TYPES OF UNIVERSITY-INDUSTRY COLLABORATION IN UNIVERSITIES IN MALAYSIA

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A thesis submitted

in fulfilment of the requirements for the degree of Master of Business Administration

Faculty of Technology Management And Technopreneurship

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

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ABSTRACT

"Types of University-Industry Collaboration in Universities in Malaysia'

BY
NORAZIMAH BINTI OTHMAN
MAR 2013

Supervisor : Professor Dr Salleh Bin Yahya

Faculty : Faculty of Technology Management and Entrepreneurship

Purpose of this study is to explore types of university-industry collaboration and the benefits generated from the collaborations. This study also explores R&D performance affected from the benefits gained in Universities in Malaysia. Besides that, it tries to identify the characteristics should R&D project have, in order to encourage industry to collaborate with the R&D project in Universities in Malaysia, and lastly to suggest and recommend towards increasing R&D project performance based on data analyzed.

Approach: The theoretical model and hypotheses in this study were tested using empirical data gathered from 85 samples of respondents that were a universities researchers through survey questionnaires and then the data being analyzed using the regression.

Results: The results revealed that two types of U-I collaborations which is joint venture and contract research are the most effective U-I collaborations, while the factor of projects characteristics, barriers, and good practices can attract industries attention to consider the collaboration.

Conclusion: This study has explored the types of U-I collaborations in universities in Malaysia. Good practices in U-I collaborations, good characteristics, and barriers also were identified in this research. The types of collaboration were studied and the most important types were identified in this study and should be useful for universities to plan on R&D project in future.

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ABSTRAK

"Jenis-Jenis Kolaborasi diantara Universiti dan Industri di Universiti-Universiti di Malaysia"

BY
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MAR 2013

Supervisor : Professor Dr Salleh Bin Yahya

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Tujuan kajian ini adalah untuk mengenalpasti jenis-jenis kolaborasi diantara universiti dan industri yang terdapat di university-universiti di Malaysia dan mengenalpasti faedah yang diperolehi daripada kolaborasi yang dijalankan. Kajian ini juga bertujuan melihat keberhasilan faedah-faedah yang diperolehi hasil daripada kolaborasi-kolaborasi tersebut dalam bidang 'kajian dan pembangunan' atau *R&D*. Selain itu, ia juga cuba mengenalpasti ciri-ciri yang perlu ada pada sesebuah projek *R&D* untuk menarik minat industri-industri agar dapat bekerjasama. Akhir sekali, kajian ini mencadangkan bagaimana sesebuah prestasi projek R&D boleh ditingkatkan berdasarkan daripada data yang sudah dianalisis.

Pendekatan: Model *theoretical* dan hipotesis telah dikaji menggunakan data yang dikumpul daripada 85 responden yang kesemuanya terdiri daripada penyelidik daripada university-universiti di Malaysia. Kajian ini dilakulan dengan menggunakan soal selidik dan kemudiannya data- data tersebut dianalisis menggunakan kaedah *regression.*

Keputusan: Keputusan kajian ini mendedahkan bahawan dua jenis kolaborasi yang paling berkesan adalan *joint venture* dan *contract research.* Sementara itu, factor seperti ciri-ciri projek yang baik, halangan-halangan kolaborasi di dalam sesebuah kolaborasi, dan amalan yang baik semasa kolaborasi membantu menambah bilangan kolaborasi dan meningkatkan prestasi projek *R&D.*

Kesimpulan: Kajian ini mengenalpasti jenis-jenis kolaborasi di antara university dan industry di university-universiti di Malaysia. Amalan-amalan yang baik semasa berkolaborasi, ciri-ciri projek yang baik, dan halangan-halangan kolaborasi telah dikenalpasti di dalam kajian ini. Jenis-jenis kolaborasi yang telah dikaji dan dikenalpasti seharusnya dapat membantu universiti-universiti di Malaysia untuk merancang projek *R&D* mereka pada masa hadapan.

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DEDICATION

This thesis is dedicated to my husband, Muhamad Syahrul Azhar bin Sani, my children, my parent and my family who supported me all the way since the beginning of my studies. This thesis is also dedicated to my best friend Umi and Ain, who went through this journey together and has been a great source of motivation and inspiration. Finally this thesis is dedicated to Accounting Department of Kolej Professional Mara, Ayer Molek and all of my friends, those who supporting and helping me completing my study at UTeM. Thanks for everything.

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DECLARATION

I declare that this project paper entitle "**Types of University-Industry Collaboration in Universities in Malaysia"** is the result of my own research except as cited in the references. The project paper has not been accepted for any degree and is not concurrently submitted in candidature of any other degree".

Signature : ----------

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Date : 17 APRIL 2013

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LIST OF ABBREVIATION

U-I	University-Industry
R&D	Research and Development
UKM	Universiti Kebangsaan Malaysia
UPM	Universiti Putra Malaysia
UM	Universiti Malaya
USM	Universiti Sains Malaysia
UTM	Universiti Teknologi Malaysia
UTeM	Universiti Teknikal Malaysia Melaka
MMU	Multimedia University
MOHE	Ministry of Higher Education

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CHAPTER 1

INTRODUCTION

1.1 Background

Most research funding comes from two major sources, government (primarily carried out through universities and specialized government agencies) and industry (through research and development departments). Universities' capacity of raising resources from private sources largely depends on the type of research carried out (Muscio *et. al.* , 2012). Public universities usually get their funding from government grant. At the same time, the creation of new channels of University-Industry (U-I) collaboration has gained strategic relevance to universities primarily because of their potential as source of external funding (Muscio *et. al.* , 2012).

Ros Carnwell *et. al.* (2009) defining of collaboration when it include that 'two or more individuals must be involved in a joint venture, typically one of an intellectual nature in which participants willingly participate in planning and decision making'. Individuals consider themselves to be members of a team working towards a common goal, sharing their expertise and responsibility for the outcome. Fundamentally, the relationship between collaborators is non-hierarchical, and shared power is based on knowledge and expertise, rather than role or title. Not to forgot that, collaborations has always happened in R&D environment.

There are several types of Research and Development (R&D) collaboration between university and industry including spinoffs and licensing, contract research, consultancy, and joint venture. Spinoffs are a university-based researcher launches in new

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venture to commercialize research perfected in the university's lab (Donald, 2007). Mike *et. al.* (2008) and Markus *et. al.* (2011) found that spinoffs are defined as new venture that are dependent upon licensing or assignment of the institution's intellectual property (IP) for initiation. Universities may need to decide between spinning off a new technology through a new company and licensing it to an existing corporation. Karl *et. al.* , 2011, found spinoffs created by researchers based on IP generated in the university with example of university spinoffs such as Google and Genentech where both companies generated billions of dollars revenues within a few years of establishment.

Second type of collaboration is contract research that usually happened between a university researchers and a corporation involves applied research often in the form of specified formal knowledge (Mike *et. al.* , 2008). Donald (2007) defined contract research as a adapting the industry's IP to the client's requirements, serves to refine the technology into a commercially viable form. While Markus *et. al.* (2011) defined contract research as a application-oriented R&D activities carried out by university but funded by industry.

Consultancy is also one of the important types of collaboration and widely practiced. Academic consulting is perhaps practiced in different forms and for different purposes. Markus and Kathryn (2008), and Markus *et. al.* (2011) defined academic consulting as the provision for the service by academics to external organizations on commercial term. They added consulting involved providing advice, resolving problems as well as generating or testing new ideas. Mike *et. al.* , 2008, agreed with this statement and adding that consultancies help to ensure the relevance and utility of the knowledge generated in the university.

Joint ventures are collaborations between university and industry when a industry have a product that needs R&D to develop the product. They develop the solution together and shared IP (Donald, 2007).

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There are many benefits to both parties by forming U-I collaborations. U-I collaboration has intensified in certain field such as staff training and consultancy services or R&D based research project. Opportunity for student to have work experience in the industry also one of the reason U-I collaboration formed (Kurtulus and Kadir, 2011).

Main benefit generated from R&D collaboration is increased knowledge, higher scientific quality, contacts and connection for future work, and generations of new ideas (Benyamin *et. al.* 2012). Reason for collaboration included accessing expertise, accessing equipment and resources one does not have, encouraging cross-fertilization across disciplines, improving access to fund, obtaining prestige or visibility, learning tacit knowledge about a technique, pooling knowledge for tackling large and complex problems, enhancing productivity, educating a student, and increasing the specialization of science.

U-I Collaboration gives benefits to scientists and researchers by means of an increase in quality and quantity of the research output (Diego and Alessandro, 2011). With most public R&D funds currently allocate for universities and public research organization, promoting U-I collaboration is essential for converting this public R&D investment to industrial and economical significant innovations. Thru collaboration, university can gain deeper understanding of R&D activities within industries that are related to their research and develop research agendas with concrete goal of innovation (Kazuyuki and Shingo, 2012).

Industry also gain benefit from the U-I collaboration as stressed by Markus *et. al.* (2011), that benefit industry gained from collaboration with universities such as accessing students, 'window' on emerging technologies, and enhancing their technologies bases. But for academics' researchers, the decision to work with firm is because of to compliment their research, and seek to attract industry funding to increase the overall resources

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available for research. They added, the fund that firm spend on working with universities constitutes a conservative indicator of the value that they attach to this kind of knowledge sourcing because their contribution are often matched by public funds.

U-I collaboration research can be considered as exchange relationship in which part obtain benefits. On the other part of university researchers, collaboration with industry guarantees access to additional financing for research and to complementary assets (Giovanni *et. al.* , 2009). Industries usually engage in frequent collaboration with universities to enlarge their general knowledge base on facilitate higher levels of technology integration with embodied knowledge (Isabel *et. al.* , 2012). Hence, university-industry collaboration is expected to be initiated through contract with established network to access new knowledge developments.

Factors that motivate collaboration are the funding agencies' need to save money, growing availability and falling real cost of transport and communication, a desire for intellectual interaction with other scientists, a need for a division of labour in more specialize or capital-intensive areas of science, requirements of interdisciplinary research, and following government encouragement for international and cross-sector collaboration (Benyamin *et. al.* , 2012).

According to Markus *et. al.* (2011), U-I collaboration happened because of three forces. First, academics' decision to work with industry is informed by considerations of complementarily with academic research. Second, research considerations play a role as academics can use the funding gained from industry contracts to supplement grant from public sources. Third, firm are interested in working with high-quality academic researchers. This statement agreed by Lluis *et. al.* (2010), that mentioned in their research, public funding for corporative R&D is an effective tool for encouraging private

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research and increasing cooperation in line with social incentive. Research funding as an uncertain business and the output of R&D are not equally uncertain, but also doubtful.

Giovanni *et. al.* (2009), found that collaborations must present significant strategic, economic or financial returns. U-I collaboration must clearly be linked to personal interest and benefits such as possibilities of obtaining financing, access to physical assets and complementary competencies.

University and firm's characteristics affecting the likelihood of U-I research collaboration being formed. Firm's size, type of industry, government support and the involvement in complementary innovative activities positively affect the probability to establish collaboration with universities (Antonio, 2011).

Universities with the most successful researchers and more 'applied' universities are more successful at establishing relationship with industry. Rational forms of involvement such as collaborative research, contract research, and consulting are more widespread and relevant by firms (Markus *et. al.* , 2011). The selection of the project to be funded consists good, very good or excellent qualities are considered to be funding (Diego and Alessandro, 2011). Funded researchers have maintained relatively high levels of collaboration in the long run would prove that the program has effectively contributed to expending their research networks (Diego and Alessandro, 2011).

U-I collaboration produces scientific result that are qualitatively better and lead to superior performance compared to research that not involved in industry collaboration (Giovanni *et. al.* , 2009). Academics who receive large amounts of industry funding will publish more and more quality output (Markus *et. al.* , 2011).

Study specify that collaboration composed of heterogeneous or multi-disciplinary members had a better chance to be more productive and to produce better quality outputs (Benyamin *et. al.* , 2012). They added U-I collaboration provides opportunities to acquire

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advanced S&T and to access more sophisticated R&D facilities, to improving R&D capacity, and for increasing R&D budget efficiency.

Antonio, 2011, highlighted in his research that universities tend to act as challenging organizations, which present a great capability to recombine and integrate knowledge coming from multiple markets and technological domains. Therefore, such an adventurous character makes universities as ad hoc R&D partners for firms, allowing them to reach and acquire new competencies, necessary to innovate and to achieve a sustainable competitive advantage.

Suggestion for government is they should promote the establishment of U-I relationship and U-I collaborative R&D project (Antonio, 2011). Government also have to recognised the importance of these linkages has been through the establishment of publicly funded with the objective of stimulating industry-university links and localise economic benefits (Nola and Stephen, 2011). Diego and Alessandro, 2011, suggested that government should attribute more emphasis to the role that funding can play in creating the incentive needed to reach an optimum level of collaboration.

The creation of new channel of U-I collaboration has gain strategic relevance to university primarily because of their potential as sources of external funding. U-I should be promoted and that government should put in place all the necessary measures to ease this process, thereby helping to bring the results of academic research to market (Muscio et al. , 2012). They added that there is extensive evidence on the effects of funding on the production of innovations and on the development of U-I network.

This research is focusing on study about types of university-industry collaboration contributes to several benefits and directly lead to higher performance of R&D projects in university in Malaysia. At the same time, this study also try to identify the important characteristics should have in R&D project, in order to encourage industry to collaborate

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with university and lastly to suggest and recommend towards increasing numbers of U-I collaborations based on data analyzed.

There are many university in Malaysia will involve in this study namely Universiti Sains Malaysia (USM), Universiti Putra Malaysia (UPM), Universiti Teknologi Malaysia (UTM), University of Malaya (UM), Universiti Kebangsaan Malaysia (UKM), and others.

1.2 Problem Statement

Collaboration is a linkages and relationship of university-industry involving knowledge and technology transfer (Mike *et. al.* , 2008). Academics engage in several broad categories of technology transfer activities. There are the creations and diffusion of knowledge through publications, transmission of knowledge through teaching, and engaging in spinoffs formation and consulting services (Rejean *et. al.* , 2010).

Benyamin *et. al.* (2012) argued that even though R&D collaboration creates benefits in term of benefits especially funding, it is not easy to clearly define collaboration. It depends on purpose of forming the collaborations. But most of the time, collaboration produces better chance to be more productive and to produce better quality outputs.

Studied by Chandran (2010) showed that the benefit such as funding is an important contributor to R&D project success. He stressed that the weakness of funding channels is including lack of pre-seed and seed funding, and lack of collaboration and linkages for demand driven innovation. He added in Malaysia context, collaborative R&D activities among industries are still low.

Chandran (2010) again indicates that research benefits such as fund should support partnered approaches to new and emerging research areas. In this aspect, institutions must eventually develop a program that collaborate the industries' need for new product with a

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public university to develop concept, ideas and product to meet those needs. The major concerns include:

i. Overlapping roles of agencies with less focus effort,

ii. Lack institutional support to manage the risk of ineffective allocation and usage of fund because of overlapping roles of agencies,

iii. Missing centres to ensure and to promote industry sponsored research, and

iv. Lack of agencies in managing the accessing the impact of R&D funding and management of various government fund.

Kurtulus and Kadir (2011), have identified that the factors that been assumed to have been the source of barriers in U-I collaborations from an academician's perspective consist from eight criteria namely lack of interest from industrialist and academicians, bureaucracy, remoteness of field studies, insufficient publicity, lack of communication, ineffective legal regulations, ineffective U-I collaboration centre, and previous bad experience.

Although U-I collaboration has made important contribution, universities need to have an important role on 'entrepreneurship' on the mission of universities with respect to education and the research direction of each higher education institution (Kurtulus and Kadir, 2011).

Collaborating R&D projects will increase higher performance. Giovanni, *et. al.* (2009) convinced that U-I collaboration have qualitative-quantitative scientific performance that are invariably higher than others those does not involved with U-I collaboration. Banji and Boladale, 2012 also agreed this statement by concluding that benefits especially funding is the most critical factors that affect university performance.

Based on the problem faced by university to find funding from collaboration with industry, this study tries to explore various types of U-I collaboration formed and the

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relations of benefits to R&D performance. This study also to indentify the characteristics that should R&D project has, to encourage industry to collaborate. This study also will give suggestion and recommendation to universities in order to increase their number of research.

1.3 Purpose of the study

The purpose of this study is to explore types of university-industry collaboration and the benefits generated from the collaborations. This study also explores R&D performance affected from the benefits gained in Universities in Malaysia. Besides that, it tries to identify the characteristics should R&D project have, in order to encourage industry to collaborate with the R&D project in Universities in Malaysia, and lastly to suggest and recommend towards increasing R&D project performance based on data analyzed.

1. 4 Research Questions

The purpose of this study is to a better understanding and concern with:

i. What are types of U-I collaboration in universities in Malaysia?

ii. What are the benefits generated from U-I collaborations and the relation to performance of R&D project in universities in Malaysia?

iii. What are the characteristic should R&D project have, in order to encourage industry to collaborate with university?

iv. What should universities do in order to increase R&D's performance from collaborating?

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1. 5 Research Objectives

The key objectives on this study are:

i. To study about types of university-industry collaboration in R&D project in universities in Malaysia.

ii. To identify the benefits generated from U-I collaborations and its relation to performance of R&D project in universities in Malaysia.

iii. To identify the characteristics should R&D project have, to encourage industry supports collaborate with university.

iv. To suggest and recommend towards increasing performance of R&D project based on data analyzed.

1.6 Scope of Study

The scope of study for this research is limited to the universities in Malaysia. Each of the institution has different expertise, carries out different research activities and offered different results.

The researchers who have participated in the survey, are assessed on variables such as characteristics, barrier, good practices towards U-I collaborations. Additionally, the researcher would like to obtain or acquire the samples opinion on how collaborations can give benefits and lead to higher R&D performance.

1.7 Chapter Scheme

Chapter one is the introductory chapter consisting of background of the research, problem statement, research questions, research objectives, and the scope of study. Other than this introductory chapter, there are four other chapters throughout this report.

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