

## Modeling Technology Transfer from University to SME

Siti Norbaya Yahaya([sitinorbaya@utem.edu.my](mailto:sitinorbaya@utem.edu.my))

Nusaibah Mansor

Nurul Zarirah Nizam

Dr Md Nor Hayati

Faculty of Technology Management and Technopreneurship  
University Technical Malaysia Melaka

### ABSTRACT

*The existence of applied technology as one of the tools in advancing SME to be more productive and efficient has been discussed widely. However, there have been significant differences between SMEs that have been successful to adopt certain type of technology. Drawing on the concept of technology transfer from university as an institutional agency, this paper is attempting to identify the best model of technology transfer to SME. Though the role of university and research institution as technology providers are frequently demanded to meet the technological challenge and market demand, this study argues that technology transfer is proposed as a readiness-dependent-strategy. The successful implementation of technology transfer requires the readiness of SME in terms of expertise and financial condition. Incompliance to these will make SME hesitant to adopt the technology.*

*Keywords: SME, technology transfer, university, finance, expertise*

### INTRODUCTION

Increasing number of SME in developing countries has proven as a critical sector in enhancing economic growth and contributes to human development especially in eliminating poverty and boost up standard of living. SMEs must be enabled to focus on both incremental as well as radical innovations to remain competitive (Arun, 2003)

Technology cannot be denied as one of the importance tool in advancing SME to be more productive and cost efficiency. However there are few elements should be considered before deciding to adopt or apply technology in the business operation. Transferring technology is not too easy, a lot of challenges need to be faced by both parties before any TT happen. In addition, the challenge has open to wide opportunity for researcher to find the best level of technology to suite to SME (Mitchael, 2005). Most of the research done said that, transferring technology from research institutions to industry has always been a strategic issue (Hong Liu, 2000).

Technology transfer is said to be the best method in adopting technology among SME. Mechanism of technology transfer namely licensing, joint venture and patenting is the most model used by the industry or business in accepting technology from technology provider or research institution. Technology transfer is “any process by which basic understanding, information, and innovations move from a university, an institute, or a government laboratory to individuals or firms in the private and quasi-private sectors” (Parker and Zilberman, 1993). On the other hand agree that, Technology transfer provide knowledge and closing a gap between technology provider and technology acquirers (Arun 2003). This process will benefited both parties in term of business development (Moirra 2007). This process is very crucial as business always need to have high element of innovation which is always supported by a new technology as it is rapidly change. This movement of technology from one entity to another (Amanjeet et.all 2010) needs to be supported by the best model to ensure the successful the transfer. Escalating the value of technology transfer has intentional benefited both nations and companies (Hong Liu, 2000).

SMEs in Malaysia have focused on addressing limitation and enhancing their capabilities in area such as finance, expertise and intellectual property and technology. It is critically to bring a front role in industrial linkages between SME and large companies or any institution in transferring the technology in the interest of developing SMEs.

Universities have played an important role in helping SME to be more productive and innovative. However all the researches are not giving a massive impact to SME. The technology is unassissable to boost profit in SME. Many researches have been done mainly in identifying the barriers faced by SME in adopting technology into their business including:

- I. Lack of capital investment fund
- II. Lack of managerial skills
- III. Lack of skilled and talented workers, which affects the quality of production
- IV. Limited capacity for technology management
- V. Difficulties to consult industrial expert (M.A Burhanuddin, 2009)

In order to reduce the barriers, this study is to gather information in establishing model in transferring technology to SME and this will assist and benefited both parties: research institution (donor) and SME (recipient) (Samuel, 1970) to transfer their expertise.

This study is attempting to focus into two critical elements which critically high focus should be given in ensuring the successful of technology transfer among SMEs. Financial readiness and expertise are the main elements which this study will focus deeply into. Public university acted as technology provider to SME. The role play by university and research institution as technology provider is often demanding to meet the technological challenge and market demand.

### **SMALL AND MEDIUM ENTERPRISE**

Small and medium enterprise is likely to bring high income to country, based on the statistic percentage contribution of SMEs to GDP/total value added range from 50% in Korea, 55.3% in Japan, 57.0% in Germany, 60% in China compared to 47.3% attained by Malaysia (Normah, 2006). However in Malaysia even though is still low but government is developing a lot of facilities and opportunity to SME.

### **UNIVERSITY RESEARCH MANAGEMENT CENTRE IN MALAYSIA**

University acted as the technology provider to industry, by defining the problem faced by industry, university work to solve the problem. Many universities are in different way assist industry, for example, joint venture and collaboration (Lambert, 2003) with industry always look as the best way is defining, contributing and solving the difficulties faced by the industry.

From a different view universities provide knowledge and innovation (Timothy, 2007) to society by doing more study through research. As a technology provider, university is assisting industry by Commercialize some of their study such as through licensing which is becomes a prominent and very beneficial for all parties involved (Timothy, 2007). Besides considering the commercialization, university always concern on the impact of their research and how efficient the researcher (Feller et. al., 2002 and Cohen et. al., 2002).

Recently, Malaysia universities have developing a system, which link all the researches under one system. More knowledge and collaboration can be done by joining other under the different expertise to gain broad idea and perspective. The system called MYREN, this is the government funded program which aimed to assist research running data-intensive applications, share computing equipments and run advanced applications within Malaysia as well as overseas (Minister of Energy, Water & Communications, Minister of Science, Innovation & Technology and Deputy Minister of Higher Education on the 28th March 2005).

Research of public universities are funded by government . It is divided based on the category of the university. There are four types of universities classified namely, research university, focus university, and comprehensive university.

### **CONCEPTUAL FRAMEWORK**

This study aimed to study further these two elements which contribute the occurrence of technology transfer between two parties namely technology provider (University) and technology receiver (SME).

#### **Proposition I**

SME with high skill worker (expertise) is likely to accept technology to assist the company's operation High skill worker is someone who can perform a good job by using any method of operation. They must be well trained, highly motivated and contributed to the positive growth of the company. SME with no expertise to run the technology is likely to reject a new technology provide by technology

provider. Therefore in ensuring the occurrence of TT, university or technology creator needs to provide along the expertise which will assist and provide knowledge to the SME. This will help to reduce and solve some of the problems or difficulties faced by the party especially in maintaining and running the technology. This is critically due to lacking of the number of workers which directly contributed to increasing business skill and capabilities (Chapple et. al., 2005)

#### Proposition II

SME with good financial readiness is likely to accept technology from technology provider.

One of the critical problem faced by SME is financial readiness, this is due to shortage of money to spend and pay to technology provider. There are many ways can be created to solve the problem. However the SME or industry itself needs to understand and aware about the importance of the technology in assisting the operation and become more competitive in the business.

University research is largely funded by government, after the technology is ready to transfer to the industry, the best method to transfer need to be determined. This is to ensure both parties benefit from the transferring of the technology instead of losing here and there.

### METHODOLOGY

Primary data will be collected through two sets of different questionnaire, which will be addressed to the respondents. Since the study focus on transferring the technology from university, the set of questionnaires will be answered by public universities which actively involved in creating technology product to be adopted and transferred to the SME will be taken as a sample. Semi-structured interviews with several university technology transfer officers (Moira, 2007) and (Michael, 2005).

On the other hand stakeholder will answer the questionnaire on SME part. All in all two set of different questionnaires will be prepared as one of the method of gathering information to be analyzed in this study. The study will focus on the SMEs in Malaysia. Qualitative data will be gathered through interview and key respondent interview will be utilized for this study.

The questionnaires will trigger few parts which are critically analyzed in this study. There are financial readiness and availability of expertise.

Secondary data will be obtained from journal articles and books to provide a firm foundation in structuring the underlying theory for the study. A population frame from SME will be gathered from SME Corp. Costing will be measure by gather data from the enterprise in term of annual sales turnover. While in view of expertise, the study will review in term of number high skill worker and number of training given to the employee.

### PROPOSED MODEL

This model is developed by Hugo Amezcua et. al., it is applied for most Mexican companies. This help in assisting company to develop high quality product with minimum power used. Using this model a wide opportunity and more innovative centre and industries can be created.

Study will use this model to test on SME in Malaysia since this model is mainly practice on SME in Maxico and many Latin American countries. The best part is, it is considering the market as a whole, start from the defining problem, designing technology, promote commercialization, policy involve and technology improvement.

### CONCLUSION

Technology is powerful tool in contributing to the company's profit, using the correct and best model of technology transfer will efficiently assist and improve company's operation. Even though few study concluded that technology transfer is a high risk since there is no guarantee that the development of the project leads to successful investment (Dorf and Worthington, 1990; Eldred and McGrath, 1997). Collaboration with university (technology provider) and industry (technology receiver), by defining problem and creating model purposely to solve the problem is the best model of transferring technology.

## REFERENCES

- Millman, A. F. (2001). Technology Transfer in the International Market. *European Journal of Marketing*, 17 (1), p. 26-47.
- Amanjeet Singh, Geeta Aggarwal. (2010). *Technology Transfer Introduction, Facts and Models*, Rayat Institute of Pharmacy, Railmajra, S.B.S. Nagar, Punjab International Journal Of Pharma World Research ISSN 0976-111X.
- M.A Burhanuddin, Fahmi Arif, V Azizah, Anton Satria Prabuwon. (2009). *Barriers and Challenges for Technology Transfer in Malaysia Small and Medium Industries*, International Conference on Information Management and engineering.
- Samuel N. Bar-Zakay. (1970). *Technology Transfer Model*.
- Ramayah Thurasamy, Osman Mohamad and Malliga Marimuthu. (2009). *Technology Adoption among Small and Medium Enterprises (SME's)*, A research Agenda, World Academy of Science, Engineering and Technology 53, 2009.
- National SME Development Council, Definitions for Small and Medium Enterprises in Malaysia. Ministry Of High Education, High Education Department, Malaysia.
- Hong Liu, Yunzhong Jiang. (2000). *Technology Transfer From Higher Education Institutions To Industry In China: Nature And Implications* China Business Centre, Manchester Business School, Booth Street West, Manchester M15 6PB, UK Office of International Co-operation and Exchange, Tsinghua University, Beijing, People's Republic of China.
- Timothy R. Anderson, Tugrul U. Daim, Francois F. Lavoie. (2007). *Measuring The Efficiency Of University Technology Transfer* Portland State University, Portland, OR, USA.
- Maira Decter, David Bennett, Michel Leseure. (2007). *University to business technology transfer—UK and USA comparisons* Enterprise and Business Partnerships, LEC, Lancaster University, UK Aston Business School, Aston University, UK School of Business Administration, Al Akhawayn University, Morocco.
- Spyros Arvanitis, Ursula Kubli, Martin Woerter. (2008). *University-industry knowledge and technology transfer in Switzerland: What university scientists think about co-operation with private enterprises*, KOF Institute for Business Cycle Research, ETH Zurich, 8092 Zurich, Switzerland.
- Michael T. Morrissey, Sergio Almonacid. (2003). *Rethinking Technology Transfer* Oregon State University Seafood Laboratory, 2001 Marine Drive, Rm. 253, Astoria, OR 97103, USA, Depto. de Procesos Químicos, Universidad Técnica Federico Santa María, Biotecnológicos Ambientales, Ave. España P.O. Box 110-V Valparaíso, Chile.
- J. Lee, H.N. Win. (2004). *Technology transfer between university research centers and industry in Singapore*, Science and Technology Policy Institute, Specialty Construction Center Building, 395-70, Shindaebang-Dong, Tongjak-Ku, Seoul 156-714, South Korea, Asian Disaster Preparedness Center, Klong Luang, Pathumthani 12120, Thailand.
- Inés Macho-Stadler, David Pérez-Castrillo, Reinhilde Veugelers. (2007). *Licensing of University Inventions: The Role of A Technology Transfer Office*, Universitat Autònoma de Barcelona, Department of Economics and CODE, 08193 Bellaterra, Spain, Katholieke Universiteit Leuven, Department of Applied Economics, Naamsestraat 69, 3000 Leuven, Belgium, EC (BEPA), Brussels, Belgium and CEPR, London, UK.
- Gideon D. Markman, Phillip H. Phan, David B. Balkin, Peter T. Gianiodis. (2005). *Entrepreneurship And University-Based Technology Transfer*, Terry College of Business, University of Georgia, Athens, GA, USA, Lally School of Management and Technology, Rensselaer Polytechnic Institute, 110 8th Street, Leads School of Business, University of Colorado at Boulder, Boulder USA.
- Normah Mohd. Aris, Chief Statistician, Department of Statistics, Malaysia. (2006). *Smes: Building Blocks For Economic Growth*.
- Paul Trott. (2008). *Innovation Management and new Product development*.
- Neil Sullivan. *Technology Transfer: Making the Most of Your Intellectual Property*, (1995)
- Parker, D.D., Zilberman, D. (1993). *University Technology Transfers: Impacts On Local And Us Economies*. Contemporary Policy Issues 11 (2), 87-96.
- Feller, I., Ailes, C.P., Roessner, J.D. (2002). *Impacts of research universities on technological innovation in industry: evidence from engineering research centers*. Research Policy 31 (3), 457-474.
- Cohen, W.M., Nelson, R.R., Walsh, J.P. (2002). *Links and impacts: the influence of public research on industrial R&D*. Management Science 48 (1), 1-23.

Lambert, R. (2003). *Lambert review of business–industry collaboration*. Final Report, 2003 December, HMSO, ISBN 0-947819-76-2.

Hugo Amezcua, Guillermo Larious, Eduardo Santin. (2005). *Technology Transfer Model as Seen from the Point of View of a Technology Importer*.

Goel Cohen. (2004). *Technology Transfer Strategic management in Developing Countries*.

TABLE 1: Definition of SME , SME CORP

| Sectors  | Small Enterprise  | Medium enterprise  |
|--|---|--|
| Manufacturing, Manufacturing-Related Services and Agro-based industries        | Sales turnover between RM250,000 and less than RM10 million OR full time employees between 5 and 50 | Sales turnover between RM10 million and RM25 million OR full time employees between 51 and 150 |
| Services, Primary Agriculture and Information & Communication Technology (ICT) | Sales turnover between RM200,000 and less than RM1 million OR full time employees between 5 and 19  | Sales turnover between RM1 million and RM5 million OR full time employees between 20 and 50    |

TABLE 2: Progame scope agreed by Economic Planning Unit (EPU), Ministry of High Education Malaysia (MOHE).

| No | Name and Scope project                     | Project cost (RM) |             | Total (RM)  |
|----|--|-------------------|-------------|-------------|
|    |  | Year 2011         | Year 2012   |             |
| 1  | Fundamental Research Grant Scheme (FRGS)   | 81,000,000        | 219,000,000 | 300,000,000 |
| 2  | Exploratory Research Grant Scheme (ERGS)   | 81,000,000        | 219,000,000 | 300,000,000 |
|    | Long-term Research Grant Scheme (LRGS)     |                   |             |             |
|    | Prototype Research Grant Scheme (PRGS)     |                   |             |             |
| 3  | Researcher's Incentive                     | 11,000,000        | 30,000,000  | 41,000,000  |
| 4  | Special Project of High Education Ministry | 27,000,000        | 73,000,000  | 100,000,000 |
|    | Total                                      | 200,000,000       | 541,000,000 | 741,000,000 |

FIGURE 3: Conceptual Framework

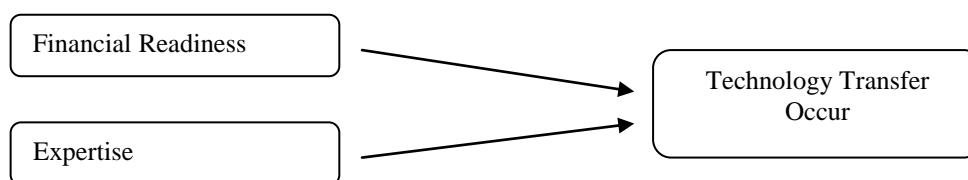


FIGURE 4: Proposed Model to Transfer Expertise

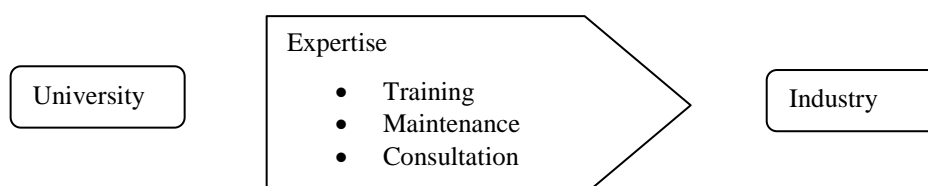


FIGURE 5: Overview of Funding Circulation, (Sullivan 1995)

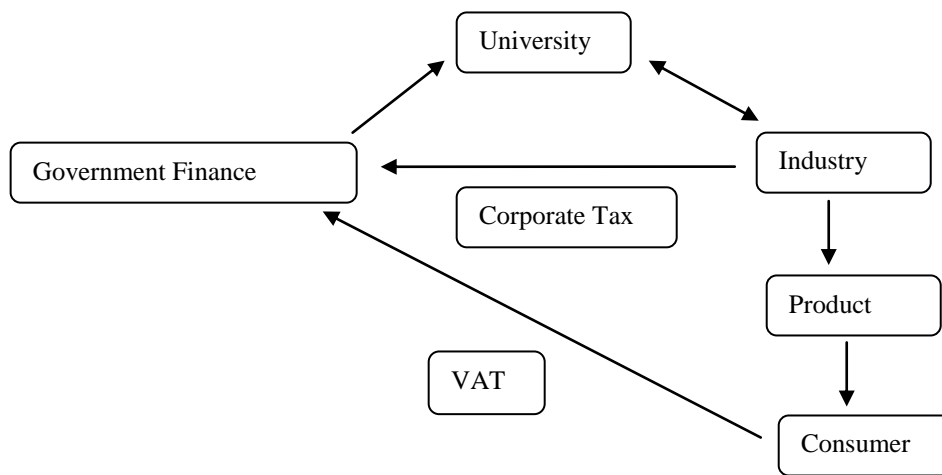


FIGURE 6 : Propose Model

