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An Economic Analysis on the Research Infrastructure for Next-Generation Network Computing Platform

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Abstract

The project to build a next-generation network computing platform is being implemented as part of the initiative to establish a basis for information technology research. The purpose of this project is to promote increased productivity of corporations by creating an environment for tests and evaluations, by establishing IT research facilities and by installing related equipment, which in turn will serve as the basis for technological progress at small and medium-sized companies. The purpose of this study is to implement an economic analysis of the project to build a next-generation network computing platform. A cost-benefit analysis was used as the study method, which showed that the ratio of benefit to cost was 1.856. Since the ratio is higher than the break-even point of 1, the project is evaluated as having more benefits compared to the cost.

Keywords: Next-Generation Network Computing Platform, ICT Research Infrastructure, Cost-benefit Analysis

1 Introduction

The project to build a next-generation network computing platform is being promoted as part of the ICT Research Infrastructure Project, with a purpose to promote increased productivity of corporations by creating an environment for tests and evaluations, by establishing IT research facilities and by installing related equipment, which in turn will serve as the basis for technological progress at small and medium-sized companies [1].

The project is about promoting the usage and establishment of research facilities and equipment that are essential to reinforcing capabilities and developing technologies at small and medium-sized corporations in the field of IT. More specifically, it is about using the established infrastructure (research facilities and equipment) to verify the quality and reliability of developed technologies or products so that they can enter new markets at home and abroad, and to have better access to technical guidance or consultation to shorten the development period for technologies and products.

This project is necessary to invigorate the next-generation network computing and application technology industry. An open network computing paradigm that has been launched with the development of a software-based network technology has been causing ripple effects throughout the entire global computing market

Recently, related industries came to be viewed as necessary for the development of new concept complex or merged ICT equipment (cloud set top, LTE-WiFi synchronized internet phones, N-Screen services) and for virtual reality mobile communication and multi-media environments. However, at the moment Korea’s next generation network computing industry is heavily reliant on large-scale vendors of the US [2].

The next generation network computing industry is seeing a trend where the paradigm led by hardware suppliers is shifting towards one with a focus on the user [3] and software-based network computing technology is seen to replace the existing market and create new markets in the future. Therefore, there is a need to support as much as possible related industries in Korea. To that effect, a test bed that can support the testing of next generation computing technologies is a prerequisite.

Moreover, given that corporations or personnel specializing in next generation network computing are in a short, and efforts to foster talent in the field is needed. Joint research and development between academia and industry through which knowhow can be accumulated will also be required.

This study aims to conduct an economic analysis on the project to build a next generation network computing platform.

2 Cost Analysis

2.1 Project Period and Input Budget by year

This project will be carried out for a total of five years from 2014 to 2018. The budget for each year is as seen in Table 1.

This project is set to cost a total of 12.5 billion Korean Won but the share of the private sector’s contribution has yet to be determined. The total duration of the project is five years, with 2.5 billion Won being put in each year. The focus in year 1 and year 2 will be the establishment of a test bed for software-based network computing platform, followed by the establishment of a test bed for software-based network computing application service solutions in year 3, reinforcement of the test bed in year 4 and expansion and reinforcement of the software-based network computing solution in year 5.

Table 1: Budget by year (Unit: Korean Million Won)

Category		**1st Yr.**	**2nd Yr.**	**3rd Yr.**	**4th Yr.**	**5th Yr.**	**Total**
Project Costs	Government	2,500	2,500	2,500	2,500	2,500	12,500
	Private Sectors						
Total		2,500	2,500	2,500	2,500	2,500	12,500

2.2 Cost Analysis

Due to the incompleteness in the projected budget in the plan, it is difficult to conduct a detailed analysis on the budget. It is also impossible to compare the benefits of a new project with those of existing projects. As such, the budget that was input for a similar project was used for comparison purposes.

In order to compare this project with similar projects, the website 'National R&D Performance Information Services (www.ntis.go.kr)' was searched. As seen in Table 2, the result of the search was that the initiative to 'Establishing the Infrastructure for Mutual Operation of Merged Service Equipment' and the initiative to 'Establishing the Infrastructure for Communications Equipment BMT' were similar in their content. These two projects had an annual budget of 18.93 million Won and 18.14 million Won, which are also similar to that of our project in question.

Table 2: Review on the budget of similar initiatives (Unit: million Korean Won)

Ministry	**Project title**	**Initiative**	**Budget**	**Duration**
Ministry of Knowledge and Economy	Establishment of IT research Infrastructure	Establishing the Infrastructure for Mutual Operation of Merged Service Equipment	9,466	5 yrs (Mar. 2009 ~ Feb. 2014)
Ministry of Knowledge and Economy	Establishment of IT research Infrastructure	Establishing the Infrastructure for Communications Equipment BMT	9,069	5 yrs (Mar. 2009 ~ Feb. 2014)
Ministry of Industry and Resources	Core Base Technology Project	Development of SoC for Next Generation Network Equipment	1,234	4 yrs (Sept. 2003 ~ Aug. 2007)
Ministry of Information Communication	Establishment of IT Source Technology	Management Control and Testing Technology for Next Generation Network Service	7,046	2 yrs (Feb. 2003 ~ Jan. 2005)
Average (Per year)			1,884.6	

A comparison with other projects, too, revealed that the budget was set relatively lower.

3 Benefit Analysis

3.1 Project Period and Input Budget by year

A quantitative and qualitative analysis was carried out on the potential benefits from the next generation network computing platform project. The equation for calculating the benefits is as follows.

Benefits = Direct Benefits + Indirect Benefits (1) + Indirect Benefits (2)
Where, Direct Benefits (by Cost Saving) = Costs × Cost Savings Rate
Indirect Benefits (1) = Benefits × Value Added Ratio
Indirect Benefits (2) = Costs × Newly Created Employment
× Annual Salary of New Recruits in the industry

3.2 Application of the Benefit Analysis Model

In order to calculate the benefits, the following data and assumptions were used. For cost, the entire budget that would be invested over the duration of the project was used. The discount rate for each year was 2.0% [4] which is the average economic growth rate in 2012. This was used to convert the figures of the budget into the present value for 2014. The cost-savings rate was set at 40%. The effects of any changes in this rate are reviewed in a sensitivity analysis in the conclusion.

For the value-added effects, the value-added rate of 78.6% for 'computer-related services' was used [5] from 'revenues and value-added coefficient table' in the 'producer price-comprehensive categorization-transaction table and various coefficients' from the <2011 extended related industry table (published in 2013)>. As for employment effects, Bank of Korea's Industry Figure for 2010 (published in 2012) was used. This figure was 12.5 people for every investment of 1 billion Won in an industry categorized as 'medium' in terms of technology level [5]. In order to estimate in monetary units the employment benefit, the average annual salary for new recruits in the industry of communication and broadcasting, 32.15 million Won was applied [6].

4 Analysis of Economic Value

In order to analyze the projects' economic value, a cost-benefit analysis was conducted. This analysis framework is the most general and comprehensive that is commonly used when assessing government policies. IT estimates the costs and benefits of various policies and proposes the best alternative [7].

Table 3: Cost-benefit analysis table (unit: 100 million Korean Won, %)

Proj year	Input budg-et	PV of cost	PV of accum. cost	Cost-saving (40%)	Value-added return	New Emp.	Ben-efits	PV of Ben-efits	PV of accum. Benefits	B/C
yr 1	25	25.00	25.00	10.00	19.65	10.05	39.70	38.92	38.92	1.557
yr 2	25	24.51	49.51	10.00	19.65	10.05	39.70	38.16	77.07	1.557
yr 3	25	24.03	73.54	10.00	19.65	10.05	39.70	37.41	114.48	1.557
yr 4	25	23.56	97.10	10.00	19.65	10.05	39.70	36.67	151.15	1.557
yr 5	25	23.10	120.19	10.00	19.65	10.05	39.70	35.95	187.11	1.557
2019	0	0.00	120.19	0.00	0.00	0.00	39.70	35.95	223.06	1.856

Since this project plans to have the budget invested over the five years from 2014 to 2018, a discount rate was applied to the input amount to convert them to the present value, which was then placed into the benefit calculation formula to conclude the present value benefits.

The analysis shows that the benefit to cost ratio is larger than 1, which indicates that it has more benefits than cost.

5 Conclusions

The ratio of benefits to cost for this project was calculated to be 1.856 but this is the result that was drawn based on the assumption that the cost-saving ratio is 40%. Meanwhile, since technological performance varies depending on the research results, a sensitivity analysis was conducted to reverse-calculate the cost-saving ratio that leads to a B/C ratio of 1.

Benefits = Cost × Cost-saving Ratio

+ Cost × Value-added Rate
+ (Cost × Number of New Jobs) × Annual Salary

Using the above analysis formula, the cost-saving rate was reverse-calculated as follows.

Cost-Saving Rate = [Benefits – (Cost × Number of New Jobs × Annual Salary) – (Cost × Value-Added Rate)] / Cost

- The base year (year 1, 2014) was used
- Benefits: the same as cost
- Cost: 2.5 billion Won (the present value of cost to be input during year 1
- Annual salary for new recruits in the industry: 32.15 billion Won
- Value-added rate: 78.6%
- Number of new jobs created : 12.5 jobs for every 1 billion Won input

By applying the above data, the cost-saving rate that makes the B/C ratio 1 is calculated to be 17.38%. An observation of the change in B/C ratio over two years (Based on the benefits that occur one year after the project is concluded (in 2019) and when the project is concluded after a 5 year duration (in 2018)) at a cost-saving rate of 40% and at 17.38% shows that when the cost-saving rate is 40%, the B/C ratio ranges between 1.557 and 1.856 but when it the cost-saving rate is 17.38%, the B/C ratio was found to be between 1.335 and 1.592.

Therefore, under such conditions, the B/C ratio of this project was proven to be larger than 1 and therefore the project can be said to have economic value.

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