

AN EXPLORATORY STUDY UNIVERSITY TEKNOLOGI MALAYSIA'S  
INNOVATION TOWARD COMMERCIALIZATION

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*Dedicated to those who stand still with me on completion of this dissertation.*

*A little thing from you always a great deal for me*

*Forever.*

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## **ABSTRACT**

Commercialization in university has increasingly been considered as a complementary and attractive solution to new technology innovation and product marketing. However, the rate of commercialization amongst academic researchers and inventors has been discouraging. The aim of this study was to identify the problems and issues on the process of innovation and commercialization and then improve the commercialization rate in Universiti Teknologi Malaysia (UTM). To achieve these goals seven factors were examined to identify how they affect on the university's innovation and commercialization. These factors were market driven innovation, financial support, marketing and selling strategy, improve technology, time to market and time constrain, the relationship between university and industry as well as the university policy and system with the special focus on the the relationship between university and industry and its effect on the commercialization rate in UTM. This study was based on a qualitative research method and was designed to use a case study approach. A total of sixteen face-to-face interviews were conducted. Respondents were chosen from inventors, academic researchers and Innovation and Commercialization Centre staff in UTM. The researcher utilized the content-analysis approach to analyze the data obtained from the semi-structured interviews. The results indicated that, the most critical factor was relationship between university and industry and role of financial support. This study also addressed the implications and recommendation for research and practitioners. Suggestions were provided to enhance the role of academic researchers and inventors toward commercialization.

## ABSTRAK

Pengkomersilan di universiti semakin menjadi pelengkap dan penyelesaian yang menarik ke dalam inovasi teknologi baru dan pemasaran produk. Walau bagaimanapun, kadar pengkomersilan di kalangan penyelidik akademik dan pencipta tidak menggalakkan. Tujuan kajian ini adalah untuk mengenal pasti masalah dan isu-isu proses inovasi dan pengkomersilan dan seterusnya meningkatkan kadar pengkomersilan di Universiti Teknologi Malaysia (UTM). Untuk mencapai matlamat ini, pelbagai faktor dan isu telah diperiksa untuk mengenal pasti bagaimana ia mempengaruhi prosedur inovasi dan pengkomersilan universiti. Faktor-faktor ini termasuk inovasi didorong oleh pasaran, peranan sokongan kewangan, pemasaran dan strategi penjualan yang baik, peningkatan teknologi, masa ke pasaran dan masa mengekang, mengeratkan hubungan antara universiti dan industri serta meningkatkan dasar dan sistem universiti. Antara tujuh faktor, kajian ini memberi tumpuan kepada mengeratkan hubungan antara universiti dan industri dan kesan terhadap kadar pengkomersilan di UTM. Kajian ini berdasarkan kaedah penyelidikan kualitatif dan telah direka bentuk untuk menggunakan pendekatan kajian kes. Bagi menyiasat faktor-faktor dan isu-isu dalam kajian ini, sebanyak enam belas muka-ke-muka temubual telah dijalankan. Responden dipilih daripada pencipta, penyelidik akademik dan kakitangan Pusat Inovasi dan Pengkomersilan di UTM. Penyelidik menggunakan pendekatan analisis kandungan untuk menganalisis data yang diperolehi daripada temubual berstruktur separa daripada responden. Keputusan menunjukkan bahawa, faktor yang paling penting adalah hubungan antara universiti dan industri dan peranan sokongan kewangan. Kajian ini juga mengandungi implikasi dan cadangan untuk penyelidikan dan pengamal. Cadangan telah disediakan untuk meningkatkan peranan penyelidik akademik dan pencipta ke arah pengkomersilan.

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## **CHAPTER 1**

### **INTRODUCTION**

#### **1.1 Background of Study**

The history of innovation can be observed when human beings start to think how to deal with their lives. Gollin (2008) indicates that from ancient to modern times, successful societies are those which promote rewards and capture individual creativity and innovation. According to Guus *et al*, (2012) the history of innovation is divided into three generations. The first generation, considers innovation as science or craftsmanship which refers to the early of mankind. The second generation, called the rise of Research & Development (R&D). Finally, in nineteenth century, this generation made a systematic innovation activities in large corporations, also they started innovation became Research & Development (R&D). The third generation, called the Raise of the System Approach which has been divided into three linear approach developments, in late twentieth first century, increasing market and technology demands, second new R&D management, third, processes of innovation have been affected by factors and actors on various levels of aggregation.

After innovation process became the main focus, many scholars discussed about innovation. Robert *et al*, (2007) indicates that nowadays we can see the rapid pace of technological development which has carried many national economies forward during

the past 200 years. Continuing the innovation which has been diffused through the marketplace made this development possible. For instance, entrepreneurs have been an instrumental factor in the commercializing innovations, specifically radical or breakthrough innovations such as: the airplane, automobile, personal computer. Since technologies have been growing more sophisticated and industries have become more high-tech, as well as universities become more sufficient and an effective player in the processes of invention, innovation and commercialization.

Commercialization in the university innovation became an important topic over two decades (Katherine, 2006). Commercialization can be described as the process by which inventions or latest technologies to become innovative or ready to market. For better understanding, the activities of commercialization provide the potential developments in the quality of life, by facilitating the access in industry to latest knowledge. A creative university leads to the availability on developed products and services. Meanwhile there are evidences which make commercialization of Research University to contribute to the national and regional growth of economic and international competitive advantage. These outcomes of economy are extremely desirable for policy makers because they represent the relatively direct benefit arising from public investments in university research that can be usable for justifying those expenditures.

Nowadays, the significance of universities and their research development as well as commercialization (R, D & C) activities is widely recognized (Djokovic & Souitaris 2008). Previously, most of the universities were focusing on R&D, nonetheless, more recently there are many progressing shift towards the inclusion of commercialisation activities. Collier and Gray (2010) defines commercialization as the character of the third mission, they also indicates that researchers in the universities produce innovations as a result for the research activities which reflects to be exploited commercially. However, the transformation from research and development to commercialization can be a path strewn with many pitfalls. Nowadays studies on the

university research commercialization and the various models for university technology transfer are receiving more attention (Jolly, 2011; Siegel *et al.*, 2003). Present research also desires to examine commercialization of the research output in Malaysian universities and it would attempt to explore notable factors affecting commercialization process.

In Malaysia the exotic phrase, Vision 2020, has been coined to signify a lofty and long term objective, so as to be a fully developed nation by 2020 (Islam, 2009). However, Malaysian believed that some challenges would stand on the way of achieving the Vision 2020. Also, the fundamental change is demanded, not only in economic and social performance, but also in the delivery of public goods and services that underpin the ability to develop the country. Whereby, as a result they committed themselves to a Government Transformation Programme (GTP). Foremost the Vision roadmap details the objectives, outcomes and the initial set of actions, as it has identified in the areas like Ministerial Key Result Areas (MKRAs) and National Key Result Areas (NKRAs). Meanwhile, parallel with National Economic Action Council (NEAC) which they formulating the New Economic Model, and the Economic Planning Unit (EPU) toward developing the Malaysia Plan. Both can be a roadmap and should be read together with this plan. Thus the government will focus on unlocking the growth and innovation potential of SMEs, creating domestic, regional and global champions as well as innovation and R&D infrastructure to be developed in areas with competitive advantage (Islam, 2009).

In Malaysia there has been a limited study on commercializing the innovation activities, particularly in research universities. It is also realized that academic researchers are viewed as the critical process, question such as: what type of commercial research activities has appeared among academic researchers in Malaysian research universities are still open for research. Under the Tenth Malaysian Plan (MOHE, 2010) commercialization and innovation development has been assigned as niche by the Malaysian Ministry of Higher Education which implies the emphasis and urgency. The

aim of the Government of Malaysia is to encourage an environment where research and innovation will flourish. Innovation is the key importance in spurring economic growth in a developing country like Malaysia. The Government of Malaysia adheres to the principle that knowledge and ideas should be harnessed for wealth creation and societal well being. The traditional resource based economy is fast being replaced by knowledge based economy. Thus, Intellectual Property can become a key factor in driving this knowledge based economy into the future (MOHE, 2010).

According to Malaysian Ministry of Science, Technology & Innovation their ninth recommendation has been accepted after the meeting with Prime Minister in 30<sup>th</sup> of November 2007 to transform Malaysia from the resource based to the innovation economy base through the National Innovation Model (NIM) (MOSTI Annual Report, 2012). National Innovation Model (NIM) has been described as the tool of balancing approaches between driven technology innovation and driven market innovation. In the model of driven technology innovation, scientists and researchers being funded for R&D, also technology will be improved fundamentally. Therefore, scientists and researchers eventually are commercializing their ideas to the international market. Meanwhile in the model of driven market innovation, the market has been determined before goes to the entrepreneur's knowledge who can acquire the excellent technology and science. Foremost, Ministry of Science, Technology & Innovation (MOSTI Annual Report, 2012) mentioned Science, technology and innovation as the central of success in today's modern economy. They also provide the Second National Science & Technology Policy as the framework for improving performance and Malaysian long-term economic growth. The aim of this policy is to:

- Raise the national capacity and capability to research and development (R&D), developing technology and acquisition.
- Encourage partnerships among industry and funded organizations.
- Place Malaysia as the technology provider to the strategic key and knowledge industries.



- Enhance knowledge transformation to products, processes, services or solutions.
- Foster the values of the society and approaches that identify S&T as critical to future prosperity, as well as the need of life-long learning.
- Ensure that S&T utilization can accords the emphasis through approaches on the conformity with sustainable developmental goals.
- To progress the new knowledge based industries.

On top of that, Agensi Inovasi Malaysia built to assist Malaysian SMEs in moving up the value chain through innovation. AIM was established to stimulate and develop the innovation eco-system in Malaysia towards achieving the vision 2020. AIM also been established under the Prime Minister department apart of MOSTI. They plan to do this by providing opportunities for them to take advantage of innovation methodologies, policies and outcomes and complement the initiatives introduced by SME Corp. AIM's role in this is to stimulate rapid new-wave wealth creation by commercializing research & development, as well as inventions and innovations that have been developed but not capitalized upon. Between the large corporations and the SMEs in Malaysia lie a number of companies that currently suffer from the "Middle Child" Syndrome. Unlike large companies that have the financial resources to take their business to another level, or the SMEs, these companies appear to be "stuck" as they do not know where to turn to for help and eventually flounder in a valley of stagnation.

According to Aziz *et al*, (2011) Universiti Teknologi Malaysia (UTM) has the highest number of commercialization output among Malaysia universities. They analyzed UTM commercialization infrastructure and procedures that can provide the blueprint for all Malaysian higher education's and institutes to follow. They also describe UTM context as an operator for providing an overview on commercialization environment towards research universities in Malaysia. Foremost, to indicate that blue print that presented as the background of university followed by the Universiti Teknologi Malaysia's research, development and commercialization policies as well as structures.

## 1.2 Problem Statement

Isabelle (2004) indicates that innovation and commercialization usually has been used to overlap methods in order to refer on the processes for discovering knowledge, technology development and converting all these to new process. She also mention commercialization is an ongoing process from mind and creativity to innovation and then to market. Meanwhile, adapt products and services as well as processes so as to be sold or compete in the market place.

Malaysian Government nowadays realized that they are trapped within the middle income plateau (NEM, 2010). However the requirements are to approach the developed status in 2020, while national progress and competitiveness can be charted against innovation and not skills based performance. It has been clear that Malaysia need to shift their direction since late in nineties but it has been noticed that the progress was slow. This comes from some reasons such as: lacks of fully engaged innovation ecosystem in the country, the education key components, ventures and industry which lead to entrepreneurial activity, government.

According to the Ministry of Science, Technology and Innovation, Intellectual Property Commercialization Policy (MOSTI Annual Report, 2009) in Malaysia, national policy cannot be seen in governing the commercialization and ownership of intellectual property in funding government projects. Therefore, it is necessary to formulate the single policy that would cover as much as possible the different situations to the common application by the government such as: government agencies and Research Institution, meanwhile providing funding to research, development as well as Commercialization purposes. That Intellectual Property Commercialization Policy is addressing these problems. Foremost, Ministry of Higher Education (MOHE, 2009) indicates that in Malaysia there is a sad paucity of innovative human capital (IHC) both in quantity and quality, and because of the important brain drain while concluded in the MOHE's blueprint Agenda on Innovative Malaysian (AIM, 2009).

There are some studies has been done on commercializing the university innovation in Malaysia such Sudulah (2002) which he argued that the prospective collaborations among the universities and industries in Malaysia, the findings of survey which contained the indicators on the passiveness in Malaysian universities such as: the insufficiency on the innovative products toward commercialization, lack of researches on commercialization and lack convictions and commitment between academic staffs toward innovation and commercialization. Senin (2006) states the lack of funding in university industry and technology problems, lack of expertise and entrepreneurships, less commitment among academics, problems in institutions and limited linkage with industry.

In Universiti Teknologi Malaysia some problems can be found firstly, funding on the process of innovation and commercialization. Second, the innovative products does not reach the market demand, there is timing mismatch, because the inventors will develop the product until prototype then patenting it and stop it. Meanwhile, most of the university inventers are focusing on patenting and publications but they claim that commercialization is not their job. Third, lack of convictions and commitment between university and industry is alarming. However, the decision makers have a significant impact on increasing the processes of commercialization and the culture in the university is strongly needed to be upgraded. University could be able to transform the knowledge from the laboratory toward commercially viable products (Ismail, 2011). The above mentioned problems will make the products low quality of technology and low quality of commercialization rate.

### **1.3 Purpose of the Study**

The purpose of this research is to study the innovation and commercialization current process in Universiti Teknologi Malaysia so as to understand the main problems and issues which influences the university's innovation and commercialization process.

### **1.4 Research Objective**

The objectives of this research are as follows:

- 1- To study the problems of innovation and commercialization process in Universiti Teknologi Malaysia.
- 2- To study the main factors that influences the university's innovation and commercialization process.
- 3- To suggest the effective innovation and commercialization practice for Universiti Teknologi Malaysia.

### **1.5 Research Questions**

The questions of this research are as follows:

- 1- What is the current innovation and commercialization process in Universiti Teknologi Malaysia?
- 2- What are the main factors that influence the effectiveness of university's current innovation and commercialization process?

## **1.6 Significance of the Study**

Base on the objectives above, the importance of this study is described. The finding and suggestions of this study will contribute to the existing knowledge which will be useful to university innovation process and other reader to further development on the factors that affect the innovation and commercialization process.

According to the objective the use of this study are well described because it offers input to the university policy makers to provide a better trend and picture toward innovation and commercialization as well as identifying the influenced factors. However, by indicating the problems and being successful of providing a better process for innovation and commercialization is critically in need for Universiti Teknologi Malaysia in order to generate the income for the university's management. Therefore, current study desires to investigate research commercialization operations at UTM. The findings of the study increase the body of knowledge on technology transfer and university commercialization particularly in UTM and generally in Malaysia.

Furthermore the empirical of the study will provide suggestions to move the efforts to increase the commercialization of the innovative products, thus strengthen on the systematic understanding on the issue. Although, the concentration of this study on commercializing the university's product differs from other fields due to the lengthy and

great development on patenting, commitment and collaboration in university. The findings of the study will be useful for the university.

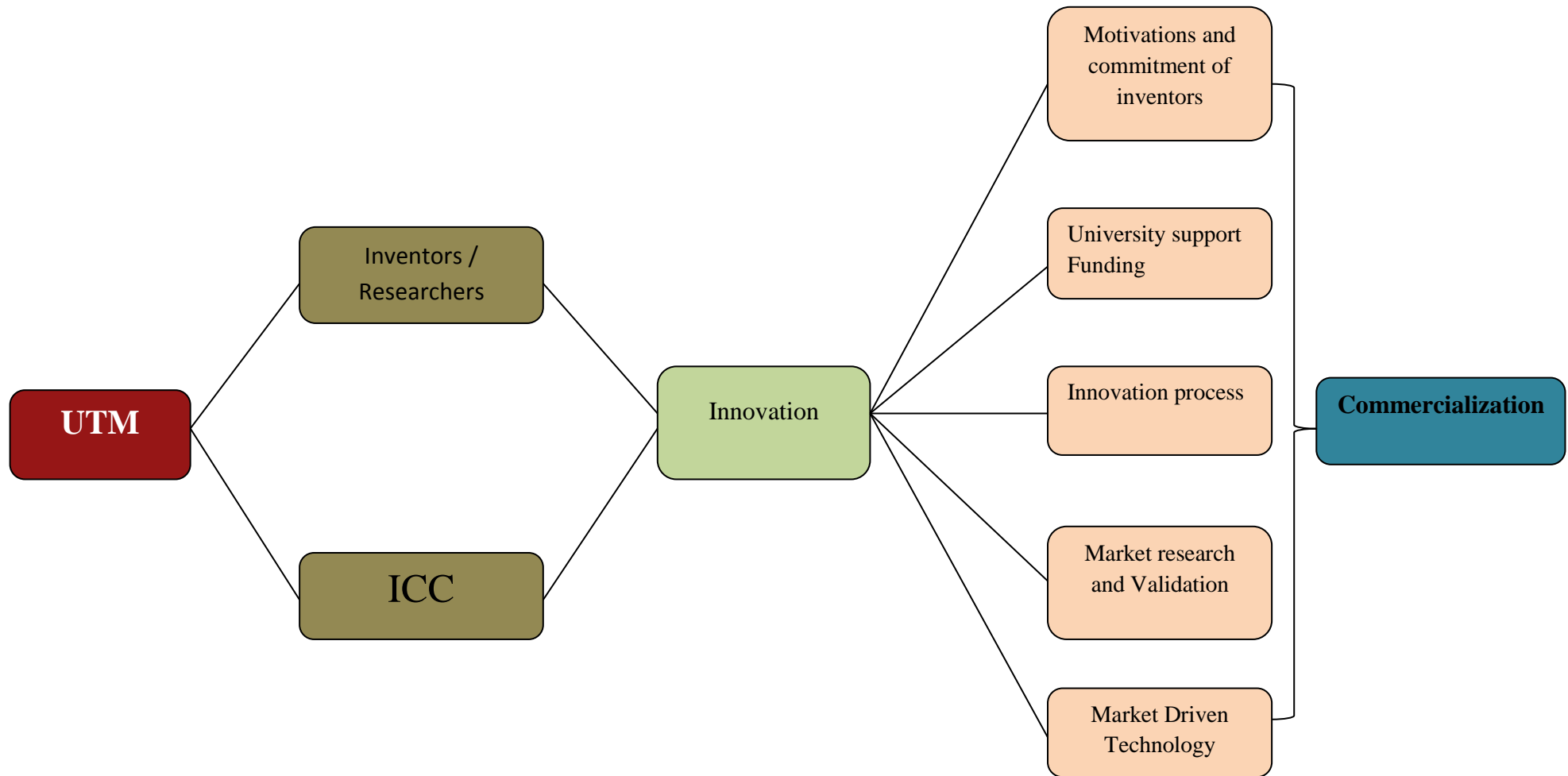
### **1.7 Scope of the Study**

The study will focus on the current commercialization process and innovation in Universiti Teknologi Malaysia. The study also focuses on what are the factors that influence the university innovative process towards commercialization. The data collection for this study will focus on the interviewing among the Universiti Teknologi Malaysia's inventors and Innovation & Commercialization Center's staff.

### **1.8 Research Framework**

The framework of this study as it captured in (Figure 1.1) is stretched from Universiti Teknologi Malaysia as an exploratory study on the inventors and staffs of innovation towards commercialized products. After this, the study focused on the innovation issues listed in the framework which has lead to problems in innovation and towards commercialization.

**Figure 1.1 Research Frameworks**



## 1.9 Research Layout

Chapter 1 explanations in brief about the innovation and commercialization in general then leads elaborate more on about commercialization in Malaysian university specifically in Universiti Teknologi Malaysia and what are the problems faced in universities commercialization. Later the focus transmit on the components of the study; which contains the problem of statement, purpose of study, objective of the study, the research question and the significance of this study. The scope study was discussed, based on the university innovation towards commercialization.

Chapter 2 starts with providing definition on the innovation and commercialization in overall. The chapter gives and explanation about the types of innovation bas on the Oslo Manual (2011). Besides, discussion on the relationships between innovation and commercialization was explored. After that the chapter gives another explanation on the problems of the innovation and commercialization process. The problem of commercialization consists; Motivation & Commitment of the Inventors, University Support and Funding, Innovation Process, Market Research & Market Validation and Market Driven Technology

Chapter 3 discussed about the methodology employed, with particular attention paid to the qualitative approach, as well as data collection based on the semi-structured interview. On top of that, this chapter provides research design, population as well as the method which includes semi-structured interview and in-depth interview questions and data collection. Data analysis procedures of the above data are described in this chapter.

Chapter 4 documented the findings of data analysis conducted on 16 of university inventors as well as the ICC staffs. Initially, the chapter starts with



background of the respondent and the data were analyzed based on the interview questions which were derived from the research objectives. Next some themes were extracted to cover the research objectives. Finally, seven significant themes were highlighted and these themes were chosen base on McKenna (1994) analysis.

Chapter 5 discusses the results of the study base of the seven significant themes. Later in this chapter, reported on the discussion of the findings compared to literature review that presented in chapter 2. Next, the conclusion, recommendation and recommendation of this study are explained in detail. Ultimately this chapter presents recommendation of future potential research and contribution of this study has been made.

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