



The Activation of University Entrepreneurship Education for Market Distribution: Implication for the Developing Countries*

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Abstract

Purpose: The importance of entrepreneurship education is increasing as interest in entrepreneurship is increasing around the world. In addition to the US and Europe, which operate advanced entrepreneurship education programs, Korea is also investing a lot of government resources for university centered entrepreneurship education. On the other hand, developing countries, which have high interest in Korea's economic development, are also trying to benchmark this Korean university entrepreneurship education. **Research design, data and methodology:** This study systematizes experiences such as training on entrepreneurship, science park management, and policy consulting for science, technology parks, and universities in developing countries. Through this, the needs of the relevant countries are analyzed based on the results of previous research, related theories, and policies. **Results:** As a result of the analysis, four key elements were derived for the establishment of entrepreneurship education and entrepreneurship ecosystem in developing countries. In addition, the details that these elements can be used in the university entrepreneurship ecosystem are presented in the form of tasks in stages. **Conclusions:** This study presents factors, including entrepreneurship-based leadership and human resources, structure and program, domestic and international network, and budget as a plan for revitalizing entrepreneurship education in developing countries.

Keywords: Technology-Product-Market Linkage, Idea-Needs-Capability, Entrepreneurship, Market Distribution Structure, Entrepreneurship Education

JEL Classification Code: D24, D39, D73, I23, L26

1. Introduction

The role of universities has expanded from education and research to industry-academia cooperation. In addition, the importance of entrepreneurship education is increasing as the demand for entrepreneurship and entrepreneurship is increasing recently. Among various definitions, Meyer & Crane (2013), who wrote 'New Venture Creation', defines it

as follows. Entrepreneurship is 'leadership that considers opportunities in a way of thinking, reasoning, and acting, approaching it as a whole rather than a part, and balancing the purpose of value creation and value utilization.' In the case of translating entrepreneurship as startups, controversy arises as to whether it is true to teach entrepreneurship to younger students when giving lectures to elementary, middle and high school students. Therefore, it is necessary to define entrepreneurship as a broad concept. In other words, if entrepreneurship is defined as 'changing ideas into values and connecting them to opportunities', it will be more receptive to all members of the organization.

Is entrepreneurship education investing hundreds of million dollars a year effective in being circulated in the market? The share of entrepreneurship education has increased year by year due to the expectation of job creation, but there are many negative opinions on its effect. Professor Carl J. Schramm (Syracuse University), who served as the president of the Kauffman Foundation for 10

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years and retired in 2011, asked whether there was a real market value in contrast to the surge in entrepreneurship classes and programs across the United States. And he has pointed out the incompleteness of university entrepreneurship education (Schramm, 2014). In other words, obstacles to entrepreneurship include socio-cultural barriers, lack of funds, and lack of education, and education has meaning as the first step to overcome them.

Previous studies have dealt with whether graduates who had completed entrepreneurship education have a higher effect on entrepreneurship and startups after graduation than students who did not. In particular, Dr. Rideout has investigated the methodology of entrepreneurship research so far and whether the results explain the effectiveness of entrepreneurship education (Rideout & Gray, 2013). She has studied entrepreneurship in depth at 12 “Innovation University” in the United States. Her conclusion pointed out that the effect of entrepreneurship education was not as great as he thought, and she emphasized the right combination of the right entrepreneurship education program and the right people as an alternative³.

Although Korea's entrepreneurship education has been around for only 20 to 30 years, the government's entrepreneurship education programs and policies have sparked the spread of university entrepreneurship education. The representative government support programs are the following: Start-up graduate school support projects supported by the Small and Medium Business Administration since 2003, and the 'Leaders in Industry-university Cooperation (LINC)' project supported by the Ministry of Education began in 2012. Based on these large-scale projects, Korea established and expanded entrepreneurship education or entrepreneurship centers at each university. In addition, the '5-year Industry-Academia-Research Plan' is also proposed to promote university start-up and entrepreneurship education.

The purpose of this study is to derive implications that can be distributed in the market while developing countries benchmark Korea's entrepreneurship education along with economic growth. In addition, as an essential factor in Korea's university entrepreneurship education, it aims to help Korea as well as developing countries. The author is a professor at the STP Education Center in Daedeok Special District (Daedeok Innopolis), and has been teaching and consulting on startups, entrepreneurship, and science park management for STP (Science Technology Park) officials in developing countries since 2008. The author is also participating in consulting for developing countries of the Institute for Science and Technology Policy (STEPI) and the Korea Development Institute (KDI), and recently visited Azerbaijan, Egypt, and Uganda to give lectures and

discussions on entrepreneurship and science parks. Based on this experience, this study aims to identify the needs of local country entrepreneurship education, and make a suggestion necessary for developing countries based on the know-how in Daedeok Special Zone and the experience of participating in the establishment of a five-year university start-up education plan organized by the Ministry of Education.

2. Analysis of the University entrepreneurship ecosystem in Korea

2.1. Korean University Entrepreneurship Education and Ecosystem

Entrepreneurship and entrepreneurship education in Korea is being activated through the support of the government. At the level of ministries, the “Five-Year Plan” has been implemented since 2013. In addition, the Ministry of SMEs and Startups has been conducting business start-up graduate schools since 2004, and is also in the process of supporting business start-up leading universities. Meanwhile, the special R&D zone is implementing the Innopolis campus support project and is expanding it to other regions.

2.1.1. Achievements and Implications of the Five-year University Entrepreneurship Education Plan

The Five-year University Entrepreneurship Education Plan was designed to solve the problems of entrepreneurship education that have been pointed out so far: insufficient quantitative and qualitative entrepreneurship education, insufficient support for entrepreneurship -friendly university education, insufficient support for entrepreneurship challenge students, and negative perception about start-up across society. As a result, academic systems related to entrepreneurship were improved, entrepreneurship education centers, etc. were established, and support for operation of related programs and facility utilization was provided. In addition, the indicators for the opening of a entrepreneurship department, the number of entrepreneurship courses, students participating in the course, and participation in entrepreneurship clubs have increased significantly. However, despite these quantitative achievements, the lack of connection to actual entrepreneurship, lack of support for graduate students, the need to spread entrepreneurship education that can affect the local community, and the need for support and education for practical entrepreneurship teachers were suggested.

The 2nd Five-Year University Entrepreneurship Education Plan aims to transform quantitative growth into qualitative growth, leading the university to lead innovative

³ Based on several interviews with Dr. Rideout during the author's study year (2015-2016).

growth and job creation. The three strategies include creating an environment where anyone can start a business, creating a foundation for high-value-added entrepreneurship, and strengthening entrepreneurship education based on universities. There are 10 initiatives to implement this: Enhancement of entrepreneurship-friendly academic system, conversion to practical entrepreneurship education, advancement of entrepreneurship club development, expansion of support for graduate students, inducement of faculty start-ups, securing the most difficult funds for entrepreneurship, reinforcement of university-elementary, middle, and high-school entrepreneurship education linkage, lifelong education entrepreneurship support promotion, strengthening university-regional startup partnerships, creating a social culture that supports startups, etc.

2.1.2. Graduate School of Entrepreneurship Support Program

Since 2004, the government has established and operated five graduate schools on entrepreneurship nationwide based on the Small and Medium Business Startup Support Act, and has selected and supported five additional universities after 10 years (Choi & Byun, 2013). Initially, there were five graduate schools in the each regions, Seoul area (Hoseo University), Gyeonggi area (Chungang University), Chungcheong area (Hanbat National University), Gyeongsang area (Gyeongnam National University of Science and Technology), and Jeolla-Jeju area (Yewon Arts University). In addition, the scale of application of these five entrepreneurship graduate schools supported \$900,000 each year for each university. Since then, five additional universities have been selected and applied. Each graduate school selected 30 students for education, and each university specializes in entrepreneurship education. In other words, it has been conducting entrepreneurship education such as specialized education for bio-life, technology start-up, and culture and art. In addition, leading start-up universities, technology start-up academies, and start-up education centers are providing entrepreneurship education, but entrepreneurship contents suitable for market distribution are insufficient. In the future, entrepreneurship education requires resources such as field research (including intellectual property rights) and funding based on idea derivation, validity verification, and business plan based on entrepreneurship. These five factors should be interconnected organically as in the Olympic symbols (Choi & Byun, 2010). At this time, the idea does not come from a specific department, so students from all departments (campus wide) should participate.

2.1.3. Innopolis Campus Support Program of Special R&D Zone

The R&D Special Zone Promotion Foundation started from Daedeok in 2005 as the ‘Special Act on Fostering

Daedeok Special R&D Zones, etc.’. Busan, Gwangju/Daegu, and Jeonbuk R&D special zones were additionally designated (2012), and 6 special zones (Ansan, Gimhae, Jinju, Changwon, and Cheongju) led by local governments were designated according to the request for designation of special zones from other regions. In addition, six were added in 2020, and there are a total of 17 special zones in Korea. The Innopolis Campus Support Project is a program that supports solving technical and management difficulties of special zone companies by utilizing the university's industry-academic cooperation capabilities and infrastructure in order to induce the participation of universities in the special zone. The university professor's experience, network and infrastructure are utilized, and excellent technologies from special zones are grafted to help support startups and corporations growth. This expansion of the university's capabilities is also very effective in supporting the growth of venture business-type SMEs that lead the R&D for high-value-added technology innovation and draw consumers' subconscious minds and demands through new ideas (Jung & Kim, 2010).

2.1.4. Korean I-Corps Program (for exploring startups linked with public technology-based markets)

The Korean I-Corps Program began in 2015 with the aim of creating economic and social values through the use of public technologies by fostering core human resources who can lead the commercialization of basic and original research results. I-Corps, the predecessor of the Korean I-Corps Project, is an abbreviation of the NSF Innovation Corps, established and supported by the National Science Foundation (NSF)⁴. NSF created in 2011 to connect scientific and engineering research findings with the technology, entrepreneurs and business community to advance science, develop technology, create social needs and economic opportunities. For the purpose of realizing the capitalization of NSF investment in basic research, it provides researchers and graduate students with an opportunity to directly learn about technological innovation and entrepreneurship. It also provides opportunities to learn and participate in the process of preparing for real-world experiences and transforming scientific and engineering discoveries to meet social needs (Choi., 2020).

The Korean I-Corps Project aims to support technology startup exploration education so that students and researchers belonging to public laboratories can lead the commercialization of technology, and aims to improve the success rate of startups. In addition, the ‘‘Lab-to-Market’’ type technology start-up education was intensively

4 In order to accurately refer to the I-Corps conducted by NSF in the United States, it must be expressed as I-Corps™.

supported so that basic and original research results from universities and research labs can be used in the market in a short time. The direction of support focuses on the search for market-linked start-ups by participating researchers to promote the commercialization of public research achievements held and researched by universities and government research institutes (GRIs). And, it's supporting a laboratory startup search team composed of university (graduate) students who want to start a business through research results and commercialization (Hong, Choi, & Jang, 2017; Lee, Choi, & Choi, 2021).

2.2. Field Research and Status of the Global Entrepreneurship Index (GEI) in Developing Countries

The Global Entrepreneurship and Development Institute (GEDI) measures and publishes the Global Entrepreneurship Index (GEI) annually in 137 countries. The GEI, measured by a total of 14 indicators, includes entrepreneurial attitude (opportunity awareness, entrepreneurship competence, risk acceptance, networking, cultural support), entrepreneurial competence (foundation opportunity, technology acceptance, human capital, competition). And it is composed of entrepreneurial aspirations (product innovation, process innovation, high growth, internationalization, venture capital). The GEI also refers to the level of entrepreneurship and entrepreneurship environment (ecosystem) in the target country. Korea's 2019 GEI, which is receiving high attention from developing countries for entrepreneurship and entrepreneurship education, is 58.1 points, ranking 21st out of 137 countries.

Based on the demand for Korea's entrepreneurship and entrepreneurship education in developing countries, the author visited institutions and universities in 11 countries (Azerbaijan, Egypt, Uganda, Iran, Indonesia, Uzbekistan, Kazakhstan, Mongolia, Vietnam, Ecuador, Thailand) to lecture and discuss university entrepreneurship education. In addition to the discussion, the following Table 1 summarizes the status of visits by universities and institutions in these countries and the GEI.

The following <Figure 1> summarizes the measurement results of the developing countries and Korea's 2019 GEI and key indicators (entrepreneur attitude, ability, aspiration).

Among them, Thailand and Azerbaijan, which show relatively high levels of entrepreneurship, show strengths in the areas of entrepreneurial competence, such as entrepreneurial skills, including opportunities for entrepreneurship, education, and labor market levels, rather than entrepreneurial attitudes and aspirations. The overall GEI is low, but Egypt also showed higher entrepreneurial skills compared to other sectors. On the other hand, in

Indonesia, Kazakhstan, Uganda, and Ecuador, similar to Korea, entrepreneurial aspirations, including new technologies and new products, financing and strategies, scientific and technological capabilities, and capital market level, were higher than the average GEI. In addition, Iran and Vietnam showed higher levels of entrepreneurial attitude, which means recognition of opportunities and competencies, quality of education, and cohesion of related infrastructure, rather than entrepreneurial competence or aspiration.

Table 1: Survey on the status of entrepreneurship education: status of developing countries (interviews) and GEI

Country	Visiting institutions and universities	2019 GEI (rank)
Azerbaijan	ANAS-HTP, Pharmaceutical University, Baku Institute of Technology	32.1(56)
Egypt	STP-ERI	24.6(81)
Uganda	University of Kampala	14.8(125)
Iran	Isfahan University of Technology	29.4(64)
Indonesia	LIPI, Bandung Institute of Technology (ITB)	26.0(75)
Uzbekistan	Karshi State University	-
Kazakhstan	University of Nazarbaev	31.0(59)
Mongolia	MUST (Mongolian University of Technology)	-
Vietnam	Danang Techno Park	26.0(73)
Ecuador	Quito University	18.5(105)
Thailand	TMUTT	33.5(54)

Source: Organized by the researcher.

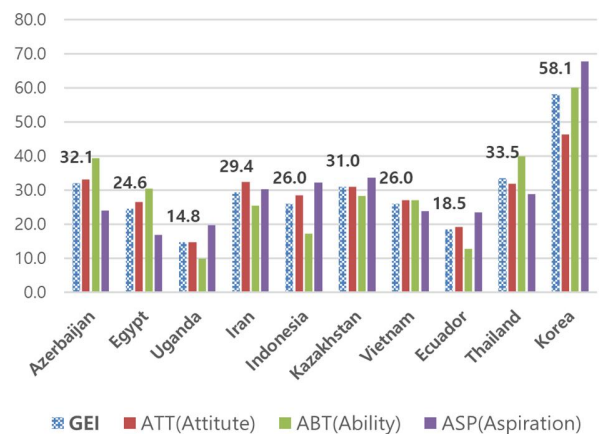


Figure 1: GEI status by country in 2019

Source: GEDI (2019), *The Global Entrepreneurship Index 2019*, rearrangement.

3. Plan to Revitalize Entrepreneurship Education in Developing Countries

3.1. Entrepreneurship Education from the Distribution Perspective of Technology-Product-Market (TPM) Linkage

In order to seize business start-up opportunities based on good ideas (discover new business), R&D-oriented technologies and products, and strategies to lead them to the market, that is, close T-P-M connectivity are required. In particular, in order to overcome the Valley of Death (VOD) that exists between R&D activities and commercialization in the process of commercializing the research results created, above all, it is necessary to have the entrepreneurial spirit ability to effectively secure and utilize limited resources (See <Figure 2>).

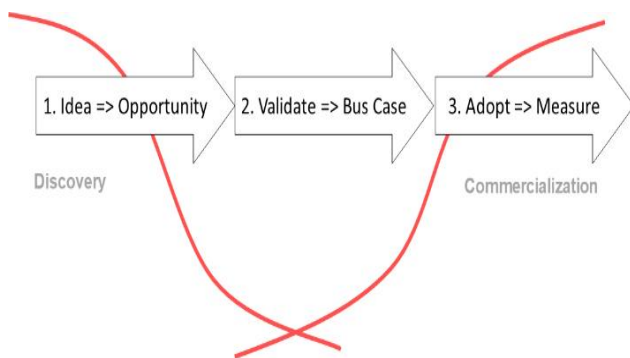


Figure 2: VOD countermeasures

Source: Markham & Mugge (2015), rearrangement.

In addition, for this, developing countries should also establish and promote measures to revitalize entrepreneurship and entrepreneurship education at the national level. Looking at entrepreneurship education from the perspective of TPM (Technology, Product, and Market) connectivity, technology can be viewed as knowledge related to entrepreneurship, products as educational contents, and market as learners' needs. According to the World Bank report, Entrepreneurship Education and Training (EET) programs are largely divided into entrepreneurship education and entrepreneurship training, and the main criterion for this classification is learners. Therefore, it is necessary to develop a entrepreneurship education program that reflects the characteristics of learners, which are the subjects of the curriculum, and this has a direction consistent with the trend of personalization of related educational contents as the non-face-to-face education environment expands along with the 4th industrial revolution.

3.2. Common Requirements for Entrepreneurship Education

Regarding university-centered entrepreneurship education, the common requirements of the 11 developing countries that were previously visited and interviewed can be summarized into the following seven (See <Table 2>).

Table 2: Developing country requirements related to entrepreneurship education

Contents	Requirements	Implication
Discovering new business opportunities with high added value	Transition from resource-oriented to new technology base	Entrepreneurial leadership
Build an entrepreneurship culture	Creating a challenging and risk-taking culture	
Expansion of entrepreneurship education	Development and introduction of startup education algorithm	Entrepreneur-oriented program
Training entrepreneurship educators	Training start-up education experts	
Expansion of faculty start-ups	Promoting startups of professors and researchers	Secure domestic and foreign networks
Participation in startup education by local communities	Measures to secure EIR, etc.	
Securing of funds	Securing angel funds, VC, etc., and contributing to university finance	Securing the budget

Source: Organized by the researcher.

- (i) Most developing countries are countries rich natural resources (such as petroleum underground), recognizing the problems caused by the depletion of resources and seeking a transition to a new technology-based industry, and among them, the desire for entrepreneurship was found to be strong.
- (ii) In terms of culture, there was a strong desire to pursue risk and build a culture, a shared value that is more receptive to failure.
- (iii) It was imperative to develop entrepreneurship by teaching entrepreneurship and entrepreneurship, to develop educational algorithms for this, and to introduce educational programs from advanced countries.
- (iv) Training of educators who can teach well is necessary in education above all else, and in particular, training of entrepreneurship education experts with theories and

experiences is required.

(v) In the case of technology start-ups, it is pointed out that the technical skills such as R&D and patents are very important factors, and the researcher and faculty who possess them are pointing out the lack of interest in startups.

(vi) Although the participation of local entrepreneurs and various services are necessary for start-up education, there is a lack of awareness and the motive of participation, and there is a need for a plan for securing various local entrepreneurs of start-up management (E.g. Executive in Residence: EIR).

(vii) The government's policy and private participation in funding for early start-ups, such as angels, are required, and the results of start-ups are utilized by universities and the university's financial aid is also expected.

The above seven needs are summarized as follows, and four implications are derived.

3.3. Plan to Revitalize Entrepreneurship Education in Developing Countries

The following four factors are pointed out as important factors in order to revitalize entrepreneurship education in developing countries (Choi & Markham, 2019; Rideout & Gray, 2013; Barr et al, 2009).

The first is to secure stable entrepreneurial leadership and human resources. Frequent replacement of university presidents generally hinders sustainable leadership. In addition, if a bureaucratic leader is appointed, it is difficult to expect active university start-ups and entrepreneurship promotion. Therefore, it is necessary for a leader who has experienced entrepreneurship to serve in the long term to clarify the direction of the organization based on stable and entrepreneurial leadership. At the same time, in terms of human resources, it is necessary to strengthen the competence of incubation leaders and managers and to retain excellent talents.

Second, it is the design of the entrepreneurial program and structure for market distribution linkage of entrepreneur-oriented program. In order to revitalize university start-ups, a professional start-up education program that can strengthen entrepreneurship is necessary, and a new start-up discovery team and a business incubation team must be formed to actively discover and support researchers and graduate students (post-doc.) entrepreneurs. In addition, the entrepreneurship education program needs to be designed according to the situation of the university by developing or introducing programs related to start-up source development, start-up capability enhancement, and business incubation. And for this, <Figure 3> show INC (Idea, Needs, and Capability)-based

systematic curriculum, such as identifying customer's unmet needs, securing realization capabilities, and discovering unique ideas (Markham & Mugge, 2015).

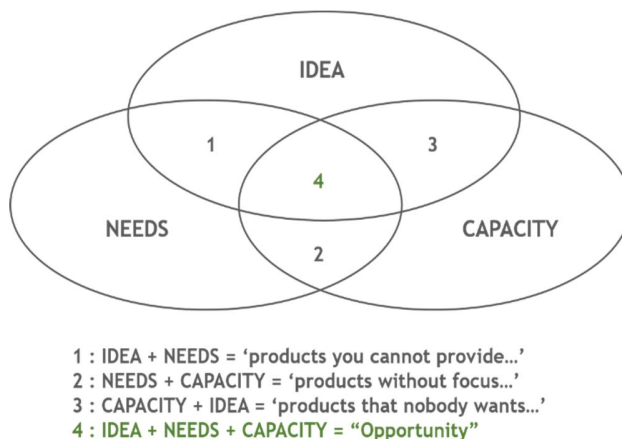


Figure 3: Entrepreneurship Education Contents: INC Education Perspective

Source: Markham & Mugge (2015), rearrangement.

Third is to secure domestic and international networks. In order to strengthen entrepreneurship capabilities through entrepreneurship education and lead to successful entrepreneurship, close cooperation with entrepreneurship and incubation institutions in the country is required. Therefore, it is necessary to find ways to share and utilize human and material resources based on official cooperation with relevant organizations in the country. For example, a more flexible approach is needed, such as sharing their tacit knowledge by using professionals related to entrepreneurship as a community concept as an informal advisor (eg, EIR). In addition, connection with overseas institutions is very important, and it is necessary to establish exchanges with various start-up and entrepreneurship institutions (Kauffman Foundation, Entrepreneurship Agency, Youth Entrepreneurship Foundation, etc.) in Korea and the United States, and promote personnel dispatch. Based on this, it is necessary to introduce education and business incubation programs of overseas institutions and develop them into their own programs in the mid to long term. Fourth is to securing an appropriate budget. In order to revitalize university start-ups, it is necessary to expand a limited range of budgets step by step based on the leader's willingness for start-up and entrepreneurship. In particular, it is essential to secure competitive labor costs and expand the budget for support programs, and it is also effective to receive support through linking with overseas institutions and programs (in the case of Korea, STP education of Innopolis and ODA programs in STEPI and KDI). These factors are summarized in the following <Table 3>.

Table 3: Factors for the establishment of entrepreneurship education and entrepreneurship ecosystem in developing countries

Entrepreneurship Ecosystem Elements	Contents
1. Leadership and Human Resources	<ul style="list-style-type: none"> - Stable and entrepreneurial leadership of university presidents, deans, and major department heads - Enhancement of manager's capabilities - Securing, maintaining and developing entrepreneurship - Reinforcement of compensation for internal personnel - Discovery and support of faculty champions in university - Support for young researchers (graduate students, postdocs) - Providing opportunities for international cooperation
2. Market Distribution Linkage Program of Entrepreneur- oriented Program	<ul style="list-style-type: none"> - Establishment of various organizations (Entrepreneurship education center, Business incubation, etc.) related to start-ups within the university - Coordinating role of decentralized startup-related organizations - Startup support and business incubation team structure - Entrepreneurship education program development: based on the connection of ideas, needs, and capabilities - Developing startup-related programs: developing startup sources, strengthening startup capabilities, and incubation program - Introduction and translation of foreign entrepreneurship education programs (US TEC, etc.) - Secure start-up risk capital program - Expansion of business incubation structure: pre-incubation, incubation, post-incubation - Post Doc StartUp program
3. Network and Logistic Network: Domestic and International	<ul style="list-style-type: none"> - Close cooperation with local start-up and incubation organizations (Science Park, private start-up support organizations) - Linkage with overseas institutions: organizations related to startups in Korea and the United States - Expanding the level of researcher awareness by strengthening external publicity - Establishment of an international logistics system for technology and knowledge related to entrepreneurship
4. Secure the Budget	<ul style="list-style-type: none"> - Efforts to strengthen access to the budget and link with related businesses - Linkage of support from overseas organizations - Securing shares and donating shares of successful faculty startups - Securing research fund related to entrepreneurship and business incubation: Industry-academia-research cooperation - Securing/linking funds related to start-ups (Angels, etc.)

4. Conclusion

The implications of the university entrepreneurship education ecosystem for developing countries are summarized as follows, focusing on the factors for establishing entrepreneurship education and entrepreneurship ecosystem in developing countries and tasks for each stage of growth as discussed above. This is a factor to consider when establishing an entrepreneurship education ecosystem not only in developing countries, but also in Korea (Choi & Markham, 2019).

First, it is important to secure leadership and human resources based on entrepreneurship. Leadership in university comes from professors and administrators. Leadership also appears from top-down and bottom-up, and affects entrepreneurship education across the campus.

These leaderships create a culture that allows the industry to naturally participate in the entrepreneurial ecosystem. University leaders create vision and culture, and support faculty champions to effectively conduct entrepreneurship education. Industry leaders create the cornerstone of entrepreneurial activities through deep immersion as a corporate champion. Corporations engage in the universities and governments through project proposals so that universities can immerse themselves in entrepreneurship. Local government leaders are also “policy champions” who lead economic development through tax and regulatory issues. These leaders and champions look for opportunities in new fields, and they use these opportunities to create organizations and devote resources. This is linked to the discovery of new business opportunities and establishment of an entrepreneurship culture among the seven needs of developing countries.

Table 4: Factors for the establishment of entrepreneurship education and entrepreneurship ecosystem in developing countries

Task / Stage	Foundation Building	Leap	Growth
Leadership and Human Resources	<ul style="list-style-type: none"> - Stable leadership of the president - Enhancement of business incubation manager capacity -Securing, maintaining, and developing incubation and entrepreneurship experts -Research institute faculty champion discovery and support -Focus on young researchers inside (graduate students, etc.) -Providing opportunities for international cooperation 	<ul style="list-style-type: none"> -President's entrepreneurial leadership - Reinforcing the capacity of leaders of business incubation -Additional acquisition and development of business incubation and entrepreneurship experts -The highest compensation for internal personnel -Research Institute Post-Doc discovery and support - Expansion of international cooperation opportunities 	<ul style="list-style-type: none"> -President's continuous entrepreneurial leadership -Spreading leaders of business incubation within their own country -Achievement of global competency and compensation level of internal personnel -Securing global level talent
Structure and Program	<ul style="list-style-type: none"> -Entrepreneurship education and business incubation team system -Introduction and acquisition of business incubation programs: development of start-up sources, reinforcement of business start-up capabilities, and successful incubation managing -Preparation for introduction of foreign entrepreneurship education program -Enhancement of understanding of risk capital -Expansion of business incubation centers: Pre-incubation, incubation, and post-incubation -Post Doc StartUp program recognition 	<ul style="list-style-type: none"> -Introduction of business subsidiary system specialized in entrepreneurship education and business incubation -Transformation and utilization of business incubation programs: development of start-up sources, reinforcement of business start-up capabilities, and successful incubation managing -Translation of foreign entrepreneurship education program (eg, TEC, etc.) - Introduction of risk capital program -Securing profits for business incubation centers: Pre-incubation, incubation, and post-incubation -Post Doc StartUp program expansion 	<ul style="list-style-type: none"> -Entrepreneurship education and business incubation division system establishment
Domestic and International Network	<ul style="list-style-type: none"> -Close cooperation with domestic start-up and incubation organizations -Foundation for cooperation with startup experts -Expanding the level of researcher awareness by strengthening external publicity: Raising Awareness (Enterprise Culture in the UK) 	<ul style="list-style-type: none"> -Achievement of practical cooperation with domestic start-up support organizations -Achievements of cooperation with startup experts -Strengthening connection with overseas organizations: Korea, United States, etc. 	<ul style="list-style-type: none"> -Establishment of the central axis of domestic start-up and incubation network -Strengthening the network of global cooperation
Budget	<ul style="list-style-type: none"> -Gradual expansion of the total budget -Efforts to strengthen accessibility of local governments/organizations -Linked with support from a small number of overseas organizations - Rent assistance and support -Securing research expenses related to entrepreneurship education/business incubation: industry-academic-research cooperation 	<ul style="list-style-type: none"> -Increase the proportion of start-up/incubation within the budget -Securing a new budget and realizing connection results -Linkage of financial support from various overseas organizations -Creation of income sources (equity, etc.) other than rent -Expansion of research expenses related to start-up and business incubation: Linking to large corporations such as oil-related companies 	<ul style="list-style-type: none"> -Securing the budget and strengthening its own revenue source -Diversification of long-term budget sources (domestic and overseas) -Linkage and support with multinational companies

Source: Organized by the researcher.

Second, it is the design of student-centered programs and structures. Students are a core asset of entrepreneurship in the era of the Fourth Industrial Revolution, and universities should develop entrepreneurship programs and provide them to students at an appropriate level. Entrepreneurship regular curriculum includes subjects, majors, minors, and certifications, and irregular curriculum activities include competitions, company visits, and clubs. Through these courses and activities, students can secure the confidence of entrepreneurship and lead to career development. The industry should cooperate in the development of entrepreneurship and actively create opportunities to visit university students. When field practice is activated, students experience practical specializations and narrow the gap between the theory-centered classroom and actual business activities. The government will also be able to increase entrepreneurship by cooperating with local organizations and corporations to expand on-the-job training. For example, apart from the Korean I-Corps program, policies for women and out-of-school youth are also needed. This student-centered program development reflects the needs of developing countries for entrepreneurship education, as discussed above.

Third, it is the development of best practices by fostering faculty and student champions. In the case of Korea, as a result of a comparative analysis of university start-ups between professor and student start-ups, the results of faculty start-ups in terms of employment were relatively excellent.⁵ This suggests that faculty start-up is a very important factor in university startups in terms of economic as well as social ramifications. Nevertheless, the lack of participation of professors in entrepreneurship education is due to lack of interest, time constraints, and traditional evaluation criteria. Therefore, it is necessary to provide appropriate time and research year, and to change the evaluation to be entrepreneurial-friendly. It is also necessary to develop subjects for professors and funding for faculty startups. The industry is also required to participate in subject development and serve as a mentor, as well as providing opportunities to participate in corporate projects and 'teacher internships'. In particular, it would be helpful to revitalize the 'professorships in entrepreneurship (PIE)', which is named after local corporations. Entrepreneurship research support and funding from local governments, and support from industry-academia-government entrepreneurship centers are also needed. This suggests that the related system needs to be improved based on the importance of faculty startups mentioned above.

Fourth, securing the budget. The local community will be

able to contribute by developing joint programs such as competitions and lectures with universities, and creating an e-clinic like a hospital. At this time, the industry serves as a sponsor, and technical and business experts meet to create a university entrepreneurship program. Local governments should also provide spaces for faculty, students, and entrepreneurs to meet, create joint investment funds, and attract companies to settle in the region. It is important to design a plan that contributes to finance for university start-ups using angel funds, venture capital, etc., based on the results of analyzing the needs of developing countries previously.

This study examined related prior studies and cases for more effective start-up education, and in particular, analyzed the needs of developing countries for start-up education to derive implications. Eventually, the four factors (Securing leadership and human resources, designing programs and structures, best practices for training champions, securing budgets, etc.) will be realized through close cooperation between industry and academia, that is, Triple Helix, which will accelerate the innovation of university campuses. However, there is a limit to the representativeness of the analysis target, and follow-up studies are needed to derive a plan for the Korean case to operate in a form that can be distributed locally. In addition, in order to establish entrepreneurship education and entrepreneurship ecosystem in developing countries, it is practically difficult to proceed with the above-mentioned elements at once, so it is necessary to approach in three stages of foundation building, leap and growth as shown in the following <Table 4>.

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