# Performance Analysis on Technology Transfer in National R&D Projects

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## 1. Introduction

In the recent years, countries around the world are striving to build their national competitiveness on the global stage. Some of the measures implemented to create new values and secure global competitiveness involve patent registration, technology transfers and commercialization of developed technologies. Keeping in pace with these trends, the Ministry of Science, ICT and Future Planning (MSIP) announced its plans to invest about 900 billion KRW (approx. 879 million USD) to commercialize the information and communications technologies (ICT) developed through R&D projects. However, several issues have been raised in relation to this matter such as the low utilization of technologies developed through massive R&D investments in the past and lack of research, analyzing the transfer of technologies resulting from the R&D projects supervised by MSIP, relative to other national R&D projects. According to the National Science & Technology Information Service (NTIS), projects supervised by the Small and Medium Business Administration (SMBA) accounted for 51.7% of all technology transfers resulting from national R&D projects from 2002 to 2012, and 71% of these projects were development research. This showed that majority of the technology transfers stemmed from small-scale projects conducted by small- and medium-sized enterprises (SMEs). Concentrating on the field of science and technology, however, this study excluded the projects carried out by SMBA and other ministries and only included the data related to the Ministry of Science and Technology and the Ministry of Education, Science and Technology in its analysis of the factors influencing technology transfers. This paper is organized in the following order: Related Works, Hypothesis, Research Methodology, Analysis Results and Conclusion and Policy Implications.

## 2. Related Works

There are challenges in introducing R&D results to the market due to the differences in the research methods, focus and objectives between universities and industries; Rosenberg &Nelson. [1] Of particular note, technology transfers in Korea have been occurring at half the rate compared to other major technologically advanced countries such as the U.S. and European nations; Lim et al. [2] In order to facilitate the transfer of technologies developed through R&D projects, there is a need for proactive communication and policy support based on analyses of various factors that influence technology transfers. Kwon[3] analyzed the factors that could have potentially affected the outcomes of the 21st Century Frontier R&D Program. The factors under examination included the research organization's affiliation, research type, research period, and technology field. The results of the analysis showed that research headed by universities resulted in more journal publications, whereas research by companies resulted in higher number of patent applications and registrations. In particular, long-term research lasting 6 years or more generally produced more patent applications. While Kwon analyzed the technology transfers according to the research period, this study examined the time between the completion of the R&D project and the technology transfer.

## 3. Hypothesis

In order to analyze the factors influencing transfer of technologies resulting from national R&D projects, the hypotheses were set based on the following considerations. First, the purpose of research and characteristics of manpower vary depending on the type of research organization and this would result in significance differences in technology transfers among different research implmenters. Second, based on the Organisation for Economic Co-operation and Development (OECD) standard, R&D is classified into basic, applied and development research;OECD[4], and each of these different R&D phases will likely produce different forms of results, thereby influencing technology transfers. Third, long-term research was found to result in more patent applications than short-term research (Kwon, 2012); based on this, it may be inferred that the time period between the completion of an R&D project and technology transfer would be an influencing factor. Based on these considerations, the following hypotheses were set:

Hypothesis 1) There will be significant differences in the number of technology transfers depending on the type of research organization.

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Hypothesis 2) There will be significant differences in the number of technology transfers depending on the R&D type.

Hypothesis 3) There will be significant differences in the number of technology transfers depending on the time it takes for a technology transfer.

## 4. Research methodology and data sample

In this study, NTIS data on technology transfers dating from 2002 to 2012 were collected and based on 644 projects, 3 independent variables and a dependent variable were taken into consideration. The details of these variables are summarized in Table 1. In order to analyze the influence of the type of research organization, the R&D type and the time it took for a technology transfer (technology transfer wait time) on the number of technology transfers, Kruskal-wallis test was performed as the data didn't verified its normality using R package. When the Kruskal-wallis test resulted in significant differences, multiple comparisons was conducted in the Bonferroni correction method.

[Table 1] Independent and dependent variables

| | | |
|---|---|---|
| Independent variable | Type of research organization | Universities, government-funded research institutes, companies |
| | R&D type | Basic research, applied research and development research |
| | Technology transfer wait time | Year of technology transfer – Year of R&D completion |
| Dependent variable | Number of technology transfer | Frequency of each technology transfer |

## 5. Analysis Results

The results of this study are as follows: Figure 1 illustrates that the three of independent variable which are type of research organization**,** R&D type, Technology transfer wait time were statistically likely to endorse the number of technology transfers using Kruska-wallis test.

```
> kruskal.test(NumberOfTT~TypeOfOrganization,data=Data)

 Kruskal-Wallis rank sum test

data:  NumberOfTT by TypeOfOrganization
Kruskal-Wallis chi-squared = 21.0546, df = 3, p-value = 0.0001026

> kruskal.test(NumberOfTT~RDtype,data=Data)

 Kruskal-Wallis rank sum test

data:  NumberOfTT by RDtype
Kruskal-Wallis chi-squared = 28.7776, df = 3, p-value = 2.494e-06

> kruskal.test(NumberOfTT~TakenTime,data=Data)

 Kruskal-Wallis rank sum test

data:  NumberOfTT by TakenTime
Kruskal-Wallis chi-squared = 40.1143, df = 8, p-value = 3.05e-06
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Figure 1. Result of Kruskal-wallis test

## 6. Conclusion

This study presented and analysed the factors influencing technology transfers. Derived from national R&D project data, we highlight three hypothesis for better research support and to improve technology transfers. Consequently this study verified the influences that the types of research organization, R&D type, technology transfer wait time influence on the number of technology transfer.

For the future research, this study need to verify with new criteria like the frequency and royalty fees of technology transfers according to the amount of research costs, the classification of the different industries by considering their characteristics instead of grouping them into a single category

## 7. References

[1] Rosenberg, N. & Nelson, R., "American universities and technical advance in industry", Research Policy, 1994, pp. 23: 323~348.
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[3] J.C. Kwon, "Achievement Characteristic Analysis for Large Scale Government R&D Projects Focusing on 21st Century Frontier R&D Program", Journal of Korea Technology Innovation Society 15 (1), 2012.3 pp.185~202.
[4] OECD, "Frascati Manual", 2002