ORIGINAL RESEARCH PAPER

Volume-7 | Issue-1 | January-2018 | PRINT ISSN No 2277 - 8179

INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

# THE SOLUTIONS FOR ENHANCING THE PRODUCT COMMERCIALIZATION THROUGH COOPERATION BETWEEN ENTREPRENEURSHIP WITH UNIVERSITIES

Management

**Dr. Le Nguyen Doan Khoi** Assoc. Prof. Can Tho University

## ABSTRACT

This paper aims to study how a firm's innovation strategy influences the decision to engage in R&D cooperation with Universities. Our findings show that financial difficulties, lack of information on the markets, and risk perceptions play an important role in the cooperation. We also found that innovation strategy affects the propensity to cooperate between entrepreneurship and Universities.

## KEYWORDS

Cooperation, Universities, innovation strategy

## 1. INTRODUCTION

Entrepreneurship research has primarily been concerned with the start-up of new firms. It has been traditionally viewed as individual-level activities related to creating new organizations. However, entrepreneurship has recently become accepted as a firm-level phenomenon (Teng, 2007). Entrepreneurship is relevant to managers irrespectively of the size and age of their organization. The notion of Corporate Entrepreneurship (CE) extends the idea of being bold, proactive and aggressive to established firms. It can be defined as "the sum of a company's innovation, renewal and venturing efforts" (Zahra, 1995, p. 227). CE is defined as entrepreneurship activities within an existing organization.

Firms benefit from entering into cooperative arrangements for innovation with different types of organizations. However, there is a risk in losing one's distinctive competencies through collaboration as partners can appropriate firm-specific knowledge (Hamel, 1991). Bercovitz and Feldman (2007) suggest that universities are preferred partners when there are concerns about the perceived ability to fully appropriate the results of R&D investments. This research will analyse the cooperation arrangements beteen enterprise with Universities as both are important contributors to the supply of new technological knowledge. The growing level of activity at the university-industry interface makes it imperative that we increase our understanding of this relationship. Although the firm-university cooperative relationships have been analysed in several papers (Acosta and Modrego, 2001; Bayona, García-Marco and Huerta, 2002), it has been mainly done from the university point of view (Jones-Evans and Klofsten, 1998; Azagra-Caro, Archontakis, Gutiérrez-Gracia and Fernández-de-Lucio, 2006). A remaining question is if, or how, the balance a firm maintains with the R&D conducted in-house influences the firm's proclivity to pursue University cooperation (Bercovitz and Feldman, 2007) and whether there is a different pattern of cooperation in low- and medium-technology sectors compared to high-technology industries.

## 2. THEORETICAL BACKGROUND

A common thread throughout the literature on firm strategy and performance is the wide-spread use of collaboration at all stages of the innovation process in order to accelerate innovative activities (Hall and Bagchi-Sen, 2007; Terziosvki and Morgan, 2006). Furthermore, the circular or interactive model of innovation process in which multiple relationships must be established between all the departments of the firm, as well as with external agents, means that cooperative R&D is a necessary condition to survive (Häusler et al, 1994).

Hagedoorn, Link and Vonortas (2000) describe the literature that attempts to explain, from a theoretical point of view, why firms enter into cooperative arrangements. They distinguish three broad categories of literature: Transaction Costs; Strategic Management and Industrial Organisation Theory. However, rather than mutually exclusive, these three approaches are complementary. We will use Transaction Costs and Strategic Management as a framework to analyze the main reasons that lead a firm to cooperate with Universities.

Transaction costs economics (Williamson, 1985) consider cooperation agreements as a hybrid form of organization between the market and the hierarchy that facilitates carrying out R&D activities. From this theoretical point of view, firms would engage in cooperation with U&RI to minimize cost of transactions involving intangible assets such us technical knowledge and to reduce and share uncertainty in R&D (Hagedoorn et al, 2000). Moreover, cooperation with University reduces the risk of losing control over the results of R&D projects. R&D cooperation may enhance the potential for discovery as well as the potential for a loss of control over the intellectual property generated. The outcome of joint research is often known to and claimed by both parties. However, universities have limited incentives to act opportunistically; therefore, they may be preferred as research partners when firms face appropriability concerns (Bercovitz and Feldman, 2007).

From Strategic Management perspective, firms would cooperate with U&RI to share R&D costs and risks (Hagedoorn, 1993; Tether, 2002). Innovation activities are considered risky and costly. The risk of innovation lies in the expected result not being obtained or in the necessity of more financial and technological funds (Tsang, 1998).

Firms collaborating with University can also increase efficiency, power and synergy gaining access to networks (Jarillo, 1988; Bayona et al, 2002). Collaboration with universities provides access to national and international knowledge networks. Firms can gain access to the knowledge networks in which their public partners are included (Jones-Evans et al, 1999; Okubo and Sjöberg, 2000).

For the purpose of this paper we will study how several innovation barriers affect the propensity of a firm to cooperate for innovation with University. Among these factors we considered the risks and costs associated with the innovation activities. As we have mentioned above, both Strategic Management and Transaction Cost Economics literature consider the reduction and sharing of risk and costs as a main motivation to cooperate with University. Following the literature, we also considered the lack of resources such as economic (finance), organizational, qualified personnel, and information on technology and markets. Firms will cooperate with University in order to gain access to these resources whose lack makes innovation difficult. Firms cooperate for innovations because they do not have internally all of the necessary resources.

## 3. RESEARCH METHODOLOGY

The data for this study were collected from a large sample of SMEs (150 firms). The unit of analysis is the firm and the sampling covered both manufacturing and services and excluded firms with fewer than 10 employees.

Table 1 shows the variable definition. Cooperation with U&RI is measured using a dummy variable that takes the value one if a firm reports that it cooperates with any university within the Mekong Delta, zero otherwise. We include a range of economic and internal factors that hamper innovation. Among these were the economic risk of innovation, the availability and cost of finance for innovation, organisational rigidities, lack of qualified personnel, lack of information on technology and/or markets, difficulties with regulations or standards, and lack of customers' responsiveness to innovation.

**Table 1 – Variable definition**

| | |
|---|---|
| Motivations | Factors hampering innovations |
| Risk | Importance of excessive perceived risks of innovations |
| Cost | Importance of costs of innovations |
| Financing | Importance of lack of finance for innovation |
| Organization | Organizational rigidity as a factor which make innovation difficult |
| Personnel | Lack of qualified personnel |
| Technology | Lack of information on technology |
| Market | Lack of information on markets |
| Regulations | Impact of regulations or standards |
| Customer | Lack of customer responsiveness to new goods or services |
| Innovation strategy | Distribution of innovation related expenditure |
| Internal R&D | Percentage of Internal R&D |
| External R&D | Percentage of External R&D |
| Machinery | Acquisition of machinery and equipment |
| External knowledge | Acquisition of external knowledge such as licences, patents. |
| Specifications | Design functions and specifications for production or delivery |
| Training | Training for personnel directly related to innovation activity |
| Marketing | Marketing activities aimed at the introduction of firm's innovation |
| Size | Log of number of employees |

We have also included size of the firm in our empirical analysis. Size is measured using the log of number of employees of the firm.

The methodology employed is the following: First of all, the non-parametric Mann-Whitney U-test was applied. This enables us to see whether, when industry is taken as a group variable, the two resulting samples show an equal distribution with respect to the remaining variables. We compared both types of industries (high-technology and low- and medium-technology) in terms of cooperation with Universities, motivations to cooperate and innovation strategy.

Finally, two logistic regression models for cooperation with University were tested, one for each type of industry. These models aim to explain the motivations of a firm to engage in R&D cooperation with University and the impact of the firm's innovation-strategy. The propensity of a firm to cooperate with University is them explained by its size, its motivations and its innovation-strategy.

## 4. RESULT AND DISCUSSION

Table 2 contains the descriptive statistics: mean, standard deviation and correlations of the whole sample.

Table 3 reflects the results of the Mann-Whitney U-test, which allow us to determine whether the two sub-samples are equally distributed with respect to the variables. The data reveal that amongst high-technology firms there is a great presence of larger firms. Furthermore, these firms have a greater R&D capacity, as reflected by the mean values of the variables that represent their innovation strategy. High-technology firms expend more in *internal R&D*, in *external R&D*, in *machinery and equipment*, in *training personnel* for innovation activities and in *marketing* activities directly aimed at the introduction of firm's innovations on the market. These findings reveal that firms in high-technology industries have a greater commitment to innovation.

**Table 2- Descriptive statistics**

| | Size | Risk | Cost | Financing | Organization | Personnel | Technology | Market | Regulation | Customer | Internal R&d | External R&d | Machinery | External Knowledge | Specification | Trainning | Marketing | Cooperation University |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Size | 1 | | | | | | | | | | | | | | | | | |
| Risk | -.050 | 1 | | | | | | | | | | | | | | | | |
| Cost | -.026 | .704 | 1 | | | | | | | | | | | | | | | |
| Financing | -.038 | .620 | .652 | 1 | | | | | | | | | | | | | | |
| Organization | .049 | .470 | .464 | .432 | 1 | | | | | | | | | | | | | |
| Personnel | -.024 | .511 | .545 | .500 | .565 | 1 | | | | | | | | | | | | |
| Technology | -.026 | .510 | .542 | .501 | .530 | .647 | 1 | | | | | | | | | | | |
| Market | -.033 | .534 | .535 | .536 | .517 | .593 | .738 | 1 | | | | | | | | | | |
| Regulations | .034 | .475 | .464 | .457 | .454 | .467 | .476 | .512 | 1 | | | | | | | | | |
| Customer | .013 | .472 | .464 | .415 | .430 | .445 | .466 | .512 | .498 | 1 | | | | | | | | |
| Internal R&D | .146 | .155 | .178 | .160 | .095 | .116 | .106 | .140 | .131 | .132 | 1 | | | | | | | |
| External R&D | .103 | .061 | .083 | .047 | .075 | .061 | .048 | .062 | .057 | .039 | .070 | 1 | | | | | | |
| Machinery | .025 | .124 | .169 | .105 | .089 | .125 | .097 | .101 | .087 | .072 | -.045 | .004 | 1 | | | | | |
| External knowledge | .051 | .020 | .033 | .012 | .032 | .027 | .008 | .007 | .012 | .031 | -.003 | .009 | .025 | 1 | | | | |
| Specifications | .000 | .054 | .068 | .048 | .035 | .053 | .045 | .051 | .043 | .047 | .006 | .001 | -.009 | .002 | 1 | | | |
| Trainning | .043 | .053 | .072 | .057 | .066 | .069 | .058 | .054 | .048 | .049 | .052 | .034 | .058 | .047 | .055 | 1 | | |
| Marketing | .033 | .071 | .088 | .052 | .043 | .060 | .055 | .068 | .064 | .095 | .054 | .025 | .021 | .037 | .060 | .070 | 1 | |
| Cooperation U&RI | .155 | .120 | .120 | .127 | .079 | .072 | .067 | .101 | .100 | .077 | .375 | .185 | .042 | .040 | .016 | .029 | .063 | 1 |
| Mean | 4.672 | .928 | 1.151 | .821 | .566 | .773 | .642 | .618 | .608 | .695 | 10.305 | 2.114 | 12.580 | .257 | 1.794 | 1.337 | 1.897 | .048 |
| Sd | .708 | 1.167 | 1.277 | 1.128 | .912 | 1.059 | .953 | .941 | .989 | 1.016 | 26.323 | 10.712 | 29.280 | 2.250 | 10.592 | 7.222 | 9.617 | .213 |

**Table 3- Descriptive statistics of the variables, Mann-Whitney U-test**

| Factors | Coefficient | Z-test |
|---|---|---|
| Cooperation Universities | 0.029 (0.169) | -20.247*** |
| Size | 4.647 (0.707) | -8.931*** |
| Risk | 0.890 (1.161) | -8.011*** |
| Cost | 1.107 (1.275) | -8.143*** |
| Financing | 0.788 (1.120) | -7.829*** |
| Organization | 0.558 (0.920) | -4.172*** |
| Personnel | 0.760 (1.065) | -4.254*** |
| Technology | 0.635 (0.962) | -3.625*** |
| Market | 0.595 (0.939) | -7.366*** |
| Regulations | 0.587 (0.986) | -6.857*** |
| Customers | 0.676 (1.016) | -5.987*** |
| Internal R&D | 6.363 (20.836) | -34.335*** |
| External R&D | 1.738 (10.038) | -15.695*** |
| Machinery | 12.567 (29.758) | -9.708*** |
| External knowledge | 0.247 (2.186) | -4.413*** |
| Specifications | 1.637 (10.348) | -10.197*** |
| Trainning | 1.184 (6.984) | -16.634*** |
| Marketing | 1.682 (9.367) | -15.364*** |

*** $p<0.001$

Standard deviations appear in parenthesis

As we can see in table 3, cooperation with U&RI has a different presence in both sub-samples. *Cooperation with U&RI* is significantly higher in high-technology industries. This finding is consistent with the literature (Tether, 2002) and shows that dynamic, high-technology environments encourage CE behaviour (Miller et al, 1998) and organizations often respond to challenging environments, such as dynamic environments, by taking risks, innovating and exhibiting proactive behaviours such as R&D cooperation. Sectors with high technological opportunity are associated with high-technology activities, and firms in these sectors are more frequent innovators than those in low-technology activities.

In general, the average values of the variables which represent motivations to cooperate with U&RI (obstacles faced by firms when seeking to innovate) are greater amongst those firms in high-technology industries. These findings suggest that firms in high-technology sectors have a stronger motivation to cooperate with U&RI, as they have greater mean values in all the factors analysed. In summary, the two sub-samples behave differently as regards size, innovation strategy and motivation to cooperate with U&RI.

## 8. Conclusion

Our results show that motivations to cooperate are different in high-technology industries compare to low- and medium-technology sectors. Firms cooperate with U&RI in low-technological sectors basically because they had some difficulties financing their innovation projects. On the contrary, in high-technology industries, apart from a lack of finance for innovation, firms are motivated to cooperate with U&RI as a way to reduce the risks of CE activities and to gain information on the markets. However, the innovation-strategy of the firm similarly affects in the propensity to cooperate with U&RI regarding the type of industry.

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