

**FACTORS DRIVEN UNIVERSITY-INDUSTRY COLLABORATION IN
CREATING VALUE FOR ECO-INNOVATION IN BIOMASS INDUSTRY**

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APPROVAL

I hereby acknowledge that I have read this works and in my opinion this works is appropriate in terms of scope and quality for the submission and award of a Bachelor Degree of Technology Management (High-Technology Marketing) with Honours.

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The thesis is submitted in partial fulfilment of the requirements for the award
of Bachelor of Technology Management (High-Tech Marketing) with Honours

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DECLARATION

I hereby declare that this thesis with the title “Factors Driven University-Industry Collaboration in Creating Value for Eco-Innovation in Biomass Industry” is my own work and has not been submitted to others.

Signature:

Name: Looi Kah Hong

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DEDICATION

Firstly, I would like to thank my family and supervisor for giving me the support and encouragement in order for me to complete the thesis report. Then, a special thanks to Universiti Teknikal Malaysia Melaka for giving me the chance to carry out and complete the research.

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ABSTRACT

Due to human being's activities on the earth, people had increased attention on the ecological footprint as the health of the earth had been stretched to a worrying limit. Many country started to explore and release programmes and policies that support sustainable development and a lot of organization started to find different ways to invest in development of eco-innovation such as through university-industry collaboration due to it is an emerging trend for representing source of advanced knowledge and propelling new technologies. Hence, this study is to identify the factors driven university-industry collaboration in creating value for eco-innovation in Melaka Biomass industry in order to motivate more industry to form collaboration with universities as the U-I collaboration in Malaysia are relatively weak. Four factors which are enhance core competitiveness, improve developmental efficiency and reduce developmental cost, promote technological capacities and improve operating performance and promoting training and recruitment of high quality personnel are going to discuss in this study. A qualitative research was used to collect information from five employees from company M. This study has showed how university-industry collaboration does co-evolved leading to eco-innovation development and the most significant factor is promoting training and recruitment of high quality personnel. As a result, this research can encourage more industry to form the collaboration with universities and develop effective R&D collaboration in eco-innovation practice.

Keywords: eco-innovation, university-industry collaboration, factors

ABSTRAK

Kemusnahan alam sekitar yang disebabkan oleh akitiviti manusia telah menyebabkan kesihatan bumi membentang ke batas yang membimbangkan. Banyak negara mula meneroka dan melepaskan program atau dasar yang menyokong pembangunan mampan dan banyak organisasi mula mencari cara yang berbeza untuk melabur dalam pembangunan eko-inovasi seperti melalui kerjasama universiti kerana ia merupakan trend yang muncul untuk mewakili sumber pengetahuan lanjutan dan teknologi baru. Oleh itu, kajian ini adalah untuk mengenal pasti faktor-faktor yang didorong oleh kerjasama industri-universiti dalam mewujudkan nilai untuk inovasi dalam industri Biomasa di Melaka untuk memotivasi lebih banyak industri untuk membentuk kerjasama dengan universiti kerana kerjasama antara university dan industri di Malaysia agak lemah. Empat faktor iaitu meningkatkan daya saing teras, meningkatkan kecekapan pembangunan dan mengurangkan kos pembangunan, meningkatkan kapasiti teknologi dan meningkatkan prestasi operasi dan mempromosikan latihan dan pengambilan kakitangan berkualiti tinggi akan membincangkan dalam kajian ini. Penyelidikan kualitatif digunakan untuk mengumpul maklumat daripada lima pekerja dari syarikat M. Kajian ini menunjukkan bagaimana kerjasama universiti-industri berkembang bersama-sama dengan pembangunan eko-inovasi dan faktor yang paling penting adalah mempromosikan latihan dan pengambilan kakitangan berkualiti tinggi. Hasilnya, penyelidikan ini boleh menggalakkan lebih banyak industri untuk membentuk kerjasama dengan universiti dan membangunkan kerjasama R & D yang berkesan dalam amalan eko-inovasi.

Kata kunci: eko-inovasi, kerjasama antara industry dan universiti, faktor

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LIST OF ABBREVIATIONS

University-Industry Collaboration	U-I Collaboration
Knowledge and Technology Transfer	KTT
Research and Development	R&D
Universiti –Teknikal Malaysia Melaka	UTeM

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CHAPTER ONE

INTRODUCTION

1.0 Introduction

Chapter 1 is about the introduction of research that provide overall view of background study about university-industry collaboration and eco-innovation. Other elements like problem statement, research questions, research objectives, scope, limitation and importance of study will also be included in this chapter.

1.1 Research Background

Due to human being's activities on the earth, people had increased attention on the ecological footprint since 1980 as the health of the earth had been stretched to a worrying limit. (Cui, 2017) There are some study believed that we can achieve sustainable development through innovation process (European Commission, 2010) and sustainable innovation is characterized as the foundation for the next industrial revolution (Braungart, 1998) and the initial theories have focused in those environmental benefit such as waste minimization and pollution control (Hellström, 2007).

Government of Malaysia started to encourage firms to invest in eco-innovation development such as Five Fuel Strategy recognized renewable energy resources as the economy fifth fuel after oil, coal, natural gas and hydro and has aimed green technology to be a drive to facilitate economy and enhance sustainable development in our country. (Yudi Fernando, 2015). One of the renewable energy source is Biomass which is biological material from living or recently living organism. As a major agricultural commodity producer, Malaysia has great potential to exploit biomass industry and owns a great position among ASEAN countries to promote use of biomass as a source of renewable energy as we has tremendous wood waste and agricultural biomass resources. (Zafar, 2018)

However, using biomass as a fuel can produce air pollution in the form of carbon monoxide, carbon dioxide, NOX (nitrogen oxides), VOCs (Volatile organic compounds), particulates and other pollutants, in some cases at levels above those from traditional fuel sources such as coal or natural gas. Black carbon – a pollutant created by incomplete combustion of fossil fuels, biofuels and biomass – is possible the second largest contributor to global warming. In 2009, a Swedish study of the giant brown haze that periodically covers large areas in South Asia determined that it had been principally produced by biomass burning and to a lesser extent by fossil fuel burning. Besides, a report by Massachusetts Environmental Energy Alliance (2009) stated that biomass is not carbon neutral and will dramatically increase greenhouse gases. Three biomass energy plants currently planned will emit 2.2 million tons of carbon dioxide a year, a 7.8% increase over 2007 carbon dioxide emission from the energy sector. All these has proved the immediate effect of biomass on environment quality is its deterioration.

In this high technology atmosphere of 21st century, innovation is crucial for an organization to sustain and they will continuously looking for ways to improve their ability to create ideas and to develop the best environment for idea creation. Therefore, since the utilization of knowledge has assumed greater importance in creating eco-innovations, collaboration across organizational boundaries has become more commonplace. According to Mike Brat and Andy (2006), collaboration is the linkage

between industry and university that involve integration of knowledge and technology. There are variety types of collaboration that consist of broad categories of technology transfer activities such as knowledge transfer through teaching and training, diffusion and creation of knowledge through publication and engagement of university and industry for the consultation service or formation of spinoffs (Rejean, Malek, Nabil, & Mathieu, 2010). University-industry (U-I) collaboration produces output in different forms, including among others, scientific and technological information, prototypes for new products and processes, skills and human capital, a capacity for scientific and technological problem-solving, and networks of scientist and technologist.

There are few driver for the industry to form the collaboration with universities. One of the drivers is to enhance the core competitiveness of the firm. Through the collaboration, universities and industry able to develop new data, method and also technology (Kurtulus & Kadir, 2011) The collaboration will enable the organization to generate new knowledge by transferring the knowledge from universities and gain broad spectrum of know-how dialogue that are important to increase their competitiveness in the market (Regina, Peter , & Franz , 2013). Next, is to improve industry developmental efficiency and reduce their development cost. Industry can pool the complementary resources and access to valuable knowledge from universities to improve their development efficiency. (Bond, Houston, & Tang, 2008; Owen & Powell, 2004). This is because no company is self-sufficient and require networking to enhance their capabilities, capacities and competencies (Taatala, Suomala, Siltala, & Keskinen, 2006) and it will facilitate the innovation when knowledge transfer occurs. (Carlile, 2004) The third drivers is promote technological capabilities and improve operating performance. According to Ekaterina (2015), the industry can access to larger extent of innovative potential based on the strong R&D capacities and innovative environment during the U-I collaboration. According to Norazimah (2016), industries realize that the researcher from universities have the ability to predict and forecast what is coming next, this by including the researcher into their team, they can get this subcultural element which provides them a commercial edge. The fourth driver is to promote training and recruitment of high quality personnel. Through the collaboration, industry can access to academic expertise which

can improve their R&D and even also product development activities (Markus, Zella, & Stephen, 2011) and these talented researcher may become their potential employees. (Norazimah, 2016)

This study however, will look into eco-innovation development through U-I collaboration. Eco-innovation relates to innovation aiming at a decreased negative influence of innovations on the natural environment. There is no generally accepted definition of eco-innovation. Various definition have been proposed in the literature since the mid-1990s (see for example Reid and Miedzinski, (2008); OCED, (2012)). There are few studies proved that companies will enjoy greater benefits in terms of research and development(R&D) and have higher productivity rates through U-I collaboration (Malairaja, 2008) as the University-based research has a close proximity to industrial innovation and affects overall R&D productivity. (Lee P. , 2012) Organization will also generate qualitatively better scientific result compare with those do not have such collaboration (Markus, Zella, & Stephen, 2011). One of the successful examples of U-I collaboration in Malaysia such as researchers from University of Nottingham Malaysia form collaboration with Malaysian industry partners to build a unique integrated zero-waste management system for pal oil mill (Emma, 2018). Government of Malaysia believed that U-I Collaboration able to foster innovation as the interaction between industry and university is considered as a strategic instrument to facilitate national and regional innovation, competitiveness, and .

1.2 Problem Statement

There are a lot of nations start to explore and release programmes and policies that support sustainable development in order to improve their citizens' health and create a better environment by lowering carbon footprint and improving air quality One of the example is the famous agreement of United Nation Climate Change Conference that was held in Paris to achieve sustainable development goals through climate. (Cui, 2017), Our

country, Malaysia has positioned green technology to become new engine of economic growth in Malaysia (Yudi, Wen, & Muhammad, 2015) and offers incentive such as soft loans and stamp duty exemptions to encourage organization to develop green initiatives (Yudi, Wen, & Muhammad, 2015). Therefore many organization have started to find different ways to achieve greener production system and invest in development of eco-innovation and one of the ways is through U-I Collaboration. Frequency and importance of U-I collaboration are increasing as it is an emerging trend for representing source of advanced knowledge and propelling new technologies. (Regina, Peter , & Franz , 2013)

However, the U-I collaboration in Malaysia are relatively weak and is falling behind compared with other countries such as China and India. (Nur Naha, Azlan, Tayebah, & Arezou, 2015) Therefore, the research aim to identify the drivers to form U-I collaboration through the different type of U-I collaboration in order to encourage more industry to form the collaboration with universities. There are also few research had studied and explored about the U-I collaboration such as (Regina, Peter , & Franz , 2013), (Frida, Alexander , & Lise, 2013). However, all these study were conducted in foreign country and the analysis are limited to quantitative aspects of innovation networks and not eco-innovation. Thus, the researcher realize there is a gap that is necessary to take the different approach, a qualitative study and stressing on analyzing the eco-innovation networks in U-I collaboration in biomass industry.

1.3 Research Questions

The research questions are fundamental parts of this research since it would decide on the area of concern and determine the appropriate methodology. There are a few questions are developed and stated as follow:

1. What are the drivers to form collaboration networks involving industry and university?

2. How university-industry collaboration does co-evolved leading to eco-innovation development?
3. Why university-industry collaboration does is important for the successful development of eco-innovation?

1.4 Research Objectives

The objective of this study was to examine the factors driven university-industry collaboration in creating value for Eco-innovation in Biomass industry. In order to achieve the research aim, the research objective were established as a guidelines through this study. The research objectives were stated as below

1. To identify the main drivers of forming university-industry collaboration toward the development of eco-innovation
2. To explore the impact of university-industry collaboration towards eco-innovation development.
3. To examine the contribution of university-industry collaboration towards the success development of eco-innovation.

1.5 Scope of Study

The scope of study for this research is to examine the factors driver university-industry collaboration in creating value for eco-innovation in biomass industry. The drivers to be identified included enhance core competitiveness, improve developmental efficiency and reduce developmental cost, promote technological capabilities and improve operating performance and promoting training and recruitment of high quality personnel. (Regina, Peter , & Franz , 2013; Fei , Jin, & Yu-SHan, 2018); Yusuf, 2008; Dooley & Kirk, 2007). Besides, this research only will get the perspective from industry. This is

because the rapid change of competition and fast moving marketplaces (Development, 2000), need of organization for innovation is increasing foster the industry to form collaboration with universities in order to enhance their capacities, capabilities and competencies. (Taatala, Suomala, Siltala, & Keskinen, 2006) One of the successful example is, a study in Colombia and Chile proves that the university-industry collaboration able to increase the propensity of an organization to patent and introduce new products. (Marotta, M, A, & K, 2007)

Besides, this research will also only focus in Biomass industry. This is because biomass is one of the most important sources for renewable energy in Malaysia. According to the Five Fuel Policy, Malaysia government had identified biomass is one of the potential renewable energy (Salman, 2011). Salman (2011) also stated that Malaysia being a major agricultural commodity producer especially in palm oil industry, Malaysia is the world second-largest producer (Star, 2018) Therefore the research would like to obtain or acquire the samples opinion on how the university-industry collaboration leads to successful eco-innovation development.

1.6 Limitation of Study

There are several limitations when doing this research. Firstly this study only focus the industry in Melaka where the respondent were mainly came from the group of employees. Thus, the drivers found in this study might be applicable for the industries and not for universities. Second limitation is this study only focus on the perception of biomass industry. Thus, in order to identify perception from other industries, further research should be conducted by selecting respondent from various industries. The third limitation is the study only conducted in Melaka state. This is because Melaka government has announced to be first green city and aim to become a Green Technology state by year 2020 (Murali, 2017). Definition of a green city is an area that is inclusive and resilient, it has ability to manage its natural resources well, reduce carbon emission to remain

competitive and improve the livelihoods of citizen (Ramesh, 2018) Therefore, the research hope to gain the perspective of biomass industry from this green cities, however the information might different from others state. Thus, further research might need to conduct in order to identify perception from other states.

1.7 Significant of Study

University-industry collaboration is crucial for skills development especially in education and training, generation, adoption and acquisition of knowledge such as innovation and technology transfer and the promotion of entrepreneurship when both parties engage together to form starts-up and spin-offs. (José , 2013) Besides Malaysia government had established variety policies to support the collaboration between universities and industries such as Knowledge Transfer Partnership (KTP) program that facilitate the integration of expertise and research finding, Graduate Employability Blueprint to boost level of graduate marketability and so on as the government believes the active university-industry collaboration will lead to positive effects on national economy (Salleha & Omara, 2012) However the university-industry in Malaysia are relatively weak , thus by understand the drivers and the value creation from the university-industry collaboration, it can facilitate the collaboration in Malaysia in order to enhance the competitiveness of universities and industries and promote the technology capacities of the nation. Other than that, this study may be used as a point of reference for future researcher to their work if there are lack of previous research regarding the factor driver university-industry collaboration in creating value towards eco-innovation in biomass industry Melaka.