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## A Pilot Study of Entrepreneurial Orientation towards Commercialization of University Research Products

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### Abstract

Recently, commercialization of university research products are getting attention from various sectors mostly from the Malaysian government to be as one of the key aspects that contribute to the economic growth. It is proven by developed countries that commercialization of university research products can generate income for the particular nation through the sale of R&D and innovations products. Therefore, this study attempts to investigate on the importance of entrepreneurial orientation (EO) towards the commercialization of university research products. It is believed that EO may help to improve the rate of commercialization of university research products in Malaysia. Comprehensive literature review discussed to argue the importance of EO towards the dependent variable. A questionnaire survey was conducted for this study and the questionnaire was distributed to the 30 respondents from five Research University in Malaysia. An early result shows that all constructs have good internal consistency reliability ready to be tested in the next stage.

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### 1. Introduction

Under the 9th Malaysia Plan (2006-2010), the Malaysian Government invested a total amount of RM 285 million in the form of R and D grants. Meanwhile, under the 10th Malaysia Plan (2011-2015), the government has increased

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the allocation up to RM741 million for R and D among the university for the first two years of the five years plan. The increasing amount of research grants has demonstrated that the Malaysian Government treats R and D a serious matter as it is important for the country development. R and D may help development of the nation through the commercialization of the R and D product itself. The commercialization of R and D products will contribute to the economic growth as reiterated by Pries and Guild (2004), United States and Canada are able to generate more than \$1 billion annually from the commercialization of university research between the years 1980 to 2002 with more than 2,000 new innovation based products.

R and D always are connected with the university due to the ability of university as a hub to the distribution, creation and application of new knowledge (Raja Suzana, 2011). At the university, R and D used and tested actively to create an innovation moreover if the innovation can successfully commercialized to the market, it will contribute new income for the university and also enhance the Malaysian economic growth due to the creation of new business subsequently enable Malaysia to become high income nation.

Due to that factor, nowadays the importance of commercialization of university research products from the R and D activities is important. Malaysian University currently receiving new focus from various sectors mainly from the Malaysian government to play as a vital role in supporting innovation and commercialization since commercialization are illustrated as one of the key factors that contribute to the economic growth of any particular nation. University is not only expected involve in teaching undergraduate and postgraduate student, doing R and D furthermore to commercialize their R and D products as well as to generate start-up or spin-out companies (Kamarulzaman, Hezlin, and Mariati, 2011).

After spending huge sum of money in promoting commercialization activities in the university, the government obligates high expectation upon the university researchers to take this prospect to commercialize their research products. Unfortunately, the report by the Ministry of Higher Education (2008) indicates that the performance on commercialization of Malaysia Public University research products has been under satisfaction despite the government's effort to allocate the significant amount of budget to fund R and D activities. The report highlighted that out of 313 identified with commercial potential only 58 products have successfully been commercialized from 16 public universities. This report was supported by the work of Kormin, Othman and Ahmed (2011). Meanwhile in the current report on 2010 shows that numbers of R and D projects conducted by 20 public universities have reached 2059, however only 442 products are categorized as commercially potential products and about 6 percent (125 products) are successfully commercialized. Although the data shows increasing trend as compare to the year before, it is still low and not achieve the nation target. Hence, there is an urgent necessity to address the circumstances and drive the universities to better performance level (Aziz, Harris & Norhashim, 2011).

### *1.1 Issues in Commercialization*

According to Renganathan, Yasin, Perumal, Tahir and Chelvarayan (2012) one of main problems to commercialize R and D results is lack of entrepreneurial skills. When the researchers who created the R and D products lack of entrepreneurial skill, it will lead to unmarketable product hence lead to the failure of commercialization. Therefore this paper tries to provide suggestion to the major drawbacks of commercialization (lack of entrepreneurial skills) with proposing EO in this study and test whether EO can help universities researcher to increase their research commercialization. This intention was supported by Zhao (2004) stated that if organization need the innovation products successfully commercialize, it is entails the blend of scientific, engineering, entrepreneurial and management skills. On the other hand, based on the previous literature (Lumpkin and Dess, 1996 Lumpkin and Dess, 1997, Anderson, 2009, Asikhia, 2011, Coulthard, 2007, Frank, Kessler, Fink, 2010, Kaya and Agca, 2009) that study on EO, mostly reported that EO is always having positive relationship with firm performance and able to increase the productivity of firm performance.

## **2. Literature Review**

### *2.1 Entrepreneurial Orientation (EO)*

EO has been conceptualized as comprising three dimensions as reiterated by Miller (1983) and these are innovativeness, risk taking and pro-activeness. Innovativeness is the predisposition to engage in creativity and experimentation through the introduction of new products/services as well as technological leadership via R and D in new processes. According to Lumpkin and Dess (1996), Schumpeter (1934, 1942) was among the first to emphasize the role of innovation in the entrepreneurial process. Schumpeter outlined an economic process of “creation destruction” by which wealth was created when existing market structure were disrupted by the introduction of new goods or services that shifted resources away from existing firms and caused new firms to grow. Innovativeness has become an important factor used to characterize entrepreneurship and to reflect a firm’s tendency to engage in and support new ideas, novelty, experimentation, and creative processes that may result in new products, services, or technological processes.

Risk taking involves taking bold actions by venturing into the unknown, borrowing heavily, and/or committing significant resources to venture in uncertain environment (Miller, 1983). Since Cantillon (1743), who first developed the term entrepreneur and defined this as a person who bears risk or profit or loss, risk taking has been viewed as a fundamental element of entrepreneurship (Antoncic and Hirsch, 2003). Risk taking is a quality that is frequently used to describe entrepreneurship and the degree to which managers are willing to make large and risky resource commitment, which have a reasonable chance of costly failure (Swierczek and Ha, 2003).

Pro-activeness is an opportunity-seeking, forward-looking perspective characterized by the introduction of new products and services ahead of the competition and acting in anticipation of future demand. Pro-activeness described by Lumpkin and Dess (1996) as “taking initiatives and pursuing new opportunities related to future demand and by participating in emerging market”. It also refers to the extent to which a firm is a leader or a follower and is associated with aggressive posturing relative to competitors (Fairoz, Hirobumi and Tanaka, 2010).

However, in 1996, Lumpkin and Dess provided the new dimensions of EO. They identified that autonomy and competitive aggressiveness must be included as the additional dimensions of EO. According to them autonomy is having the authority to follow through on your convictions. A more complex definition regards autonomy as the freedom granted to teams and individuals encouraging them to exercise their creativity in bringing forth an idea and being able to follow it through to completion. Thus entrepreneurs have the autonomy to make strong and decisive decisions and guide the direction of the business. Even Kusumawardhani, McCarthy and Perera (2009) are agreed with Lumpkin and Dess and suggested that autonomy offered by firms would motivate employees to work in a positive manner that could lead to higher performance. They also argued that firms cannot function entrepreneurially without giving autonomy to their employees. Their findings showed that autonomy is the most important factor for improving firm performances across industries. It is apparent that giving autonomy to all players in the organization will motivate them to act entrepreneurially, and in turn improve firm performance.

Another dimension that Lumpkin and Dess (1996) bringing out is competitive aggressiveness which is refer to an organization’s tendency to openly and intensely encounter their competitors to attain entry or improve position. Even though Lumpkin and Dess (1996) suggest these further dimensions unfortunately, some researchers are arguing that competitive aggressiveness and pro-activeness is almost similar in terms of definitions (Miller, 1983, Swierczek and Ha, 2003) therefore in this study the researcher left out the competitive aggressiveness.

## *2.2. Importance of EO towards commercialization of university research products*

The importance of EO towards business performance has been widely acknowledged in the literature. According to Zahra (2008) if the new entry wants result in high performance the firm must have a strong EO. It is supported by Wiklund and Shepherd (2003) who state that EO likely has positive performance implications for the firm. An EO can assist companies in such a process. Innovative companies, creating and introducing new products and technologies, can generate extraordinary economic performance and have even been described as the engines of economic growth. EO has also been linked to key organizational outcomes such as innovativeness, strategic flexibility and improved firm performance (Wiklund, 1999). Unfortunately, even though the strong consensus among the previous researchers regarding the relationship between EO towards business performance, there is less studies that has tested the relationship between EO towards performance of commercialization university research products. Thus, this paper proposed the importance of EO may help to enhance the rate of commercialization of university research products.

### 3. Methodology

This study applied correlational research design using a quantitative research method to determine the relationship between independent and dependent variable. At the early stage of study, in depth interview conducted as preliminary study to investigate on commercialization issues and obtained insight about the degree of the variables and dimension regarding this study from respondents. Face-to face interview executed with six researchers from Malaysian Research University recognized successful commercialize their products. As it is submitted by the respondents, construct questionnaire are design collectively with existing literature review. Subsequently, the questionnaire design has become a survey form which offers the quantitative data collection, analysis and finding. Moreover, the questionnaire undergoes two stages of test to ensure the content validity and to detect any mistake in format, wording or any confusion in the questions. First, the questionnaire discussed and pre tested by few postgraduate students and lecturers. After that it was given to the three panels of experts (commercialization expert and questionnaire design expert) and they were requested to review the questionnaire. Upon their comments, the questionnaire was amended to enhance clarity.

The respondents for this pilot study consist of 30 researchers from five Malaysian Research Universities. According to (Nunnaly & Bernstein, 1994) that was stated in Hertzog (2007) suggested a minimum acceptable number for pilot study is 30 respondents. A simple random sampling using list name of researcher at every universities used to achieve the target of 30 sample size. Around 50 survey forms distributed. However, only 35 survey forms returned. Hence, only 30 forms used due to the other 5 forms are defected for various reasons. The questionnaire was divided into five sections. Section A captured the information about respondent demographic profile and Section B covered questions on Entrepreneurial Orientation including Innovativeness, Risk Taker, Proactiveness and Autonomy and Section E covered the dependent variable of this study (only Section A , B and E are discussed in this paper). This study adopted five-point Likert scale due to the nature of the respondents who are a scientist (they are not very friendly to answer long questionnaire) and five-point likert scale is easy to understand by them due to universal method for survey collection and easy to understood and all completed questionnaire are analyzed using SPSS version 20.

#### 3.1 Findings and analysis

##### 3.1.1. Frequency Analysis

Demographic analysis has been described in terms of four different areas; gender, age, length of service and commercialization experience. Table 1 illustrated the result of frequency analysis. In term of gender, most of the respondents are male, which was accounted by 63.3% and female respondents accounted for only 36.7%. The findings showed that male respondents are more responsive to the survey rather than female respondents. Meanwhile in term of age, 30% of the respondents aged between 25-30 years old followed by 26.7% between 31-40 years old. More, 41 – 50 years old and 51 – 60 years old sharing the same percentage (16.7) and only 10% of the respondents above 60 years old. This result indicates that above 50 years old researchers are majority of the respondents.

Further, in term on length of service, 40% of the respondents served their universities between 0 – 5 years, followed by 23.3% of the respondents served their university between 11- 15 years. Another 20% more than 20 years of service, 13.3% for 6-10 years of service and only 3.3% between 16 - 20 years of service. This result exemplifies that respondent which served university less than 15 years are majority responsive to respond this survey. As a result, less in period of service indicated low commercialization experience. It is proven by 60% of the respondents answered no experience in commercialization activity rather than 16.7% respondents answered have experience commercialization.

Table 1: Frequency analysis

Item	Frequency	Percentage	Item	Frequency	Percentage
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Gender	Male	19	63.3%	Length of service	0-5 years	12	40%
	Female	11	36.7%		6-10 years	4	13.3%
Age	25-30 years	9	30%	Commercialization experience	11-15 years	7	23.3%
	31-40 years	8	26.7%		16-20 years	1	3.3%
	41-50 years	5	16.7%		More than 20 years	6	20%
	51-60 years	5	16.7%		Yes	5	16.7%
	Above 60 years	3	10%		No	18	60%
					In the process	7	23.3%

### 3.1.2. Exploratory Factor Analysis (EFA) and Cronbach’s Alpha

Table 2 reports the results of the EFA of the independent variables (Innovation, Risk-taking, Pro-activeness and Autonomy) and the dependent variable (Perception of Commercialization of university research product). The 40 items were subjected to a principle component analysis (EFA) with varimax normalized rotation. However for this paper only 32 items reported. A factor loading value of 0.60 is regarded as good and significant (Hair et al, 2006) All 32 items had value of exceeding than 0.60 with 0.855 was the higher and the lowest value is 0.607. Thus, the result shows that all constructs that achieve eigenvalues greater than one are considered as significant. After completing EFA, internal consistency reliability was evaluated by Cronbach’s alpha.

Cronbach’s Alpha was used to measure the internal consistency of the construct and to test how well the individual item correlates with each other in the construct (Sekaran, 2005). As a rule-of-thumb, a scale is consider reliable when the Cronbach’s Alpha value is at least 0.7 (Nunally and Bernstein, 1994). Table 2 shows the reliability analysis on independent and dependent variables. The constructs used in the Entrepreneurial Orientation demonstrated a highly reliable because all is above accepted level with the Innovativeness (0.737), Risk-taking (0.843), Pro-activeness (0.904) and Autonomy (0.848) and the dependent variable; perception on commercialization of university research products (0.934). Thus the result illustrate that all construct have good internal consistency reliability.

## 4.0 Conclusion

This study explored EO towards commercialization of university research products and believes EO will help university to increase their commercialization rate. The components identified for further investigation are innovativeness, risk taking, pro activeness and autonomy. Findings from the pilot study illustrate that all constructs have good internal consistency reliability ready to be test in the next stage. However, age and length of services of the respondents may influence the results of commercialization experience. Respondents who are very young and less in period of services may face limited experience in commercialization activity. Thus, in the future study, the respondents should be balance in term of age and length of services to get the better results.

Table 2. EFA and Cronbach’s Alpha

Items	Loading	Cronbach’s Alpha
<b>Innovation</b>		
In general, I prefer a strong emphasis on R&D, when I am doing my research project	0.622	0.737
In general, I prefer a strong emphasis on innovations when I am doing my research project	0.811	
I am creative in the approach of producing new product for commercialization	0.72	
I actively introduce improvement in my research approach	0.63	
I prefer to try my own unique way rather than doing it like everyone else does	0.855	
<b>Risk Taking</b>		
In order to commercialize research product, I have to adopt a strong and fearless measure	0.693	0.843
In general, I have a strong tendency for high risk projects (with chances of very high return)	0.613	
I prefer to take calculated risk with new ideas	0.646	
I am willing to invest a lot of time on something that might yield a high return	0.626	
I am willing to invest a lot of money on something that might yield a high return	0.744	
I tend to act "boldly" in situations where risk is involved	0.682	
<b>Pro-Activeness</b>		
I am excellent in identifying opportunities	0.812	

I usually act in anticipation of future problems, needs or changes	0.846	
I tend to plan ahead on projects	0.643	
I prefer to "step-up" and get things going on projects rather than sit and wait for someone else to do it	0.7	
In case of insecure decision-making situations, I adopt fearless and aggressive position to increase the chance of exploiting potential opportunities	0.611	0.904
<b>Autonomy</b>		
For successful commercialization, freedom is important for individuals to develop new ideas	0.701	
Fully delegated policy for researchers I important to support successful commercialization	0.608	
Reduced administrative bureaucracy/procedure is important to support successful commercialization	0.772	
I prefer to try my own choices of methodology or approach to commercialize rather than being determined by the university	0.67	0.848
Flexibility in working schedule contribute towards greater success in commercialization	0.776	
Financial freedom in managing research funds contribute towards successful commercialization	0.774	
<b>Perception on Commercialization of University research products</b>		
My research projects has potential to spin-off	0.607	
My research projects have potential for start-up	0.619	
My research projects have potential to receive royalties and other income from commercialization	0.653	
My research projects have potential to commercial through licensing	0.634	
My research projects have strong potential to be sold to a buyer	0.696	
My research projects have potential to secure an agreement for a development phase	0.785	0.934
My research projects have potential to secured joint grants/ agreements for commercialization	0.781	
My research projects have potential to be in the marketplace and adopted by industry	0.78	
My research projects have potential to obtain commercialization funds government and private sources	0.788	
My research projects have potential to be successfully evaluated in the commercialization evaluation phase	0.794	

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