Institute of Technology Management and Entrepreneurship

UNIVERSITY-INDUSTRY COLLABORATION AND RESEARCH PRODUCT COMMERCIALIZATION: A CASE STUDY IN SELECTED HIGHER LEARNING INSTITUTION

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Master of Science in Human Resource Development

2018

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A thesis submitted
in fulfillment of the requirement for the degree of Master of Science
in Human Resource Development

Institute of Technology Management and Entrepreneurship

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

2018

DECLARATION

I declare that this thesis entitled "University-Industry Collaboration and Research Product Commercialization: A Case Study in Selected Higher Learning Institution" is the results of my own research except as cited in the references. The thesis has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

Signature : Atiqah

Name : Nurul Atiqah Yahaya

Date : 28/10/2018

APPROVAL

I hereby declare that I have read this thesis and in my opinion this thesis is sufficient in terms of scope and quality for the award of Master of Science in Human Resource Development.

Signature : .....

Supervisor Name : DR. HAZMILAH HASAN

Date : 31/10/2018

ABSTRACT

This study intends to address the failure of synergy between universities and industries that leads to ineffective research product commercialization. The factors of collaboration issues are universities and industries have low engagement with each other. Besides, research product commercialization among academicians in Malaysia is not encouraging and less progress. Other several issues including misunderstanding of roles in collaboration, university researchers are lack of entrepreneurial skills, lack of research skills, researchers are battling with workload issues, university produce unsatisfactory of research product commercialization and researchers attitude towards learning and doing research. This study utilizes the qualitative research approach using in-depth interview conducted through face-to-face. Seven respondents were selected consisting of those who are directly involved and has knowledge on issues regarding university and industry collaboration, as well as research product commercialization. The findings of the study found that researcher's creativity to develop research product, market survey, product marketability, support structure, recognition and respect for researchers and products, plagiarism, attitude and mindset as contributing factors that affect university and industry collaboration and research product commercialization. This study contributes effective university and industry collaboration and research product commercialization. For future research, researchers may adopt the quantitative research approach to identify factors affecting university and industry collaboration and research product commercialization in other universities. Perhaps, researcher will identify different issues and findings due to the phenomena of collaboration and research product commercialization within the university is not the same.

ABSTRAK

Kajian ini bertujuan untuk menangani kegagalan sinergi antara universiti dan industri yang membawa kepada pengkomersilan produk penyelidikan yang tidak berkesan. Faktor-faktor masalah kolaborasi adalah universiti dan industri mempunyai penglibatan yang rendah antara satu sama lain. Tambahan pula, pengkomersilan produk penyelidikan di kalangan ahli akademik di Malaysia tidak menggalakkan dan kurang menunjukkan kemajuan. Beberapa isu lain termasuk salah faham peranan dalam menjalinkan kerjasama, penyelidik universiti mempunyai kurang kemahiran keusahawanan dan kemahiran penyelidikan, para penyelidik bertarung dengan isu beban kerja, universiti menghasilkan produk penyelidikan yang tidak memuaskan dan sikap penyelidik terhadap pembelajaran dan penyelidikan. Kajian ini menggunakan pendekatan penyelidikan kualitatif dengan menggunakan temubual secara mendalam yang dilakukan melalui tatap muka. Tujuh responden dipilih terdiri daripada mereka yang terlibat secara langsung dan mempunyai pengetahuan tentang isu-isu berkaitan kerjasama diantara universiti dan industri, serta pengkomersilan produk penyelidikan. Penemuan kajian mendapati kreativiti penyelidik untuk membangunkan produk penyelidikan, tinjauan pasaran, pemasaran produk, struktur sokongan, pengiktirafan dan penghormatan kepada para penyelidik dan produk, plagiarisme, sikap dan pemikiran sebagai faktor penyumbang yang mempengaruhi kerjasama universiti dan industri serta pengkomersilan produk penyelidikan. Kajian ini akan menyumbang dalam menghasilkan kerjasama universiti dan industri yang berkesan dan pengkomersilan produk penyelidikan. Untuk penyelidikan masa depan, penyelidik boleh mengamalkan pendekatan penyelidikan kuantitatif untuk mengenal pasti faktor-faktor yang mempengaruhi kerjasama universiti dan industri dan pengkomersilan produk penyelidikan di universiti lain. Mungkin, penyelidik akan mengenal pasti isu dan penemuan yang berbeza kerana fenomena kerjasama dan pengkomersilan produk penyelidikan dalam universiti tidak sama.

ACKNOWLEDGEMENTS

Alhamdulillah, praised to Allah SWT with His will and blessing, I am able to finish this thesis. My sincere appreciation is to my both supervisor, Dr Hazmilah Hasan and Dr Mohd Fauzi Kamarudin for their excellence guidance and patience, I would not made this far. I would also like to thank my parents and my siblings. They were always supporting me and encouraging me with their best wishes. Lastly, I also would like to thank all of my friends, without their ideas and help, I would never made this far. Thank you.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

LIST OF ABBREVIATIONS

R&D	-	Research and Development
MOSTI	-	Ministry of Science, Technology and Innovation
K-Economy	-	Knowledge Economy
HEI	-	Higher Education Institution
MoHE	-	Ministry of Higher Education
KTP	-	Knowledge Transfer Program
K-Worker	-	Knowledge Workers
NEM	-	New Economic Model
NDTS	-	National Dual Training System
NSTP2	-	National Second Science and Technology Policy 2
MASTIC	-	Malaysian Science and Technology Information Centre
IHL	-	Institutions of Higher Learning
UPM	-	Universiti Putra Malaysia
USM	-	Universiti Sains Malaysia
UKM	-	Universiti Kebangsaan Malaysia

KPI	-	Key Performance Indicator
GRI	-	Government Agencies and Research Institute
BE	-	Business Enterprises

LIST OF PUBLICATIONS

1. Nurul 'Atiqah Yahaya, Hazmilah Hasan, (2018) *"Challenges in University-Industry Collaboration and Research Product Commercialization in a Selected Higher Learning Institution: Lessons for Teaching and Learning"*, The Turkish Online Journal of Design, Art and Communication, ISSN: 2146-5193: September 2018, Special Edition, pp.1900-1905.

2. Nurul 'Atiqah Yahaya, Hazmilah Hasan, Mohd Fauzi Kamarudin, (2014) *"Exploring the Best Practices of Research Management through University and Industry Collaboration"*, Science International, 26(4) pp.1-4

CHAPTER 1

INTRODUCTION

1.1 Introduction

This chapter will elaborate the importance of research and development (R&D), the significance of knowledge in globalize era, illustrate problem statement, research question and research objective. After that, researcher will examine significance of doing this research by providing valuable insight from the people involved and impacted through activities of collaboration and research product commercialization.

1.2 Background

1.2.1 Importance of Research and Development (R&D)

The importance of R&D in developing educational progress is undeniable (Dash, 2015; Berita Harian, 2009). Investment in R&D is one of the most important factors in enhancing technological progress and economic growth in developed and developing countries (Lee & Kim, 2015). In Malaysia, supported by National Higher Education Strategic Plan (Kementerian Pengajian Tinggi, 2005), higher institutions, specifically through its R&D can help ensure that Malaysia achieves a developed nation status by 2020.

Higher education is currently the second largest R&D performer after the business sector (Hasyim & Taib, 2012). Many countries have increased investment in national R&D programs for industrial technologies, educational and infrastructure (Lee & Kim, 2015).

R&D activities in higher education institutions have a key role in shaping the status, the quality of institutions, the contribution which they make to economic and social development (Hazelkorn, 2008). To enhance R&D, greater compliance to global standards, collaboration between stakeholders and sustainable manufacturing practices is a crucial step towards achieving a high income nation (News Desk, 2015).

1.2.2 Importance of Knowledge

R&D is a major factor towards cultivating knowledge and innovation (Marzuki, 2005). Knowledge has been recognized as the important source of growth in the global economy (Cavusoglu, 2016; Marzuki, 2005). Knowledge Economy (KE) also means that organizations and people create, disseminate, and use knowledge more effectively for greater economic and social development (Ogunsola, 2008). Furthermore, developing countries can benefit from knowledge based economy throughout the global development process (Ogunsola, 2008). Thus, it shows that knowledge based economy leads to globalization and wealth creation.

In this regard, Malaysia needs knowledgeable workers to support the industries dynamic development and contribute towards reaching the target of being a high-income nation by the year 2020. According to Malaysia's Knowledge Transfer Program (KTP), to reach a high income nation status, the demand for knowledgeable workers will rise (Knowledge Transfer Program Committee, 2012).

In this respect, the New Economic Model (NEM) was launched with the aim of making Malaysia a high-income nation by 2020 (The World Bank Group, 2014). Malaysian government must continuously strengthen the human capital development to produce a workforce that is knowledgeable, skillful, innovative and simultaneously be able to compete in the globalized environment (Hasmori, Yunos, Hamzah, & Aripin, 2015). Therefore, the education and training industry must work closely to produce knowledgeable workforce that will be able to compete in a globalized environment (Hasmori *et al.*, 2015). Through research, universities expand the horizons of knowledge and transfer the knowledge to the rest of societies and industries (Veugelers & Rey, 2014).

1.2.3 Importance of Knowledge Workers (K-Workers)

In a rapidly developing country like Malaysia, having k-workers are important to ensure sustainable growth in the global free market economy. Thus, the Ministry of Human Resource and the Department of Skills Development have been assigned to the National Dual Training System (Hasmori *et al.*, 2015). The National Dual Training System (NDTS) is designed to provide skilled and knowledgeable workers under a comprehensive training system to meet the industries and national fundamental needs. The training will expose workers with the industry (Hasmori *et al.*, 2015; Sulaiman, 2010). The Ministry of Education targets the entire higher education sector in Malaysia to produce more than 10,000 knowledge workers every year (Hasyim & Taib, 2012).

In this National Dual Training system (NDTS), knowledge workers are involved with human and social competence rather than just being skilled workers. Knowledge workers are trained to have the ability to work in a team, to undertake self-monitoring and to bear the responsibility. Additionally, knowledge workers should have personality

development and social integration when working in teams (Hasyim & Taib, 2012). In the rapidly changing economy, the role of universities not only produce educated and skilled students, but also producing workers who can generate new ideas (Hazelkorn, 2008). Most importantly, knowledge workers must possess the ability to do research and reflect on their work performance.

1.2.4 R&D Expenditure

R&D has been recognized as a critical determinant of a country's competitiveness worldwide including Malaysia (Ismail, Ramly, & Rasdi, 2008). Moreover, the levels of growth for R&D expenditure are viewed as reliable indicators of innovative capacity (Ismail *et al.*, 2008). Figure 1.1 and 1.2 will explain the growth of R&D expenditure and R&D expenditure by sector from 2000 till 2012.

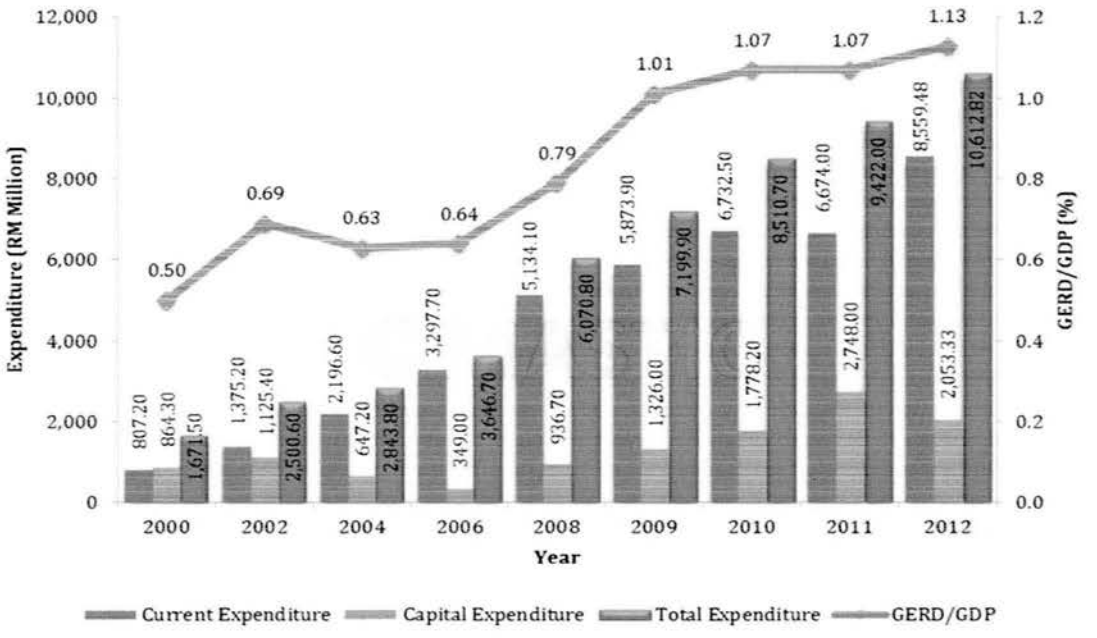

Figure 1.1: R&D Expenditure in Malaysia (Year 2000 – 2012) (Pusat Maklumat Sains dan Teknologi Malaysia (MASTIC), 2015)

Based on figure 1.1, the gross expenditure on R&D has gradually risen in each year (Pusat Maklumat Sains dan Teknologi Malaysia (MASTIC), 2015). Total expenditure each year keeps increasing showing positive results. In 2010 and 2011, the GDP percentage records at 1.07 percent. The year 2012 recorded the highest increase of GDP with 1.13 percent. In the year 2008 to 2009, the GDP showed significant increase with 0.22 percent increment.

The significant increase in 2008-2009 was due to the increase in the number of researchers recorded at 40,000 (Rahman, 2012). Most of these researchers were funded by the Malaysian government through research funding schemes. As shown in figure 1.2 below, the number of researchers in 2008 to 2009 showed a significant increase with 18.6 percent. This shows that the R&D framework provided by the National Second Science and Technology Policy 2 (NSTP2) improves the long-term growth of Malaysian economy by focusing on seven strategic thrust (Rahman, 2012).

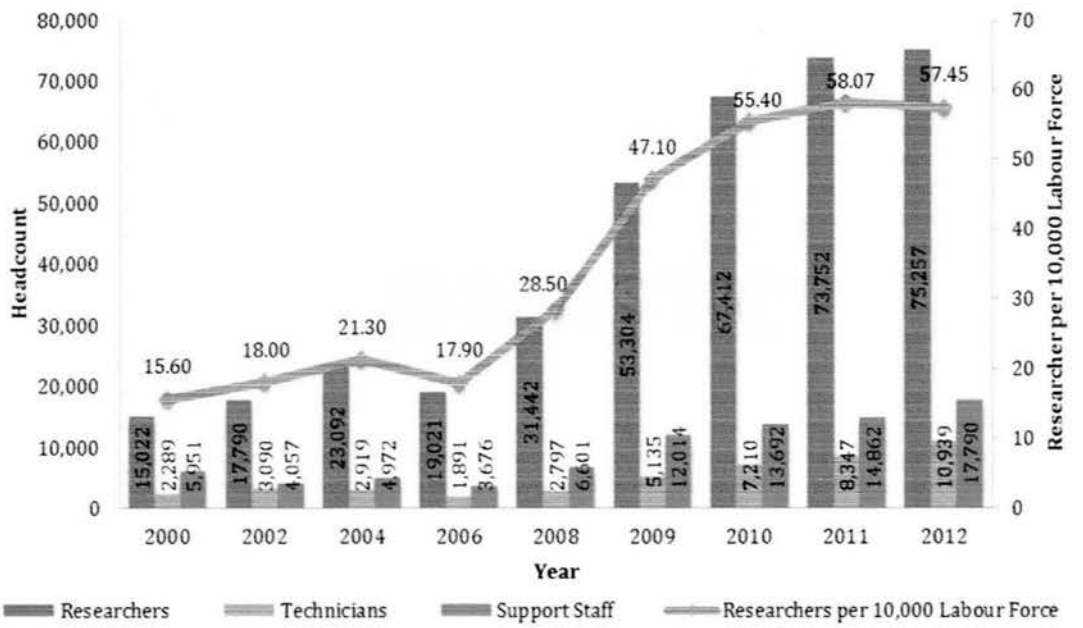

Figure 1.2: R&D Researcher in Malaysia (Year 2000 – 2012) (Pusat Maklumat Sains dan Teknologi Malaysia (MASTIC), 2015)

The seven-strategic thrusts are important to ensure Malaysia's economic growth and development is the first thrust is to enhance national capability and capacity for R&D. The second thrust is to promote partnerships between universities and industries. The third thrust is to accelerate the transformation of knowledge into value added products and services.

The fourth thrust is to place Malaysia as a technology provider in key strategic knowledge industries. The fifth thrust is to utilize science and technology that are in conformity with sustainable development. The sixth thrust is to foster societal values and attitudes that recognize science and technology as important for future prosperity. Lastly, Malaysia target to develop more knowledge-based industries. This effort shows that the Malaysian government is steadfast with its initiative to help universities, industries player, stakeholder, and community towards developing R&D in Malaysia.

Figure 1.3 below explains that Malaysia's R&D expenditure is generated through government agencies and research institute (GRI), institutions of higher learning (IHL) and business enterprises (BE) (Pusat Maklumat Sains dan Teknologi Malaysia (MASTIC), 2015).

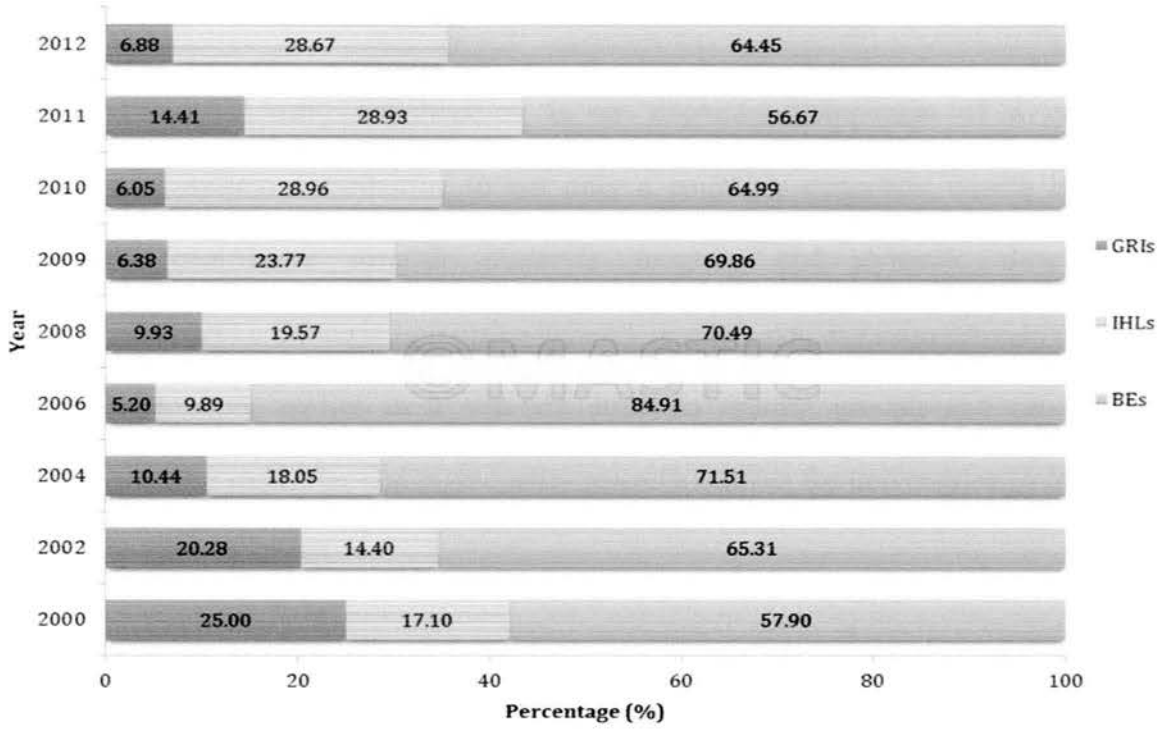

Figure 1.3: R&D Expenditure by Sector in Malaysia (Year 2000 – 2012) (Pusat Maklumat Sains dan Teknologi Malaysia (MASTIC), 2015)

In 2000 to 2012, business enterprises (BE) remain the largest contributor to R&D activities in Malaysia. Based on the statistics for year 2012, business enterprises (BE) contributed 64.45 percent of R&D expenditure in Malaysia, followed by institutions of higher learning (IHL) with 28.67 percent and government agencies and research institute (GRI) with 6.88 percent.

These three contributors benefited through the various initiatives and programs that were implemented by Ministry Of Science, Technology and Innovation (MOSTI) including the enhancements of national capability and capacity for R&D; the enhancement of commercialization of R&D outputs; and fostering university and industry partnership (Rahman, 2012). In this regard, it is crucial for the government, industries, and universities to work closely to enhance R&D in Malaysia.

1.3 Problem Statement

University-industry collaboration is an important component of a country's innovation ecosystem contributing to not only a country's economic wealth but most importantly contributes towards society's progress and dynamic development (Rauhvargers, 2011). Strategic university-industry research collaboration provide a myriad of benefits to both parties in a win-win situation driving growth and productivity improvements for industries and high quality research outputs for universities (Adewunmi, Koleoso, & Omirin, 2016).

Thus, every effort should be made to ensure that the interface to university and industry collaboration is a model of success. For academics, these benefits can include the opportunity to address challenging research questions with real-world applications, see their research have tangible impacts and gain access to new skills, data or equipment (Ismail, Nor, & Sidek, 2015). Industries can improve business performance through developing new techniques or technologies, de-risk investment in research, and extend the capabilities and expertise available to the firm (Aziz *et al.*, 2013).

Despite of the wealth of knowledge and existing new research products in universities are increasing each year, these knowledge and products did not reach the mass. Research products commercialization among academicians in Malaysia is not encouraging and less progress. In 2011, only 3.2 percent of 1,143 research outputs were successfully commercialized with an allocation of RM7.6 million (Berita Harian, 2011). The low percentage of commercialization is due to lack of research output and highly skilled researchers (Ministry of Education Malaysia, 2015). Research universities in Malaysia have been perceived as the pioneer and catalyst for commercialization of research products (Ramli & Senin, 2015). Yet, the research output for commercialization is not encouraging