DOI: 10.20472/IAC.2015.019.026

SUNGHO CHO

KISTEP (Korean Institute of Science & Technology Evaluation and Planning), □□□□

STRATEGIC GOVERNMENT R&D BUDGET ALLOCATION OF FUTURE GROWTH ENGINE SECTOR IN KOREA

Abstract:

The goals of R&D Budgeting are to provide the outlays of government R&D budget allocation and adjustment for the strategic investment in government R&D programs, and it is directly followed by establishing the directions and the standards in overall government R&D investments and related budget deliberation.

R&D investment follows the policy coordination, in particular. Policy coordination provides guidelines to program coordination. Policy coordination will provide R&D programs with S&T goals and proper budget estimates. It must ensure that the goals are reached through the most efficient ways. Thus, it is important not only to follow the strategy plan and to track the development in reaching the objectives, but also to continuously monitor changes in the R&D environment and eventually to adapt the activities to new circumstances. In other words, the detailed investment strategies in association with S&T policies and technology development status which are subject to global environment changes are investigated. There can be many ways to deal with it. Here, Korea's case study will be introduced and it has been evolved for finding effective and efficient way to invest at this moment.

This paper will cover the concepts of R&D program coordination and budget allocation, their roles in future growth engine in KOREA. First, Korea's case of establishing government R&D direction and standards will be introduced. It let us to share the main ideas and procedures of S&T policy/technology priority setting. Second, budget allocation in program point of view and detail procedure will be presented. Also, brand new results of Korea's R&D program coordination and budget allocation will be introduced in practical sense.

Keywords:

Budget allocation, Future growth engine, Priority setting, Program coordination, KOREA

JEL Classification: O32

1 Introduction

The government has confirmed an execution strategy to foster 13 future growth engines, such as to develop the 5th generation (5G) mobile communication key services and to commercialize 100 wearable smart devices, 2014. The policy is to foster 13 growth engines in each industrial sector, and thus to achieve national income of $40,000 by 2020.

South Korea is a leading country aiming at economic growth based on science and technology. 13 Future growth engines are strategic industries selected to be a promising future key industries at the national level, which are led the research and development budget for the development of these industries announced a policy commitment to strategic support.

Despite the recent economic recovery, the uncertainty in the revenue situation is expected to continue to be difficult in contrast with the past budget increases. Government investment in research and development is facing a tough situation significantly increase its spending as in the past at this point that the financial soundness issues have emerged. Such as full-fledged national tasks under difficult financial conditions and spending structures to ensure the fiscal soundness is also a movement to reform to national issues emerged as central to the core agenda of budget allocation adjustments.

The next significant research and development expansion of investment is difficult considering the conditions carefully grasp the economic impact of the increase in policy measures by expenditure covered by the major initiatives and increased even more the need for proactive policy suggestions for portfolio management. Its governmental R & D budget allocation adjustment in investment priorities improve investment efficiency considerations rather than on in-depth discussion on the portfolio management for scientific and technological policy objectives due to the fact that emphasis has ever had.

This paper has been prepared in order to be used as a reference for the adjustment of future portfolio of government R & D budget by analyzing the difference between the 13 future growth areas of government R & D budget status and investment priorities in the policy and industrial importance point of view.

2 Research objective and Problem definition

The main points of the execution plan are to expand R&D on key technologies and services based on future market demands and to develop small and medium-scale companies and venture business as the center of future industry. This plan also contains

the government's support policy for parts and materials localization, technical mentoring system implementation and open global partnership promotion.

The 13 future growth engines are divided into nine strategic industries to be the new national income sources and four backbone industries. The nine strategic industries are △smart car, △5G mobile communication, △deep-sea offshore plant, △customized wellness care, △wearable smart devices, △intelligent robot, △disaster safety management smart system, △realistic contents and △new and renewable energy hybrid system. The four backbone industries are △intelligent semiconductor, △big data, △convergence materials and △intelligent Internet of things (IoT).

The purpose of this paper is aimed to propose a steering direction of the government portfolio in new growth engine areas and strategic R&D plans to establish a research and development budget allocation. Analysis of industrial policy priorities with the economic priorities for the national strategic industry technology, and presented in a variety of investment direction, so is called over-investment sector or under-investment sector through gap analysis of the current status and perspectives of investment.

Two kinds of methods are considered for priority setting. One is analytical hierarchical process for finding industrial policy priorities. The other is inter-industrial (input-output) analysis for industrial impact such as production inducement effect, value added effect, employment inducement effect and etc.

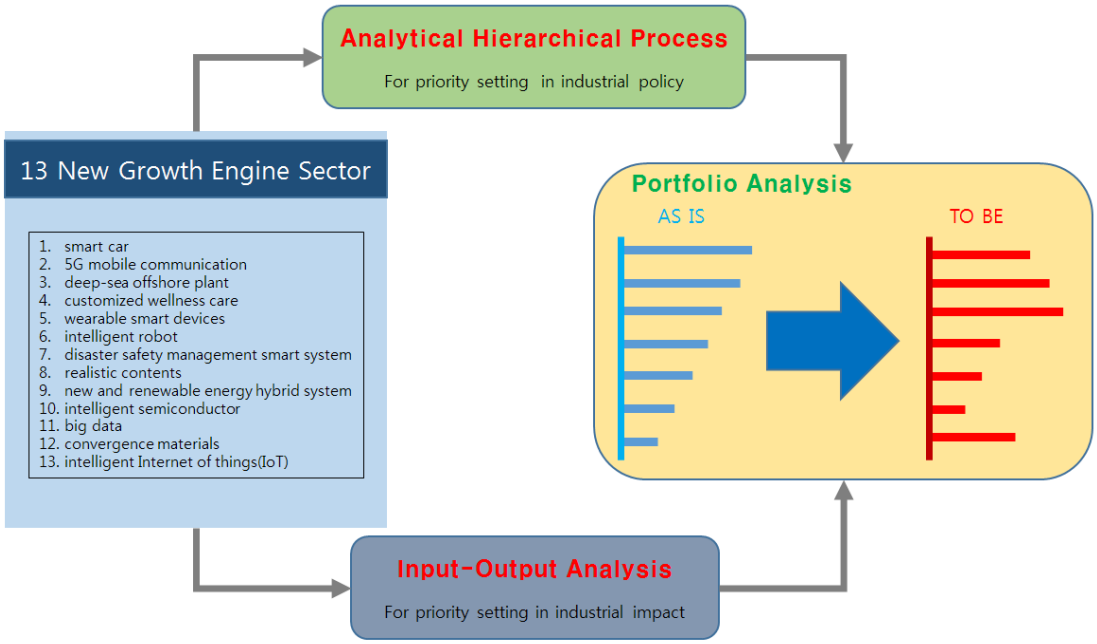

Figure 1. 13 New Growth Engines and Its Portfolio Analysis through AHP and IO Analysis

3 Portfolio and Priority Setting in the Sense of Industrial Policy

A framework of the investment direction through gap analysis between government R&D investment and policy priority is suggested. Table 1 shows R&D investment and its ranking, AHP result as a policy priority and its ranking. AHP survey represents the results of a survey aimed at professionals who participated in planning of 13 future growth engines.

The government R&D investment portfolio of 13 future growth engines is investigated that the convergence material is No. 1 in 4409 billion won, customized wellness care is second with 93.2 billion won, intelligent robot in third with 75.9 billion won, as shown in Table 1. Wearable smart device and New, renewable energy hybrid system, and big data sectors are comparatively low invested.

According to the analysis of policy priority survey, wearable smart device is No. 1 in 0.136, intelligent robots 2nd, smart car 3rd. However, 5G mobile communications is 12th and deep sea offshore plant is analyzed 13th in rank.

After performing a gap analysis from the above results, wearable smart device is analyzed in (+) 10, big data is accounted for (+) 5 gap. It means these sectors have been invested lower than policy priority. But customized wellness care has (-) 9, 5G mobile communications (-) 5, and deep sea offshore plant (-) 5, convergence materials (-) 5 gap. (-) gap shows these sectors have been over-invested in the sense of policy priority.

Figure 1 shows 2 dimensional graphical interpretations between government investment and policy priority. Upper triangle area represents over-investment and lower triangle under-investment under considering policy priority survey.

Table 1 Gov't R&D Investment, Policy Priority and its Gap Analysis

13 New Growth Engine	Gov't R&D Investment(2013)		Policy Priority		Gap Analysis (A-B)
	Investment (100M$)	Ranking (A)	AHP	Ranking (B)	
Smart Car	615	5	0.090	3	2
5G Mobile Communication	551	7	0.049	12	-5
Deep-Sea Offshore Plant	401	8	0.037	13	-5
Intelligent Robot	759	3	0.111	2	1
Wearable Smart Device	80	11	0.136	1	10
Realistic Contents	694	4	0.090	4	0
Customized Wellness Care	932	2	0.053	11	-9

Disaster Safety Management Smart System	578	6	0.085	5	1
New And Renewable Energy Hybrid System	60	12	0.055	10	2
Intelligent Semiconductor	196	10	0.067	9	1
Convergence Material	4409	1	0.080	6	-5
Intelligent Internet Of Things(Iot)	289	9	0.077	7	2
Big Data	17	13	0.070	8	5

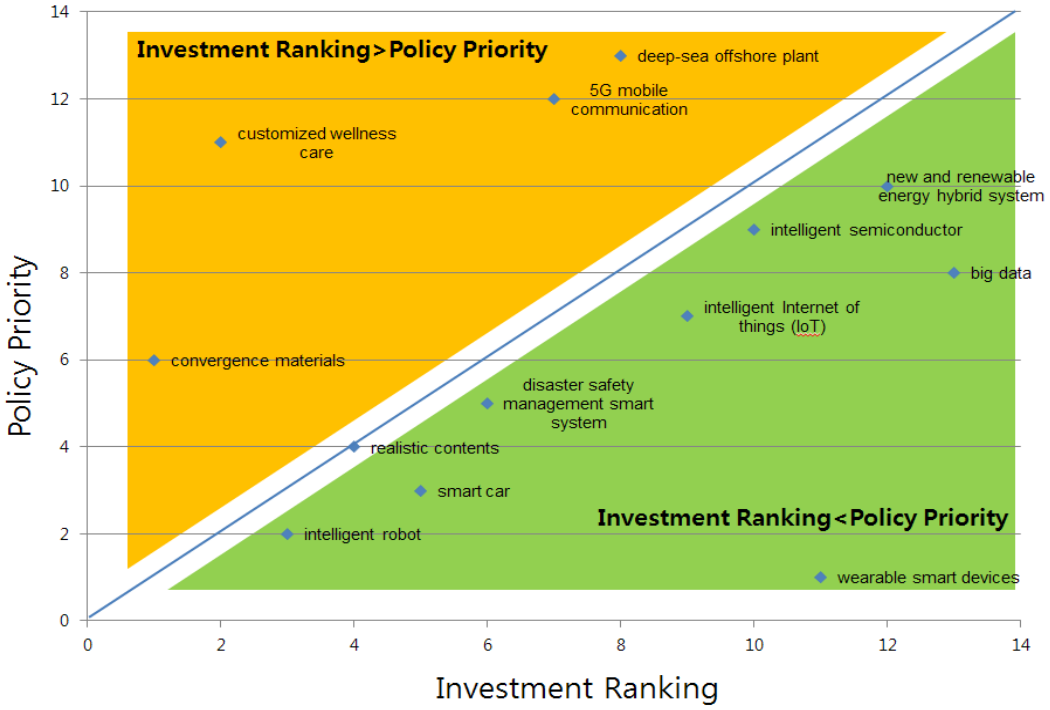

Figure 2 Graphical Interpretation on Over/Under Investment in the Sense of Policy Priority

4 Portfolio and Priority Setting in the Sense of Industrial Impact

A framework of the investment direction through gap analysis between government R&D investment and industrial impact is suggested through input-output analysis. Table 2 shows ranking of industrial ripple effects such as production inducement, added value inducement, and employment inducement. This result reflects the in-situ economic structure in South Korea, then high rank sector will be anticipated more effective return (such as ROI) because of economic impact through R&D investment.

According to the analysis of production inducement effect, smart car, intelligent robot, and intelligent internet of Things (Iot) are important area in series. In the sense of added value inducement effect, big data, 5G mobile communication, customized wellness care are important sectors in series. In the employment point of view, customized wellness care and disaster safety management smart system are efficient area as the result of input-output (inter-industry) analysis.

After performing a gap analysis from the above results, wearable smart device and intelligent internet of things are analyzed in (+) 6, smart car is accounted for (+) 4 gap in the sense of production inducement effect. It means these sectors have been invested lower than importance of production inducement effect. But customized wellness care has (-) 6, deep sea offshore plant (-) 5, and convergence material (-) 3 gap. (-) gap shows these sectors have been over-invested in the sense of production inducement priority.

In the added value inducement effect analysis, big data has biggest (+) gap which means its government investment size is too much lower than the importance of added value priority. But convergence material has biggest gap in (-) direction which represents over-investment status in the sense of this kind of priority. In the employment inducement effect, big data is also analyzed under-investment sector but convergence material has been over-invested rather than its employment inducement priority.

Figure 2 and 3 show graphical interpretations between government investment and industrial impact priority. Upper triangle area represents over-investment and lower triangle under-investment under considering economic point of view.

Table 2. Gov't R&D Investment, Industrial Impact(Ripple) and its Gap Analysis

13 New Growth Engine	Gov't R&D Investment Ranking (A)	Industrial Ripple Effect					
		Production Inducement (B)	Gap Analysis (A-B)	Added Value Inducement (C)	Gap Analysis (A-C)	Employment Inducement (D)	Gap Analysis (A-D)
Smart Car	5	1	4	6	-1	7	-2
5G Mobile Communication	7	9	-2	2	5	8	-1
Deep-Sea Offshore Plant	8	12	-4	13	-5	12	-4
Intelligent Robot	3	2	1	8	-5	5	-2
Wearable Smart Device	11	5	6	11	0	9	2
Realistic Contents	4	7	-3	4	0	4	0
Customized Wellness Care	2	8	-6	3	-1	1	1
Disaster Safety	6	6	0	5	1	2	4

Management Smart System							
New And Renewable Energy Hybrid System	12	13	-1	12	0	13	-1
Intelligent Semiconductor	10	10	0	9	1	11	-1
Convergence Material	1	4	-3	10	-9	10	-9
Intelligent Internet Of Things(Iot)	9	3	6	7	2	6	3
Big Data	13	11	2	1	12	3	10

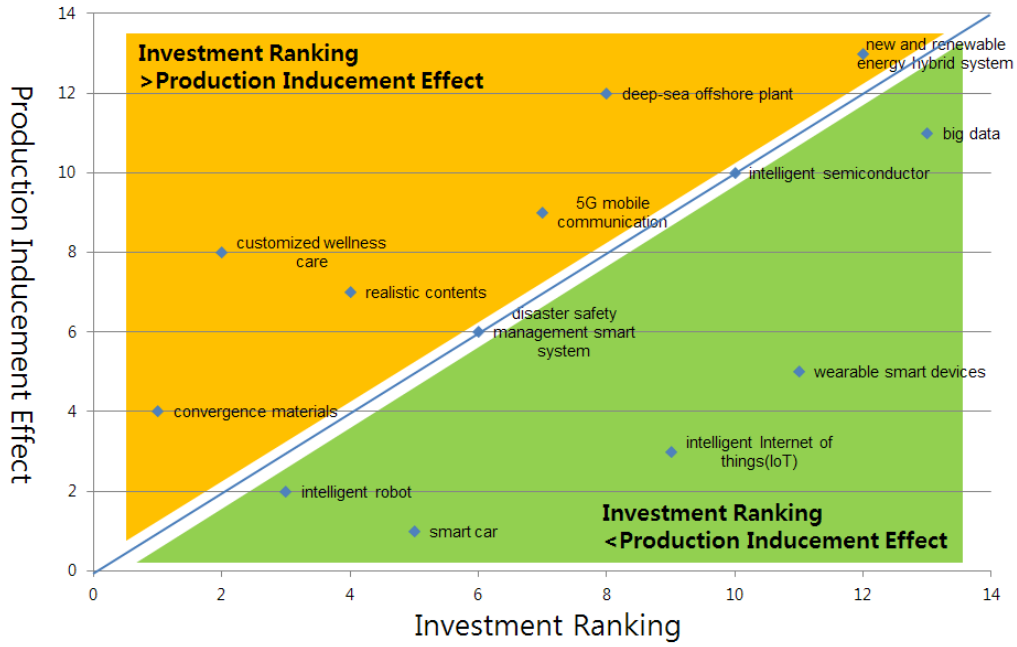

Figure 3. Graphical Interpretation on Over/Under Investment in the Sense of Production Inducement Effect

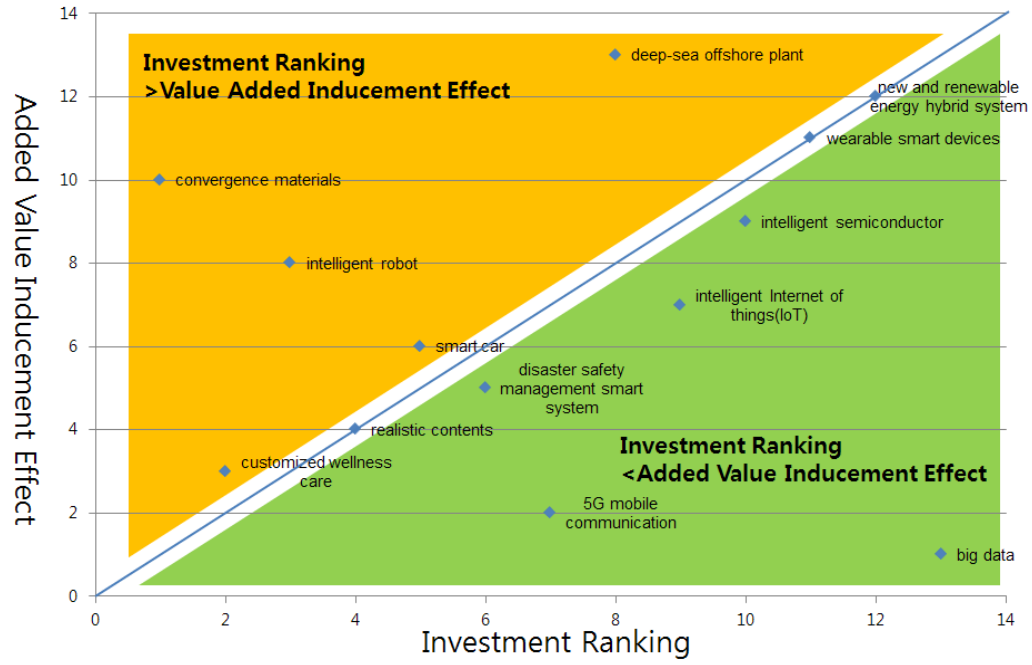

Figure 4. Graphical Interpretation on Over/Under Investment in the Sense of Added Value Inducement Effect

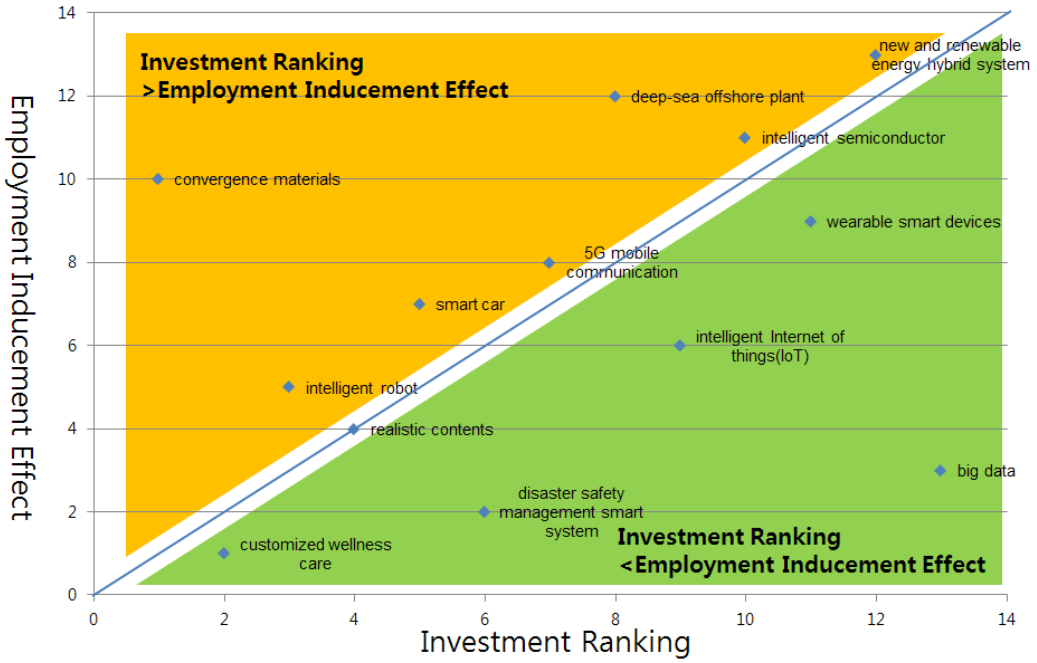

Figure 5. Graphical Interpretation on Over/Under Investment in the Sense of Employment Inducement Effect

5 Discussion

Deriving policy priorities and industrial priorities, this paper proposes a comprehensive methodology to prioritize them, and their investment direction. This method can evaluate a variety of perspectives through a gap analysis in future growth engine sectors.

To analyze the policy priorities, analytical hierarchical process was adopted. Through survey on experts in working group of planning future growth engine, policy priorities were presented. From input-output analysis, industrial impact priorities were also discussed. Industrial policy and economic impact priorities give us a variety of hint on the budget investment direction.

Suggested methodology framework can be widely used in decision making on industrial technology R&D investment under considering the country industrial structure and expert opinions together.

References

Joint Interagency, the 3rd Science and Technology Basic Plan ('13 - '17)

Joint Interagency, Future growth engine for realizing income $ 40,000

The Bank of Korea, Korea's System of National Accounts, 2010