Subtheme: 5.2

Contribution of the support and operation of government agency to the achievement in government-funded strategic research programs

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Introduction

The notion of strategic research has been growing more important since the early 1970s and started to appear in a variety of sources in the 1980s[1]. It is well defined by Irvine and Martin that strategic research is basic research carried out with the expectation that it will produce a broad base of knowledge that forms the background to solutions to current or future practical problems[2]. The strategic research has been particularly accepted by policy makers since then as it has policy goals in a prescriptive way and differs from the conventional pure basic research based on the freedom and curiosity of the scientists. Considerable emphasis was placed on the funding to strategic research in the UK, and actually, the funding of strategic research had taken a growing share of the Science and Engineering Research Council through its Directorate program since 1975[3].

When policy makers in Japan caught this trend of strategic research in the world and attempted to create a strategic research program, it had just so happened that Japanese government launched the five-year basic plan for science and technology in1996[4]. In this context, CREST (Core Research for Evolutional Science and Technology) program, a new strategic research program has been launched with the aim of integrating the scientific and technological excellence and forming the basis of solutions of current or future programs. In the CREST program, top-down approach is taken in the determination of strategic goals and the design of the strategic research area oriented to the goals. More specifically, the ministry sets priority in science and technology, and determines strategic goals that show the future objectives of the research. Then, the Japan Science and Technology Agency, one of the government agencies for promotion of science and technology, designs a strategic research area based on the strategic goal and designates the program officer who directs and supervises the researchers within the strategic research area. The program officer organizes and facilitates a kind of virtual institute and serves as a director of the virtual institute with the strong leadership in the whole management of the research area such as adoption of the research directors through the high-degree competition by open applications, and direction of each research project, etc.

The evaluations have been conducted at both levels of individual project and research area in the CREST program, where research activities have been mainly focused. Actually, such evaluations shed light on the outstanding outputs and outcomes of the projects such as establishment of the iPS cell (induced pluripotent stem cell) in the CREST program. It has not been clearly quantified to what extent the operation and

support of the government agency contributed to the research outputs and outcomes from the program. This is partly due to the fact that peer review is the most widely used and it often focuses on the research outputs from the viewpoint of the science and technology.

Methodology

In order to assess effectiveness of the support and operation of the government agency and to find more specific rationale for support of government-funded strategic research program, we designed questionnaire survey based on the analysis on the final reports of the completed research projects and the categorization of the aggregated excerptions of opinions and comments about the CREST program. The questionnaire survey was conducted against 340 researchers who had served as research directors in the CREST program. It asked about the contribution and effectiveness of CREST to what they achieved in their research projects.

The questionnaire mainly consisted of the following four items:

- How much did the CREST budget account for in the total research budget at that time?
- How did the scientific positioning of the research group change before and after the project in the CREST program within the related scientific and technological communities both in Japan and the world?
- What kinds of differences have been made and how additional were they in the operation of research budget, the progress of the research, the creation of the scientific and technological or socio-economic outcome and so on through conducting the CREST project?
- How effectively did the support and operation by the government agency contribute to a research project, especially in the program officers' identification of CREST research directors in the selection process or management of the research area strategically set by the government agency?

Findings and interpretation

In the first question we asked how much the CREST budget accounted for in the total research budget at that time. As shown in Figure 1, the CREST budget accounted for more than 60 percent of their total research budget at that time among the most of the respondents. Accordingly, the CREST budget was likely to provide an important boost for each research directors.

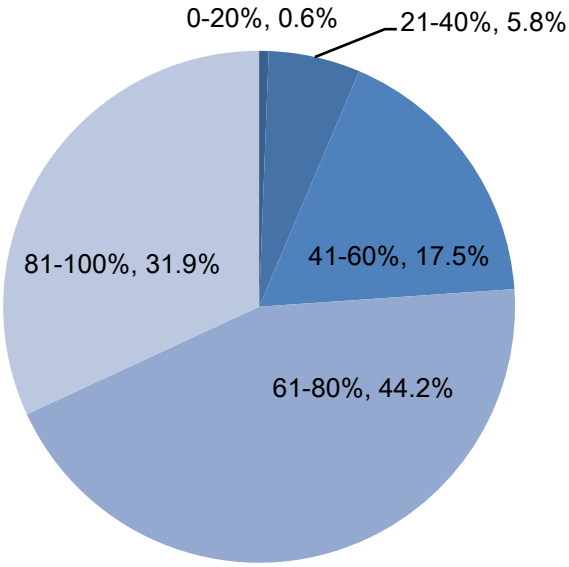

Fig.1. Ratio of the CREST budget in their total research budget

In the second question we asked how the scientific positioning of the research group change before and after the project in the CREST program within the related scientific and technological communities both in Japan and the world. The results are shown in Fig. 2. Prior to do CREST research, 32 percent of respondents indicated emerging research with fewer scientists and 31% of respondents did embryonic research with less previous or similar research. This suggests that the relatively-challenging scientists have been adapted in CREST. On the other hand, 60 percent of respondents indicated well-established research with more scientists and 16 percent of respondents did that their research results are currently influencing on applied research. Therefore, this fact suggests that CREST research has been likely to boost participating scientists to make scientific and technological progress

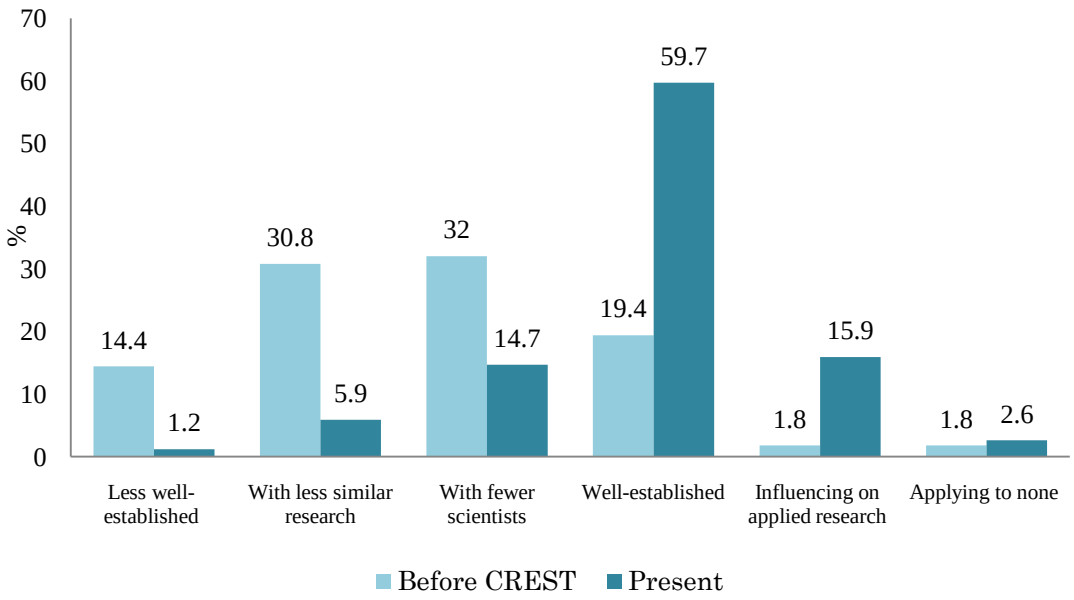

Fig.2. Scientific positioning of the research group change before and after the project in the CREST program

In the third question, in order to measure to what extent CREST has attributed the scientific and technological progress of the scientists, we focused on the additionality[1] which was proposed by Georgiou [5] as the difference in firm behavior resulting from the intervention. Especially in the evaluation of basic research, the effectiveness of publicly funded research is not fully measured by the research outputs and outcomes, partly because they would be achieved without publicly fund. Therefore behavioural additionality is likely to be one of the effective way to measure the contribution of the publicly fund. As shown in Fig. 3, the major changes which the CREST program gave the participants were mainly input additionality such as larger research budget and process additionality in research progress. This result is basically consistent with the previous study on the behavioural additionality at the R&D projects supported by the R&D Start grant in Austraria [6].

[1] The concept of additionality rests originally on the concept of market failure based on neo-classical economics [7].

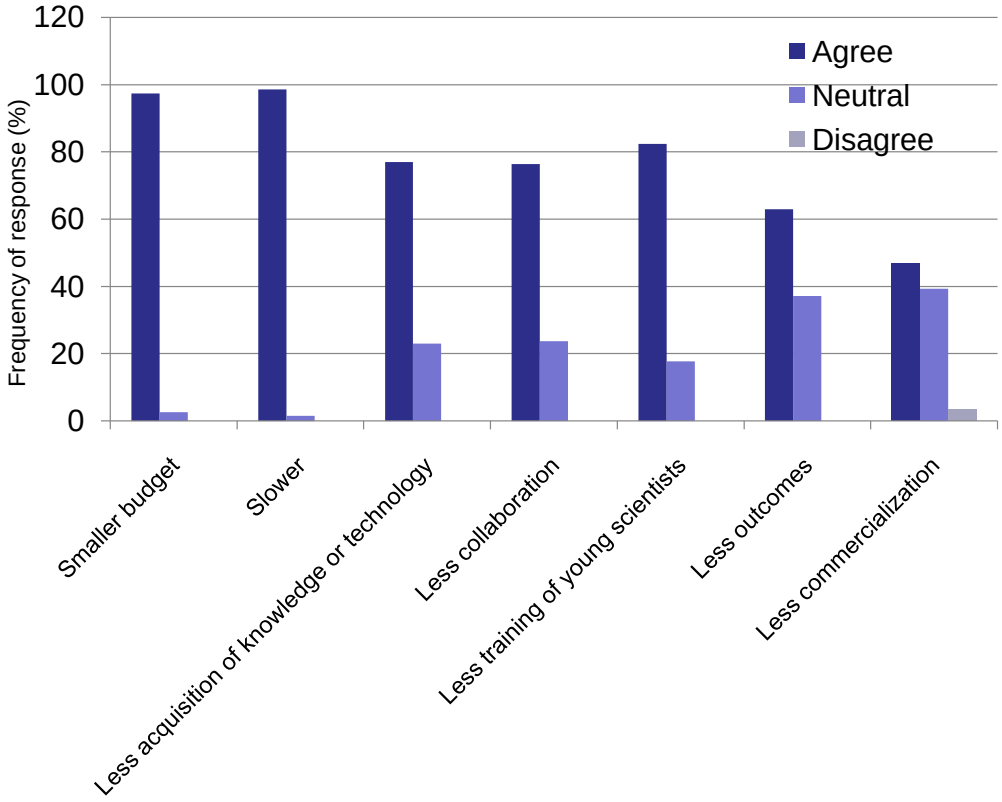

Fig.3. Predicted effects of continuing the research without CREST funding

Further, we inquired the respondents who reported that the research would have proceeded more slowly in the absence of CREST fund about the reasons, and they suggested it as follows:

- Organizing research team with high quality (83.1%)
- Introducing the key instruments, machines, devices, and so on (78.1%)
- Accelerating the research progress with the enhancement of research infrastructure (59.2%)
- Organizing research team with sufficient quantity (56.9%)

This suggests that in the view of the progress of research quality is likely to be more important than quantity in organizing research team. This also corresponds to Heinze's findings that small group size was highly influential for the creative accomplishment [8].

Then, in order to measure the attribution of the operation and support with both aspects of importance and effectiveness, we inquired about ten items: (i) identification of creative scientists among the applicants; (ii) Program Officer's facilitation of scientists; (iii) Technical Managers support, (iv) recruitment of research staff; (v) flexible research funding; (vi) management of intellectual property; (vii) public implementation of research results; (viii) improvement and provision of favorable environment for the research activity; (ix) provision of opportunities for collaborations; and (x) taking care of support for research outcomes after the CREST project (Table 1).It appeared that both importance and effectiveness were closely related each other.

Table1. Specific effectiveness in the Program Officer's identification of creative scientists among the applicants

	Importance		Effectiveness	
	Highly important	Important	Highly effective	Effective
Identification of creative scientists among the applicants	70.1%	26.6%	60.7%	32.2%
Program Officer's facilitation of scientists	39.8%	52.2%	39.6%	48.3%
Technical Managers support	33.4%	46.9%	36.6%	40.7%
Recruitment of research staff	70.0%	26.1%	69.5%	24.0%
Flexible research funding	79.5%	18.7%	72.8%	22.0%
Management of intellectual property	23.2%	49.8%	19.0%	36.2%
Public implementation of research results	22.6%	59.2%	15.3%	54.3%
Improvement and provision of favorable environment for the research activity	20.3%	46.3%	17.2%	34.7%
Provision of opportunities for collaborations	23.7%	56.9%	21.8%	49.8%
Taking care of support for research outcomes after the CREST project	18.7%	54.5%	14.2%	38.4%

In order to measure the effectiveness more specifically, we further inquired about four items in particular among above items: (i) Program Officer's identification of creative scientists among the applicants; (ii) Program Officer's facilitation of scientists; (iii) Technical Managers support; and (iv) flexible research funding (Table 2-5). Heinze et al.

found that flexible research funds were pivotal in several research breakthroughs in their case studies on organizational and institutional influences on creativity in scientific research [8]. As shown in Table 5, we have also found that the flexible research funds were highly important and effective to the CREST scientists, and, furthermore, have showed it more specifically.

Table 2. Specific effectiveness in the Program Officer's identification of creative scientists among the applicants

Specific effectiveness	Percentage
Insight into the scientific significance and difficulties in the research proposals	72.0%
Insight into the potential of the applicants based on the concept rather than research performance in the past	69.0%
Appropriate decision making based on the applicant's research performance in the past	52.3%
Insight into the essence of the research proposal despite the difference in academic specialization	51.3%
Consideration of socio-economic outcome on the research proposals	26.7%
Leadership in the selection of the research proposal which was difficult to be selected on consensus of reviewers	21.6%
Others	7.6%

Table 3. Specific effectiveness in Program Officer's facilitation of scientists

Specific effectiveness	Percentage
Hosting symposium, workshop, or other networking event	71.4%
Mentorship in the mid-term and/or ex-post evaluation	64.5%
Taking concrete action toward enhancement	64.5%
Discretionary earmarking for research activity	58.1%
Open-minded discussion at research site visits	42.4%
Casual contact with the program officer	26.3%
Others	4.6%

Table 4. Specific effectiveness in Technical Managers support

Specific effectiveness	Percentage
Expenditure of research budget	74.2%
Management of personnel matters on research staff	74.2%
Liaison and coordination with the head-quarter of the organization	72.7%
Intervention between the research directors and program officers	66.0%
General support for the research infrastructure	61.3%
General support for intellectual property	45.4%
General support for academic activity	14.9%
Others	3.1%

Table 5. Specific effectiveness in flexible research funding

Specific effectiveness	Percentage
Procurement in research activity	72.5%
Purchase or construction of research infrastructure	71.6%
Oversea travel fee	66.5%
Consumable supplies and materials expense	58.5%
Conference participation fee	50.4%
Conference hosting fee	37.7%
International payment	24.2%
Carrying over the funds in the next fiscal year	23.7%
Others	7.6%

Conclusions

In particular, the results suggested that:

- For almost all of CREST-funded researchers, the CREST budget accounted for major part of their research budget at the inception of CREST project.
- Approximately 60% of CREST-funded researchers conducted emerging research as few had previously conducted all over the world including Japan.
- More than 90% of CREST-funded researchers found it significant in that the CREST program had enhanced the research system including provision of research infrastructure and strengthened international competitiveness in

science and technology.

- The major changes which the CREST program gave the participants were mainly input additionality in research budget and process additionality in research progress
- The support and operation which the government agency provided was recognized to be highly effective with such as the flexibility in the operation of research budget and the insight of the program officer into high potentiality for innovative research of candidate scientists

Policy implications and directions for further research

Probably it is a propitious time to conduct evaluation that focuses on contribution of the government agency on the CREST program as about fifteen years have passed since its inception. Through the questionnaire survey on the former CREST research directors, we may highlight the flexibility in the management and the critical role of the program officers in the selection process as key features of government agency in the support and operation. These functions are the intended feature of the CREST program. This survey would be helpful for that policy makers to accept the importance and effectiveness of the promotion of strategic research.

As this survey was conducted only on the former participants of the program in the past, the results may not fully reflect the actual situation on the CREST program. It would still be necessary for us to continue investigating on what roles of the government agency are expected from more various aspects.

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