Analysis of Government's Supporting Policy for SMEs: Focusing on GRIs[*]

by Jinmin Kim[**] and Jaebum Hong[***]

SMEs need a strategy to respond to rapid changes in the global business environment of the Fourth Industrial Revolution. In order to overcome such a business environment, SMEs must concentrate on the core competency. Because of the structural characteristics of SMEs, government support is very important, as it is difficult for SMEs to carry out the entire supply chain role. The support of GRIs is very important for ensuring competitiveness through technological innovation of SMEs. Recently, the construction of SMEs network for business expansion is demanded. SMEs can form networks to induce synergistic effects. In order to secure the competitiveness of SMEs by utilizing the advantages of mutually cooperating networks, the necessity of cooperation of SMEs is increasing. The government has proposed various support programs to support network cooperation.

In this research, in order to derive an effective strategy of the SME support program, we analyzed the difference in necessity and satisfaction of the GRIs support program. We analyze the differences between government policies and perceptions for SMEs and to derive strategies for supporting SMEs in a systematic approach for the development of SMEs. In a situation where research to revitalize SMEs is insufficient, in consideration of the market demand of SMEs, we grasp the problems of the current system and try to guide improvement strategies. Also, we suggest policies that can derive and utilize support strategies for SMEs. From a long-term perspective, research related SMEs must be conducted and a sustainable support program for SMEs must be developed.

***Keywords** : Demand-Based, GRIs, SMEs, Support Program*

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Ⅰ. Introduction

Small and medium-sized enterprises (SMEs) need strategies to respond to rapid changes in the global business environment of the fourth industrial revolution. Recent business environments are placed on rapid changes in technology, economy, politics, society, industry and the entire corporate environment. The low growth of the world economy has been fixed, the export and the occupancy rate of the manufacturing industry have declined, and the wage gap between large and SMEs is getting worse. In addition, the need for energy conservation and efficiency is presented, the necessity for substitute energy increases rapidly, and the severity of many business environments are faced, such as lack of specialized human resources.

In order to overcome these business environments, SMEs must concentrate on their core competency field to overcome difficulties. Because of the nature of SMEs, government's support is very important as it is hard for SMEs to implement the entire supply chain roles. Recently, collaboration are suggested to develop SMEs network for expanding business. For supporting the cooperation of the network, the government has established various laws and support projects to enhance SMEs' competitiveness, develop of high value products, new business initiation, etc. The effect of the GRIs' support of SMEs can be different due to various factors. In order to derive efficient policies for the support of GRIs for SMEs, it is necessary to analyze the current state of the system and seek improvement.

The basic purpose of Government-funded Research Institutes (GRIs) is to play a role of improving national science and technology capacity according to purpose of establishment, such as R&D and introduction and dissemination of advanced technology for SMEs. SMEs support program of the GRIs is classified into 4 types of On-site demand response, Demand-based technology development, Supporting the use of public infrastructure, and Practical support and details of each type are shown in the table 1.

Previous research are focus on development of GRIs (Chung, Chung, and Kim, 2014; Song and Park, 2017) and case studies for support for SMEs (Seong, 2012; Kwak, Jeong, and Jo, 2013; Yun, Kim, Kang, and Jeong, 2015). Due to lack of a practical approach to SMEs cooperation, it is difficult for GRIs to derive the result of more effective cooperation strategy for supporting SMEs. In this research, we derive a enhancement strategy for SME support in more systematic approach by analyzing the difference in recognition of current support program between GRIs and general SMEs.

This paper is organized as follows. In section 2, we review the literature related with supporting SMEs and introduces the methodology for this study in section 3. Section 4 provides the result of this research through analyzing questionnaire survey from SMEs. Finally, there are our conclusion and limitations in section 5.

Ⅱ. Literature Review

Research on general SMEs is attempted

Table 1
Support Program for SMEs

On-site demand response	Technical guidance and consultation, Workforce dispatch, Business planning consulting, Support for overseas market entry
Demand-based technology development	Technology transfer R & D and commercialization, Customized technical support, Development of industrial source technology
Supporting the use of public infrastructure	Networking, Equipment support, Training, Support for utilization of information infrastructure, Policy Research
Practical support	Test, analysis, certification, evaluation, Support for prototype production, Business incubation

in various fields. Some studies to analyze factors that improve the performance of SMEs was mainly presented. Seo and Cho (2015) analyzed the effect of R&D support program using innovative capability audit tools. They showed that there are a strong relationship between innovative capability with sales of a firm. Heo, Sohn, and Ji (2014) investigated the performance of MFP from the viewpoint of the bankruptcy ratio of success rate of IPO of SMEs which could not attract matching fund. They analyzed KITIAs MFP applicant data from 2001 to 2004 applying logistic regression. Al-Hyari (2013) analyzed the restrictions that prevent success of SMEs support in Jordan. This study showed the common constraints for SMEs growth and survival are lack of financial support, competition barriers, lack of qualified human resources, and rigid business rules and regulations. Choi, Jung, and You (2014) analyzed the impact of the number of participation in the government's R&D grant program on SMEs R&D outcomes. After the Government's R&D grant program was implemented, this paper found that various factors of the company had positive influences on administrative performance management ability. Also, they showed the factors affecting on R&D investment and technical outcome. To show the necessity of cooperation, Brien and Hamburg (2014) presented the importance of continuous training and cooperation of SMEs and introduced the ways that SMEs can work together to strengthen their business.

Previous research for support of general SMEs is as follows. Song, Nam and Kweon (2007) evaluated the outcome of SMEs support policy through the satisfaction level of the beneficiary's service quality by considering SMEs support policy as a concept of customer-oriented service. Shin and Choi (2008) analyzed the relationship between the R&D of SMEs and technological innovation with government policy support as a moderating effect. They showed that there are the main effect of R&D of innovation and the interaction effect of financial support and human resources support. Song, Hong and You (2014) studied the influence of characteristic factors of consumers and providers on business results in government consulting support for SMEs. In the consulting support project for SMEs, they suggested the policy direction not only on the manufacturers but also on the consumers. Lee, Lee, Kim, and Kim (2017) analyzed the influence of the satisfaction of the GRIs support program on the technical outcome of ICT SMEs.

Previous research on SMEs support mainly studied with R&D cooperation, but emphasized a strategic approach that can overcome the limitations of SMEs for R&D. Cho and Lee (2013) proposed a cooperative model for developing fusion technology of SMEs. Lee, Lee, and Wi (2014) investigated the influence of support of R&D on the outcome of R&D of SMEs and presented the effects of technical innovation through R&D of SMEs. Choo and Kang (2015) derived meaningful results by analyzing the effects of corporate innovation through mutual trust and interdependence partnership through R&D of SMEs by analyzing the influence on enterprise's business results.

Some studies analyzed the impact on performance to improve the effect of technical cooperation with SMEs. Lee, Lee, and Shin (2012) showed the commercialization results of certification and patents on SMEs R&D conducted by government support. Chung, Ko, and Kim (2012) analyzed the relationship of corporate performance against technical outcome and economic achievement in order to measure the result of technical cooperation.

Suggestions for development strategies of support organizations are derived in Chung et al. (2014) and Song and Park (2017). Chung et al. (2014) presented measures to effectively improve the research results in order to analyze the cooperation network of GRIs. Song and Park (2017) analyzed success factors for the cooperative relationship between support organizations and SMEs. They insisted that it is necessary to build a support process and to practically improve the support program to maintain

the long-term and continuous cooperation of GRIs and SMEs. Case studies are conducted for development direction of GRIs, which are deriving the development strategy of GRIs (Seong, 2012), analyzing the influence on technology commercialization (Yun et al., 2015), and suggesting an effective role of GRIs (Kwak et al., 2013).

Existing research has not analyzed the results of cooperation in practical dimension, nor conducted research which analyzed the difference between policies and cooperation results. An analytical approach is required to derive a more effective strategy for SMEs support of GRIs.

III. Research Methods

3.1 Method

In this study, we conducted the importance-performance analysis (IPA) (Martilla and James, 1977) on the questionnaire result to derive the improvement strategy of SMEs support program of GRIs. It is a useful way to select strategic issues to be improved and can be used to decide policies that should be preferentially concentrated with limited resources. By analyzing IPA results, it is possible to clearly grasp the result visually and have an advantage of easy analysis.

3.2 Data

SMEs support programs for GRIs are classified into four types, 15 types of factors: On-site demand response for Technical guidance and consultation, Workforce dispatch, Business planning consulting, and Support for overseas market entry; Demand-based technology development for Technology transfer R&D and commercialization, Customized technical support, Development of industrial source technology; Supporting the use of public infrastructure for Networking, Equipment support, Training, Support for utilization of information infrastructure, Policy Research; Practical support for Test, analysis, certification, evaluation, Support for prototype production, Business incubation.

We conducted a questionnaire survey on SMEs support projects of GRIs for 3 weeks from April 10, to April 20, 2017. We collected 133 questionnaire and the results are as follows. Of the 133 questionnaires, 68 companies answered "I have experience" as a question about whether or not the GRIs promotion's experience of supporting SMEs. Of the 130 companies who replied the establishment year, 21 companies (16.1%) founded before 1997, 38 companies (29.2%) founded before 2007, 71 companies established since 2007, Companies under 10 years founded within 54.6%. Of the 121 companies

Table 2
Objectives of Collaboration with GRIs

	Research Institute		Total	Research Institute		Total	Gap (A-B)
	Not Have (A) (n=68)	Have (B) (n=65)		Not Have (A) (n=68)	Have (B) (n=65)		
Securing Research Expenses	39	38	77	60%	56%	58%	4%p
Use of equipment	22	30	52	34%	44%	39%	-10%p
Commercial development	25	23	48	38%	34%	36%	4%p
Improvement quality of performance	22	20	42	34%	29%	32%	5%p
Utilization of human resources	23	16	39	35%	24%	29%	11%p
Shorter research period	8	19	27	12%	28%	20%	-16%p
Securing sales channels	17	7	24	26%	10%	18%	16%p
Risk dispersion of R&D	10	7	17	15%	10%	13%	5%p
Other	3	3	6	5%	4%	5%	1%p
Total	65	68	133	100%	100%	100%	

that answered about sales, 41 companies (33.9%) has under 1 bil. won, 49 companies (25.62%) for 1 bil.~10 bil. won, 31 companies (25.6%) exceeding 10 bil. won. There are 68 companies holding research laboratories out of 133 responded to the possession of research laboratory and 65 companies don't have laboratory. Having a laboratory is expected to cause SMEs to respond differently to collaboration with GRIs.

The general status of GRI support programs for SMEs is as follows. The main objective of SMEs in cooperation with GRIs is to secure research expenses, followed by utilization of equipment, commercial development and Improvement quality of performance. Regardless of whether it holds a research institute or not, SMEs consider securing research expenses as a primary objective, and in the case of a company holding a research institutte, emphasis is on utilization of equipment and shortening of research period, on the other hand companies with no research institute focus on securing

sales channels and human resource utilization (Table 2).

The most collaboration type in which SMEs cooperate with government is collaborative research, followed by technical consultation, guidance, and commissioned research. Companies owned research institute want technology transfer, but companies not owned research is interested in technical advice, guidance and collaborative research. In the case of companies owned research institute, it is possible to interpret that technological commercialization is achieved only by technology transfer (Table 3).

Table 4 shows the results of cooperative networks. When SMEs constitute a cooperative network with GRIs, the most important difficulty is recognized to be lack of support systems. Lack of region-based corporate support was also pointed out as an important difficulty. Company owned research institute presented the shortage of support system as a relatively more important difficulty and the Company not owned research institute

Table 3
Collaboration Types with GRIs

| | Research Institute | | | Research Institute | | | |
	Not Have (A) (n=68)	Have (B) (n=65)	Total	Not Have (A) (n=68)	Have (B) (n=65)	Total	Gap (A-B)
Joint research	44	42	86	68%	62%	65%	6%p
Commissioned research	20	20	40	31%	29%	30%	2%p
Technical advisory/guidance	35	30	65	54%	44%	49%	10%p
Technology transfer	8	13	21	12%	19%	16%	-7%p
Commissioned education	4	4	8	6%	6%	6%	0%p
Foundation support	6	4	10	9%	6%	8%	3%p
Other	3	3	6	5%	4%	5%	1%p

Table 4
Difficulties of Collaboration with GRIs

| | Research Institute | | | Research Institute | | | |
	Not Have (A) (n=68)	Have (B) (n=65)	Total	Not Have (A) (n=68)	Have (B) (n=65)	Total	Gap (A-B)
Lack of support system	28	36	64	43%	53%	48%	-10%p
Culture differences between SMEs and GRIs	21	23	44	32%	34%	33%	-2%p
Lack of region-based corporate support	27	28	55	42%	41%	41%	1%p
Lack of mutual trust	7	5	12	11%	7%	9%	4%p

pointed out lack of mutual trust as a bigger difficulty.

Ⅳ. Results

The analysis results of this research are as follows. As a percentage of the participation experience in the GRIs support program, as a ratio of the number of participation of a specific support program to the total number of respondents, the program with the highest proportion of participation experience was Support for prototype production. Overall, many companies participated in Support for prototype production, Technical guidance and consultation, and Test, analysis, certification, evaluation (Table 5 and Figure 1).

Table 5
Participation Experience in GRIs Support Program

		Total	%
On-site demand response	Technical guidance and consultation	39	29.3
	Workforce dispatch	31	23.3
	Business planning consulting	40	30.1
	Support for overseas market entry	40	30.1
Demand-based technology development	Technology transfer R & D and commercialization	48	36.1
	Customized technical support	39	29.3
	Development of industrial source technology	44	33.1
Supporting the use of public infrastructure	Networking	34	25.6
	Equipment support	41	30.8
	Training	35	26.3
	Support for utilization of information infrastructure	36	27.1
	Policy Research	31	23.3
Practical support	Test, analysis, certification, evaluation	46	34.6
	Support for prototype production	52	39.1
	Business incubation	33	24.8
	Total	133	100.0

Figure 1
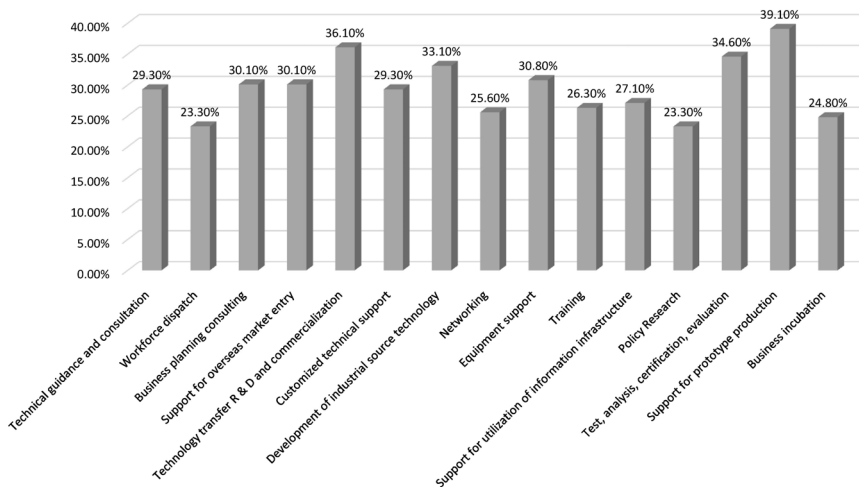### Participation Experience in GRIs Support Program

Table 6 and Figure 2 Shows the result for Necessity of GRIs support program. In the case of 4 points or more at the measurement with 7 point scale, we recognize the necessity, 4.57 points for the group owned the Research institute at 4.46 points on the total, 4.36 points for the group of Not Have Research institute. SMEs which have Research institute recognize the necessity of the support program more. There is no big difference depending on the possession of the research institute, but the company owned Research institute emphasizes the necessity of Business incubation and company not owned Research institute for Test, analysis, certification, evaluation.

Table 6
Necessity of GRIs Support Program

| | | Research Institute | | Total | Gap (B-A) |
		Not Have (A) (n=68)	Have (B) (n=65)		
On-site demand response	Technical guidance and consultation	4.37	4.51	4.44	0.15
	Workforce dispatch	3.46	3.77	3.62	0.31
	Business planning consulting	4.32	4.34	4.33	0.02
	Support for overseas market entry	4.73	4.91	4.82	0.18
Demand-based technology development	Technology transfer R & D and commercialization	4.32	4.54	4.43	0.22
	Customized technical support	4.26	4.37	4.32	0.11
	Development of industrial source technology	3.92	4.29	4.11	0.37
Supporting the use of public infrastructure	Networking	4.30	4.65	4.47	0.35
	Equipment support	4.75	4.89	4.82	0.14
	Training	4.13	4.29	4.21	0.16
	Support for utilization of information infrastructure	4.34	4.64	4.49	0.30
	Policy Research	3.63	3.78	3.71	0.15
Practical support	Test, analysis, certification, evaluation	5.57	5.39	5.48	-0.18
	Support for prototype production	5.45	5.67	5.56	0.22
	Business incubation	3.79	4.50	4.15	0.71
	Total	4.36	4.57	4.46	0.21

Figure 2
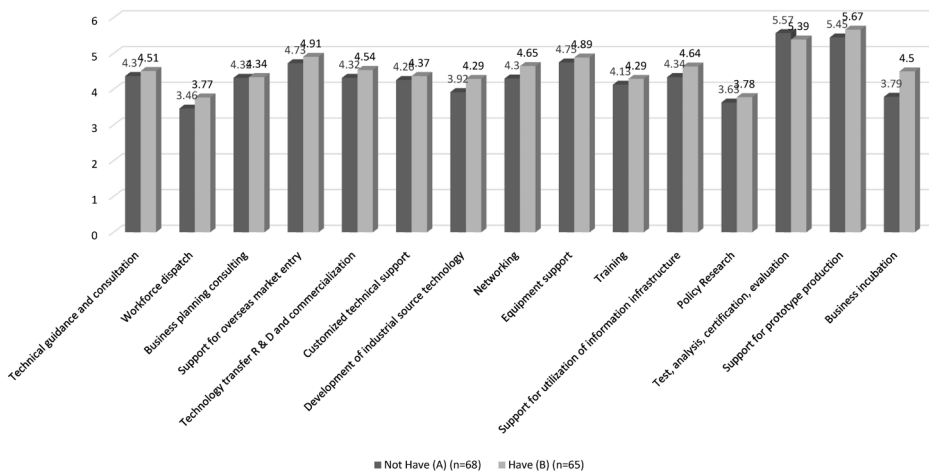### Necessity of GRIs Support Program

Table 7 and Figure 3 Shows the result for Satisfaction of GRIs support program. In the case of 4 points or more at the measurement with 7 point scale, we recognize that a company was satisfied with GRIs support program. The total average is 4.78. The group owned the Research institute for 4.95 was more satisfied than the group of Not Have Research institute for 4.49. The group owned the Research institute has a high level of satisfaction with Networking and the group of Not Have Research institute has a high

Table 7
Satisfaction of GRIs Support Program

| | | Research Institute | | Total | Gap (B-A) |
		Not Have (A) (n=68)	Have (B) (n=65)		
On-site demand response	Technical guidance and consultation	4.55	4.89	4.79	0.35
	Workforce dispatch	3.75	4.68	4.32	0.93
	Business planning consulting	4.38	4.93	4.75	0.54
	Support for overseas market entry	5.00	4.96	4.98	-0.04
Demand-based technology development	Technology transfer R & D and commercialization	4.59	4.81	4.73	0.22
	Customized technical support	4.91	4.86	4.87	-0.05
	Development of industrial source technology	4.92	4.75	4.80	-0.17
Supporting the use of public infrastructure	Networking	3.67	5.16	4.50	1.49
	Equipment support	4.71	5.44	5.20	0.73
	Training	4.33	4.65	4.54	0.32
	Support for utilization of information infrastructure	4.21	4.68	4.50	0.47
	Policy Research	3.27	4.35	3.97	1.08
Practical support	Test, analysis, certification, evaluation	5.59	5.62	5.61	0.03
	Support for prototype production	5.83	5.76	5.79	-0.07
	Business incubation	3.58	4.71	4.30	1.13
	Total	4.49	4.95	4.78	0.46

Figure 3
Satisfaction of GRIs Support Program

■ Not Have (A) (n=68) ■ Have (B) (n=65)
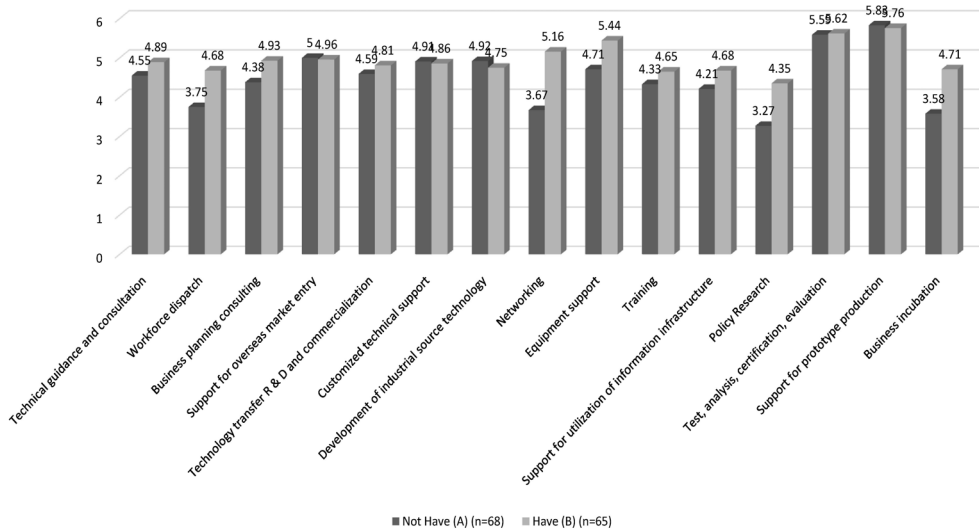
level of satisfaction with Customized technical support. It is expected that companies that have a research institute will be able to make more advanced forms of solving problems and decision making with the cooperation of GRIs, thereby enhancing the satisfaction of cooperation.

V. Conclusion

In this study, we analyzed the differences in perceptions of the Necessity and satisfaction of the current support programs of GRIs in order to derive effective strategies for SMEs support program. We analyzed the difference between the national policy and the perception of SMEs and derived a systematic GRIs support strategy for SMEs.

Since there is a lack of research to revitalize small and medium enterprises, we derived the improvement strategy by grasping the problems of the current system based on the market demand of SMEs. In addition, we presented a specific approach that can be used practically by deriving the actual support strategies of SMEs. From a long-term point of view, academic and practical research should be promoted and sustainable SMEs support program should be developed.

The results of the analysis of the research are as follows. Support for prototype production and Test, analysis, certification, evaluation are the most important support programs for SMEs regardless of the type of company. However, the policy priorities are relatively low when the SME support project is in progress. Support for prototype production and Test, analysis, certification, evaluation are low priorities for policy support because the main objective of SME support programs of the GRIs is R&D. The reason why SMEs consider Support for prototype production and Test, analysis, certification, evaluation is a crucial process for introducing new products into the market and is directly connected with the profit of the company.

Second, the demand of enterprises is not directly linked with the essential goals of GRIs SME support program, but considering the influence of SMEs on the national economy, the direction of policy support corresponding to these needs is important. Support for prototype production and test, analysis, certification, evaluation can become an important business in the future taking into account the policy trend of the government. Prototype production is a very important process at the start-up companies, and the necessity of policy execution can be improved in consideration of the government's will that emphasizes the start-up companies in the future. Support for prototype production and test, analysis, certification, evaluation can increase requirements for carrying out relevant policies because convergence is emphasized also in the 4th industrial revolution.

Third, the main reason for general companies to cooperate with GRIs is to secure research expenses, and proactively support through GRIs' SMEs support program is support for practical application. The top priority objective of cooperating with GRIs is collaboration type as securing research expenditure. Collaborative research is the most frequent collaboration type. Problems in cooperation with GRIs include lack of support system and lack of regional material enterprise support. Disagreement of the policy of the government and the demand of the company is the most frequent factor which is not reflected properly when supporting SMEs of GRIs.

The policy recommendations are as follows. Regardless of the type of enterprises, the most important support programs for SMEs are Support for prototype production and test, analysis, certification, evaluation. Searching for policy directions based on market demand is important.

Currently, organizations providing support for prototype production and testing, analysis, certification and evaluation of GRIs are only 56%, so the development of support program based on market demand is necessary.

Second, considering Support for overseas market entry and Development of industrial source technology, the importance of the

these support program is high but the achievement is low. It is necessary to reduce consulting and patent map business which are in low corporate satisfaction, and to expand support target such as overseas patent support program which support is more effective. Also, it is required to carefully promote the process of joint development and commercialization opportunities with companies such as R&D of source technology development.

Third, GRIs has been made much effort in promotion of support program, but lack of recognition has been pointed out as a problem. We present the following improvement plan. It needs to integrate the homepages of the departments responsible for supporting SMEs in GRIs to increase accessibility. More aggressive public promotion are required, in collaboration with relevant organizations to systematically support SMEs.

The limits of this research and future research are as follows. First, we need to collect more samples and analyze it. Further participation of SMEs should be attracted by expanding the interest of SMEs' support program.

Second, it is necessary to actively promote cooperation and support of SMEs of GRIs. Through case studies for the success of support program, it is necessary to organize the results, to actively promote success stories through case analysis, and to induce participation by other companies. Also, variables that affect the outcomes of the GRI support programs should be analyzed.

Lastly, It is important to analyze changes in corporate perception of GRIs support program and develop a systematic support system by continuous research. To standardize the process of corporate support and systematically support is necessary at each stage. And as a way to customized support for SMEs, it is necessary to analyze the demand of SMEs, and a systematic system is required for all processes on the entire supply chain.

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중소기업 지원 실태 분석: 출연(연)을 중심으로[*]

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　　중소기업은 제4차 산업 혁명의 글로벌 비즈니스 환경의 급속한 변화에 대응하는 전략이 필요하다. 이러한 사업 환경을 극복하기 위해 중소기업은 핵심 역량 분야에 집중해야 한다. 중소기업의 구조적 특성으로 인해 중소기업이 전체 공급사슬의 역할을 수행하는 것은 어렵기 때문에 정부의 지원은 매우 중요하다. 최근 중소기업의 사업 확대를 위한 중소기업 네트워크의 구축이 요구되고 있다. 중소기업들이 네트워크를 형성함으로써 시너지 효과를 유발 할 수 있다. 상호 협력하는 네트워크의 장점을 활용하여 중소기업의 경쟁력을 확보하기 위해 중소기업 네트워크의 협력의 필요성이 높아지고 있다 정부는 네트워크의 협력을 지원하기 위해 다양한 지원 프로그램을 제시하고 있다

　　본 연구에서는 중소기업 지원 프로그램의 효과적인 전략을 도출하기 위해 출연(연)의 지원 프로그램의 필요성과 만족도의 차이를 분석하였다 중소기업에 대한 정부의 정책과 인식의 차이를 분석하고, 중소기업의 발전을 위한 체계적인 출연(연)의 중소기업 지원 전략을 도출하고자 한다. 중소기업을 활성화하기 위한 연구가 부족한 상황에서 중소기업의 시장 수요를 고려하여 현행 제도의 문제점을 파악하고 개선 전략을 이끌어 내고자 한다 또한 중소기업에 대한 지원 전략을 도출하고 활용할 수 있는 구체적인 방법을 고안하고자 하였다. 장기적인 관점에서 학문적이고 실질적인 연구를 장기적인 관점에서 진행되어야 하고 지속 가능한 중소기업에 대한 지원 프로그램을 개발해야한다.

주제어 : 수요기반, 중소기업, 지원프로그램, 출연(연)