
Performance and Challenges of Purchasing Policies Regarding SMEs' Public Technologies and Challenges

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Chapter 1. Introduction: Background and Purpose of the Study

In order to realize the “creative economy” currently promoted by the government to create decent jobs and secure stable basis for growth, innovative technology development is essential. However, in terms of small and medium sized enterprises (SMEs) who play a leading role in realizing creative economy, due to recent sales slump in Korea and abroad and deepened anxiety for the future they prioritize development of technologies whose sales market can be easily secured and it gets difficult to have creative innovation enabling another leap forward. Moreover, with regard to creative innovation, the likelihood of success in development is uncertain and even if it is successful, it is highly likely to fail to enter into market at the initial stage because of unstable features of products, lack of trust toward SMEs and concerns over post product management if problems occur.

Since the mid-1990s, the Korean government has promoted

various facilitation policies through various government agencies such as the small and medium business administration, the public procurement service and the ministry of commerce and industry with an aim to stabilize management using huge purchase volume of the government and public institutions and to facilitate technological innovation. Recently, in order to improve effectiveness of technological innovation of private companies, the government has reinforced demand-side policies through public procurement while escaping from existing supply-side policies such as providing subsidies for R&Ds.

However, it is considered that roles and functions of public procurement are still not enough to facilitate technological innovation of SMEs. As of 2014, out of 111 trillion won worth of purchasing volume of the entire public institutions including the government, SMEs represent 78 trillion won but purchasing amount of products made by technological development is just 2.6 trillion won.

In addition, when the public agencies purchase products made by technological development, in many cases the features of the product do not include significant technological innovation with enormous external economic effect or do not required in the country and the products can be improved gradually or can be easily copied by competitors, so there is a gap between the purchase and the original purpose of demand-side innovative policies.

In fact, the biggest hurdles that hinder the achievements of public technology procurement policies of the government are implicit problems of various players participating in the transaction and structural problems occurred by correlations or the mismatch of policy demands and policy response.

Therefore, as this year is the third year of promoting creative economy, it is required to check the effectiveness of public technology procurement policies of the government to identify whether the policy achieves success or not and it is needed to make measures for improvement preemptively so that it would be able to figure out restraints of policy achievement and issues to improve effectiveness in the future. However, despite of increasing importance of the public procurement policies for innovation, there are not enough empirical studies and it is required to conduct studies based on various approaches.

Thereby, in order to facilitate innovate technological innovation with high risks in development and commercialization, this study tries to derive policy measures to form an initial market for products made by technology development and to strengthen the role of reference market through enormous public procurement of the government, in terms of 'building an creative technological innovation ecosystem with a virtuous cycle' which is a key strategy in realizing creative economy. To this end, this study would look into current state of major polices operated by government to spur public procurement of products with new technologies; and evaluate the adequacy for SMEs who would be the beneficiary of the policies; and suggest measures for improvement in the future by analyzing best practices of advanced countries in the EU.

Chapter 2. Current State and Characteristics of Public Technology Procurement Policies

From the 2000s, the government has devised various mea-

asures such as providing government funded subsidies, offering tax cuts and supporting researchers through national R&D projects to strengthen SMEs' capacity of technological innovation. One of the measures is public technology procurement policies. Public technology procurement policies for SMEs can be categorized into a policy that expands purchase of products made by technology development, a policy that expands public procurement of products made by SMEs, a policy that induces healthy competition among SMEs, and a policy to secure effectiveness and transparency of administration process of procurement.

As the public technology procurement policies are gaining importance, the government announced "measures to facilitate public procurement of products with new technologies" in Aug 2013 and then promoted "measures to innovate public procurement to facilitate the economic stimulation" in September 2015.

A public procurement market in which public agencies are buyers is a large scale market with annual transactions worth of more than 100 trillion won, and the transaction volume is gradually expanding from 106 trillion won in 2012 to 111 trillion won in 2014. In particular, as a result of efforts made by the government to stabilize markets for goods and services of SMEs, the amount and share of SMEs' products in the public procurement are significant recording 78 trillion won and 70% respectively. Meanwhile, the public procurement service purchasing products on behalf of public agencies is purchasing 77% of its purchasing products from SMEs.

Public procurement of products whose technology is developed by SMEs is reduced for a moment in the 2010s, but in overall it has increased continuously recording 2.62 trillion won in 2014. By

government agency, local governments purchased products worth of 1.2 trillion won, and public institutions recorded 650 billion won and by certification, performance certification, NET and NEP recorded 230 billion won, 210 billion won and 180 billion won respectively (As of 2012).

Despite of this, the share of products with technology development among the entire amount of purchase by the public agencies is 9.4%, less than the recommended purchase target of 10%. The figure is substantially low compared with advanced countries with best practices, so this shows that the Korean government needs to put more efforts to expand public technology procurement.

As a representative program of public technology procurement for SMEs, firstly there is "first purchase program" operated by Small and Medium Business Administration. The program makes public agencies to purchase products whose technology is developed by SMEs first, more than 10% of the purchasing amount when the agencies buy products. The total purchasing amount of products with technology development by the public agencies through the program is gradually increasing from 1.68 trillion won in 2011 to 2.11 trillion won in 2012. In particular, recently to improve the execution of this program, recommendation of purchasing ratio program was changed into mandatory program. Despite of positive achievements, this program is not enough to induce voluntary and systematic technology purchase by each of the agencies. When it comes to public technology procurement, various stakeholders take part in under numerous legal and policy restrains such as the government's procurement contract law, thereby measures to harmonize the stakeholders are needed.

Second, there is “NEP mandatory purchase program”. In this program government supports new products in securing its initial market by evaluating and then certifying new products in which new technologies developed as the first in Korea and innovative alternative technologies. Especially this program is mandatory so since 2007 public institutions should purchase more than 20% of these certified products. As a result, amount of mandatory purchase has gone up significantly every year recording 600 billion won in 2009, thus helping companies developing these new technologies to secure initial market for the products. However, starting from the 2010s, purchasing performance of government agencies has been weak and certified companies are more displeased with the situation. It is the result of various factors combined such as limits existing in forced implementation even though the program is legally mandatory, increasing risks for government institutions in purchasing the products, lack of understanding by the government agencies, and difficulties in calculating the purchasing performances.

Third, there is the “excellent product designation program in procurement” operated by the public procurement service. This program is to support companies in securing markets through priority purchase such as private contract by evaluating products with excellent performance, technology and quality produced small and medium sized venture companies and then designating the product as excellent products for procurement. This program was implemented in 1996 and as of 2014 3,978 products were designated as excellent products for procurement and a total of products worth 2,111.3 billion won were purchased thus inducing technological innovation of SMEs. However, as the program is led by the pub-

lic procurement service specialized in public procurement; there are limits of insufficient direct policy foundation that can facilitate technological innovation of SMEs and not enough associated policies that can spread the product to private markets after delivering the products to the public sector.

Fourth, there is “the program of new product development based on conditional purchase” operated by the SMBA. In this program the government provides some of development funds on the assumption of purchase by customers including large corporations, public institutions and overseas countries, and if partner SMEs succeed in developing and commercializing technologies, the government finds out markets by making consumers to purchase the products for some time period. This program solves the issue of securing markets which is the largest obstacles in technological innovation, thereby this program is achieving significant policy effect as three fourth of participating companies expressed their willingness to participate in the program again. As a result, the amount of supporting budget of the government has increased substantially every year, roughly two times from five years ago recording 93.2 billion won in 2015, thus supporting 522 SMEs. Companies and industries need improvements of this program such as bolstering policy tools to ensure purchase, supporting the process of securing purchasing budget of consumers, holding a pre-briefing session of technology roadmap of consumer institutions and facilitating joint development.

Otherwise, various government agencies are supporting the process of securing markets through technology certification system.

Chapter 3. Evaluation of Public Technology Procurement Policies

This study comprehensively evaluates the entire policies instead of reviewing individual supporting programs related to public technology. It is because calculating policy effects of individual programs are difficult and the purpose of this study is to build up or improve public technology procurement system which stimulates technological innovation.

As a basic reference data of this policy evaluation, “2014 survey on corporate innovation” of the STEPI which has broad objects of investigation and relatively objective and “2014 survey report on current state of technologies of SMEs” of the SMBA and the Korea Federation of Small and Medium Business were utilized. In addition, insufficient parts of this survey are complemented by related previous studies, self-evaluation report and interviews with experts. Checking that the programs, which enable priority purchase of developed products to facilitate technological innovation of SMEs, are adequately operated to fit the purpose of policy is very important. As delivering products to public institutions has many advantages in terms of enormous scale of delivery volumes, stability of sales and conditions of delivery price, many companies are making efforts to participate in the program, but there is high possibility of failure due to moral hazards of some companies and the issue of adverse selection resulted from information asymmetry.

First of all, in order to evaluate the program supports adequate SMEs 1) it turned out that concentration rate of beneficiary SMEs of public technology procurement is higher than non-beneficiary

Table 1. Adequacy of Recipients of Supports from Public Technology Procurement

Evaluation items		Unit	Companies that use technology procurement policies ¹⁾		Companies that do not use technology procurement policies ¹⁾		Entire SMEs ²⁾	
			Focusing on sales in public market	Focusing on sales in private market	Focusing on sales in public market	Focusing on sales in private market ²⁾		
Features of companies	Age of companies	Year	18.4	17.9	19.2	18.4	18.5	
	Scale of companies (based on the number of employees)	No. of persons	49.4	87.7	47.3	63.0	62.7	
	Amount of innovation investment per one employee	Million won	21.9	18.8	9.2	13.6	13.8	
	Ratio of workers dedicated to R&Ds	%	13.2	17.0	10.5	6.9	7.3	
	Ratio of innovative companies (venture companies)	%	37.2	39.3	25.0	16.9	18.0	
	Ratio of innovative companies (innobiz)	%	39.5	46.1	30.5	19.8	21.1	
Regional characteristics	Metropolitan area	%	39.5	40.4	44.5	39.9	40.1	
	Region _ Metropolitan city	%	11.6	11.2	14.6	28.7	27.5	
	Region _ province	%	48.8	48.3	40.9	31.5	32.4	
Features of industries	OECD industry classification	Advanced technology industry	%	20.9	22.5	12.8	12.5	12.9
		High technology industry	%	23.3	39.3	37.8	32.4	32.7
		Mid technology industry	%	41.9	25.8	32.3	32.4	32.4
		Low technology industry	%	14.0	12.4	17.1	22.7	22.1
	Capital intensity	Heavy chemical industry	%	74.4	78.7	81.7	72.0	72.6
		Light industry	%	25.6	21.3	18.3	28.0	27.4

(Continue)

Evaluation items			Unit	Companies that use technology procurement policies ¹⁾		Companies that do not use technology procurement policies ¹⁾		Entire SMEs ²⁾
				Focusing on sales in public market	Focusing on sales in private market	Focusing on sales in public market	Focusing on sales in private market ²⁾	
Characteristics of technologies	Nov- elty	For the first time in the world	%	5.3	12.8	0.0	7.4	7.3
		For the first time in Korea	%	31.6	40.4	18.9	27.8	28.3
	Inno- vation	New technologies	%	23.3	28.1	6.7	8.1	8.7
		Steadily improving technologies	%	34.9	46.1	20.1	15.3	16.4
No. of companies analyzed (N)			No. of companies	43	89	164	3,550	3,846

Source : Science and Technology Policy Institute, using original data of 「2014 survey on corporate innovation」.

Note : 1) The table is based on the performance of recent three years after 2011.

2) Among SMEs whose answers were analyzed, majority of them do not use technology procurement policies and focus on sales in private market, so the result has significant impacts on the entire features of SMEs.

SMEs as a result of analyzing concentration of R&D investment in consideration of business scale by comparing dedicated research manpower, and 2) as a result of comparing the beneficiaries of policies between the innovative companies certified by the government such as venture companies and ino-biz and other general companies, innovative companies were more benefited from the policies, 3) in terms of locations of companies, the policy was more adequate to cities in non-metropolitan areas than metropolitan areas including Seoul and more appropriate to companies in provincial areas than those in metropolitan cities. However, 5) in terms of age of companies, there is no significant gap between startups

and senior companies in term of benefits from the policies, and ⑥ in terms of business scale, in many cases that of beneficiary companies were smaller than non-beneficiary companies, in particular private companies, accordingly in some cases there are issues of being satisfied with public procurement markets. This is shown in that many beneficiary companies answered that they are in the process of growing when being asked their position in the growth stage.

Next, the adequacy of items or industries of public technology procurement, in short items that government agencies try to buy need to be areas strategically nurtured by the country or industries with significant economic ripple effect. As a result of reviewing the adequacy of industries based on OECD industry classification which separated industries into four types including high technology, mid technology and low technology according to R&D investment concentration of specific sectors of each industry, the share of beneficiary companies was lower than non-beneficiary companies and in particular the share of advanced industries or high technology industry is lower than companies selling their products both in private and public markets, and it shows some rooms for improvement.

Next, in the aspect of technological features of products purchased by public technology procurement, it is favorable to have radical innovation with new ripple effect on external economy, instead of incremental innovation that gradually improves existing technologies and technologies developed for the first time in the world turned out to be better than technologies generally used in the country. As a result of analysis, 1) it seems that in terms of novelty of developed technologies, beneficiary companies were better

than non-beneficiary companies in many cases, so their novelty seems to be better. However, 2) in terms of innovativeness the result was slightly different from the previous result, as in many cases the innovativeness is the result of improvement of existing products or production process. This is due to management strategies for technologies different from management conditions of each company such as business scale, type of industry and supply chain, and it shows that there should be careful reviews when selecting subjects of support from the government.

Before the policy is actually used by SMEs, when it comes to usefulness and importance of “demand institutions in the public sector and customers” as a starting point and source of technological innovation and delivery of goods, utilization rate of companies selling their products to public institutions was about 50%p higher than those selling their products in private markets, and significance of companies was 30%p higher so it is viewed that the role as a source of information is relatively appropriate. However, it is needed to improve utilization rate and importance of SMEs that hope to start transactions although they do not deliver their technological products before. In short, there should be more efforts made for customer institutions’ business promotion, provision of information and response to SMEs.

Next, when it comes to evaluation of access utilization and condition of application for public technology procurement policy, companies selling their products to public institutions evaluate the factors similarly with those selling their products in private market.¹⁾

1) This evaluation is the result of indirect evaluation made by checking whether the

In other words, in terms of convenience in application procedure, transparency in the evaluation process, speed of administrative process, sufficiency of support period, and adequacy of support amount, the evaluations were positive recording 3.2 to 3.3 out of five point scale.

However, evaluation of beneficiary companies was lower than that of non-beneficiary companies in all categories of questions, and it shows that if the support policy of the government is actually

Table 2. Evaluation of Access Utilization and Application Requirements of Technological Innovation Policies

Unit : 5 point scale, No. of companies

Evaluated items	By main sales market			By beneficiary of technology procurement policies		Entire companies
	Focusing on sales in public markets	Sales both in public and private markets	Focusing on sales in private markets	Beneficiary companies	Non beneficiary companies	
Convenience of application process	3.25	3.05	3.25	3.09	3.25	3.22
Transparency of review process	3.34	3.20	3.35	3.13	3.37	3.33
Speed of administrative process	3.24	3.14	3.26	3.04	3.29	3.25
Sufficiency of support period	3.27	3.24	3.33	3.19	3.34	3.31
Adequacy of support amount	3.24	3.22	3.24	2.96	3.29	3.23
No. of companies answered (N)	165	264	2,207	203	2,433	2,636

Source : Small and Medium Business Administration, KBIZ, referring to data from 「2014 survey report on current state of technologies of SMEs」.

Note : This evaluation deals with the entire technology innovation policies including technology procurement.

surveyed companies use technology procurement policies, and it was verified through other existing evaluation reports and interviews with experts.

used, then there would be more insufficient factors than expected, and it is required to improve the policy by reflecting requests from subjects of the policy. In order to spur or induce technological innovation of products delivered by SMEs, aggressive efforts of the public institutions which are the customer are quite important.

In order to evaluate adequacy of related activities, first this study looked into whether innovation is included in the procurement contracts with the public sector, as a result it turned out that about half of suppliers to the public institutions did not pursue innovation, and about 30% of the cases did not include innovation in the execution of contract, even if they did execute innovation. Meanwhile, only 20% includes innovation in contract, so it turned out that comparing with advanced countries in the US and the EU, public procurement institutions' efforts to induce innovation are somewhat insufficient.

Particularly, in terms of demand side innovation, the participation of customers and users in joint development is more important, therefore as a result of this analysis two third of SMEs delivering their products to public institutions said they cooperated, but only one third of the companies said that public procurement agencies were the most useful among various external partners for innovation. In addition, aggressive efforts to transfer technologies owned by the public procurement agencies to SMEs which delivered products were weaker than that of transactions with private companies. This shows that there is much room for quality improvements when it comes to joint R&D between public procurement institutions and SMEs delivering their products. While it is important to maintain procedural fairness in the public pro-

curement but in order to maximize policy achievement of technology procurement, there should be close exchange of information and knowledge such as institutions in charge of purchase, ordering department, and actual customer department.

The government's technology procurement policy is to expand the markets including domestic markets and further the overseas markets by facilitating technological innovation of beneficiary companies by using public procurement and to strengthen the source of national growth and job creation by spreading it to other companies. Accordingly, policy achievement of technology procurement can be reviewed in various aspects.

However, it is true that there are difficulties in evaluation and assessment of policy achievement due to insufficient objective evaluation data, time consumed until the effect is realized, differences in awareness of qualitative values, and separation of pure effects of government policies. Therefore this study processed fact-find-

Table 3. Evaluation of Utilization and Importance of Public Technology Procurement Policy

Unit : %

Evaluated items	Companies using procurement policies		Companies not using procurement policies		Entire companies
	Focusing on sales in public markets	Focusing on sales in private markets	Focusing on sales in public markets	Focusing on sales in private markets	
Ratio of companies using the policies	44.2	60.7	-	-	52.5
Ratio of companies viewing that the policy is important	31.6	27.8	42.9	41.7	38.4

Source : Science and Technology Policy Institute, using original data from 「2014 survey on corporate innovation」.

ing investigation data of 2014 survey on technological innovation conducted by Science and Technology Policy Institute, Small and Medium Business Administration and KBIZ and then tried to assess policy achievements by comparing various achievements of technology management of beneficiary companies of the policy. First of all, when it comes to evaluation of importance made by SMEs concerning the government's technology innovation support policies, it turned out that public technology procurement policies are important following government funded subsidies and tax cuts through national R&D projects. It means that the effectiveness of the policy is significant.

Next, as a result of looking into patent applications of the recent three years to evaluate technological capacity of companies utilizing technology procurement policy, the ratio of companies applying for patent was 44% about two times higher than those are not. However, when it comes to companies focusing on sales targeting public institutions, the figure was slightly lower than companies selling their products in private markets, so it is needed for them to put more efforts.

Next, in terms of developed products' contribution to sales, it turned out that companies using the policy have contributed more to sales of innovative products such as products made for the first time in market and for the first time in a company than those are not, so it is evaluated as favorable policy achievement. Meanwhile, with regard to growth such as sales growth of companies, the companies using the technology procurement policy were better than those are not. However, there were not many cases in which a company expands its market to the domestic private market and

overseas export market through the entry into public markets. It is because of that there were not many sales of initial products with new technology given the characteristics of products purchased by the public institutions and their purchasing practices and it is difficult to do so, and also because of that diversifying sales market requires a lot of time and efforts.

Chapter 5. Analysis on Overseas Best Practices

The EU, the US, Japan and other advanced countries which are faced with economic difficulties in the 2000s utilize innovation as a very important policy tasks and tools for sustainable economic growth and job creation. In particular, based on enormous purchasing volume, governments of the countries actively use public procurement as a tool to facilitate technological innovation. In the case of EU, the amount of public procurement is significant recording 18.6% of its GDP (as of 2010). Traditionally, the EU has made interventions for solving public or social issues such as environmental protection, sustainable growth, improvement of quality of life, energy, healthcare, environment, construction and defense, but recently the EU is aggressively utilizing public procurement for the development of specific industries such as advanced health care or companies.

Innovative achievements, such as new products and services manufactured by technology intensive companies, improve the quality and the levels of satisfaction of products purchased by public institutions, and also facilitate the development of the industry through commercialization of innovative achievements and pre-

emptive support for users. Along with this, it could be a starting point for innovative companies to advance into the domestic markets as well as the global market.

The OECD shows that articulation of new technologies or product demands can be done by suppliers but demands can be articulated by consumers and then offered to the suppliers; and in the process of doing so innovation of suppliers can be induced. According to public technology procurement policy for SMEs, major countries in the world are putting more efforts to reflect their demands correctly to SMEs through programs related to public institutions who are customers and in the course of doing so the countries are trying to strengthen innovation of SMEs.

The US federal government's support to SMEs are made in various aspects including finance, management, procurement, technological innovation, investment, and support for minority group, women and SMEs. However, comparing with other countries' SME related policies, the most distinctive differences are that the federal government has a very strong policy to support SMEs through procurement. Support for SMEs through procurement has a long history among many other SME support policies of the federal government.

As the US government's representative policy related to public technology procurement for SMEs, there is the program called Small Business Innovation Research (SBIR). It has been operated since 1982 and this program compels federal agencies with more than 100 million dollar of annual Extramural R/R&D Budget to provide more than 2.9% of the Extramural R/R&D Budget to SMEs.

In terms of technology development, the SBIR pursues mutual

benefits through mutual cooperation between the federal government and SMEs. The federal government meets the R&D demands of the government by using creative and innovative technology development capacity of SMEs; procures excellent products for material procurement; and tries to reinforce job creation and basis for economic growth for the national economy. For SMEs, in order to develop new technologies that can contribute to profit enhancement, they would be able to actively promote difficult technology development projects which cannot be done with their own funds.

Supports of SBIR program are categorized into three phases so that SMEs' new ideas for technology development would be successfully commercialized. The phases are comprised of 1) feasibility study, 2) technology development, and 3) commercialization. Especially, the commercialization in the phase 3 is the stage in which projects whose technologies were successfully developed in the phase 1 and 2 are supported for its commercialization so that the developed technologies would lead to products and sales. Through this, the government is trying to procure excellent products through public procurement after the commercialization.

Policies in the EU area to support technology innovation through public procurement of SMEs' products can be separated into policies at the EU level and those at individual country level. European countries can be categorized according to the level of utilization of demand side innovation policies such as public procurement into three groups such as experiencing strong policies, promoting related policies and promoting limited policies.

The EU is promoting European style SBIR programs, which are based on three stage of application identical to the SBIR program

Table 4. Level of Implementing Demand Based Innovative Policies in European Countries

Classification	Name of country
Experiencing strong policies	Germany, Finland, Denmark, Belgium, Sweden, the United Kingdom, the Netherlands and Norway
Promoting related policies	Austria, Ireland, Portugal, Spain, Italy, Iceland, Poland, Malta and Czech
Promoting limited policies	Hungary, Greece, Lithuania, Bulgaria, Romania, Slovenia, Cyprus, Slovakia, Estonia, Latvia, France, Switzerland, Luxembourg and Liechtenstein

Source : Izsak Kincso, Edler Jakob, *Trends and Challenges in Demand-Side Innovation Policies in Europe*, 2011.

in the US. However, to induce innovation of SMEs, the EU is seeking aggressive use of public procurement as part of strengthening demand side supports. For each stage, the EU is working on investments at the EU level.

Germany made an initiative for sustainable public procurement by integrating existing initiatives operated by Procurement Office of BMI. As a goal for strategic public procurement, the country set sustainability and operates the initiative. In addition, the country provides consulting services to buyers in the public sector who want to make purchases by using public procurement market, and operates an online platform to provide information. The supports are made centered on strategic areas such as electric vehicle, resource efficiency, traffic and sustainable construction.

The UK is working on to expand participation of SMEs in public procurement through the policy called ‘Making Public Sector Procurement More Accessible to SMEs’. As major directions of the

policy, there are connection between demands and supply, operation of fast track and securing monitoring channel.

In addition, the country is pushing forward with SBRI to reinforce innovative activities of SMEs by supporting R&Ds to get solutions for clear needs by using public procurement policies. SBRI is a business model similar to the SBIR program of the US and it was started in 2001, and by adding four stages the UK is supporting public procurement or entry into markets of technologies developed through SBRI.

Japan's public procurement policies for SMEs are based on the principle of appropriate use of budget by procuring quality products fairly at low prices and the policies can be summarized as those for increasing opportunities of SMEs to obtain orders. The Japanese government (the Ministry of Economy, Trade and Industry and the Small and Medium Business Administration) makes policies to improve opportunities for SMEs to obtain orders and then makes decisions on the policies after having consultations between ministries and agencies before proclaiming the policies.

As a major policy related to public technology procurement for SMEs in Japan, there is the SMEs' technology innovation policy. The policy was launched in 1999 based on the "Act on stimulation of new business creation" and starting from Apr 2005 the "Act on stimulation of new business creation" was integrated with the "Act on supporting SMEs' management innovation" and the "Temporary Act on stimulation of creative business activity of SMEs, and the policy has been operated based on the "Act on stimulation of new business activities of SMEs" that supports new business activities pursued in connection with other SMEs.

The policy explicitly encompasses other commercialization support policies within the public support system. In particular, in 2008 through the revision of “expansion of opportunities for SMEs with technologies to participate in bidding”, the country is working on special measures on participation in tender by SMEs receiving subsidies from technology innovation policy for SMEs. For effective implementation of the special measure, “operation guide for special measures on participation in bidding” was made in Mar 2010. The contents of special measure is about enabling participating in bidding regardless of grades in existing bidding participation qualification and past achievements if SMEs that received specific subsidies can prove their technological cooperation in the area of tender.

Chapter 6. Policy Direction and Action Plans

(1) Creation of conditions for aggressive purchase of technologies by government agencies

In fact, for government institutions, strengthening of technological innovation through purchasing technological products made by SMEs is based on the need of country and in many cases it is not a key objective of the institutions. In particular, it is true that public institutions are passive in purchasing technologies due to anxiety coming from the fact that SMEs are suppliers of purchased technologies, complaints surrounding favors, unstable performance of products, difficulties in setting appropriate prices, and concerns over post management.

Therefore the government has devised various supplement measures such as introduction of performance insurance system, insertion of an exemption clause for a person in charge of purchase, rewards for public procurement events and reflection in the management evaluation of government agencies. However, there is a limit in eliminating deep rooted passive purchase practices of government agencies. Moreover, as situations in sales markets at home and abroad worsened due to global economic contraction, competition surrounding the existing markets is getting fiercer. This is highly likely to strengthen the government agencies' tendency of avoiding risks putting priorities on procedural impartiality and fairness instead of actively purchasing technology products.

Therefore, it is needed to explore policy tools that can induce voluntary participation while strengthening efforts to review and improve current conditions so that existing measures to encourage participation of public procurement institutions would be implemented well.

(2) Exploration of new demands for products of public technology procurement and expansion of policy scope

The government has frequently revised the list of products with technology development that the public agencies can purchase first. Starting from Aug 2015, purchase target of excellent products with technology development which has been operated under recommendation system was strengthened to a mandatory system, so subjective products are included in the 13 types of government certification and 5,289 products were designated. In short, as 13

certification systems for excellent technological products of which the government agencies should purchase more than 10% of the products from SMEs, there are NET of Korean Agency for Technology and Standards, NEP, GS, excellent products in procurement by the public procurement service, products designated as excellent procurement joint brand, performance certification by the Small and Medium Business Administration, convergence R&D success products on the assumption of purchase and based on public-private joint investment, products with technology development whose achievement is shared, green certificate products, industry convergence products and products selected for development.

Strictly defining policy subjects of products with technology development subject to priority purchase as new technological products whose performance is verified is reasonable in terms of policy aspects, as by doing so effectiveness of policy would be secured and financial and time burdens coming from duplicated certification would be reduced. However, it is also true that there are concerns in which some technologies such as excellent technologies spontaneously developed by companies in the new growth area are excluded from supports even if they need the policy supports.

Institutions subject to mandatory participation in public technology procurement vary and their characteristics are different from each other. In particular, it is needed to set the scope of subject institutions at the initial stage of the policy and voluntary participation of government agencies is essential to the policy. While current 13 certification systems are different in terms of operation and difficulties in achievement, if the government compels the program, the policy could be operated while not meeting the original

purpose. Thereby by being more flexible, it is needed to provide rooms for active participation by the government agencies which are highly likely to buy and have demands for developed technological products.

Meanwhile, while escaping from the viewpoint centered on manufacturing sector or information communications, it is needed to aggressively find out needs for technology innovation in the area of energy, environment industry, SOC area, defense and military which are gaining attention as a new growth industry.

(3) Building up a stepwise support system for facilitation of technology purchase

Purchase of developed technological products is quite different from that of general products in terms of purpose of purchase, method and post management. With regard to purchase of general products, most of the products' performances are verified in many cases and in terms of price suppliers and customers have formed a consensus based on accumulated past experiences. Therefore, buyers are most interested in purchasing quality products at reasonable price, and if issues occurred later, it is not hard to resolve them. Meanwhile, developed technological products have made based on specific demands to satisfy the needs of customers so to enhance the satisfaction level of customers it is needed to provide sufficient information from the planning and developmental stages. Delivery price would be higher than general products as more development efforts were made, but opinions on the appropriate price could be different, and inevitably the products would need

to be modified or complemented in the process of installing and operating the products after purchasing them.

If there lacks close cooperation or communication between customer public institutions and SMEs that supply the technological products, there would be discontent about the transaction, and this would lead to negative factors in the facilitation of transactions in the future. Therefore, the government needs to build up a system encompassing technological needs of the public institutions, signing of development and purchase contracts, checking the joint development and the on-site application, purchase, operation management, and post management by considering distinctiveness of public procurement of developed technological products so that the entire process of technological product transactions would go smoothly.

(4) Early settlement of the policy through systematic and consistent response under integrated promotion system

In order to expand public technology procurement, in the 2000s the government announced countermeasures for activation for several times in June 2003, June 2006, Aug 2011 and Aug 2015 respectively, and this shows that the effects of the policy are insufficient. It is because that interests of stakeholders including supplier SMEs and the customer government agencies are different, and laws, systems and purchasing practices are not aligned with each other, therefore it is not the issue that can be easily resolved.

Therefore, in order to solve this complex and structural issue, related stakeholders and ministries should improve the situation

consistently under cooperation. Accordingly the government agencies jointly announce countermeasures for activation for this reason. These efforts should be made more systematically and in a more integrated way. In particular, it is highly required to do so as target purchase policy for excellent technological products is strengthened by becoming mandatory in Aug 2015 previously from recommendation.

(5) Improving connections between technological innovation and public procurement

It is needed to connect technology innovation support programs and public procurement supporting programs currently under separate operation. It needs to improve quality of public procurement by connecting those with excellent achievement in the technology innovation supporting program with public procurement, and to stimulate SMEs having difficulties in securing initial market to put more efforts.

Concerning projects conceived as being successfully developed through KOSBIR operated in Korea in the viewpoint of participating institutions, supporting system for the commercialization can be established by utilizing follow up supporting system of the Small and Medium Business Administration. By recommending the excellent products produced as a result of the system, and by doing so when connecting the products with the public procurement, consistent supporting system could be built up.

In the case of SBIR program of the US, the country separated supporting process into technology development of the 1st to 2nd

phases and commercialization of the phase 3, thus pursuing mutually organic connectivity. As there is growing attention on the 3rd phase that supports commercialization, SBA is aggressively looking for measures to facilitate the support in the third phase.

Japan's program to innovate technologies of SMEs is seeking special measures for bidding participation with an aim to practically support commercialization using achievements in R&D. In the European style SBIR program in the EU and SBRI of the UK, demands of public sector are actively reflected in R&Ds and the programs promote public procurement of innovative products and services produced from the R&Ds.

(6) Promoting systematic information provision and sharing

In order to link programs that support technological innovation of SMEs and public procurement of innovative technological products, it is needed to connect and provide information of the two. To this end, it is needed to connect KOSBIR support information system, policy information provision system tailor made to SMEs (www.spi.go.kr) and public procurement comprehensive information network (www.smpp.go.kr).

As mentioned above, it seems possible to provide related information systematically under mutually interconnected system, if KOSBIR, follow up projects of the Small and Medium Business Administration, and public procurement are connected with each other. In particular, by exposing related information at certain extent, it is needed to play a role of implicit peer pressure in the industries and suggest future direction for innovation.

SIBR program in the US tries to provide information systematically. SBA which is the operating institution of the program provides integrated information by using HP of SBIR program and each enforcement agency is providing information by utilizing their characteristics. In the program, one can clearly look into supports for individual companies. As a result, those in charge of SBIR are well aware the contents of the program and SMEs get to know more about the program and pay more attention to the program.

Japan's program for technological innovation of SMEs also aggressively promotes its supporting program and is making more efforts to provide information aimed at improving the access convenience of companies. HP which has been operated since 2009 provides information on public contest for specific subsidy, participating companies and successful examples of commercialization of the achievements.

(7) Promoting communication with related institutions through training and business negotiation

For public procurement of products and services made by SMEs, cooperation of participating institutions is important. In terms of public technology procurement with high technological risks, it can be said that understanding of those in charge of the work in public agencies is more significant. To this end, it is needed to broaden understanding on the program by conducting training session for those in charge of procurement of SMEs' technologies. In particular, it is expected that exploring best practices and providing training for the practices would expand the ripple effect.

In addition, through regular business negotiation, it is needed to find out and resolve difficulties faced by those in charge of the work. By doing so, it would be required to make those in charge of purchase in the government agencies to actively participate in.

Germany is working on training, symposium, exchange and provision of publications in the Competence Centre for Sustainable Procurement and through this the country promotes communication between SMEs and related institutions. In the case of SBIR program in the US, the operating agency, SBA, is working on approaches using training or prior inducement such as regular business negotiation with implementing agencies to have effective promotion of the program and meet the performance goal, instead of offering ex post facto examination.

Meanwhile, through a conference to facilitate public procurement, it is needed to expand rewards to institutions and those in charge of the work when they excellently promoted public technology procurement for SMEs. In addition, in the case in which government agencies explored technology development projects and it leads to the development by SMEs and budgets are saved by purchasing the developed products, it is needed to aggressively find out measures to provide monetary incentives to those in charge of the work.