergence. As for this research, based on the mean obtained from the questionnaires answered, the level of technological knowledge management adoption is then classified into low, medium and high range based on the extent level of mean developed by as shown in table 5.4.1 [16]. Meanwhile, standard deviation is a widely used measure to determine the variability or dispersion. It shows how much variation there is from the average (mean). A small standard deviation indicates that the data points tend to be very close to the mean, whereas high standard deviation indicates that the data is spread out over a large range of values.

Table 5.4.1: Extent level of mean (Tasmin & Wood, 2008)

Extent	Range
Low	1.0 – 2.3
Medium	2.4 – 3.7
High	3.8 – 5.0

5.4.2 Mean score distribution and standard deviation for the level of technological KM adoption

Figure 1 shows that the level of technological KM adoption in terms of knowledge acquisition to be moderate. The item which scores highest mean is having regular meetings with the management team and encouraged to attend training, seminars and conferences with the value of 3.19. Meanwhile, the item which scores lowest mean is direct interaction with the customers with mean value of 2.83. This result shows that employees gain knowledge mainly from the management during meetings and also from the training, seminars and conferences that they attend. However, there is lack of interaction between employees and the customers. This may be due to the common idea of having only people in the marketing department to be involved with the customers in order to gain knowledge on what customer wants and needs. The overall mean is 3.02 which categorizes under the medium category, while the overall standard deviation is 0.751 which is low. This indicates that the data points tend to be very close to the mean.

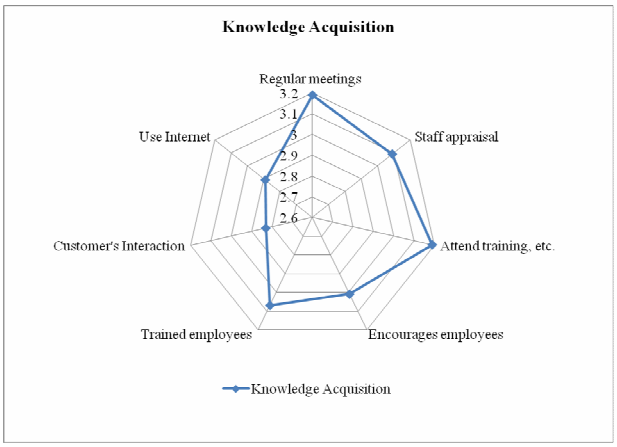

Figure 1. Level of technological KM adoption (knowledge acquisition)

Figure 2 shows that the level of technological KM adoption in terms of knowledge dissemination to be moderate. The item which scores highest mean is that the organization frequently updates policy and procedure manuals with the value of 3.64. Meanwhile, the item which scores lowest mean is marketing people in our organization frequently spend time discussing customer's future needs with people in technical departments with mean value of 2.86. This result shows that all involved organizations in this study are active in updating the policy and procedure manual, also imply dissemination to the whole organization. However, the organization does not encourage marketing people to spend time with the people in technical departments. Thus, knowledge on customer's need could not be disseminated to the people in technical department. This knowledge might have affected the end product which might satisfy customers' need better. The overall mean is 3.22 which categorizes under the medium category, while the overall standard deviation is 3.731 which is considerably high. This indicates that the data is spread out over a large range of values.

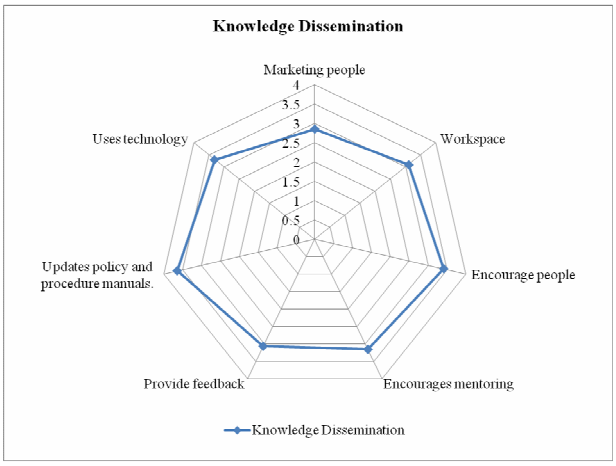

Figure 2. Level of technological KM adoption (knowledge dissemination)

Figure 3 shows that the level of technological KM adoption in terms of knowledge utilization to be moderate. The item which scores highest mean is regarding organization's quick respond to the customer complaints with the value of 3.59. Meanwhile, the item which scores lowest mean is when something important happens to a competitor then the whole organization knows about it quickly with mean value of 2.77. This means that all studied organizations give importance to their customer's complaints. Meanwhile, low mean on knowledge regarding competitors shows that organization does not spread the knowledge regarding their competitors to the whole organization. This means knowledge regarding competitors is not utilized by the organization to its full extent. The overall mean is 3.18 which categorizes under the medium category, while the overall standard deviation is 0.663. This value is considered low and indicating that the data points tend to be very close to the mean.

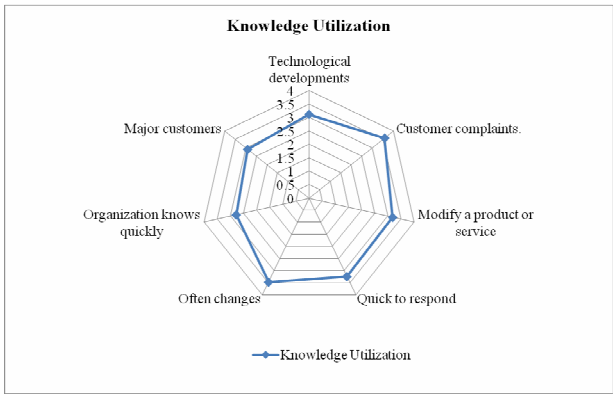

Figure 3. Level of technological KM adoption (knowledge utilization)

Hence, the overall level of technological KM adoption is medium in the organizations being studied with mean value of 3.15 and standard deviation 0.745. The knowledge process which obtains highest mean is knowledge dissemination. This means the organizations are good at disseminating information compared to acquiring and utilizing it. As the companies are subsidiaries and the parent companies are located outside Malaysia, the focus of the companies is mainly on dissemination of knowledge to ensure organization can meet the demand on their products.

Table 5.4.3: Level of technological KM adoption

KM Process	Mean	S/D	Extent
Knowledge Acquisition	3.04	0.751	Medium
Knowledge Dissemination	3.22	3.731	Medium
Knowledge Utilization	3.18	0.663	Medium
Overall	3.15	0.745	Medium

5.4.4 Mean score distribution and standard deviation for the extent of firm's innovativeness

Table 5.4.4 indicates that the mean for both the item in terms of innovators to be quite close with only small deviation between both. As for the item, I am venturesome and eager to be the first to try new products in the market, the mean value is 3.56 while for the item I am always looking for new products, the mean value is 3.58. The overall mean for innovators are 3.57 which falls in medium range while the standard deviation is 0.758 showing that the items are very close to the mean.

Table 5.4.4: Firm's innovativeness (innovators)

Q.	Innovators	Mean	S/D
26	I am venturesome and eager to be the first to try new products in the market.	3.56	0.767
27	I am always looking for new products.	3.58	0.874
	Overall	3.57	0.758

As for the firm's innovativeness in terms of early adopter, the item says that my opinion about innovations is respected by peers' scores highest mean with value of 3.86. Further, the item which states that I buy newly launched product in the market and influence others to do so scores 3.38. Thus, the overall mean score is 3.62 which categorizes under medium range. Meanwhile, the overall standard deviation is 0.679 which is small and shows that the items are very close to the mean.

Table 5.4.5: Firm's innovativeness (early adopter)

Q.	Early Adopter	Mean	S/D
28	I buy newly launched product in the market and influence others to do so.	3.38	0.869
29	My opinion about innovations is respected by peers.	3.86	0.743
	Overall	3.62	0.679

Moreover, as for the firm's innovativeness in terms of early majority, the item which says that I will buy new product but do not attempt to influence others to do so scores highest mean between the two items with mean value of 3.76. This shows that most of the members in the organization tend to buy new product only for themselves without it having any impact to others. Further, the item I am willing to follow the lead of others in buying new products scores mean value of 3.43. The overall mean is 3.59 which categorizes in medium range with a standard deviation of 0.550, showing that the items are very close to the mean.

Table 5.4.6: Firm's innovativeness (early majority)

Q.	Early Majority	Mean	S/D
30	I am willing to follow the lead of others in buying new products.	3.43	0.925
31	I will buy new product but do not attempt to influence others to do so.	3.76	0.739
	Overall	3.59	0.550

Further, table 5.4.6 indicates that firm's innovativeness in terms of late majority to have an overall mean value of 3.76 and standard deviation of 0.550. Hence, the mean falls in medium range and the standard deviation is small showing items are very close to the mean. Between the two items, the item I go along with innovations out of necessity scores higher mean with value of 3.72. The other item I need to be convinced of the advantage of new products by peers scores 3.68. Overall, it can be deduced that most employees in these organization, adopt an innovation due to the necessity of having them rather than being influenced by peers.

Table 5.4.7: Firm's innovativeness (late majority)

Q.	Late Majority	Mean	S/D
32	I need to be convinced of the advantage of new products by peers.	3.68	0.777
33	I go along with innovations out of necessity.	3.72	0.688
	Overall	3.70	0.550

Finally, table 5.4.8 indicates that firm's innovativeness in terms of laggards. Based on the table, there is huge difference between the two items. The item, I am suspicious of newly launched products scores higher mean with value of 3.44 while the item I am resistant to change scores 2.22. This means that most of the respondents are not resistant to change; they are able to accept the change. However, they are suspicious of the newly launched products. The overall mean is 2.83 which categorizes in medium range with standard deviation of 0.650 showing items are very close to the mean.

Table 5.4.8: Firm's innovativeness (laggards)

Q.	Laggards	Mean	S/D
34	I am suspicious of newly launched products.	3.44	0.809
35	I am resistant to change.	2.22	1.120
	Overall	2.83	0.650

The adopter category in table 5.4.9 indicates that it possesses highest mean is late majority with the value of 3.70 and standard deviation of 0.550. Thus, it can be deduced that most of the employees in the company that we investigate are late majority. It means, these individuals approach an innovation with a high degree of skepticism and after the majority of society has adopted the innovation. Further, they approach an innovation out of necessity. Overall, the extent of firm's innovativeness falls in medium range (3.46) with a very small standard deviation (0.360).

Table 5.4.9: Firm's innovativeness

Adopter Categories	Mean	Standard deviation
Innovators	3.57	0.758
Early adopter	3.62	0.679
Early majority	3.60	0.550
Late majority	3.70	0.550
Laggards	2.83	0.650
Overall	3.46	0.360

6. INFERENTIAL ANALYSIS

Inferential statistic is a statistical method which is used to describe the relationship between two variables, differences in a variable among different subgroups, how several independent variables might explain the dependent variable and so on. As for the context of this research, inferential statistic in the form of correlation is used to determine the relationship that exists between the level of technological KM adoption and firm's innovativeness [17].

6.1 BIVARIATE CORRELATION TEST

Bivariate correlation is a method used to describe the nature, direction and significance of the bivariate relationship; relationship between two variables which as for this study, the relationship between the level of technological KM adoption and firm's innovativeness [18]. Correlation entails the provision of a yardstick whereby the intensity or strength of a relationship can be gauged. In providing such estimates, correlation coefficients are calculated. These provide succinct assessments of the closeness of a relationship among pairs of variables. There are two prominent methods for examining relationship between pairs of ordinal variables; Spearman's rho (ρ) and Kendall's tau (τ) [19]. The most common is Spearman and thus will be used in this research. The results of the bivariate correlation obtained from the SPSS.

Table 6.1: Level of technological KM adoption and firm's innovativeness

			Knowledge Process	Innovativeness
Spearman's rho	Knowledge Process	Correlation	1.000	.297**
		Sig. (2-tailed)	.	.005
		N	90	90
	Innovativeness	Correlation	.297**	1.000
		Sig. (2-tailed)	.005	.
		N	90	90

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

Based on table 6.1, the correlation between the level of technological KM adoption and firm's innovativeness is 0.297. Further, based on table 6.2, the strength of the relationship is low. In facilitating the interpretation, the coefficient of determination is found. This is simply the square of correlation coefficient multiplied by 100. First, rounding 0.297 gives the value of 0.3 which when squared gives a value of 0.09. Thus, when multiplied with 100, the value becomes 9%. Hence, level of technological KM adoption shares about 9% of its variability with firm's innovativeness. This shows that there is relationship between the level of technological KM adoption and

firm's innovativeness. This is because 9% of the variation in the level of technological KM adoption can be explained by firm's innovativeness. Meanwhile the significance level is 0.005 which is lower than the stated significant level, 0.01. This suggests that the relationship is statistically significant.

Table 6.2: Extent level of correlation (Cohen & Holiday, 1982)

Extent	Range
Very low	0.19 and below
Low	0.20 – 0.39
Modest	0.40 – 0.69
High	0.70 – 0.89
Very high	0.90 - 1

7. DISCUSSION, SUGGESTION AND CONCLUSION

This paper attempts to explore and expose KM practices in manufacturing firms in Malaysia especially in Batu Pahat. This study found that KM practices in manufacturing firms in Malaysia are still limited. In fact, there is a general consensus in KM practices and academia on the fact that manufacturing firms in Malaysia are falling behind large established companies in developing KM practices and benefits of KM has not fully exploited by these firms. This is reflected in a literature gap where little research efforts have been carried out on this topic. The level of technological KM adoption were of medium range in the three organizations employing technology transfer in Batu Pahat namely Fujitsu Component Malaysia Sdn. Bhd., Sharp Manufacturing Corporation (M) Sdn. Bhd. and Itami Plastic Corporation (M) Sdn. Bhd with the mean score of 3.146 (Table 5.4.1). This finding is consistent with the previous research performed by [20] among Malaysian large manufacturing firms. Further, this finding conforms to other research reports that claimed KM is widely practiced among large corporations [21]. As for the reasons on why the level of technological knowledge management is at moderate level; first, many organizations have just started to implement KM, they are not aware of the whole spectrum of KM implementation [22]. KM approach among electrical and electronic firms in Malaysia reveals that most organizations are lacking of clear KM strategy [23]. Second, it may be due to human perception of knowledge being a source of power. Malaysian do not seem to practice sharing of knowledge in their environment, they tend to keep their knowledge to themselves rather than sharing it with others. They are self centered or indulged in Chinese-man culture. Most of the people do not teach their skills to others as they are scared on losing their specialty [24]. Further, technological KM adoption is at moderate level may be due to inferiority complex. Most Malaysians are rather reserved, less proactive and they commonly feel inferior to those from advanced nations. They are afraid of their knowledge is not accurate enough to share and they are scared that once they share their knowledge, others may find fault in it and label him or her as wrong. This is totally in contrast to their western counterpart [25]. Moreover, communication can also be the factor that influences knowledge sharing in Malaysia as language is one of the tools for communication. The usage of different languages when communicating with others may cause problems in the process of sharing knowledge. Thus, some people may not share their knowledge in order to avoid from being asked by people as they are unable or not confident enough to explain. Rather than that, other barrier that may have caused the level of KM to be medium is knowledge on information technology (IT). Nowadays, the most important tool for KM is information technology. If a person is not computer savvy, it is hard for the person to share his or her knowledge by using computers and other tools which uses computer medium like the internet.

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