

An Analysis on the Features and Effect of University Research Organization Support Programs

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ABSTRACT

The Korean government's support towards the establishment of leading research hubs at universities began with the initiation of the Science/ Engineering Research Center in 1990. Such efforts to provide support to research organizations have continued for some twenty years in various forms, which implies that building research hubs was critical in acquiring global leadership in research. However, the effect of such research hub nurturing policies has never been properly evaluated, apart from an assessment of their validity. Therefore, this paper analyzes how major programs to form research groups by providing assistance to joint research by researchers at universities are operated, and the characteristics of such programs through comparative analysis with other programs. There are two major focal points in the analysis: the first is the evaluation of the level of differentiation between Research Organization Support Programs (ROP) and other R&D Programs from an efficiency perspective, and the second is an examination of the extent of systematization of research organizations that exist at universities and impact of Research Organization Support Programs on the activities of participating professors from an effectiveness perspective.

The result showed that the ROP were no longer only relevant for the formation and maintenance of research groups. Other R&D Programs are growing increasingly larger in scale and conducted over longer periods of time. Thus, the ROP can no longer be differentiated from other programs in research period and size of funding.

An analysis on the effect of ROP demonstrated that all activities by participating professors in organizations that were the beneficiaries of group research assistance were more active compared to their counterparts in organizations that received other research support, but there was little difference in the elements of systematization. This implies that the joint research conducted at universities is not systematized and that it is still research based on

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individual themes but conducted jointly. In addition, it also means that the ROP is failing to effectively lead the systematization of research. In other words, today, university research organizations are not operated as independent, long-term bodies, but are more relevant as a combination of research units of individual professors.

KEYWORDS: university, research organization, research unit, supporting program

1. BACKGROUND

In a knowledge-based society, the capacity to create knowledge is the source of state competitiveness. Universities have maintained numerous roles, namely in education, but recently, their roles as creators of knowledge are becoming increasingly emphasized. Today's expansion of research activities by universities is a relatively new trend in Korea. Only back in the 1980s, almost no universities conducted research. The research activities by universities showed a sharp rise, in step with the increase in R&D investments across Korea, over the past two decades, leaving little time to overhaul the R&D system of universities. Although universities are working to advance their systems, such as improving transparency in the management of research funds, there is relatively less interest in the R&D implementation system.

However, the R&D implementation system is important because the accumulation of knowledge and activities to proliferate it are emphasized if the ultimate goal of R&D is the production of knowledge and its use in economic and social terms. Therefore, it is only appropriate that the growing size of R&D funds provided to universities and rapid increase of research staff require due concern on the adequate implementation system of the universities and the direction of the government's policies in research. University research funds have continued to increase with the expansion of national R&D investments. This is the reason for an increase of more diverse forms of programs undertaken compared to previous ones that were mainly by individuals. In general, the R&D systems at universities are established based on academic departments, and the actual research itself is carried out by a couple of professors and students on an individual research lab basis. This system is relevant if assistance provided to university research is based on the research of an individual and the research grant is not large. However, universities also conduct larger scale research projects, which require discussions on how to operate university R&D systems for more efficiency in university research activities. The current research system based on individual research labs cannot respond adequately to the trends in technological progress which continue to grow larger and more complicated, and the ongoing turnover of graduate school students could weaken the school's function of accumulating knowledge. Meanwhile, in case of R&D systems based on departments, it has been noted that the rigid academic department system and narrow division of research areas limit the response to technology fields duly required in economic and social terms and generation of creative fields (Ikenberry & Friedman 1972; Nissani 1997). Furthermore, there are doubts on whether the government's increasing assistance is resulting in stronger organizational capacity of universities due to a lack of transparency in research accounting and weak research organizations. Therefore, it is necessary to ponder on the changes to be made in university R&D systems that can undertake research with increased government assistance.

The Korean government's support for the construction of leading research hubs at universities began in 1990 with the commencement of the Science/Engineering Research Center (SRC/ERC) pro-

gram. However, the effectiveness of research hub building policies has never been properly evaluated, apart from the validity assessment of such policies. The research expenses implemented in universities in the early 1990s totaled around 300billion Won, which jumped to more than ten-fold in 2007 to reach over 3.3trillion Won. Further, various programs to support research centers in universities have been initiated since the Science/Engineering Research Center program. Yet, there are almost no studies that analyze the effectiveness of the ROP customized with the relevant features of the program. The only analyses made so far were mainly a comparison of programs based on the number of papers, patents, technology transfers or researchers produced. The analysis of trends in the outputs of such projects cannot effectively grasp the effectiveness of the program. Furthermore, there is a possibility that the comparative advantages that ROP had over other R&D programs during the early stages in providing support to collective research by university researchers may not exist today.

Therefore, this paper plans to analyze how major programs to form research groups by providing support for joint research by researchers in university are operated, and the features of the collective research program through a comparison with other programs. The analysis will focus on two main points: on a program *efficiency* level, it will evaluate the level of differentiation of ROP from other R&D programs, and on a program *effectiveness* level, it will examine the level of systematization of university research organizations and the impact of ROP on the activities of participating professors.

The paper consists of five sections: Section Two will explain why systematized research units in universities are necessary, based on the definition and functions of university research organizations. It will also review the programs that currently support the research organizations. Section Three is devoted to introduction to our method and data sets. In the efficiency evaluation, the latest national R&D information provided by the National Technical Information Service (NTIS) was used to analyze how the major characteristics of ROP differ from other programs in terms of the scale of research expenses and support period. In the effectiveness evaluation, we conducted a survey on university research centers nationwide.

Our findings are given in Section Four. First, we analyze how the University ROP differs from other general programs by comparing them with other R&D programs. Next, the effectiveness of government support programs on the level of systematization of research organizations and activities of participating professors has been analyzed, with regard to ROP and General R&D Programs, through a survey of university research centers in Korea. Finally, Section Five will provide a summary on the results of the analyses and suggest a framework for ROP in a changed environment.

2. UNIVERSITY RESEARCH ORGANIZATIONS

2.1 Concept

University research organizations are often understood as ‘institutes’ or ‘research centers’, but there are as many forms and features as the number of research organizations that exist in universities. Before we begin our analysis on the characteristics of ROP, which is the goal of this study, it will be relevant to define, however briefly, the meaning of university research organizations.

Collaboration, or joint research, is a natural activity that has continued since the beginning of academic studies. In particular, in the area of science and engineering, ‘joint research’ is not only considered natural, but also, desirable. This is why various programs to facilitate collaboration between researchers are implemented not only in Korea, but also, many countries. The facilitation of

collaboration between individual researchers and players of industries, academia and research, and international cooperation will increase the volume and improve the quality of 'collaboration', including joint research. The increase in quantity or deepening of quality of such collaborations naturally calls for a more detailed organization, rather than continuing unofficial exchanges between the players. Therefore, the simplest definition of university research organizations is "an organization separate from academic departments established solely for research in a university."

There are numerous forms of university research organizations. Their forms are countless and varied according to the size of researches undertaken and number of participating staff, proportion of full-time and part-time staff, independence from departments, multi-disciplinary level of research and whether it is basic or applied research. They range from the most basic form, which is a research team composed based on common interests on a research theme, regardless of whether it receives external research funding and installed within a department, to larger-scale research centers that are equipped with an independent building, scores of research/administrative/support personnel, and reliable external funding.

Stahler & Tash (1994) defined all organizations that conducted research in a university by asking the most basic question of whether research organizations "conduct research or not" and analyzed the differences between various research organizations based on the level of independence, external funding, participating staff, extent of division from departments, whether they were multi-disciplinary and the development phase of the research (basic/applied). However, this definition is closer to a division of various activities conducted within a university rather than a definition of university research organizations. Therefore, instead of searching for a precise definition, it is more important to find the difference between research organizations and 'departments' or 'schools', which are the basic organizational systems of a university.

Many previous studies define university research organizations by noting the difference between them and university departments, and by comparing them to departments/schools. Zajkowski (2003) defined research organizations as "*strategic instruments installed through university policies to strengthen their research function and acquire outside funding.*" and Bozeman & Boardman (2003), "*an organization composed of staff from various departments and established separately from the department system to do research*". Gray (2001) defined research organizations as "*organizations composed of multi-disciplinary staff to conduct numerous research tasks with sufficient or important research equipment or facility that has a semi-independent status within the university and is operated separately from departments.*" Meanwhile, Geiger (1990) described research organizations as "*organizations composed of staff belonging to departments and which conduct multi-disciplinary research relying mainly on external funding.*"

This study focuses on organizations that have the minimal basic conditions as an organization. As examined above, the various definitions of research organizations are made on a comparison with departments. The common features are, first, it is an organization which is independent from a department and second, that it specializes in the conduct of research. According to its external size and level of independent status, it is called 'laboratory', 'research center' or 'research institute', among others, but basically, it is a unit that differs from 'department' or 'school', and it requires a certain level of systematization that goes beyond unofficial exchange or collaboration. Therefore, the 'research organization' in this study refers to a unit independent from a department, and is 'an organization composed of more than a certain number of personnel with a set of goals and which conducts activities by acquiring funds to achieve its goal from inside or outside the university over a certain period of time'. Such organizations are often called 'Organized Research Unit (ORU)', and this study uses research

organization when referring collectively to research centers and institutes.

The university research organizations currently being installed have a core common feature: they are independent from university departments. This is a reflection of the following three conditions that modern society demands of universities. First, inter-dependency is gradually deepening across the world since the onset of globalization, and accordingly, the speed of change in economic and social issues are also growing faster. Therefore, university research must be able to respond organically to such rapidly changing economic and social issues. Second, most of the science and technology knowledge required by modern society can be produced not only by mastering one certain field, but by mutual communication and convergence of several fields. Therefore, universities must be able to conduct collaborative research between different fields. Third, after the end of the cold war, the science technology research paradigm shifted from centralized to a decentralized nature, and this has led to an emphasis on local innovation and the building of dispersed networks. In step with such changes, universities must be able to contribute to the formation of such networks by becoming important actors in research networks.

University research organizations independent from departments meet these requirements well. First of all, they can respond swiftly to the changing demands of the economy and society because they have a high level of autonomy (Larédo 2003). According to Stahler & Tash (1994), research centers at universities are organizations where the philosophy, interests and goals of the director are directly incorporated into their operation. Therefore, they are dependent on the leadership of the director, but are also an autonomous organization that can respond with flexibility. In addition, university research organizations provide a flexible environment which can faithfully meet the demands of the research supporter by increasing the proportion of full-time researchers who are free from education and academic affairs and thereby can avoid a conflict of interests between teaching and research (Geiger 1990; Larédo 2003).

Second, university research organizations do not belong to a certain department so they are appropriate in conducting multi-disciplinary research. In general, the basic goal of research centers within a university is to induce collaboration between researchers. Research centers inspire collaborative research between researchers of different fields, and if the need arises, arrange collaborative research between researchers of different universities or research institutes of companies or different countries (Boardman & Corley 2008). Such collaborative research naturally produces multi-disciplinary research. Furthermore, they can act as mediums that help communication between departments, and by enabling students participating in the research to experience different fields, provide a new dimension in education which meets the demands of the modern society.

Third, university research organizations contribute significantly to the building of research networks by establishing various relations with organizations outside of the university. Generally, they maintain a broad relationship with other universities, companies and even overseas research institutes, and by sharing research personnel and equipment they become an important actor in the network. In particular, 'specialized research-based universities', which are based on a region and focus their core capacities in a certain research theme related to that area, maintain an enduring partnership with other research institutes that have complementing capacities, thereby contributing to the local community and the advancement of science technology on an international level at the same time (Larédo 2003).

As can be seen from the above, the establishment of new university research organizations that are separate from departments, have high flexibility, conduct multi-disciplinary research and can build research networks, is an important tool universities must utilize in effectively responding to the economic and social changes after the end of the cold war.

2.2 Supporting Programs in Korea

The Korean government began to provide support to university research organizations or research teams with the Science/Engineering Research Center (SRC/ERC) program in 1990. The SRC/ERC of the former Ministry of Science and Technology was the first government project to support research organizations in universities. The goal of SRC/ERC was to systematize dispersed research personnel within a university into specialized fields and nurture research groups that would play a central, leading role in the advancement of basic research in natural science and engineering fields and vitalize research conducted by universities.

The SRC/ERC program played an extremely important role in terms of investments made in science technology in the 1980s-1990s. Almost half of the research expenses of the Korea Science Foundation (currently the National Research Foundation of Korea) were occupied by the SRC/ERC program. Its proportion of the total basic science research expenses is relatively the same. The government's University Research Center Support Program supports the formation and development of research groups that exist in universities, and so when the policy was being designed in the 1990s, it offered a relatively long research period and comparatively large research funds. This was the reason for the positive results produced during this period. Later, programs to support various university research organizations were designed, and the support for research organizations produced varied results ("40 Years of Science Technology." 2008).

Following the successful establishment of the SRC/ERC program, a broad range of programs to provide support for research organizations of various functions were adopted. These programs support research units such as the Regional Core Research Program and the Frontier R&D Program; department/school units, such as the BK21; and university units, such as the New University for Regional Innovation. Table 1 is a summary of programs on research centers provided by government ministries as of 2008.

TABLE 1 Current status of University Research Organization Support Programs by ministry ('08)

(Unit: One Million Won)

Ministry	Project title/ Type of research center	Purpose	'08 Budget	Year of inception	Ave. support provided	
Ministry of Education, Science and Technology	Science Research Center	Nurture global leading scientists	60,886	'90	1,000	
	Engineering Research Center	Nurture global leading engineers			1,200	
	Science/Engineering Research Center (SRC/ERC)	Medical Research Center	Build research hubs in basic medical science	17,200	'02	700
		National Core Research Center	Nurture future-oriented global research center in science technology	13,500	'03	2,000
	Science Engineering Convergence Education & Training Center	Provide education on basic knowledge in humanities and social studies to university students in science and engineering	600	'06	300	
	Global Research Laboratory	Pursue international joint research which produces advanced results led by a Korean research organization	2,300	'08	500	
	Basic Research Lab	Specialize research centers at universities in the field of basic sciences	23,988	'99	500	
	WISE Center	Encourage female students to study science engineering fields	2,200	'02	150	
	Subtotal			120,674	-	-

(Unit: One Million Won)

Ministry	Project title/ Type of research center	Purpose	'08 Budget	Year of inception	Ave. support provided
Ministry of Knowledge Economy	Regional Innovation Center	Provide support to regional universities as actors of regional innovation, improve R&D capacity and strengthen industry-academia cooperation	42,600	'95	700
	Energy Technology Education Center	Provide support to re-education of work at industrial businesses	2,150	'03	500
	Renewable Energy Education Center/ Core Technology Research Center	Provide support to technical problems of businesses	6,620	'05	900
	Power Education Center/ University Power Research Center	Conduct R&D in power	5,007	'01	400
	University IT Research Center	Develop IT core basic technology and nurture specialized talents	30,560	'00	800
Subtotal			86,937	-	-
Ministry of Health and Welfare	Clinical Research Center	Advance and globalize clinical capacity by building leading clinical tests	4,815	'04	1,000
Ministry of Culture	Culture Research Center (CRC)	Conduct R&D of specialized products based on local culture, nurture talents and build industry-academia cooperation system	2,500	'05	300
Defense Acquisition Program Administration (DAPA)	Specialized Research Center	Conduct basic research tasks to build infrastructure in defense	18,791	'04	1,337
Grand Total			233,717	-	-

Source: Ministry of Education, Science and Technology (2008), Evaluation Report on University Research Center Programs

3. STUDY DESIGN

3.1 Research Question and Method

The SRC/ERC program of the 1990s by the Ministry of Science and Technology, which benchmarked the ERC program of the U.S., was the beginning of government policy to provide support to research groups in Korea. Given that this initiative took off at a time when the R&D infrastructure and capacity of universities were lacking, the Science/ Engineering Research Center was a groundbreaking program, which would inject R&D funds of one billion Korean Won per year over a maximum of nine years. It fully conveyed the strength of the government's determination in creating research hubs at universities. This program has been maintained for some twenty years, which signifies that it is still critical in the achievement of global leadership in research. Compared to the 1990s, Korea's science technology capacity has recorded remarkable growth, which is based on continued R&D investments.

The university research conducted today is joint and collaborative research, carried out by team

units rather than research conducted by individuals. This can be interpreted as a situation that is caused by increasing multi-disciplinary research and the recent changes in the environment where large-scale collaborative research is inevitable in order to solve global issues. In the case of university research support programs, most of them are collaborative research projects conducted in teams rather than individual-based research, and tasks that used to be provided on an individual level, such as creative research and National Research Laboratory (NRL), are more commonly undertaken by small-size research groups. In step with this trend, the government support is also provided directly to collective research or large-scale programs for collaborative research. This is a significant change from the days when the SRC/ERC first took off.

Bearing these changes in mind, we raise the following questions in regard to the efficiency and effectiveness of ROP:

- 1) Are ROP still successful over other programs in view of size and period?
- 2) Are ROP successful in formulating research hubs at universities?

To answer the first question, we compare research funds and period of support between ROP and other R&D programs. Up to now, the success of ROP is attributed to its relatively long research period and comparatively large research funds. But, it is questionable whether the comparative advantages of ROP are still valid considering the fast increase of other R&D programs.

The effectiveness of ROP can be measured by the level of systematization of research organization. The purpose of ROP is to formulate research hubs at universities, which discriminates ROP from other R&D programs supporting collaborative research. We thus measure the level of systematization through three steps such as before-, mid-, and after-supporting. In before-supporting step, we compare the closeness between participating professors of research organizations funded by ROP and others. Here, we assume that the systematized organization is more likely composed of members with no pre-acquaintance than informal working groups. In the middle of supporting step, we compare the tasks undertaken by participating professors and the types of collaborative activities within organizations funded by ROP and others. Finally in after-supporting step, we conduct a comparison of the elements of systematization of organizations that received support from ROP and others. We adopt the phase-by-phase organization elements first suggested by Youtie et al. (2006), which range from minimal characteristics such as provision and space to accompanying characteristics such as grants and stakeholders.

3.2 Data

The two types of data sets are used in this study. First, on an efficiency level, we use the information on national R&D programs of 2008 provided by NTIS to compare the characteristics between ROP and other R&D programs. We extracted those tasks that were being researched by universities from the list of tasks of national R&D programs of 2008, and based on the title of those programs, categorized them into ROP and other R&D programs.

The range of ROP is based on the programs applicable to the university research center program evaluation of national R&D programs of the Ministry of Education, Science and Technology (MEST 2008). The programs conducted by university research centers have been analyzed by their more specific characteristics based on the following five types:

- (TYPE 1) Program to support middle and large-sized joint research between researchers; includes S/ERC, MRC, Basic Research Lab, and Global Research Center
- (TYPE 2) Program to support university/departments: includes BK21, NURI (New University for Regional Innovation), University for Industrial Collaboration, and School-based Enterprise Program
- (TYPE 3) Individual or small-size joint research support program: includes National Research Laboratory (NRL), International Cooperative Research, and Creative Research Initiative
- (TYPE 4) Program to nurture talents; includes IT Research Center, WISE Center, and Industrial HR Center Program of the Ministry of Knowledge Economy
- (TYPE 5) Industry-academia cooperation and regional-based programs; includes RIC, Regional Environmental Technology Center, and Material Bank

TABLE 2 is a summary of the programs included in the various types of the ROP. Among the five types, Type 2 and Type 3 are not applicable as the university research organizations defined in Section Two. Therefore, we have conducted a separate analysis on Types 1, 4 and 5, which we defined as “Consultative ROP.”

TABLE 2 ROP Included in the Different Program Types

Types	Title of Program	No. of Tasks Included
(Type 1)	Science/ Engineering Research Center <SRC,ERC,MRC,NCRC>	799
	Science Engineering Field Focus Research Center Support Project	101
	Nuclear Research Basis Expansion Project	44
	Basic medical scientists nurturing project (MD-PhD)	14
	Cultural contents industry technology support	13
	Building innovative research basis, such as local national university hospitals	13
(Type 2)	Health and Medical R&D	4
	Phase Two Research-based University (0.5)	569
	Regional University Innovative Capacity Strengthening Project (0.4)	140
	Industry-Academia-Research Cooperation System Support	42
	Nurturing Regional Research-based Universities	4
(Type 3)	Industrial Cooperative Universities Support	3
	National Research Laboratory	264
	Creative Research	86
	International Cooperative Research	15
(Type 4)	National Scientist Research Support (former “Top Scientist Research Support”)	2
	Support fostering of university IT research centers	48
	Proliferation of academic accomplishments WISE	17
	Fostering renewable energy engineers (Power fund)	13
	Fostering power engineers <On-site engineers + basic engineers + high quality engineers>	13
	Industrial Researchers Education & Training Program	9
	Fostering energy engineers	5
(Type 5)	Fostering blue ocean-type talents	4
	Operation of Regional environment technology development center	182
	Regional Technology Innovation Center <RIC=TIC+RRC>	70
	Specialization Promotion Program	52
	Strengthening of Regional R&D capacity (former “Marine Korea Development Program”)	3
	Industry-academia joint technology development	2
Local Culture Research Center (CRC) Support	1	

Next, on an effectiveness level, we undertook an additional survey on research centers of each university through the Survey on Research Activities of Universities. We selected the targets of the survey according to the size of research funds of universities nationwide, and excluded the research centers that have no full-time researchers. The existence of full-time research personnel was adopted as a criterion to discern formal research centers from informal research centers, but the current status and list of full-time researchers and participating professors in the research foundation DB did not match that of the real world. Therefore, we had to confirm the latest information on research centers by contacting industrial-academia cooperation groups of 69 universities, including major universities, and telephoning each affiliated research center, in order to acquire the list of research center directors and participating professors. The survey lasted for two months from mid-September to mid-November 2009.

Our survey of 898 research center directors and participating professors affiliated in the research centers of each university yielded responses from 379 persons (166 research center directors and 213 participating researchers) (response rate 45.83%). Among these responses, we conducted an analysis on only 166 research center directors nationwide.

Out of the final 166 research centers, around 40% were established after 2000, and about one third of them were founded before the 1990s. By major, 61% was in engineering, and by area, universities in the capital area occupied one third of the total. In terms of types of funds in their establishment, 18% were organizations founded by projects that funded research groups, such as ERC, and 13% were research organizations established through other government projects.

In terms of types of establishment, research centers in both natural sciences and engineering recorded the highest in “research centers founded upon voluntary willingness among researchers and designated by the university (38%)”, and the proportion of “research centers established strategically and designated by the university (34.3%)” was also similar. The percentage of research centers designated by the government was 22.3%, not a small figure. In the case of research organizations that meet a certain level of requirements within a university, the major forms are organizations established voluntarily by researchers (professors), organizations established based on strategic decisions by universities, and organizations established by universities or businesses with a special purpose. Research centers are established through various routes and operated under different rules and regulations, and there are probably many differences in the conditions of their operation. This will be examined further below.

TABLE 3 Types of Research Centers

	Total	Natural Sciences	Engineering
Government-designated research institute (center)	24.7%	25.0%	24.5%
Contract-based cooperation research centers with businesses	2.4%	-	3.9%
University-designated research institute (center) established with a strategic purpose	34.3%	35.9%	33.3%
University-designated research institute (center) voluntarily organized by researchers	38.0%	39.1%	37.3%
International cooperative research center	0.6%	-	1.0%
Total	100.0%	100.0%	100.0%
Total No. of research centers	166	64	102

Source: Adapted and modified from Jollands et al. (2010).

4. FINDINGS

4.1 Efficiency of ROP

Among total national R&D tasks of 2008, an aggregate of 14,725 tasks were conducted by universities, which have been utilized for the analysis. Among them, there were 2,534 ROP in a broad sense and Consultative ROP

TABLE 4a Total Tasks Conducted by Universities

		Total	Avg.	Standard deviation	Minimum value	Maximum value
Research period (years)	Basic	7,941	2.81	2.02	0.5	12
	Applied	2,324	3.74	2.51	0.5	13
	Developed	3,534	1.99	1.79	0.5	10
	Others	926	2.29	1.87	0.5	9
	Total	14,725	2.73	2.12	0.5	13
Government research funds(million Won)	Basic	7,941	95.8	364.3	0.0	18781
	Applied	2,324	208.2	396.0	0.0	7500
	Developed	3,534	124.0	393.6	0.0	15288
	Others	926	275.3	469.8	0.0	4700
	Total	14,725	131.6	387.7	0.0	18781
Total research costs (million won)	Basic	7,941	111.6	450.6	1.0	23661
	Applied	2,324	286.8	584.5	1.0	8497
	Developed	3,534	168.5	547.2	1.0	18138
	Others	926	375.6	650.1	1.0	5296
	Total	14,725	169.5	518.1	1.0	23661

Source: Tasks conducted by universities extracted from the NTIS DB2008

TABLE 4b ROP Tasks Conducted by Universities

		ROP			Other R&D Programs		
		N	Avg.	SE	N	Ave.	SE
Research period (years)	Basic	1,304	5.42	2.13	6637	2.30	1.54
	Applied	720	5.95	2.27	1604	2.75	1.90
	Developed	241	3.78	3.08	3293	1.86	1.58
	Others	269	1.52	2.14	655	2.61	1.65
	Total	2,534	5.00	2.64	12189	2.26	1.63
Government research funds (Million Won)	Basic	1,304	177.3	179.8	6637.0	79.8	388.5
	Applied	720	291.8	416.8	1604.0	170.7	380.5
	Developed	241	174.9	287.2	3293.0	120.3	400.1
	Others	269	491.3	595.0	657.0	186.8	373.7
	Total	2,534	243.0	348.0	12191.0	108.5	391.5

		ROP			Other R&D Programs		
		N	Avg.	SE	N	Ave.	SE
Total research costs (million Won)	Basic	1,304	260.0	375.7	6637.0	82.4	458.3
	Applied	720	494.9	780.3	1604.0	193.4	440.3
	Developed	241	273.6	505.7	3293.0	160.9	549.4
	Others	269	765.5	902.1	657.0	216.0	419.0
	Total	2,534	381.7	619.5	12191.0	125.4	482.9

Source: Tasks conducted by universities extracted from the NTIS DB2008

TABLE 4c Consultative ROP Tasks Conducted by Universities

		Consultative ROP			Others		
		N	Avg.	SE	N	Ave.	SE
Research period (years)	Basic	756	4.74	2.34	7185	2.61	1.87
	Applied	344	5.48	2.90	1980	3.44	2.31
	Developed	222	3.69	3.18	3312	1.88	1.59
	Others	85	2.98	2.62	839	2.22	1.76
	Total	1,407	4.65	2.73	13316	2.53	1.93
Government research funds (million Won)	Basic	756	134.9	141.5	7185	91.69	380
	Applied	344	265.5	343.3	1980	198.3	403.7
	Developed	222	153.9	247.6	3312	122	401.4
	Others	85	211.5	512.7	841	281.7	465.1
	Total	1,407	174.4	260.5	13318	127.1	398.5
Total research costs (million Won)	Basic	756	228.9	408.7	7185	99.24	453
	Applied	344	405.6	577.5	1980	266.1	583.4
	Developed	222	254.8	484.4	3312	162.8	550.8
	Others	85	249.6	533.1	841	388.4	659.7
	Total	1,407	277.4	479.9	13318	158.1	520.7

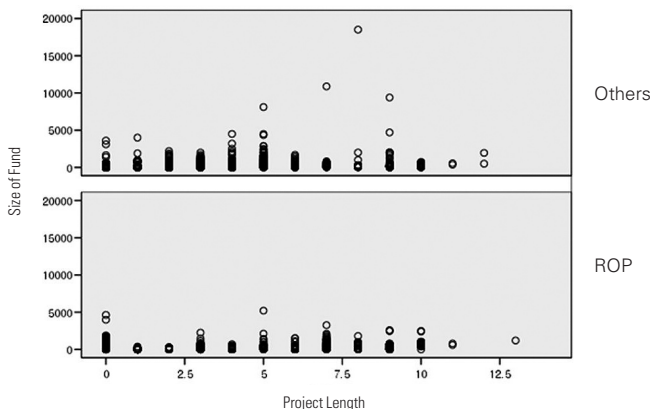
Source: Tasks conducted by universities extracted from the NTIS DB2008

An analysis of the level of differentiation in the size and period of support between other R&D Programs and ROP was carried out. The purpose of the analysis is to find out the differences that exist between them, and thus, the size and period of support for both cases have been interpreted into graphs and compared.

FIGURE 1(a) is a graph of the research fund size and period of other R&D Programs and ROP among the national R&D projects of 2008. Both cases had a variety of projects that ranged from short-term tasks of less than one year to long-term tasks of some ten years. However, there were a number of large-scale projects in other R&D programs. A magnified study of tasks under 4billion Won (FIGURE 2(b)) shows that with the exception of tasks of less than one year, there are more projects over five years compared to that of ROP.

FIGURE 1 Comparison of Research Period and Funds of ROP and other R&D Programs

(a) Total Project Distribution



(b) Tasks below 4billion Won

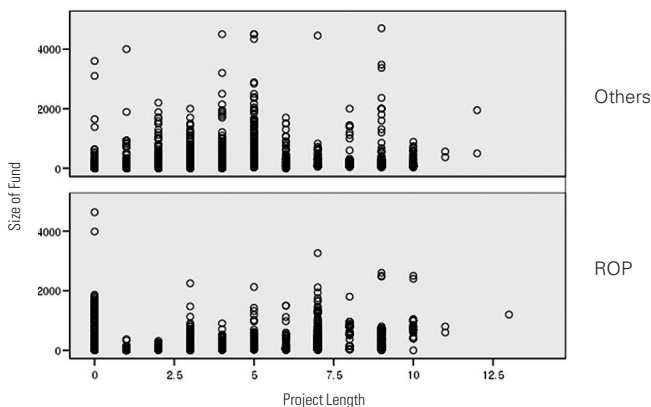
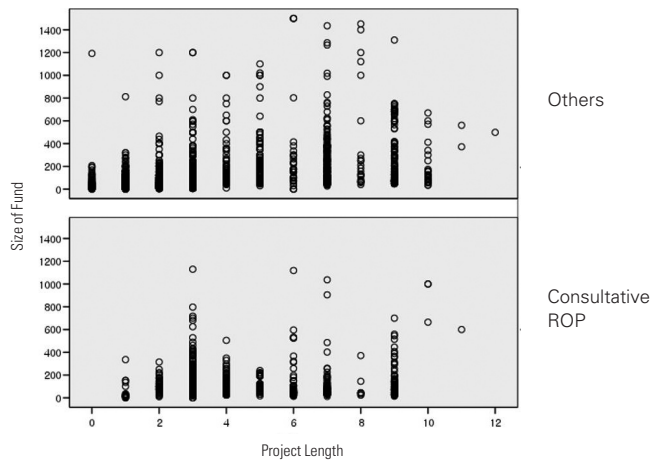


FIGURE 2(a) is an analysis of Consultative ROP, and FIGURE 2(b) is the same analysis solely on basic research tasks. It can be noted that basic research tasks of other R&D Programs include not only short-term tasks, but also mid-long term tasks of large scales which require the cooperation of a number of researchers.

FIGURE 2 Comparison of Consultative ROP and Other R&D Programs

(a) Total Tasks below 1.6billion Won



(b) Basic Research Tasks under 1.6billion Won

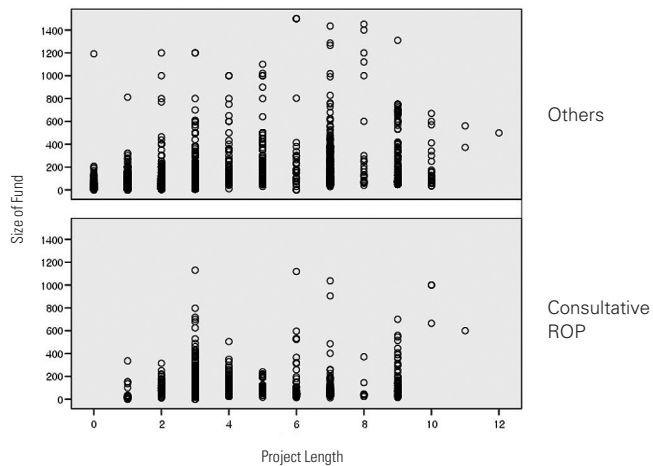
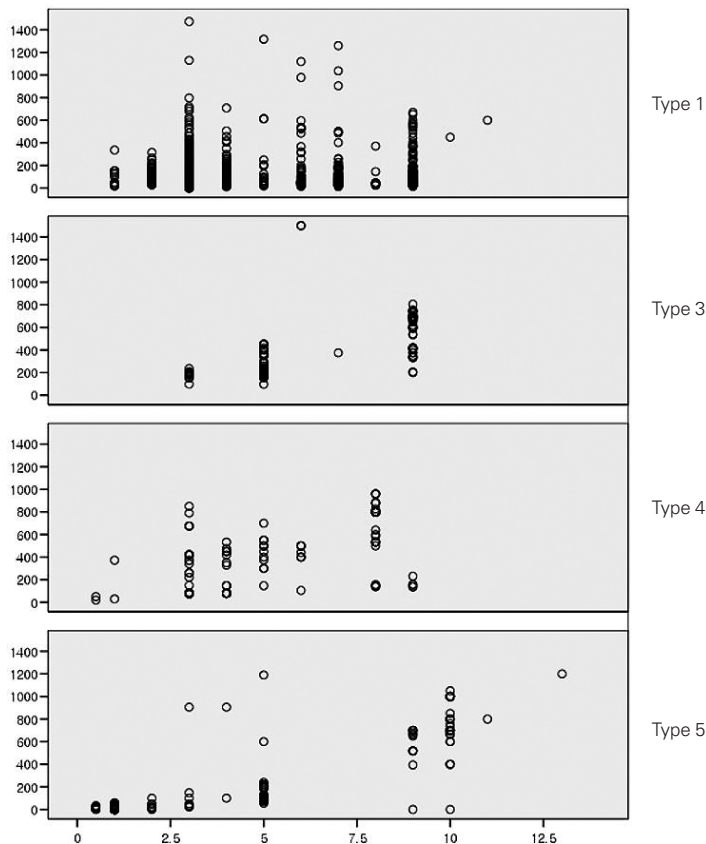


FIGURE 3 is a graph on the size and duration of tasks according to the detailed types of ROP except the university-level support, Type 2. SRC/ERC and other research group support programs (TYPE 1) provide support to mid-long term tasks of three to eight years, and their size are varied, some reaching over 1 billion Won. Programs that provide support to research centers (Type 3) are mainly for smaller-sized tasks over mid-long terms. Programs that include the nurturing of talents and R&D functions (Type 4) show a distribution that is similar to Type 1. As for Type 5 programs that focus on industry-academia cooperation and the role of regional hubs, they are composed of long-term tasks of more than ten years and short-medium term tasks of fewer than five years.

FIGURE 3 Size and Period of Tasks by Different Types of RO



4.2 Effectiveness of ROP

First, the results of a study on the level of ‘closeness’ between professors taking part in the research organization in order to evaluate how much the ROP was meeting the goal of establishing research groups are as follows:

A study, delineated by different types of funding, indicates that the relationship of participating professors of research centers established as part of government projects before their establishment

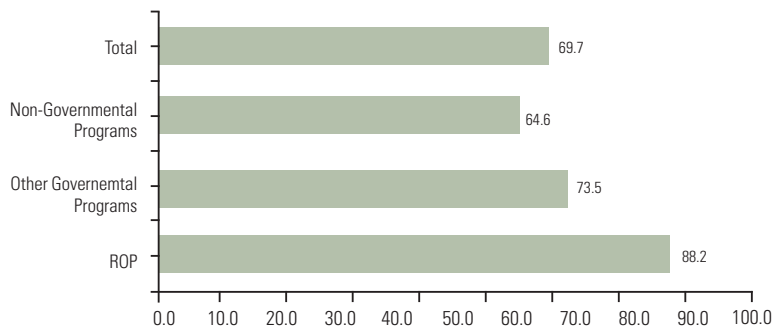
TABLE 5 Prior Level of Closeness between Participating Professors by Different Types of Funding

		Group funding project	Government project, excluding group funding	Additional funding projects	Total
Closeness/exchange with most of the professors	N	50	24	222	296
	%	73.53	72.73	80.14	78.31
Closeness with a part of the professors	N	14	6	52	72
	%	20.59	18.18	18.77	19.05
No acquaintance	N	4	3	3	10
	%	5.88	9.09	1.08	2.65
Total	N	68	33	277	378
	%	100	100	100	100

was relatively less close to that of research centers founded with additional funding. However, in the case of government-funded projects, the level of closeness of professors participating in group funding projects and those in additional funding projects is almost the same. In other words, in case of government projects, professors with little acquaintance are sought out in order to acquire efficiency in a certain research field, whereas in most projects funded by universities, it can be understood that they are based on activities of previously acquainted professors. Nevertheless, in the case of projects that support the establishment of groups, already more than 70% of them involve groups with already-established exchange relations. Therefore, their contribution to the formation of exchange in new fields or new personnel is not significant. In other words, the actual group formation projects themselves did not contribute much to the goal of creating research groups in universities.

One of the indicators of how well research organizations are operated is whether participating professors actually participated and undertook the tasks of the research organization. The professors of research centers established through group support projects undertook more joint research tasks compared to their counterparts in research centers established through other types of funding. This is probably because group support projects more often provided support for the actual implementation of joint research tasks.

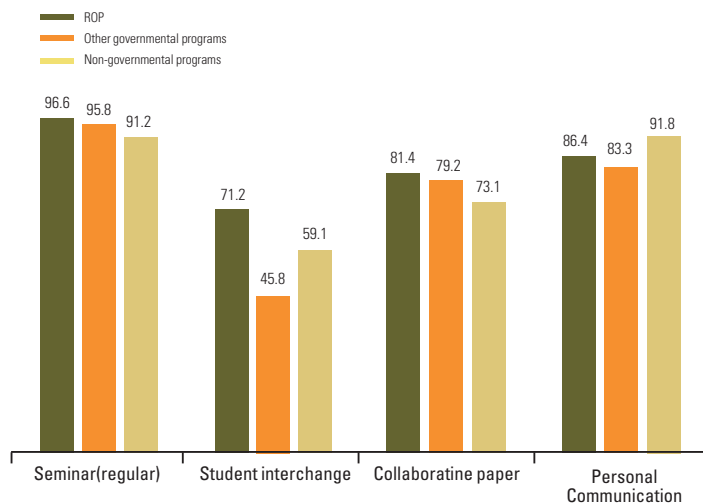
FIGURE 4 Proportion of Participating Professors' Joint Research According to Different Types of Funding



Source: Barbier (2010); Robins et al. (2009); Robins et al. (2010).

In terms of the method of exchange between professors participating in joint research, professors undertaking joint research by participating in research organizations supported through the group support project had, overall, a greater level of exchange activities of all types, and in particular, activities with students, compared to other types of research organizations.

FIGURE 5 Comparison of Exchange Method between Participating Professors by Different Types of Funding (based on professors participating in joint research)



Next, we conducted a comparison of the elements of systematization of research organizations that received support from group support projects and those that received other government support projects. The elements of systematization of research organizations include indicators to evaluate how many characteristics a research team or center possesses, such as independent space, establishment procedures and goals of operation. As a result, with the exception of differences in the possession of independent space, the difference between most elements was not significant in statistical terms. In other words, both group support projects and most government-supported projects require the operation of a research organization or team established in relation to those projects to be based on basic elements of flexible organizations. However, it is important to remember that whether or not they have such official elements and whether or not they have a flexible operation system may be a separate problem.

TABLE 6 Comparison of Characteristics of Research Organizations of Government-funded Projects

<Features of flexible research organizations>		N	Avg.	Standard deviation	ANOVA
Independent space	Other government projects	34	0.853	0.359	3.368*
	Group support projects	68	0.956	0.207	
	Total government-supported projects	102	0.922	0.270	

<Features of flexible research organizations>		N	Avg.	Standard deviation	ANOVAF
Hierarchical structure in decision making	Other government projects	34	0.794	0.410	0.028
	Group support projects	68	0.779	0.418	
	Total government-supported projects	102	0.784	0.413	
Full-time administrative staff	Other government projects	34	0.971	0.171	1.218
	Group support projects	68	0.912	0.286	
	Total government-supported projects	102	0.931	0.254	
Resource distribution system	Other government projects	34	0.824	0.387	0.654
	Group support projects	68	0.882	0.325	
	Total government-supported projects	102	0.863	0.346	
External reputation	Other government projects	34	0.941	0.239	0.513
	Group support projects	68	0.971	0.170	
	Total government-supported projects	102	0.961	0.195	
Official establishment procedures	Other government projects	34	0.971	0.171	0.414
	Group support projects	68	0.941	0.237	
	Total government-supported projects	102	0.951	0.217	
Goal of research center	Other government projects	34	1.000	0.000	.
	Group support projects	68	1.000	0.000	
	Total government-supported projects	102	1.000	0.000	
External portals	Other government projects	34	0.912	0.288	0.787
	Group support projects	68	0.956	0.207	
	Total government-supported projects	102	0.941	0.236	
More than one funding channel	Other government projects	34	0.912	0.288	0.787
	Group support projects	68	0.956	0.207	
	Total government-supported projects	102	0.941	0.236	
Full-time research personnel	Other government projects	34	0.912	0.288	0.418
	Group support projects	68	0.868	0.341	
	Total government-supported projects	102	0.882	0.324	
Internal & external cooperation network	Other government projects	34	0.941	0.239	0.075
	Group support projects	68	0.926	0.263	
	Total government-supported projects	102	0.931	0.254	
Various research results	Other government projects	34	0.912	0.288	1.677
	Group support projects	68	0.971	0.170	
	Total government-supported projects	102	0.951	0.217	
Education function	Other government projects	34	0.735	0.448	2.752
	Group support projects	68	0.868	0.341	
	Total government-supported projects	102	0.824	0.383	
Coverage of various academic fields	Other government projects	34	0.824	0.387	0.146
	Group support projects	68	0.853	0.357	
	Total government-supported projects	102	0.843	0.365	

<Features of flexible research organizations>		N	Avg.	Standard deviation	ANOVAF
Various interested parties	Other government projects	34	0.824	0.387	1.289
	Group support projects	68	0.721	0.452	
	Total government-supported projects	102	0.755	0.432	
Setting up of research center agenda	Other government projects	34	0.853	0.359	0.806
	Group support projects	68	0.912	0.286	
	Total government-supported projects	102	0.892	0.312	

Source: Tasks conducted by universities extracted from the NTIS DB2008

It is highly interesting that there is almost no difference between the ROP and other organizations in terms of not only most elements, namely full-time administrative staff, full-time research personnel, and establishment goals and procedures of research centers, but also in the number of academic fields covered. This implies that there is little differentiation between ROP and other programs in terms of establishing research hubs at universities.

5. CONCLUSION

As a result of an analysis on the size and period of each research task of national R&D projects undertaken by universities, we conclude that the support from group support programs is no longer unique in the formation and maintenance of research groups. The period of ROP were distributed broadly, from less than one year to longer terms of around ten years, and were not differentiated from general research projects. It was found that with the increasing size and elongation of other R&D projects, ROP no longer had a unique business status based on research period and size of research funds. In other words, the size or period elements can no longer be considered as the unique characteristics of ROP in a changing R&D environment. However, an examination of programs into five different types presented that within the research organization support group showed they were somewhat differentiated in terms of project period and size.

In terms of the effect of ROP, there was little difference in the systematization elements of the organization, although participating professors in organizations that receive group research support are much more active than professors who receive other R&D support, in terms of all forms of exchange activities. This signifies that joint research in universities does not yet have systematization elements, and that research is based on individual themes conducted jointly by a number of researchers. ROP fail to effectively lead to the systematization of research. In other words, research organizations in universities today are not operated as independent, long-term organizations, but are more relevant as a combination of individual professor research labs.

According to an in-depth interview of project leaders for an in-depth evaluation of the 2008 National R&D Projects (KISTEP 2008) on University Research Center Projects, the ROP were assessed to be sufficiently worthwhile in that they create research hubs where researchers can conduct joint

research within a university. However, it can be noted that compared to the grand goal of building hubs, the size of tasks is relatively small. Since the SRC/ERC first commenced in the 1990s, there were many changes in Korea's R&D environment, and in particular, in the nature of technology and R&D activities themselves. In this regard, the fact that researchers undertaking ROP believe the size of tasks were relatively small compared to their goal is perhaps only natural, and therefore, it would be timely to redefine the meaning and direction of support provided through ROP.

Under such circumstances, the current Research Organization Support Program, which aims to build and maintain small-and-medium size research groups, requires the design of a new framework of support based on a new concept. It seems that it will be increasingly difficult for current programs that support research groups in universities to differentiate themselves from other R&D Programs in terms of the beneficiaries of the project or size of support. In addition, due to a change in the research environment since the early stages of the program, there are programs with purposes that no longer are relevant today. Building a research group with characteristics of research teams may hold little significance today when joint research has become widespread and broad, unofficial networks exist between researchers. Today, the forms of basic research teams in universities have changed, and the types of university centers are highly diverse. Therefore, new measures to support the changing research organizations must be devised.

The results imply that an upgrade the university research system in Korea is urgently needed. The last 20 years saw an expansion in the amount of funding and number of researchers. As a result, ROP have dropped down to average-sized programs and are no longer able to lead the formulation of research hubs, although they were successful seeds that allowed research activities in university to flourish in 1990s.

In order to redesign the university research system and upgrade ROP, it would be important to define the characteristics of 'group research support'. Until now, research teams that mainly conducted joint research were not clearly separated from research organizations that were systematized and conducted both administration and research activities. Various sizes of research institutes and centers are being supported, and each hold very different significance. Since the aim was to provide support to centers, the beneficiaries were research teams that were selected and evaluated. However, in the evaluation of research results or election of research teams there was no consideration about how effectively an organization was operated.

Therefore, we need to design a program that conceptually separates 'support for joint research' from 'support for research organizations'. Support for joint research (or research teams) should be based on results, as it is currently done. However, the growth of an organization should also be considered as a critical element in the selection of tasks and evaluation. The phase-by-phase organization elements as suggested by Youtie et al. (2006) can be the first step in the study of how to evaluate the effectiveness of organizations.

With increasing systematic research carried out by universities, there are many research organizations, set up voluntarily, within universities that are of various sizes and themes. However, most of these organizations have yet to be stabilized, and therefore, support to make them more systematic and organized is required. Furthermore, this will also call for differentiated support on the level of systematization and role of each organization.

REFERENCES

- Boardman, P. & Corley, E. "University research centers and the composition of research collaborations." *Research Policy* (2008), Vol. 37, pp. 900-913.
- Bozeman, B. & Boardman, C., *"Managing the new multipurpose, multidiscipline university research center: Institutional innovation in the academic community."* Washington D. C.: IBM Endowment for the Business of Government. 2003.
- Gray, D. O. et al. "Industry-university research centers: a multivariate analysis of member retention." *Journal of Technology Transfer* (2001), Vol. 26, No. 3, pp. 247-254.
- Geiger, R. L. "Organized Research Units - Their Role in the Development of University Research," *Journal of Higher Education* (1990), Vol. 61, No.19, pp. 1-19.
- Ikenberry, S. O. & Friedman, R. C. *"Beyond academic departments."*, London: Jossey-Bass Inc. Publisher. 1972.
- Laredo, Philippe. "University Research Activities: On-going Transformation and New Challenges," *Higher Education Management and Policy* (2003), Vol. 15, No.1, pp. 105-123.
- Ministry of Education, Science and Technology of Korea (MEST). *"Evaluation Report on University Research Center Programs."* MEST. 2008.
- Nissani, M. "Ten cheers for interdisciplinarity: The case for interdisciplinary knowledge and research", *Social Science Journal* (1997), Vol. 34, No. 2, pp. 201-216.
- Stahler, G. J. & W. R. Tash. "Centers and institutes in the research university: issues, problems, and prospects", *Journal of Higher Education* (1994), Vol. 65, No. 5, pp. 540-554.
- Youtie, J. et al. "Institutionalization of university research centers: The case of the National Cooperative Program in infertility research", *Technovation* (2006), Vol. 26, pp. 1055-1063.
- Zajkowski, M. E. "Institutional structure and the Australian research director: a qualitative study", *Journal of Higher Education* (2003), Vol. 25, No. 2, pp. 203-212.