A Study of Effects of University's R&D Capabilities on the Technology Based Start-up

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Abstract- **Technology based start-up(hereinafter "start-up") is develop the industry, cultures and are positioned as the universal means to create new value sector in the knowledge-based economy. This is because the traditional industrial capital is changing to the knowledge-based economic environment. Recently the reason that extra attention is focused on start-up, is because they are playing the role of core to pull the growth of the existing industries and create new market and the interest of ordinary people is increasing due to the popularization of technology start-up. However, in order to make a start-up firm and grow to reach the certain level, it is important to have the superiority of item, demand of market and timeliness with the technology based on R&D. In particular, for students who starting the start-up at the university, they are influenced by the R&D capabilities of the university (infra, knowledge, technical level etc) for the development of start-up item. The entrepreneurship and start-up support program are also acting as important factors for the beginning and success of start-up. Such factors are playing the role to supplement the uncertain areas difficult for individuals to have a responsibility. This study intends to verify the effects that the R&D capabilities of university give to start-up of university students. In addition, I identified the influence by intermediary role of entrepreneurship and start-up support program and attempted the comprehensive analysis. To accomplish the purpose of the study, I formulated a hypothesis through advanced research and set the questionnaire items. For empirical study, I asked for cooperation to teachers, staffs and related persons of 43 start-up support teams are performing the start-up support projects of Korean government cross the country and carried out the research for university students who participated in start-up related programs and the questionnaires used for this study were total 435 copies. SPSS 22 was used to analyze the collected data. As a result of analysis based on the collected questionnaires, it showed that the intention of start-up, entrepreneurship and start-up support program were influenced directly by the R&D capabilities. In addition, it was identified that the entrepreneurship and start-up support program were effective as partial parameters. These results give message that the R&D capabilities had a major influence for Intention of start-up and in order to encourage high technology start-up of university students, it is needed to expand R&D capabilities of university.**

Index Terms- Start-up, R&D Capabilities, Entrepreneurship, Intention of Start-up, Start-up Support Program.

1. INTRODUCTION

Government and industries need the continuous discovery of new growth engines. To do this, the government makes efforts continuously to formulate the new market trend and build the foundation of new industry as a part of effort to cultivate the strategic and leading industrial sectors that need the concentrating cultivation. Recently as the interests are focused on start-up for the purpose of developmental effects for the existing industry and the establishment of foundation of new industry, supporting the start-up politically and systematically is recognized as the means that increase the possibility of success of start-up and give a boost to the industry. In this context, it is found that the political and systematic supports of the government for the success of start-up are important factors and there are significant correlation between economical growth rate and the level and type of start-up activities (Bosma et al., 2011). The university draw the attention to start-up through education which is its original purpose, support students to secure the start-up capabilities and play the role as the herb of start-up by supporting them to be connected with actual start-up using the R&D and start-up related infrastructure and human resources of university (Kraaijenbrink, Groen, Bos, 2010).

This study intends to verify the effects that the R&D capabilities of university influence the technology start-up of university students and in addition, we identified the influence of intermediary role of entrepreneurship and start-up support program and carried out the comprehensive analysis..

2. LITERATURE REIVIEW

2.1 R&D of university

The research and development (R&D) performed by university is defined as the creative activity performed with systematic methods to obtain new knowledge for all things including the knowledge regarding to human, culture and society or invent new applications using the already obtained knowledge (OECD, 2002; Lee, 2007). The research power and R&D capabilities of university is core factors which determine the developmental aspects of entire country and the competitiveness of country (Min, 2002) and in particular, it is shown that they had important influences in the beginning of technology-based start-up. This is the reason that it is thought that the R&D facilities, use of space and the help of advanced knowledge and technical experts will be influenced to technology start-up of university students positively.

2.2 Start-up support program

All societies are influenced by social, cultural, economical, political and technical environment. In particular, the economical and political factors have both sides of opportunities and threats to start-up entrepreneurs. If there are obstacles in the market entry, the possibility of start-up will be low and if the start-up environment is favorable, the possibility of start-up will be high as much as that (Turker, Selçuk, 2009). Like this, it is know that the political and systematic support of one country influences the start-up will of individuals and it is thought that there are significant correlation between per capita income, economic growth rate, level and type of start-up activities (Bosma et al., 2011).

2.3 Entrepreneurship

For entrepreneurship, I accepted the definition from Miller(1983) and Gatner(1985). The entrepreneurship in the step before start-up for preliminary start-up entrepreneur is defined as 'the capability of the prepared start-up entrepreneur who can lead new business successfully'. The entrepreneurship in the step after start-up for the existing start-up entrepreneurs is defined as 'the capability of entrepreneur to secure the competitive advantages for the continuous growth of enterprise'.

2.4 Intention of start-up

The intention of start-up is defined as the mind desired to perform the work that he/she wants to perform successfully (Bandura, 1977; Yun, 2004). Boyd•Vozikis (1994) introduced the definition of start-up intention based on self-effectiveness at first time, and the concept of start-up intention began to be used in the follow-up study and settled in full (Cox et al., 2002). They suggested the personal belief that the role and tasks of start-up can be performed successfully, as the concept of start-up intention.

3. RESEARCH MODEL AND HYPOTHESIS

3.1 Research Model

This study set the entrepreneurship and start-up support as parameter and the intention of technology start-up as dependent variable in order to analyze the effects that R&D capabilities of university influence the intention of technology start-up. The research model is shown in Figure 1.
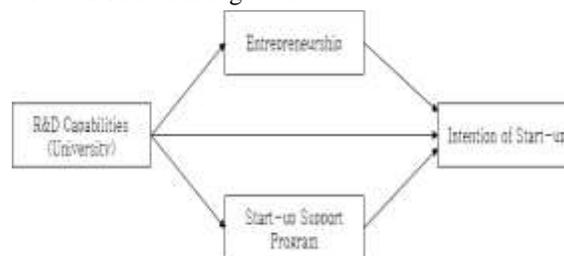

Figure 1. Research model

3.2 Research Hypothesis

To activate the start-up, the expansion of capital availability (De Bettignies & Brander, 2007), and the reduction개of individual income tax (Gentry & Hubbard, 2000) are recognized as important factors and if the support policy of government are not proper, the start-up is thought to be difficult (Baumol, 1993). The R&D is the factor that supports the fast growth of industries and enterprise (Hong, Kim, 2016) but the continuous support and follow-up as well as start-up care are needed (Kim, 2013).

Considering these aspects, it is found that the R&D capabilities of university will have important influences to technology start-up of the students belonging to the university.

In addition, the interest in government-oriented start-up is reflected as support system of university. Kraaijenbrink, Groen, Bos (2010) urges that in order to identify the start-up education of university and the effects of support objectively and clearly, it is required to measure the recognition level for start-up education and start-up support program that students receive from their university. The start-up leading university cultivation project in progress currently is the package type start-up support project based on university, supported by Ministry of SMEs and start-up (MSS – start-up Promotion Institute) where selects the university having the start-up infrastructure by area and supports the (preliminary) start-up entrepreneur for the purpose of cultivating the youth start-up enterprise by region and spreading the start-up culture. When a university proceeds the start-up support project, the MSS has an objective to strengthen the 'selection and concentration' principle to build the start-up leading university by metropolitan area and make the university perform the base function of youth start-up and initial start-up care. The existing researches (Lee, 2000; Im, Jeon, 2015) define the start-up intention as the first step of start-up process and are focused on the growth of start-up will through comprehensive start-up support program. However, this study tried to identify the effects of R&D capabilities by focusing on the initial technology start-up of students as main view points.

This study intends to set the research hypothesis below based on the above discussion and verify the feasibility of hypothesis through empirical analysis.

H 1. The entrepreneurship will serve as medium for the relation between R&D capabilities and intention of start-up

H 2. The start-up support program will serve as medium for the relation between R&D capabilities and intention of start-up

4. RESULTS OF ANALYSIS

4.1.Characteristics of Respondents for Questionnaires

To verify the hypothesis of this study, I carried out the survey by the cooperation of start-up support teams of 43 university in Korea who are performing the start-up leading university cultivation projects. The survey was carried out for students who are attending the university and have experienced the technology start-up program in progress by each university. For sample selection, I asked the persons in charge of university start-up support teams across the country to explain, distribute and collect the corresponding questionnaires and secured the questionnaires by email, or by online survey or by visiting research. The research period lasted for 45 days from May. 1, 2018 to Aug 14, 2018 and among the collected questionnaires of 528 copies, 435 copies except for insincere answers of 93 copies were used for final analysis. The characteristics of samples for this study are shown in Table 1.

Table1. General characteristics of the sample (n=435)

Assortment		n(%)
Gender	Male	228(52.4
	Female	207(47.6)
Age	21.25 ± 1.87	
Grade	1st	87(20.0)
	2nd	113(26.0)
	3rd	98(22.5)
	4th	124(28.5)
	Master course	8(1.8)
	Doctoral course	5(1.1)
Academic field	Humanity	51(11.7)
	Social science	62(14.3)
	Natural science	38(8.7)
	Engineering	143(32.9)
	Health and medical	28(6.4)
	Agriculture, fishery and marine	5(1.1)
	Art & sport	27(6.2)
	Interdisciplinary	40(9.2)
	Other fields	41(9.4)

4.2. Reliability and Factor Analysis and Correlation Analysis

For reliability verification of this study, I used Cronbach's alpha coefficient. As a result of examination of internal consistency of each variable, most of measured variables appeared more than 0.8 over the default 0.7 which shows the high reliability of measurement. The result of reliability and factor analysis are shown in Table 2.

Table 2. Validity and factor analysis results

Variable		Factor loading	Eigen value	Cumulative(%)	Cronbach's α
R&D Capabilities	RDAS1	0.816	3.972	79.98	0.885
	RDAS2	0.924			
	RDAS3	0.830			
	RDAS4	0.812			
	RDAS5	0.778			
	RDAS6	0.872			
	RDAS7	0.782			
	RDAS8	0.804			
	RDAS9	0.887			
Entrepreneurship	ETCDS1	0.858	4.334	81.85	0.934
	ETCDS2	0.764			
	ETCDS3	0.823			
	ETCDS4	0.863			
	ETCDS5	0.862			
	ETCDS6	0.885			
	ETCDS7	0.823			
Start-up Support Program	SSUC1	0.883	3.858	78.72	0.960
	SSUC2	0.843			
	SSUC3	0.824			
	SSUC4	0.828			
	SSUC5	0.779			
	SSUC6	0.897			
	SSUC7	0.821			
	SSUC8	0.843			
	SSUC9	0.865			
Intention of Start-up	ISSE1	0.808	4.228	83.05	0.926
	ISSE2	0.846			
	ISSE3	0.878			
	ISSE4	0.872			
	ISSE5	0.776			
	ISSE6	0.898			
	ISSE7	0.826			
	ISSE8	0.894			
	ISSE9	0.847			

The average, standard deviation and correlation of each measuring items consisting the research variables are shown in Table 3. As a result of analysis, it is found that the correlation between entrepreneurship and start-up support program(0.683) and between start-up support program and Intent of start-up (0.662) shows high relation relatively compared with other items.

Table 3. Descriptive statistics and correlation matrix

Variable	Mean	S.D.	1	2	3	4
R&D Capabilities	4.28	1.21				
Entrepreneurship	4.82	1.12	.298**			
Start-up Support Program	4.83	1.87	.323**	.683**		
Intention of Start-up	3.62	1.31	.383**	.396**	.662**	

Note : **Correlation is significant at the $p < 0.01$ level (two trailed)

4.3. Hypothesis Verification

First, the results of verification for H 1 'The entrepreneurship will serve as a medium for the relation between R&D capabilities and intention of start-up' are shown in Figure 2 and Table 4.

The R&D capabilities influence the Intention of start-up (B=0.154, p<0.001), and also influence the entrepreneurship (B=0.202, p<0.001). H-1 'The entrepreneurship will serve as a medium for the relation between R&D capabilities and intention of start-up' shows that the indirect effect using the entrepreneurship as a medium is 0.165 and the result value (7.27) that verified the effects through Sobel test, is more than ±1.96, which showed the effect of partial medium, resulted in supporting the corresponding hypothesis.

Figure 2. Analysis results, Mediating effects of entrepreneurship

Table 4. Analysis results, Mediating effects of entrepreneurship

Step	Variable	B (s.e)	beta (β)	t (p)	Adj·R2	F (p)
1	R&D Capabilities → Intention of Start-up	0.319 (0.02)	0.324	7.462 (0.001)	0.082	73.25 (0.001)
2	R&D Capabilities → Entrepreneurship	0.202 (0.04)	0.293	8.879 (0.001)	0.084	59.87 (0.001)
3	R&D Capabilities, Entrepreneurship → Intention of Start-up	-				
	R&D Capabilities	0.154 (0.03)	0.171	4.945 (0.001)	0.361	183.58 (0.001)
	Entrepreneurship	0.522 (0.03)	0.529	16.308 (0.001)		
Sobel test		z= 7.27 (p<0.01)				

Second, the results of verification for H 2 'The start-up support program will serve as a medium for the relation between R&D capabilities and intention of start-up' are shown in Figure 3 and Table 5.

The R&D capabilities of university influence the start-up intention (B=0.227, p<0.001), and also influence the start-up support program (B=0.249, p<0.001). H-2 'The start-up support program will serve as a medium for the relation between R&D capabilities and intention of start-up' shows that the indirect effect using the start-up support program as a medium is 0.144 and the result value of Sobel test (6.532) is more than ±1.96, which showed the effect of partial medium, resulted in supporting the corresponding hypothesis.
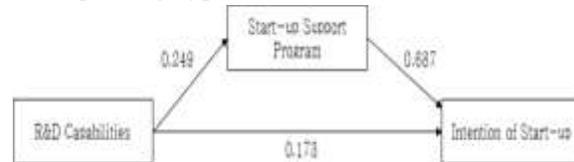

Figure 3. Analysis results, mediating effects of start-up capability

Table 5. Analysis results, mediating effects of start-up capability

Step	Variable	B (s.e)	beta (β)	t (p)	Adj·R2	F (p)
1	R&D Capabilities → Intention of Start-up	0.317 (0.03)	0.302	8.675 (0.001)	0.109	71.79 (0.001)
2	R&D Capabilities → Start-up Support Program	0.249 (0.04)	0.347	8.451 (0.001)	0.086	75.21 (0.001)
3	R&D Capabilities, Start-up Support Program → Intention of Start-up	-				
	R&D Capabilities	0.173 (0.03)	0.125	4.184 (0.001)	0.386	218.6 (0.001)
	Start-up Support Program	0.687 (0.03)	0.597	17.315 (0.001)		
Sobel test		z= 6.532 (p<0.01)				

5. CONCLUSION

This study analyzed the effects that the R&D capabilities of university influence the start-up intention of students empirically. In particular, I tried to analyze the effectiveness for start-up support project empirically by verifying the medium effect of entrepreneurship and start-up support program.

As a result of analysis, it is found that the R&D capabilities of university influence the start-up intention directly and the entrepreneurship and start-up support are acting as partial parameters, which proved the partial effects of start-up leading university cultivation project.

The existing research related to the start-up of university students considered the start-up education or start-up will as major variables but this study suggested the importance of R&D capabilities of university as the connected step of actual item development and start-up and identified that the support characteristics influenced the start-up intention. In particular, the fact that verified the effectiveness of R&D capabilities of university and start-up support program through start-up leading university cultivation project, one of the biggest start-up support project in size, can be recognized as new attempt. To expand the start-up culture and cultivate the preliminary start-up entrepreneurs, the continuous improvement and interests for R&D capabilities program of university are needed, and also need to add diversity and activities to expand the role of intermediate step of start-up education and start-up commercialization.

The qualitative study to identify the trend of change by R&D capabilities of university and identify the main momentum that led to decide the start-up is needed as a follow-up study in the future. In addition, the start-up support teams of 43 university across the country who helped the survey are using the different program of university, which is also the limit of this study. To solve such problems in the future, it is needed to combine the quantitative/qualitative study methods and also identify the programs in force individually by each university to compare the influences and effects.

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