

Effectiveness of R&D Capabilities towards Operational Performance Moderated by Intellectual Property Rights

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Abstract. The primary focus of this pilot study is to understand the relationship between firm's internal R&D and external R&D in stimulating operation performance of manufacturing firms moderated by intellectual property rights particularly patent in Malaysia. The study contains an extensive review of existing literature and data resources related to internal and external R&D in manufacturing industry in Malaysia. The study begins by presenting the context of internal and external R&D. The business case for its relationship towards operation performance of a firm is discussed next followed by description of intellectual property as a moderating variable. The survey method has been chosen to conduct this study. A pilot data based on 23 cases were then analyzed to see how the consistencies of the construct. The sector of chemical and metallurgy manufacturing firms is chosen due to its high ranking in gaining patent in the Malaysian patent statistics in year 2010. Detailed discussions on the Cronbach's Alpha obtained for the dependent variable and all variable is then being discussed. Intellectual property rights policy especially regarding patents should be part of firm's business strategy. Implementing IPR will safeguard firm's new invention, innovation or processes in the long run. Furthermore, firm may gain benefits in creating new business opportunity during various patenting stages. Effective practice of internal R&D will give advantage to the firm in three different aspects namely ability to develop and grow critical human resources, dynamic involvement in the corporate R&D program and ability to connect information wise. Therefore, relationship between internal R&D and operation performance moderated by Intellectual property rights will encourage for betterment of firms in the near future. The environment and conditions for R&D activity have changed significantly in the last decade. It is reported that the average R&D intensity for manufacturing firms rose from 2.3% in the 1980's to 7.0% in the 2000's. In 2005, Malaysian R&D expenditures growth from 5.0% to 7.0% continues to grow with strong support from the government. This shows that relatively how importance R&D investment that should be made by firm for their sustainability. This paper highlights the relationship of internal R&D and external R&D towards operation performance of a firm moderated by intellectual property rights.

Keywords: Internal R&D, External R&D, Intellectual Property Rights, Patents, Operation Performance.

1. Introduction

R&D capability is defined as ability to restructure the current knowledge and produce new knowledge (Fleming 2001; Henderson & Cockburn 1994; Kogut & Zander 1992). It also has been determined as a prime competence to differentiate between successful and unsuccessful firm performance. There are five core elements of R&D capabilities which are R&D planning, internal R&D practices, external cooperative R&D activities, coordination between internal and external activities, and IPR management.

Firms interested to gain benefit through the implementation of in house R&D or internal R&D due to the fact that they can recruit and train high-quality employees. Therefore, they will have better opportunity to gain control over the research process. In China, application of internal R&D able to help the foreign side to win over beneficial policy measures from Chinese regulators who favor innovative R&D investments (Liu & Zou, 2008).

Chan and Daim (2011) in their study have found that firms may reduce risks and cost through virtual network. When multiple individuals agreed to invest in a risky enterprise, win-win situation has to occur with the concept of risk sharing. This will reduce the burden if only one entity to cover if anything happen. Collaboration and cooperation with additional parties will also reduce amounts that need to be paid for the

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investment. Situation like this will create a healthy environment to do research efficiently. It broadens up company capacity; improve the flexibility, lower down the fixed infrastructure.

Internal R&D has been practiced by many corporations due to its less consuming funds to be allocated by the management. Therefore, it has become the most preferred choice by many corporations. Generally, firms understood that huge amount of money need to be allocated for firms to do research and development (R&D) activity.

Nakamura and Odagiri (1992) argued that external R&D may become worthless unless the firm makes conscious efforts to procure it. One way to procure the efforts is through making sacrifices in the form of payments or the allocation of its human and other resources. They argued that firm may gain benefits from external R&D without paying through spill-over.

According to Cassiman and Veugelers (2006), several reasons that attract firms to implement external R&D are: firms has the ability not to take risks of R&D own their own expense, firms ability to run away from dealing with financial constraints, and firms opportunity to gain the spill-over effects especially when the new knowledge come in to the firm. When these promising gains have com into the mind of top management of the firm, then they will evaluate the positive outcome that can be derived from external R&D practise.

Rigby and Zook (2002) found from their case studies that the strategy of opening up the innovation process to external knowledge flows, have the tendency to reduce the cost, improve the quality and faster the speed of innovation when the number of ideas to choose from increases for those responsible for innovation. Therefore, external knowledge flows has the same effect with external R&D which later on, bring favourable effect to increase performance of a firm.

From the other side, external R&D is a sign of network linkages which shows the R&D site's relationship with their external associates. External associates include research institutions, local firms, multinational firms, universities and the government. Advantage in becoming critical external associates in the local R&D network permits the R&D subsidiary to strike into critical human resources, secure additional and/or complementary knowledge and to improve / preserve its competitiveness. Asakawa (2001) highlighted that there is a connection between internal and external network linkages.

Many advantages can be derived through combination of external technology sourcing and internal R&D. Firms would be involved in multiple technological trajectories, speeded-up research direction development, and effective external skills performance. At the same time, direct contact with corresponding research and development activities that is done externally can also be utilised. As a result, it will increase effects to the internal R&D performance (Belderbos, Carree, & Lokshin, 2006; Cassiman & Veugelers, 2006).

Even though internal R&D would be able to perform successfully accompanied by external R&D and knowledge sourcing, the empirical literature came out with various interpretations. A few papers that cross-checked internal R&D and external technology sourcing in multiple scenarios concluded that there was no complimentary relationship between the two. Some even suggested that these strategies are substitutes.

IPR is a type of property that can generate financial returns which needs to be applied and granted before it can be used. Benefits of owning the property is, owner's work are being protected against infringement and has the rights over its application. At the same time, IP owner has the authority to license its work to another person or organisation to use these rights.

The license contains terms and condition on how to use the work. It also includes how much royalty that should be paid to the IP owner. The most common types of licensing agreements are exclusive, non-exclusive, compulsory, and cross licensing. Different types of licensing are design for different requirements that is needed for firms and IP owners to choose from. IP owner can also benefits IP rights through technology transfer brokerages, and through sale or transfer of ownership (Singh, 2007).

Park (2002) mentioned that there are two ways IPR can impact on firm potential output. One way is directly by affecting the technical efficiency of production. The second way is by indirectly stimulating factor for accumulation especially relating to R&D capital. This can be done by increasing the returns to investment or by the ability to appropriate those returns. These two ways (technical efficiency of production

and R&D accumulation) have become hot debates among policy makers and fellow academics. The policy maker would stress on the importance of legal perspectives for the markets to operate. The new growth and/or knowledge based economy adherents would emphasise the role of R&D, inventions and technology as the primary engines growth.

Table 1: Sorted patent granted by class 2010.

Ranking	Section	Details	Year 2010	Percent
1	C	Chemistry; Metallurgy	599	28%
2	B	Performing operations; Transporting	390	18%
3	A	Human necessities	364	17%
4	H	Electricity	328	15%
5	G	Physics	274	13%
6	F	Mechanical Engineering; Lighting; Heating; Blasting	125	6%
7	E	Fixed Constructions	75	3%
8	D	Textiles, Papers	22	1%

Source: Booklet MyIPO (2010), Intellectual Property Corporation of Malaysia, p.25.

Based on the information above, it is decided that chemical and metallurgy manufacturing firms being chosen as a respondent for this study.

2. Methodology

A pilot test was conducted to a few companies. According to Neuman (1997), a pilot study is important because it improves the questionnaires. It is used to detect weaknesses in design and instrumentation and to provide proxy data for selection of a probability sample (Cooper & Schindler, 2001). According to Emory and Cooper (1991), respondents of 25-100 are appropriate for a pilot study. The results of the pilot study should identify misunderstandings, ambiguities and useless items (Wiersma, 1993).

Therefore, several parties were contacted for an interview session in order to clarify the contents of the questionnaires. They are combination between academicians and industry player from the executive level who are representing manufacturing firms. These experts were asked to give suggestions and critiques in order to improve the questionnaires. During our meeting, they were asked to answer the questionnaires.

During the session, any ambiguity in the questions and irrelevant questions were pointed out by the respondents. Then, they were asked about the relevancy of the questions. The majority responded that the questions were appropriate. 23 sets of questionnaires were also distributed randomly to a few firms. However, only 20 responded.

2.1. Independent and dependent variable

In this study, there are two independent variables which are Internal R&D and External R&D. This IV is supposed to have a significant relationship with the dependent variable which is Operational Performance of a firm moderated by Intellectual property rights. IPR in this study is focusing on Patent and main respondents are the chemical and metallurgy manufacturing industry in Malaysia.

The research questions for the study are:

- What is the relationship between internal research and development with firm's operational performance?
- What is the relationship between external research and development with firm's operational performance?
- Does intellectual property rights moderate research and development capabilities towards firm's operational performance?
- What is the relationship between external and internal R&D, IPR and firm's operational performance?

The framework of this study is shown in the figure below:

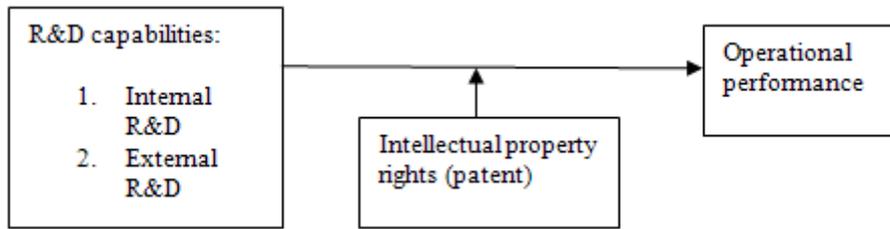


Fig 1: Research framework

3. Findings

It was found that for the dependent variable in this study which is Operational performance of manufacturing firm, with 11 items, the cronbach's alpha reported was .844. According to the statistician, value of more than .8 is considered as good. So, in this case, the high number of cronbach's alpha shows that the item has fulfils the requirement needed for the study.

Table 2: Reliability statistics for DV- OP

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.844	.846	11

Later on, when the whole sample of 20 cases being analyzed to see the value of all variables used in this study, it was indicated that the Cronbach's alpha is .943. According to the statistician, if the value is more than .9, the value is considered excellent and it really fulfils the requirement needed for this study.

Table 3: Reliability statistics for all variables

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.943	.947	67

As a conclusion, this study shows that intellectual property rights plays it role in moderating the relationship between R&D capabilities and Operational performance. Therefore, it should be noted that the limitation for the study is suitable for chemical and metallurgy manufacturing industry and it may not well suited other manufacturing sector or other scope of business element. Therefore, further research should concentrate on the other sector with different setting.

4. Acknowledgements

The author would like to thank the Ministry of Higher Education of Malaysia and Universiti Utara Malaysia for the financial support in caring out this study. To those who involve in this study directly or indirectly, your commitment and support is very much appreciated. May the God reward you with all His blessings for all the kind works that you have done.

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