Journal of the Korea Academia-Industrial cooperation Society
Vol. 20, No. 3 pp. 338-352, 2019

https://doi.org/10.5762/KAIS.2019.20.3.338
ISSN 1975-4701 / eISSN 2288-4688

A Study on Obstacle Factors of Global Start-up Promotion

Seol-Bin Lee

Dept. of Industrial Management, College of Business, Gyeongsang National University

글로벌 스타트업 육성에 따른 장애요인 분석

이설빈

경상대학교 산업경영학과

Abstract This study was empirically intended to determine obstacle factors of the global start-up promotion for the international inroad of global start-up companies. The statistical analysis of reliability and validity was conducted through the AMOS structural equation model after surveying 300 companies over 5 years old into start-up in metropolitan cities across the country. The findings are as follows. The global start-up growth had a very close relationship with capital, product development period, quality and human resources. And capital as a start-up obstacle factor was insignificant, but development period, quality and human resources had a close relationship with industrial competitiveness. Even in the mediating effect of start-up obstacle factors on industrial competitiveness, capital was rejected, while quality, development period and human resources were adopted, having a positive mediating effect. These results demonstrate that capital is not a big obstacle to the management because of the continuous support of the government due to the nature of start-up companies, but growth is in a remote future as long as there is no independent product competitiveness to maintain the quality of products at a certain level and support of professional workforce to develop and commercialize them.

요 약 본 연구는 글로벌 스타트업 육성에 따른 국내 스타트기업의 해외진출을 위한 장애요인을 규명하기 위한 목적으로 실증조사 하였다. 조사방법은 스타트업으로 참여한 전국 각 지역별 광역시에 소재한 5년 이상 된 기업 300개 기업을 대상으로 조사 후 신뢰도 및 타당도 분석과 동시 구조모형에 의한 AMOS 구조방정식으로 통계 분석하였다. 그 연구결과를 보면 다음과 같다. 글로벌 스타트업으로 성장하기 위해서는 자금, 제품개발기간, 품질, 인적자원이 매우 밀접한 연관성이 있음을 실증해주었다. 그리고 스타트업 장애요인으로서의 자금요인은 유의하지 않았으며 개발기간과 품질, 인적자원은 산업경쟁력에 밀접한 연관성을 가지고 영향을 미침을 입증해주었다. 또한 스타트업에서의 장애요인이 산업경쟁력에 미치는 매개효과에 있어서도 자금요인은 기각된 반면, 품질과 개발기간 및 인적자원 요인은 채택되어 긍정적 매개효과를 있음을 실증해 주었다. 이는 스타트업 기업들의 특성상 자금 요인은 정부의 지속적인 지원으로 인해 경영에 큰 걸림돌이 되지 않으나 제품의 질을 일정 수준 유지하기 위한 독자적 제품 경쟁력과 이를 개발, 제품화 시켜주는 전문 인력의 뒷받침이 없는 한 성장이 요원함을 입증한 것으로 평가할 수 있다.

Keywords : Capital Financing, Development Period, Human Resources, Obstacle Factors, Start-Up, Quality

1. Introduction

Recent domestic start-up has been growing rapidly in the high-tech field by national intensive promotion policy. Global private investment in start-up is currently up 3.6 times from $ 45.3 billion in 2012 to

*Corresponding Author : Seol-Bin Lee(Gyeongsang National Univ.)
Tel: +82-55-772-1515 email: sblee777@gnu.ac.kr
Received December 10, 2018 Revised January 3, 2019
Accepted March 8, 2019 Published March 31, 2019

$ 164.4 billion in 2017 over five years. Unicorns such as Uber, Airbnb, and Xiaomi - which lead the high-tech fields such as e-commerce, Internet service, and FinTech - have led employment creation since the financial crisis[1].

However, the domestic start-up industry is growing fast, but it is still at an early stage compared to the global start-up industries such as Silicon Valley, London and Singapore. The Global Startup Ecosystem Report to be released recently says that the Seoul start-up ecosystem is worth $ 2.4 billion, ranking 27th of the 45 areas surveyed. Given that GDP of the Seoul metropolitan area is third among 45 areas, the start-up ecosystem scale is much lower than the economic scale[2,3].

One of the causes why the start-up industry in Seoul is undervalued is the poverty of exchange with the overseas start-up industry. The international comparison of the number of significant global links with the advanced start-up industry showed that the start-up in Seoul was the lowest in the world by an average of 2.1 links per enterprise(global average of 6.3). As such, networks with overseas ecosystems are in urgent need of establishing a venue for exchange of overseas information, since startups are not only mentored or invested initially, but also have a significant impact on subsequent Scaling-up[4].

As of December 2017, the new government has announced “Plan for Innovation and Entrepreneurial Start-up Ecosystem Creation” for new economic growth along with income-driven growth for innovation growth to put the start-up support at a key task of the Moon Jae-in government's innovation growth policy.

The innovative start-up is born on good soil. The promotion of an innovative start-up through the discovery of opportunity needs the creation of an innovative ecosystem based on the private and public cooperation. The reason is because the innovative ecosystem is a precondition for the promotion of innovative start-up[5].

Professor Mariana Majukato in UK emphasized not new firms or start-ups themselves, but the importance of the innovation ecosystem they build, and the importance of high-growth innovation start-up that exists in the innovative ecosystem. He pointed out that the UK government gives a tremendous amount of aid, even though start-ups do not actually have economic value such as job creation, productivity and innovation, and what matters is not a large number of start-ups but an innovative ecosystem based on interaction between the private and the public. However, the increase in the number of start-ups is not directly linked to economic growth. Ultimately, the achievement of economic performance needs not quantitative growth like the number of start-ups but the promotion of high-growth start-ups, that is, quality growth[6].

As Schumpeter(1934) defined entrepreneurs as “those who find new ideas to implement high-growth companies”, successful entrepreneurs lead to economic revival and create employment, but what matters is not the number of new startup companies but how many innovative start-ups can lead to economic revival through disruptive innovation. As a typical example, in the case of UK, the start-ups founded under the Startup Britain policy do not substantially contribute to the UK economy[4]. The reason is because need-based start-ups are more than opportunity-based start-ups, and these micro start-ups do not have much impact on national economic performance. The UK has grown into a Startup nation and its start-up performance is high, but few companies have achieved high growth into high productivity. Among SMEs(Small and Medium-sized Enterprises), which account for 99% of the total number of enterprises in the economy, few high-growth companies have increased more than 20% in sales or employment over three years[3]. In Sweden, by contrast, the proportion of high value-added entrepreneurs are 50% higher than in the UK, which means that the government has instituted policies to provide entrepreneurs with the flexibility of staff’s business hours so that they can prepare for start-up in

any full-time work environment to expand start-ups of highly educated people[7].

Then, to promote high-growth companies, that is, gazelle-type start-ups, the development of new products in initial start-ups is directly linked to the survival of start-ups. Thus, the success or failure of new product development is a measure of market entry. However, a study by Page(1993) found that US companies spend an average of three years and $ 20 million or more on new product development, while products on the market are only 12.4% and successful new products are only 9.4%[8]. Recently, new product development of start-ups by the lean start-up process has a great advantage in delivering optimal value products to customers through quick attempts and repeated failures from a customer-oriented perspective. However, even this has many difficulties in the implementation process for an initial start-up with insignificant organization[9]. In particular, development personnel, development cost, market research, and quality control are inherent limitations that initial start-ups can not afford. Thus, it is necessary to develop a new product development model that is applicable to the initial start-ups that can overcome this, but most of previous studies were aimed at companies with organization, and , Most of studies on the new product development process beared gradual innovation in mind like the development of subsequent model after succeeding in development of existing products[3,5,7].

As a solution to these problems, this study is intended to look into the obstacle(risk) factors of promotion from the stage of product development planning to the stage of product production and to growth of initial start-ups into a global company for first market entry, and offer industrial implications.

2. Theoretical Background

2.1 Start-up

“Start-up” refers to an existing startup company as “a manufacturing-based new company that produces and sells high-tech products.” As the software-led start-up boom dominated Silicon Valley in the late 1990s is now switched into hardware, the trend toward start-up is gradually expanding[6]. In the past, the awareness of "Hardware is Hard" was dominant, but recently, with interest in start-up growing, the start-up revitalized in the US at around 2010 is being commercialized in a way of mass production at a low cost through the production facilities in China after devising, designing, prototyping and financing the product in Silicon Valley[3].

The starting point of start-up is found in the privately-led Maker's Movement spread in the US. The Maker’s Movement started from the open source manufacturing movement that refers to the flow of sharing and developing how people make things they need themselves, and it is a concept first mentioned by the largest publisher in the US, O'Reilly co-founder Dale Doherty. The Maker culture, the source of start-up, became popular as the culture spread in the public libraries and the Maker Space based on the industry-academia cooperation to enable anyone to manufacture products with ideas[7].

Another influential factor is the emergence of Accelerator, which helps start-ups in the hardware field. The Accelerator company, which professionally promotes hardware start-ups, discovers hardware companies of potential growth, and acts as an incubator to help them perform a series of processes from production to distribution. They select potential groups through public offerings, and then provide them with services such as idea formulation, manufacturing, production, distribution, sales, procurement, finance and networking through the incubating program to play a role of accelerating the process of launching start-ups’ ideas into market products.

2.2 Obstacle Factors of Start-up

Mass Production and Marketing are obstacle factors to the growth base of start-up. The growth stage of

start-up can be divided into commercialization of technology, mass production of products, and marketisation. Heo Bum-do(2007) compared the growth stage of this company to the mountain of 1000m Technology, the mountain of 2000m Production and the mountain of 3,000m Marketing, and emphasized the sustainable growth of enterprise needs the effective time allocation at 1: 2: 3 for each stage[10]. This is to point out the reality and problem of SMEs that companies across the mountain of Technology among total companies is 90%, but companies across the mountain of Production is only 40% to 50%, and companies across to the mountain of Marketing is only 51%[6].

In addition to the above general growth obstacles of enterprise, initial start-ups have many risk factors[9]. This Risk includes multiple forms of risk, including capital risk, technology risk and market risk. Thus, such Risk Management is important for the sustainable growth of start-up, and it needs to be pro-actively managed in the light of cost-cutting aspects. In particular, risk and growth obstacles by industry characteristics in start-up based on the manufacturing industry are as follows.

First, unlike enterprises, the start-up need a lot of capital because they must deal with production and logistics including manufacturing, packaging, shipping and tariff as a fund factor. In particular, logistics needs Supply Chain Management including procurement logistics, production logistics and sales logistics, and it needs many infrastructures, systems and organizations since it must be combined with Inventory Control. Thus, the initial start-up must devise ways to effectively solve this factor in the launch stage after product development for stable settlement.

Second, the product development takes a longer time as a development period factor. The product development is usually launched on the market through the process of product design, instrument design and circuit design, prototype mock up production, working mock up production, mold design and production, product reliability verification, mass production facility construction, and mass production quality verification. Each process must be taken into account the manufacturing period, and the initial start-up without internal manufacturing infrastructure also needs the process of exploring and negotiating the appropriate outsourcing enterprise. In particular, shorten Time to Market through proper respond to market environment with shorten Product Life Cycle needs the time management and development process.

Third, as a quality factor, the mass production quality control against target quality such as defect rate is needed in the market launch stage of product, and continuous after-sales service support is also needed after sale. In particular, the initial start-up entering into the existing market must secure the price competitiveness through cost management while meeting the customer's demand value of expected market to survive in intense competition. The market-leading innovation product, not imitation product launch needs element technology for product development and checklist for the setting of appropriate target quality level.

Fourth, as a failure cost factor, the modification other than recall after product launch is difficult. These product development and launch risks must be predicted and managed through proactive management. The entrepreneurship and growth obstacles of such start-up include a factor of uncertainty in the unpredictable external environment within the start-up other than an inherent factor of industry characteristics. Thus, the policy and institutional support needs efforts to mitigate such uncertainty factor. The establishment of governance and local innovation ecosystem by Indicative Planning can also be suggested as an alternative[11].

The facilitation of financing, reduction of development period, setting of quality target and verification of product quality, and proactive management for reducing failure cost are needed to solve the obstacles of start-up as above. This is that the

policy support within the start-up industry can increase the development of the product and the potential for market success.

2.3 Domestic Start-up Trend and Problem

The Korea start-up is growing rapidly, but it is still far below the global startup industry such as US Silicon Valley, London and Singapore. The latest Global Startup Ecosystem Ranking 7 showed that Silicon Valley, New York and London were ranked first, second and third, respectively, and Beijing (fourth), Shanghai(eighth), Stockholm(fourteenth) was newly included in the ranking, while Seoul was not ranked within 20th[12].

The Seoul start-up industry was worth $2.4 billion(1% and 2% level in Silicon Valley and Beijing, respectively), ranking 27th among the 45 areas surveyed, and given that GDP of the Seoul metropolitan area is ranked third among 45 areas, the size of the start-up industry is still a small level compared to the size of the economy[11].

In particular, the network with the overseas start-up industry is poor, being concerned that it will be a factor limiting the growth of our start-up in the future. Despite world-class Internet infrastructure, excellent labor pool and world's third largest economy, one of the main causes of the undervaluation of Seoul's start-up industry is that it has low connectivity with the overseas start-up industry. In other words, the Seoul's start-up has 2.1 average significant links with the advanced start-up ecosystem(Silicon Valley, New York, London, and Berlin), only one third of the global average of 6.1, and it has the ratio of foreign customers by 14%, which is far below the world average of 23%[5].

This is that the value of start-up industry has a close relationship with the global links of local start-up, and that the Seoul's start-up has the smallest number of global links in the world, except for Chinese cities that have the advanced start-up ecosystem such as the US, UK and Germany, and the largest domestic market.

A survey conducted by the Korea Start-up Ecosystem Forum(KSEF) on 295 domestic start-ups in 2018 showed that 21.4% of start-ups entered the overseas market, while only 11.9% of them made sales performance. Many start-ups responded that they are considering the entry in the overseas market after stabilizing domestic performance(sales), having a relatively low priority of the overseas market.

In addition, connectivity with the external ecosystem is not only important to be mentored or invested in the early stage of growth, but also has a big influence on subsequent growth(Scaling-up) and at the same time, according to the Waterloo Startup Ecosystem Report, the startups targeting consumers from the early stage grow 2.1 times faster than those that do not.

Thus, the activation of start-up ecosystem is in urgent need of a venue for Korean start-ups to make an active exchange with other entrepreneurs and investors, especially those in the major overseas ecosystem. This is because it is very important to create an environment where the promising start-ups can receive investment in a timely manner, since the start-ups have the characteristics of intrinsic high-risk and high-growth[9].

In particular, unlike the conventional SMEs that do not greatly expand their scale after entrepreneurship, the start-ups have the characteristics of intrinsic high-risk and high-growth in that they start from the beginning with the scale expansion and the entry in global market in mind[4].

In this regard, Paul Graham, co-founder of famous accelerator Y Combinator, emphasizes that "making start-ups a start-up is neither the fact that they started a new business nor funded by venture capital, but only growth."

Thus, this study aims to look into the cause-and effect relationship of promotion obstacles through the design in the next chapter by reflecting global start-up promotion factors in that it is very important to meet appropriate investors at each growth stage since most start-ups depend on funding from accelerators, venture capitalists, and angel investors from the beginning to

the Exit stage for rapid growth.

3. Research Method

3.1 Research Model and Hypothesis Establishment

The risk factors as obstacle factors of start-up promotion and development process based on Kim Gun-woo(2018) and Start-up Korea report(2018), that is, capital financing, development period, quality factor and human resources were reflected in the model for performing this study to look into the effects of these risks on growth stage and industrial competitiveness factor. The schematized research model and the established hypotheses are as follows.

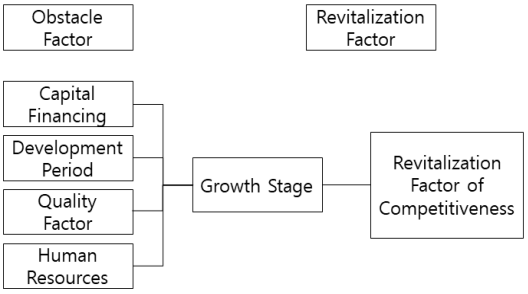

Fig. 1. research model design

Hypothesis 1. Obstacle factors will have a significant effect on growth stage in start-up.

Hypothesis 1-1: Capital will have a significant positive effect on growth in start-up.

Hypothesis 1-2: Development period will have a significant positive effect on growth in start-up.

Hypothesis 1-3: Quality will have a significant positive effect on growth in start-up.

Hypothesis 1-4: Human resources will have a significant positive effect on growth in start-up.

Hypothesis 2. Obstacle factors will have a significant effect on industrial competitiveness in start-up.

Hypothesis 2-1: Capital will have a significant positive effect on industrial competitiveness in start-up.

Hypothesis 2-2: Development period will have a significant positive effect on industrial competitiveness in start-up.

Hypothesis 2-3 Quality will have a significant positive effect on industrial competitiveness in start-up.

Hypothesis 2-4 Human resources will have a significant positive effect on industrial competitiveness in start-up.

Hypothesis 3. Growth will be mediated in the effects of obstacle factors on industrial competitiveness revitalization in start-up.

3.2 Questionnaire Composition

The scale as a tool for measuring this survey was composed in response to questionnaire using the success factors of start-up ecosystem based on the data of Moon Byung-ki(2018) and Kim Gun-woo(2018). The questionnaire was composed of 50 items by combining nominal scale with Likert 5-point scale.

Table 1. Questionnaire Composition

Classification	Item	Item Number	Number of Item	scale	Source
General Status	Establishment Year Location	1-3	3	Nominal Scale	
Start-up Owner	Gender Education Level Major	1-5	5	Nominal Scale	Yoo Ji-hyun (2018)
Obstacle Factors	Capital	1-6	24	Likert 5-Point Scale	Nam Dong-hoon (2018)
	Development Period	1-6			
	Quality	1-6			
	Human Resources (=HR)	1-6			
Growth Stage, Revitalization	Growth Stage	1-6	12	Likert 5-Point Scale	Song Woo-yong, Hwang Kyong-yeon (2012)
	Industrial Competitiveness	1-6			
Capital Financing, Investment	Financing Method Role Performance	1-5	5	Nominal Scale	Moon Byung-ki (2018)
			49		

3.3 Survey Target

A survey on the obstacle factors of start-up promotion was carried out to 350 companies within 5 years designated as start-up. The final 300 companies of them were analyzed after excluding final missing and non-responding companies.

Table 2. Research Design

Classification	Content
Target	CEOs and Managers of 300 Nationwide Startups Established in the Last 5 Years
Sample	Random Sampling(Equal Distribution by Industry and Size)
Period	2018.09.03.~11.02.
Survey Method	Survey in the Combination of Mail, E-mail and Visit

3.4 Analysis Method

Data collected by this study are analyzed as follows through the coding process using IBM SPSS statistic version 23.0 and AMOS 23.0.

First, the frequency and percentage was calculated by Frequency Analysis to obtain data on general characteristics of those surveyed.

Second, a reliability analysis was conducted to ensure the validity and reliability. And by the AMOS program, a Confirmatory Factor Analysis(CFA) on measurement models was conducted to see if the overall validity result of scale is support.

Third, a Structural Eqation Modeling(SEM) was established and analyzed to examine the mediating effect of growth in the effects of obstacle factors on industrial competitiveness revitalization in start-up.

4. Analysis Result

4.1 General Characteristics of Sample

This survey shows the general characteristics of respondents. The establishment year of responded companies showed that 75 companies(25%) were established in 2015. For their location, 139 companies(46.3%) were located in Seoul, which Seoul has the highest percentage.

Table 3. General Characteristics of Sample

Classification		Frequency	Percent
Gender	Male	215	71.7
	Female	85	28.3
Age Group	20s	22	7.3
	30s	156	52
	40s	100	33.3
	50s	22	7.3
Highest Level of Education	Less High School Education	5	1.7
	University Graduate	101	33.7
	Master	97	32.3
	Doctor	46	15.3
Major	Humanities	42	14
	Commerce	22	7.3
	Education	59	19.7
	Engineering	72	24
	Natural Science	90	30
	Medical Science	8	2.7
	Arts and Physical Education	6	2
	Other	1	0.3
Establishment Year	2014	58	19.3
	2015	75	25
	2016	72	24
	2017	67	22.3
	2018	28	9.3
Location	Gyeonggi	59	19.7
	Gyeongnam	34	11.3
	Daejeon	26	8.7
	Seoul	139	46.3
	Incheon	18	6
	Chungnam	24	8
Industry	Information and Communications	30	10
	Content	35	11.7
	General Manufacturing	49	16.3
	Biotech	63	21
	Service/Education	115	38.3
	Distribution	1	0.3
	Other	7	2.3
Startup Motive	Difficulty in Employment/ Working Life	73	24.3
	Choice for Living	48	16
	For Troubleshooting	36	12
	Commercialization of Patent, Technology and Works	64	21.3
	Commercialization of Marketable Media	71	23.7
	Lots of Start-up Support Policies	5	1.7
	Social Atmosphere Encouraging Start-up	3	1

For their industry type, 115 companies(38.3%) had the service/educational industry.

CEOs' gender showed that men were 215 persons(71.7%). For their age, there were 156 persons(52%) in their 30s. For CEO's highest level of education, there were 101 persons(33.7%) with university graduates, which most respondents were

university graduates.

For their major, there were 90 persons(30%) majored in natural science.

For their start-up motive, 73 persons(24.3%) started up for difficulty in employment/ working life.

4.2 Validity Verification of Scale (Exploratory Factor Analysis)

First of all, the exploratory factor analysis was conducted to verify the discrimination validity of variables through a preliminary survey, except for questionnaire items judged inappropriate. The principal component analysis was used for the factor analysis on exogenous variables. In the factor rotation, the varimax method was used to test mutual independence between factors because it is useful for minimizing the number of factors and the loss of information in factor extraction.

4.2.1 Factor Analysis on Obstacle Factor

Table 4. Obstacle Factor Analysis

Classification		1	2	3	4	total	% variance	% Accumulation	Cronbach's α
Human Resources (=HR)	HR5	.832	.051	.207	.051	3.267	16.333	16.333	.83
	HR4	.795	.115	.124	-.033				
	HR3	.774	.125	-.066	-.215				
	HR2	.690	.069	-.325	.109				
	HR1	.632	-.028	-.474	.020				
Development Period	Development Period1	.219	.598	-.187	.039	2.280	11.400	27.733	.788
	Development Period5	.224	.530	.300	.376				
	Development Period2	.069	.442	.164	-.056				
Quality	Quality1	-.145	.093	.559	.024	2.039	10.196	37.929	.802
	Quality2	.088	.159	.532	.402				
	Quality3	.199	-.362	.464	.099				
	Quality5	-.136	-.032	.438	-.068				
Capital Financing	Capital Financing3	.045	.156	.202	.594	1.988	9.942	47.871	.754
	Capital Financing1	-.057	-.240	-.099	.564				
	Capital Financing2	-.258	.063	.093	-.411				

KMO=0.747, χ^2=393.083, df=190, Total Reliability:0.870

The KMO analysis on obstacle factors showed that KMO= 0.747 and Bartlett sphericity verification χ^2 =393.083(df=190, p=.000). In the factor analysis, the factor loading of related factors was based on 0.5 or more, and 4 factors with eigenvalue of 1.0 or more were extracted, and the total variance explanation power explaining the obstacle factors was 47%, securing the validity of measurement items to some extent.

4.2.2 Factor Analysis on Industrial Competitiveness and Growth Stage

Table 5. Factor analysis on Industrial Competitiveness and Growth Stage

Classification		1	2	total	% variance	% accumulate	Cronbach's α
Competitiveness	Competitiveness 5	.893	.005	4.420	36.83	36.83	.865
	Competitiveness 3	.873	.134				
	Competitiveness 4	.862	.102				
	Competitiveness 1	.834	-.059				
	Competitiveness 2	.823	.071				
	Competitiveness 6	.794	.052				
Growth Stage	Growth Stage3	-.043	.929	4.158	34.65	71.48	.879
	Growth Stage2	.054	.917				
	Growth Stage4	.020	.914				
	Growth Stage5	-.087	.911				
	Growth Stage6	.125	.858				
	Growth Stage1	-.290	.113				

KMO=0.799, χ^2=597.418, df=66, Total Reliability: 0.888

The factor analysis on industrial competitiveness and risk factors showed that KMO= .799 and Bartlett sphericity verification χ^2=597.41(df=66, p=.000). Generally, if the KMO value is 0.5 or more and if the p-value in Bartlett's sphericity verification is the significance level p<0.1, there is a good correlation to conduct the factor analysis. In the factor analysis, the factor loading of related factors was based on 0.5 or

more, and 2 factors with eigenvalue of 1.0 or more were extracted, and the total variance explanation power explaining the factors was 71.4%, securing the validity of measurement items to some extent.

4.2.3 Validity Verification of Scale (Confirmatory Factor Analysis)

The confirmatory factor analysis(CFA) using the covariance matrix about sub-variables was conducted to verify the validity of scale based on the measurement items composed by reliability verification. The CFA is a method of proceeding with analysis from the perspective of whether exploratory research has been done in advance or whether the data can be sufficiently explained by pre-assumed model. First of all, the overall goodness-of-fit index must be reviewed to interpret the results of CFA. This study used statistics, RMR(Root Mean Square Residual), GFI(Goodness-of-Fit Index), AGFI(Adjusted Goodness-of-Fit Index), NFI(Normed Fit Index) and TLI(Tucker-Lewis Index) being most commonly used as criteria for evaluating the fit of CFA model. Generally, if 4 or more of 6 evaluation standards reach an evaluation standard, the measurement model is judged to be appropriate.

Table 6. Model Goodness-of-Fit in Confirmatory Factor Analysis on Entire Research Concept

Goodness-of-Fit Index	Absolute Goodness-of-Fit Index						Relative Goodness-of-Fit Index			
	χ^2 Value (p)	Q	GFI	RMR	RMSEA	AGFI	TLI	NFI	CFI	IFI
Final Model	150.066 (p<.001)	1.668	.946	.045	.074	.902	.947	.915	.936	.926
Acceptance Level	Comparison of Calculated χ^2 Value with Threshold	ELT 10	EMT .90	ELT .05	FLT .10 FLT .05	EMT .90	EMT .90	EMT .90	EMT .90	EMT .90

ELT : Excellent for Less Than
EMT : Excellent for More Than
FLT : Fit for Less Than

As a result of confirmatory factor analysis, goodness-of-fit was calculated as shown in table 6. The χ^2 and significance probability(p) is determined by the difference between input covariance matrix and estimated covariance matrix and the size of sample. As χ^2=150.06 and p<.001, goodness-of-fit did not meet the criterion that it is desirable that the p-value of χ^2 is more than 0.05. However, it does not become a big problem, given that χ^2 of goodness-of-fit indexes is sensitive to the size of sample and the number of measurement variables, and the size of sample is too large to meet the criterion. Thus, it is common to judge goodness-of-fix with other goodness-of-fix indexes. In other goodness-of-fix indexes, RMR = 0.016 was judged acceptable. Next, the Convergent Validity was examined for each research concept.

As the convergent validity indicates the correspondence of observational variables that measure latent variables, it is about the degree how two or more scales have a correlation with one research concept. In other words, the convergent validity means that the degree of correlation between the measurement values should be high when the same concept was measured in different ways. The methods of evaluating the convergent validity include the size of standard factor loading, the concept reliability, and the mean variance extraction index.

The mean variance extraction(AVE) through the confirmatory factor analysis is shown in Table 7. Thus, the AVE value was over .5, and the concept reliability was over .7, verifying the validity and the concept reliability of the related variables. All paths were significant at the significance level p <.001, adopting all factors.

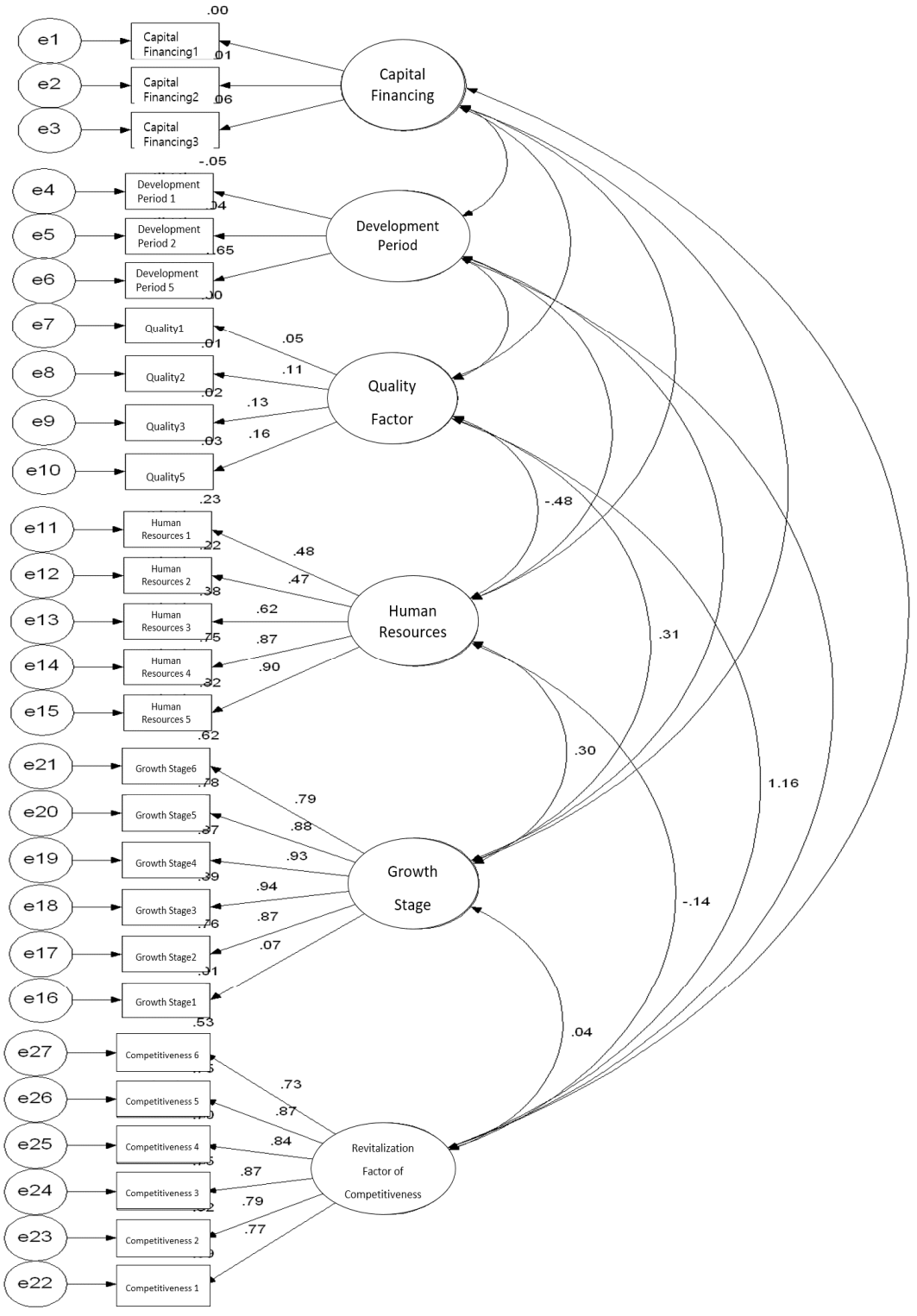

Fig. 2. Convergent Validity of Entire Research Concept

Table 7. Intensive Validity of Entire Research Concept1

Path			β	B	S.E	t	Mean Variance Extraction Index	Concept reliability
Capital Financing3	<-	Capital Financing Factor	.142	1.000			.564	.785
Capital Financing2	<-		.233	.240	.157	6.729		
Capital Financing1	<-		.273	.180	.146	7.542		
Development Period5	<-	Development Period	.320	1.000	.157	6.729	.536	.799
Development Period2	<-		.341	.120	.146	7.542		
Development Period1	<-		.654	.150	.130	7.220		
Quality3	<-	Quality Factor	.130	1.000	.128	7.540	.602	.847
Quality2	<-		.112	1.315	.790	7.664		
Quality1	<-		.152	.314	.322	6.977		
Quality5	<-		.160	.663	.343	7.935		
HR5	<-	Human Resources (=HR)	.904	1.000			.574	.714
HR4	<-		.865	.813	.099	8.223		
HR3	<-		.618	.781	.145	5.393		
HR2	<-		.472	.460	.118	3.884		
HR1	<-		.483	.447	.112	3.991		
Growth Stage1	<-	Growth Stage	.073	1.000			.603	.857
Growth Stage2	<-		.870	13.249	22.924	8.578		
Growth Stage3	<-		.941	12.719	21.997	8.578		
Growth Stage4	<-		.932	.355	.097	7.578		
Growth Stage5	<-		.883	12.490	21.609	7.578		
Growth Stage6	<-		.786	11.540	19.983	7.577		
Competitiveness 1	<-	Revitalization Factor of Competitiveness	.769	1.000			.564	.777
Competitiveness 2	<-		.788	1.055	.157	6.729		
Competitiveness 3	<-		.866	1.101	.146	7.542		
Competitiveness 4	<-		.836	.938	.130	7.220		
Competitiveness 5	<-		.866	.964	.128	7.540		
Competitiveness 6	<-		.728	.851	.139	6.126		

5. Hypothesis Verification

The covariance structure analysis(CSA) using the AMOS 23.0 program for all study participants and each brand was conducted to verify goodness-of-fit of the hypothetical path model explaining the relationship between obstacle factors, growth stage and industrial competitiveness revitalization in start-up, and determine the direct and indirect effects of variables affecting the behavioral intention.

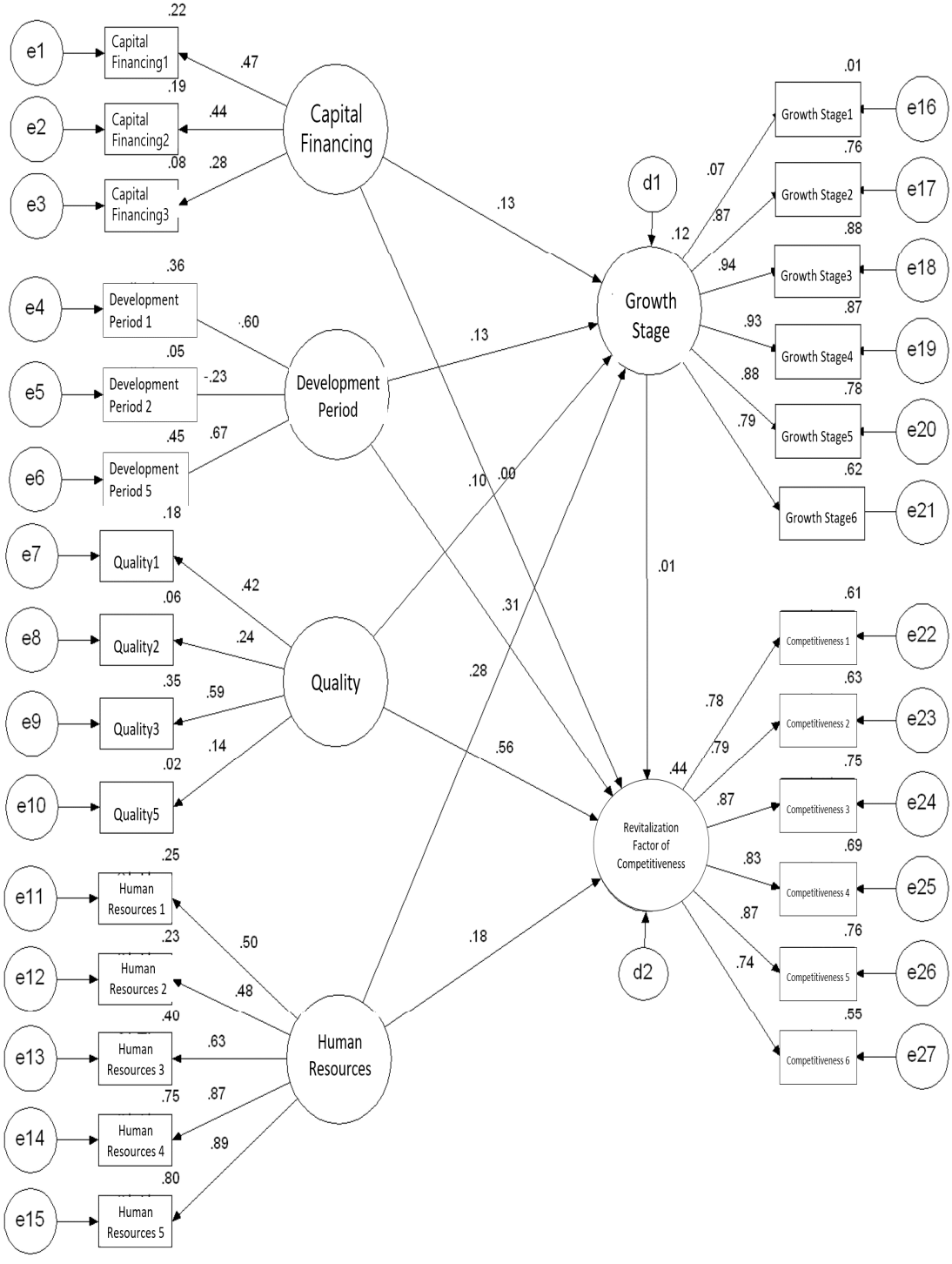

Fig. 3. Final Path Model

Table 8. Final Path Model (Total)

Path			β	B	S.E	t	P
Growth Stage	<-	Capital Financing	.134	.149	.117	3.416 ***	<.001
Growth Stage	<-	Development Period	.127	.121	.045	4.461 ***	<.001
Growth Stage	<-	Quality	.098	.023	.057	2.399 *	.015
Growth Stage	<-	HR	.278	.019	.035	4.554 ***	<.001
Competitiveness	<-	Capital Financing	.002	.109	.760	.012	.571
Competitiveness	<-	Development Period	.308	.580	.352	4.647***	<.001
Competitiveness	<-	HR	.184	.149	.098	3.512 ***	<.001
Competitiveness	<-	Quality	.563	1.576	.830	3.899 ***	<.001

* p<.05, **p<.01, ***p<.001

5.1 Effect of Obstacle Factors on Growth Stage in Start-up

The effects of obstacle factors on growth stage in start-up showed that capital β=0.134, which capital had a significant positive effect on growth stage(p<.001). Thus, the “Hypothesis 1-1: Capital will have a significant positive effect on growth in start-up.” was adopted. Development period β=0.127, which development period had a significant positive effect on growth stage(p<.001). Thus, the “Hypothesis 1-2: Development period will have a significant positive effect on growth stage in start-up.” was adopted. Quality β=0.098, which quality had a significant positive effect on growth stage(p<.05). Thus, the “Hypothesis 1-3: Quality will have a significant positive effect on growth in start-up.” was adopted. Human resources β=0.278, which human resources had a significant positive effect on growth stage(p<.001). Thus, the “Hypothesis 1-4: Human resources will have a significant positive effect on growth in start-up.” was adopted.

5.2 Effect of Obstacle Factors on Industrial Competitiveness in Start-up

The effects of obstacle factors on industrial competitiveness in start-up showed that capital β =0.002, which capital had no significant effect on industrial competitiveness(p>.05). Thus, the “Hypothesis 2-1: Capital will have a significant positive effect on industrial competitiveness in start-up.” was rejected. Development period β=0.308, which development period had a positive effect on industrial competitiveness(p<.001). Thus, the “Hypothesis 2-2 Development period will have a significant positive effect on industrial competitiveness in start-up.” was adopted. Quality β=0.563, which quality had a significant positive effect on the industrial competitiveness(p<.001). Thus, the “Hypothesis 2-3 Quality will have a significant positive effect on industrial competitiveness in start-up.” was adopted. Human resources β=0.184, which human resources had a significant positive effect on industrial competitiveness(p<.001). Thus, the “Hypothesis 2-4 Human resources will have a significant positive effect on industrial competitiveness in start-up.” was adopted.

5.3 Mediating Effect of Growth Stage in the Effect Obstacle Factors on Industrial Competitiveness Revitalization in Start-up

The bootstrapping was conducted to verify the significance of indirect effect. As the bootstrapping is a method to estimate the sample distribution of parameter estimates, it can obtain a sample bootstrap estimate, a standard error and a confidence interval by substituting a random sample for the population, and performing re-sampling for a predetermined number of times. The results of the significance of indirect effect verified by bootstrapping are shown in Table 9. The effects of obstacle factors on industrial competitiveness revitalization showed that the total effect of human resources was .278, followed by quality .098,

development period .127 and capital .134, which the total effect was significant. The direct effect of human resources was .184, followed by quality .563 and development period .308, which the direct effect of human resources, quality and development period was significant, but the direct effect of was insignificant. The indirect effect of human resources, quality and development period through growth stage was significant.

These results show that obstacle factors play a role as mediators except for capital in the "Hypothesis 3. Growth will be mediated in the effects of obstacle factors on industrial competitiveness revitalization in start-up."

Table 9. Path Analysis Result of Final Model

Classification	Full effec		Direct effect		Indirect effec
	Growth Stage	Competitiveness	Growth Stage	Competitiveness	Competitiveness
Human Resources	.278***	.287***	.278***	.184***	.103**
Quality Factor	.098*	.664***	.098*	.563***	.101**
Development Period	.127***	.509***	.127***	.308***	.201**
Capital Financing	.134***	.000	.134***	.002	-.001
Growth Stage		-.010		-.010	

* p<.05, **p<.01, ***p<.001

6. Conclusion

The above research results are summarized as follows.

First, obstacle factors had a significant positive effect on growth stage, adopting hypothesis 1.

Development period, quality and human resources had a significant effect on industrial competitiveness in the hypothesis 2 that obstacle factors will have a significant effect on industrial competitiveness in start-up, adopting development period, quality and human resources, but rejecting capital.

As the hypothesis 3 - which growth will be mediated in the effects of obstacle factors on industrial competitiveness revitalization in start-up - was partially adopted, capital was rejected, while quality, development period and human resources were adopted.

The results showed that the start-up growth and promotion had a very close relationship with capital, product development period, quality and human resources. And capital as an obstacle factor in start-up was insignificant, but development period, quality and human resources had a close relationship with industrial competitiveness. Even in the mediating effect of obstacle factors on industrial competitiveness in start-up, capital was rejected, while quality, development period and human resources were adopted, having a positive mediating effect. This is to demonstrate that capital on characteristics of some start-up companies is not a big obstacle to the management due to the continuous support of the government, but growth is in a remote future without independent product competitiveness to maintain the quality of products at a certain level and government support to develop and commercialize this. Thus, start-up companies need to focus on cultivating professional human resources in that overseas start-ups are more likely to use as test beds because SMEs have excellent ICT infrastructures than large corporations in human resources and technology and consumers make high acceptance of new technologies. The average start-up number of domestic companies in the network with international companies is 2.1 per company in Seoul, while the global average is 6.3. Securing and cultivating professional manpower need to be given priority, given the reality of being in active marketing from the beginning with internationalized manpower by securing the talent pool based on the international network from the beginning stage of start-up in the UK, Sweden and Singapore. In addition, aggressive

global networking activities are needed to lower the barrier of language, institution and culture, and strengthen international cooperation with domestic small and medium start-ups so that overseas start-ups can actively participate in Korea. In particular, if overseas start-ups with high technology enter Korea, they will be able to enrich Korea's innovative ecosystem and reenter overseas markets based on Korea. If you are startup talents in developing countries with low ICT infrastructure and consumption, it will be a great opportunity to try new technologies and business models in the Korean environment. These talents will be very helpful for securing talents and strengthening national competitiveness through the global start-up promotion by staying in Korea.

References

[1] B. K. Moon, G. I. Jung, N. Y. Kang, G. W. Kim, J. H. Lee, S. K. Yoo, H. S. Jung, "(First Six Months of 2018) Import & Export Assessment and the Second Half Outlook", *Korean Institute for International Trade(IIT) under Korea International Trade Association*, Electronic Data, 2018.

[2] Startup Genome, "Global Startup Ecosystem Report 2017", 2017.

[3] D. H. Nam, "The Present of Korea Startups from Global Perspective", *Trade Policy Support Center under Korea International Trade Association*, Electronic Data, 2018.

[4] B. K. Kim, "Startup Trend and Its Implications from Unicorn", Korea International Trade Association, *Trade Brief 8*, 2017.

[5] S. H. Oh, P. J. Park, "Economic Contribution of US Technology-Based Startups and Its Implications", *Trade Policy Promotion Center(IIT) under Korea International Trade Association*, Electronic Data, 2018.

[6] Korea Startup Ecosystem Forum, "Korea Startup Ecosystem White Paper 2016", 2017.

[7] J. W. Lim, "The Status and Tasks of Korean Startup Ecosystems", *Journal of Korea Information Science Society*, Vol.33, No.1, pp.19-25, 2015.

[8] Page. A. L, "Assessing new product development practices and performance", *JOURNAL OF PRODUCT INNOVATION MANAGEMENT*, Vol.10, No.4, pp.273-290, 1993.
DOI: https://doi.org/10.1111/1540-5885.1040273

[9] G. W. Kim, "Innovative Strategies on Startup Ecosystem through Global Conference", *Institute for International Trade in Korea International Trade Association*, No.7, pp.1-28, 2018.

[10] B. D. Heo, "Global SME's Management Theory 「TPM Law」", *Technological Standards of Standards-Based Innovation Team at Korean Agency for Technology and Standards*, Vol.71, pp.11-12, 2007.

[11] J. H. Park, "A Study on the Policy Trends and Cooperative Measures for Establishment and Startup Incubation in Emerging Areas", *Korea Information Society Development Institute*, 2018.

[12] Startup Korea Report, Google Campus(Seoul : The Asan Nanum Foundation, 2018)

Seol-Bin Lee [Regular member]

- Aug. 2012 : Hanyang Univ., MS
- Feb. 2017 : Hanyang Univ., Ph.D.
- Sept. 2017 ~ current : Gyeongsang National Univ., Dept. of Industrial Management, Adjunct Professor

<Research Interests>
Operations Management, Project Management, Supply Chain Management, Technology Management