UNIVERSITI TEKNIKAL MALAYSIA MELAKA

INVESTIGATION ON VIABLE KNOWLEDGE TRANSFER

This report submitted in accordance with requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor Degree of Manufacturing Engineering (Manufacturing Process)(Hons.)

by

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DECLARATION

I hereby, declared this report entitled “Investigation of Viable Knowledge Transfer” is the results of my own research except as cited in references.

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APPROVAL

This report is submitted to the Faculty of Manufacturing Engineering of UTeM as a partial fulfillment of the requirements for the degree of Bachelor of Manufacturing Engineering (Manufacturing Process) (Hons.). The member of the supervisory is as follows:

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ABSTRAK

‘Peralihan pengetahuan’ telah menjadi peralihan sebagai aliran yang pelbagai di mana ianya berkaitan dengan penghasilan pengetahuan dari akademik dan berpotensi untuk diadaptasikan kepada persekitaran di luar akademik. Kertas kajian ini adalah sebahagian daripada kajian yang luas di dalam menerokai isu-isu yang berkaitan dalam pemindahan pengetahuan dari proses inovasi. Mengikut tanggapan asas, pemindahan pengetahuan untuk institusi akademik di Malaysia adalah pada tahap yang lemah menimbulkan persoalan penting tentang masalah-masalah yang dihadapi oleh sistem pengurusan bagi penyelidikan dan innovasi dan cara yang terbaik untuk menyelesaikan jurang daripada masalah tersebut. Peralihan pengetahuan adalah satu proses yang penting bagi penyelidik dan inovator, kertas kajian telah mengenal pasti masalah yang terdapat di dalam proses peralihan pengetahuan dengan membuat analisa tentang elemen yang perlu dititik beratkan melalui boring soal selidik yang dieadarkan kepada penyelidik di bawah fakulti kejuruteraan Universiti Teknikal Malaysia Melaka (UTeM) di mana elemen berkenaan di tambahkan ke dalam model yang sedia ada sebagai garis panduan untuk penyilidik menjalani proses ‘Peralihan Pengetahuan’ dengan lebih efektif. Hubungan antara elemen tersebut telah di analisa menggunakan T-Test untuk menyelidik hubungan signifikan antara elemen tersebut.

ABSTRACT

'Knowledge transfer' has become established as shorthand to wide variety that linked the production of academic knowledge to the potential use of the knowledge in non-academic environments. This study which is a part of large study explores the issues related in transferring knowledge of the innovation processes. Under basic perception that knowledge transfer in Malaysian academic institution is still weak, the question on major problems faced by the management systems in research and innovations, improvement to solve the existing gap become, becomes crucial. As knowledge transfer has a significant important to the researchers and innovators, this study had determined the existing gap and barriers to conduct Knowledge Transfer (KT) process by analysing the critical element through surveys that had been conducted among researchers under manufacturing engineering faculties in Universiti Teknikal Malaysia Melaka (UTeM) and the lacking element(s) was added into the existing knowledge transfer model as a guideline for the researchers to conduct Knowledge Transfer (KT) process in more effective ways. The relations between the elements were analysed using T-test in order to check the significant different between those elements.

DEDICATION

To my beloved parents, W Abdul Rahman Hj W Said and Norkiah Ghazali

To my Siblings,

Wan Mohd Hilmi bin W Abdul Rahman

Wan Nadiah binti W Abdul Rahman

Wan Mohd Zahir bin W Abdul Rahman

Wan Rasyidah binti W Abdul Rahman

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"Bismillahirrahmanirrahim"

In the name of Allah, the most gracious, and most merciful...

Alhamdulillah, first and foremost, praise to *Allah S.W.T* for giving me the opportunity to complete my Bachelor's degree Final Year Project from the very beginning until the very end. Without *His* help, I would not have been able to complete my project. For my beloved parents, who have been very supportive no matter how dark the times were. Your love is the greatest gift that I ever had. Last but not least, to my nine good friends, whom I considered brothers, thank you and good luck for the upcoming journey.

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Intellectual Property	IP
Intellectual Property Management	IPM
Knowledge Transfer	KT
Research and Development	R&D
Small and Medium sized enterprises	SME
Technology Transfer Office	TTO
Technology Transfer	TT

CHAPTER 1
INTRODUCTION

This chapter emphasize the background, problems statement, objectives, scope and important of the study. Besides, it also explained information about knowledge transfer issues in academic institution.

1.1 Background

Many researchers believed that universities must have strong environment towards management system in conducting knowledge transfer of innovation process. As already know that universities are one of the institutions that act as a knowledge producers. It is important issues when the knowledge developed from the universities to be transfer to the economies sectors through innovation support in order to create a new development in nation growth. The knowledge transfer can be more effective if the interrelationship and collaboration between universities-industries occurs (Bjerregaard, 2010).

However, there is a need in seeking alternative on how the knowledge is transferred in order to support the innovation by focusing on the invention disclosure and other types of measurable forms of university-industry linkage (Agrawal, 2001).

Our education system before this had only focused on teaching and learning process. Thus, in order to face the new growth of globalization era, the perception of universities need to be change in performing universities role of learning, investigating, producing and transferring the knowledge that are produced in a better ways. (Etzkowitz, 2003) stated that amount of majority of universities in Europe, America and most recently Asia begin to adopt the entrepreneurial university model.

In this particular area, the needs of government to encourage universities in improving their research and development by exploiting the intellectual property and patents in order to be more competitive and productive like other develop countries. The goals of researcher in universities in Malaysia is becoming leaders in innovation, conducting researches approved in the world class research, becoming one of the centre of excellence that will bring benefits to the country and development of research, innovation and commercialization phase that would bring benefits to the societies (Yaacob, 2011).

1.2 Problems Statement

Knowledge transfer in Malaysian universities nowadays is in a weak position where the transfer of knowledge outside of the academic environment is still low. Chandran (2010) stated that researchers in academic institutions nowadays are accenting efforts on moving towards knowledge and innovation based economy. The point of bringing ideas from the researchers and innovators to the market sectors is now depending on the shoulder of government, universities and also industries in Malaysia as the focusing only on research and innovation is not enough to make the country to be developed. Even though the economy in Malaysia has successfully flourishing, based on the management in cost labour, existing resource and capital encouragement can no longer be the key drivers.

Although there are a lot of initiative supports from the government to strengthen the rate of knowledge transfer by stressing out programmes including providing grants, there are still gaps occurs which need to be solved. As already noticed knowledge transfer process would take longer time to be accomplished as the flow in the process is complex (Ismail et. al., 2012) that involved capital investment to be success in order to complete the filling of intellectual property (IP) and marketing the outcomes of research and development (R&D).

Associated to the discoveries of intellectual property (IP), universities management in knowledge transfer system also has a low efficiency in ensuring the commercialization opportunities. The technology transfer office (TTO) in universities is lack in skilfulness in managing the scientific discoveries from their research (Aniza et al., 2014). There are a lot of alternatives treated by the universities management on investigating the problems that occurs in the areas. Yet, there is still an opportunity to identify the ways to conduct better knowledge transfer by proposing a suitable model.

1.3 Objectives

This study aiming to achieve the following objectives are:

i. Identify the lacking elements for the researchers in conducting Knowledge Transfer (KT) process.
ii. Recognize the barriers in conducting Knowledge Transfer (KT) process towards the commercialization phases.
iii. Purpose a conceptual model based on identified lacking element/s in order to help researchers in conducting successful Knowledge Transfer (KT) process.

1.4 Scope of study

This study is conducted for the universities sector in Malaysia and it focuses more on the study of knowledge transfer phases that will be associated with the developing of new model to solve the gap. For data collection, several methods like literature search from previous studies, existing models, and questionnaire are used. The new model which will be developed can be used as a reference for further studies and research in management of commercialization process especially for the entire universities in Malaysia. The new development of new model may not be applied to the other agencies which have different data measuring conception.

CHAPTER 2
LITERATURE REVIEW

2.1 Introduction to Knowledge Transfer (KT)

Knowledge transfer (KT) is a process in which the ideas is ready to be commercialize from the academic sectors to outside of academic environment in which the idea from an innovation is transform into a profitable commercialize product. The commercialization process depends on the technology transfer, knowledge and sharing resource among the university researcher, company and also federal entities. In short, to be success in commercialization phase, the innovators must set up the market need, address ownership and disclosure considerations, identify the issues that regulated with the environment on commercialization and develop models for the commercialization plan. First and foremost, innovators must assure that the idea that created must align with the existing need in the market place.

Fletcher AC, Bourne PE (2012) stated that commercialization is much on studied subject by the academics including scientist and researcher which also involved business community who much more understand with the market sectors. In academic institutions usually they have offices where the scientist and researcher were placed in this department to develop new idea and creation of the ideas produced by the institutions. Commonly, researcher and scientist contributed research by considering whether it makes an original contribution to our understanding of the world. Commercialization of the ideas have difference rational by which to solve the problems among the users and might also gain money from the ideas itself by making a business through the development of the ideas. Commercialization of the scientific ideas is something that has become formalized in recent years in which the ideas is translating into business.

The idea that might solve the problems will create a demand among the customers who really need the kind of products. Many of products which are created and pushed into the market place without receiving any feedback from the audience. In order to avoid this kind of problems, it is important for the innovators and researcher must satisfy the distribution channels and planning ways to communicate the benefits of the new technology. According to (K Smith, 2005), commercialization is the process of transforming the ideas and knowledge into a better property for individuals, business or the society site. Commercialization is a subdivision of a broader process of innovation phase. According to the conference held by Department of Education, Science and Training in Australia in 2005, research commercialization refers to the process that generates commercial returns through the return and capital gain. The incomes are gain from the licenses and revenue from the sales of new technology development products. However, (Howard, 2005) disagree with the traditional statement and define that the commercialization is phase of the knowledge transfer that might solved the problems by discovering a new ways on developing products where interactions occurs between the customers and developer or innovators not only to gain profits but to received feedback so that the collaboration between research and innovation keep on rotating and find a better ways of producing new ideas. (Howard, 2005) discover four types of knowledge transfer which extend beyond the traditional understanding of commercialization which are stated in Table 1.

Researchers or innovators who create their own ideas must know how to protect their ideas by keeping careful records. In some cases, university or industry that created the ideas to be innovated and commercialize may require invention disclosure and no information of the ideas should be publicly disclose.

Table 1.1: Types of definition in knowledge transfer (Howard, 2005).

Types of knowledge transfer	Description
Knowledge Production	Universities and research organisations generating useful economic and social outcomes by selling or licensing the results of research in the form of commodified knowledge—directly exploiting 'knowledge products' embedded in intellectual property and other explicitly codified formats. This is a 'standard' model of research commercialisation.
Knowledge Diffusion	Universities and research organisations generating useful economic and social outcomes via encouraging the broad industry-wide adoption of research findings through communication, building capacity within industry through extension, education and training, creating standards relating to production and distribution.
Knowledge Relationship	Universities and research organisations generating useful economic outcomes by providing services that indirectly exploit broad intellectual property (IP) platforms consisting of trade secrets, know-how and other forms of tacit knowledge. This approach centres on cooperation, collaboration, joint ventures and partnerships.
Knowledge Engagement	Universities and research organisations generating useful economic outcomes as a by-product of shared interests and concerns that transcend the boundaries of the university.

2.2 Necessity for Effective Commercialization

In building effective commercialization flow, firstly need to construct an effective research and innovation flow. These will leads to a better performance for the commercialization. Many of the researcher and innovators starts to build a new

technology based new idea creation but they failed to attract the customers based on creative works and products. According to (Eric Ries, 2011) the planning of works must be done clearly and the connection must be strong among all researcher, innovators and entrepreneurs so that the problems can be solved easily and systematically. Strategic alignment in the organization "Plan, Structure, Invest and Act" will eventually help the flow becoming more systematic. Researcher and innovators also must focus on the customers and competitiveness to ensure that the ideas and products can be commercializes and ready for the market sectors. Collaboration and understanding among the leaders through partnerships with players established in each territorial market and thus capable of acting fast and decisive with tangible results and need to be proactive in seeking appropriate anchor companies which can pull through sales as partners.

2.3 Research and Development to Commercialization

Research and development has become an important approach for the development of technology according to the scientific knowledge. Through the research and development (R&D) process, the new ideas and outcomes will be generated and it is assumed as the new scientific knowledge which is discover from the three stages of research. The three stages of research are basic research, applied research and development research (Figure 2.1) also named as Research and Development (R&D) Model for technology development (Darius Mahdjoubi, 2009).

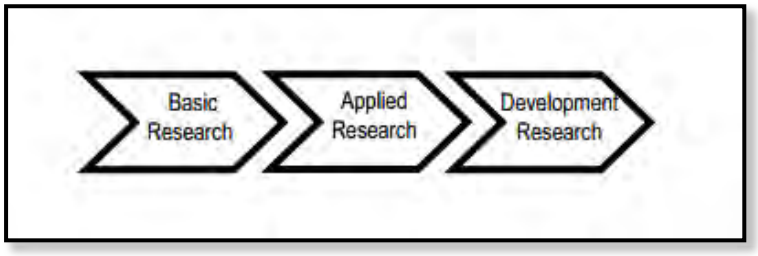

Figure 2.1: Research and Development (R&D) Model (Darius Mahdjoubi, 2009).

The relation of these three stages might develop new stages of ideas generation in innovation and then generates commercialization through the output of the innovation phases. Basic research is conducted through the understanding of nature

and its law which provides the means of resolving the important practical problems and leads to the development of new ideas but the ideas created in this type of research tends to not directly applicable to the real world. This basic research is the important scientific capital that will be continued by the applied research. Applied research will serve as the answer for the findings from the basic research that may direct the application of the ideas created to the real world before entering the last stage of research and development (R&D) model that is the development research. According to (Seels & Richey, 1994), development can be view as the "process of translating the design specification into the physical form". Thus, the development research stage is more likely towards the innovation phase before the commercialization phase takes over as shown in Figure 2.2.

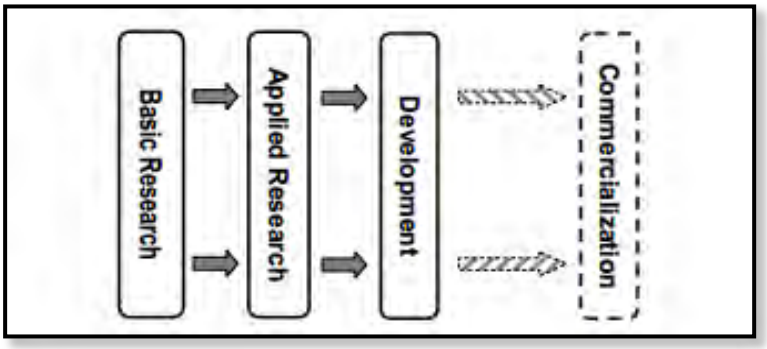

Figure 2.2: The stages of research towards the commercialization phase (Darius Mahdjoubi, 2009).

Development research attaches a variety of research methodologies and applying any tools that meets the requirements. This stage of research may involve reporting and analysing data stage. From the specific data that were collected, the innovation phase will translating all the data into specialize products to be commercialized. Relation that forms in these stages will creates a rotation after the commercialization phase received some feedback from the customers where the feedback is actually new ideas comes from the customers problems. The ideas are then will develop a new technology by conducting some research and innovates the ideas in becoming more advanced for the customers satisfaction.

2.4 Creating the Ideation Process in Research and Development

An organizations needs to be more creative in creating of new ideas to develop new products, business and solutions for the customers in order to achieved the customer satisfaction. Innovators and researchers were simply “freelancing” and works to produce new ideas on their own initiative and creativity rather than having a joint venture with other organizations to get better idea production. Robert B. Tucker, (2014) stated that almost without the exception, these ideas generations methods has been applied sporadically rather than develop them strategically, systematically and continuously. According to Streling Speirn et al, (2008) many ideas productions from innovators nowadays do not come to the intention from the management and some of the ideas not develop until the commercial success. The needs of better idea creation flow to be applied among the innovators in order to have development for the ideas to be successfully commercialize and remained systematic. Innovators must have some change in their ways of thinking in producing new ideas and paying more attention to the front end of innovation where possibilities first come to light. Thus, innovators and researchers must fortify their ideas by managing the ideas in superior idea management systems. There were several keys need to be highlight in order to produce a better flow in ideas creation which are the innovators might include more employees in the process of creating new ideas and solving the problems in the organization.

Somehow, the relations between management and customers also need to be considered when translating the ideas into products and ready to be served in the market sector. The management should spend at least 20% of their time with the customers to understand the customer’s requirement and the management also should look outside of the organization field in getting the ideas from the customers input. Other than that, the ideas also might be perform when the innovators observed from the customers activities on what they are not doing and what they are not saying which is from this situation, the innovators and researcher can gain the source from the customers frustration and find the potential ways to eliminate the problems by creating something than can helps them. Other than that, innovators also should

thinking forward not by focusing the formation of the ideas and products for the present customers but must also consider for the future the customers where the will be question whether the ideas might meet the customer's need.

2.5 Innovation of Research and Development towards Commercialization Phase

Innovation is the phase after the research and development phases which encompasses an end-to-end process and extract the value of the idea through implementation into new activities and products. Innovation is likely to adopting things that have been successfully tried by other innovators which is categories as "innovation-on-innovation" and mostly the innovators has to moving outside the existing paradigms to get the better production or development of new ideas. The ideas created from innovators must be more specific and more towards the solving problems in order to get attraction from the customers when the commercialization occurs. Innovation is considerably important in an organization as it is closely related to the productivity even though there are highly avenues in increasing productivity; innovation is the most significant factor.

The rate of economies growth might fall to zero if there is absence of support from the innovation phases where from the innovation, it can drive for the improvement of the productivity across all sectors in an organization (Gans J, 2009). Innovation should come from all section and should not be restricted to the high level of cutting edge technology. In the terms, innovation can be divided into two types which are innovation that is technological and non-technological. The technological innovation will involves the development of the new technology from the creation of the ideas while the non-technological innovation is more into the marketing and corporate sectors. In order to get more people to get involved in innovation sectors, it is better to focus on the non-technological innovation than technological innovation as the non-technological(corporate) innovation is exploiting the innovative ideas in enterprise which favourable the employees to generate innovative ideas, developing