

Evaluation of R&D Projects – European Practice –

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1 Introduction

There are two types of governmental R&D projects: the “open-type” project, and the “closed-type” project. In the past, Japan heavily depended on the “closed-type” R&D project via negotiated contracts, but there have been an increasing number of “open-type” R&D projects that select proper proposals after accepting a wide variety of proposals from researchers.

In line with its reports from the “Competitive R&D Fund System Reform Project,” the Cabinet Office’s CSTP (Council for Science and Technology Policy) submitted its opinion paper to the prime minister and other related ministers in April 2003. As the competitive R&D fund has already reached ¥349 billion, or about 10% of the total S&T expenditures in the FY 2003 government budget, the opinion paper provides specific policy recommendations for further expanding such R&D fund^{[1],1}.

In addition, the opinion paper points out the reason for expanding such competitive R&D fund as follows.

“In order to yield top world-class R&D outcomes, it is necessary to selectively provide funds to R&D activities proposed by motivated researchers.... The United States has competitive R&D funds about ten times as much as Japan. In the US, an independent fund allocation entity allocates R&D funds to universities and other institutions based on a fair and transparent evaluation process. Under such competitive R&D environments, the United States has been creating top world-class R&D outcomes and bringing about technological innovation for revitalizing its economy.”

The expansion of a competitive scheme

surely requires a proper evaluation system. As the opinion paper points out, there are four important factors for establishing a proper system: Excluding stakeholders from the evaluation process; involving competent researchers and technical experts in the initial evaluation process; disclosing evaluation results to applicants; and establishing proper interim and ex post valuation processes after adopting a R&D project.

While Japan’s competitive fund system reform initiative is based on the corresponding fund scheme in the US, Europe also has its own competitive R&D fund scheme. Since I had an opportunity to participate in the initial evaluation process in Europe, I would like to explain the European practice as compared to Japan’s scheme.

2 Framework Program

Since 1984, the European Union has been promoting an R&D program called the “Framework Program^[2].” The Framework Program is a five-year-long program (practically, one term is four years long). The Sixth Framework Program covers the period between 2002 and 2006. The previous fourth and fifth Programs covered the 1994-1998 term and the 1998-2002 term, respectively.

The fourth and fifth Program had a fund amount of €13,215 million and €14,960 million, respectively. The current sixth Program has a fund amount of €17.5 billion. If converted into Japanese yen at an exchange rate of ¥130/€, the sixth Framework Program represents about €2,275 billion. This means the EU has a competitive R&D fund capability larger than that of Japan on a yearly basis.

The EU carries out the Framework Program because the EU recognizes the importance of R&D activities in enhancing industrial competitiveness as well as protecting consumers and the environment. While the EU has been forming its own monetary union in accordance with the Maastricht Treaty of 1993, the new Amsterdam Treaty became effective in May 1999. This new treaty has one chapter covering R&D activities and emphasizes the importance of such activities.

Table 1 shows the fund allocation for each R&D field based on the sixth Framework Program^[2]. Japan selectively allocates funds to four priority fields. The EU similarly sets out priority fields such as life science, information society, nanotechnology, and environmental technologies. Unlike Japan, the EU sets out aerospace as an independent priority field, which suggests that the EU puts more emphasis on the aerospace industry, including Airbus.

The Framework Program is an open-type program. Researchers must solicit for research institutions in at least three different EU member states when submitting their proposals to the European Commission, which serves as the Framework Program secretariat. The secretariat then evaluates these proposals to identify those deemed appropriate.

3 Initial evaluation of proposals

The initial evaluation process consists of two steps: peer review by experts; and the subsequent coordination by the secretariat.

As described in detail later, experts evaluate whether or not a submitted proposal carries academic value. Since researchers are allowed to submit more than one project, two or more R&D projects submitted by a same researcher might pass this expert evaluation. In this case, it is necessary to make some adjustments, including priority/timing adjustments in the projects and designation of an alternate researcher. Adjustment is also necessary if the expert evaluation does not approve the full amount of the budgetary request for the R&D project. The European Commission is authorized to make such adjustments.

The following statements explain the initial evaluation process by experts.

In parallel with soliciting for R&D project proposals, the European Commission appoints panel members who are in charge of the evaluation process. Basically, the panel members must be experts who do not have any stake in the specific proposal. Usually, three to five experts are involved in the examination of a project proposal. In this sense, if each expert evaluates ten project proposals, about 40 experts are needed to examine 100 project proposals^{*2}.

Table 1 : Fund allocation plan in the sixth Framework Program
(Unit: € million)

Priority fields			13345
Items	Life science	2255	
	Information society	3625	
	Nanotechnology, materials	1300	
	Aerospace	1075	
	Food safety	685	
	Sustainable development, environment	2120	
	Citizens and governance in a knowledge-based society	725	
	Others	2060	
Mobilizing R&D staff			2605
Establishing research collaboration schemes			320
Others			1230
Total			17500

Source: Author's compilation based on European Commission documents.

On the other hand, since there are not so many experts available, it is difficult to always appoint the necessary experts who do not have any stake in the project. In order to solve this problem, the European Commission sometimes appoints experts from non-EU member European nations or non-European nations. If this solution does not provide the sufficient number of experts necessary, the European Commission will need to appoint experts who have some stakes in a specific proposal. In this case, the Commission temporarily excludes such interested expert from the evaluation process or orders the expert to leave his/her seat when other panel members are discussing the proposal.

The secretariat gathers all the evaluation panel members and instructs them to stay in a certain place for a week. It is prohibited to take out the document and to bring in PCs and mobile phones. The secretariat then hands over proposals to the panel members.

Due to their characteristics, R&D project proposals are divided into five categories as

shown in Table 2. In addition to pure R&D activities, the EU intends to provide R&D funds not only to NOE and CA, which would strengthen collaboration among many existing research institutes in the EU member states, but also to SSA, which would be indirect activities (e.g., holding a symposium). While recently Japan aims at establishing the Center of Excellence (COE), the EU's NOE aims at forging closer ties among COEs. This represents an interesting contrast.

Each of these five categories has different evaluation items. The list is shown in Table 3. For each evaluation item, a perfect score is 5 points. A proposal will pass the expert evaluation if it gains 3 points or more for items marked with 3/5, and 4 or more points for items with the 4/5 mark. In addition, the proposal must at least receive a score at its qualifying criteria.

Each panel member independently evaluates the proposals. After that, they hold a panel meeting with the coordinator to draw up the tentative evaluation results, as a consensus of the panel consisting of three to five members.

Table 2 : R&D project categories

Name	Abbreviation	Description
Integrated Project	IP	A large-scale project to support objective-driven research.
Network of Excellence	NOE	A project that strengthen excellence by tackling the fragmentation of European research.
Specific Targeted Research Project	STREP	A R&D project designed to achieve a certain goal.
Coordination Action	CA	A continuous activity to promote and support the networking and coordination of research and innovation activities
Specific Support Action	SSA	A specific support activity, such as holding a symposium.

Source: Author's compilation based on European Commission documents.

Table 3 :List of evaluation items

Project category	IP	NOE	STREP	CA	SSA
Relevance	3/5	3/5	3/5	3/5	4/5
Potential impact	3/5	3/5	3/5	3/5	3/5
Science and technology excellence	4/5		4/5		
Quality of the consortium	3/5	3/5	3/5	3/5	
Quality of management	3/5	3/5	3/5	3/5	3/5
Mobilization of the resources	3/5		3/5	3/5	3/5
Degree of integration and joint program of activities		4/5			
Quality of the coordination				4/5	
Quality of the support action					3/5
Total threshold	24/30	20/25	21/30	21/30	17.5/25

Source: Author's compilation based on European Commission documents.

Then, panel members will have enough time to read the other proposals that he/she is not in charge of. After they grasp the total picture of the proposals, the secretariat gathers all the panel members together.

In the plenary panel session, the secretariat presents the tentative evaluation results for each category. Then, the panel members hold discussions to make the necessary adjustments in the initial conclusion. As already explained earlier, the secretariat orders any interested expert to leave his/her seat when other panel members are discussing the proposal. In this plenary session, the panel members evaluate and discuss the following points: “whether or not it is proper that this proposal would involve researchers from non-EU member states,” “whether this project would intentionally exclude female researchers³,” and “whether this project would abuse personal information or other protected information.”

For small-sized projects such as STREP, CA and SSA, the secondary evaluation results by experts are regarded as the final conclusion.

For relatively large-sized IP and NOE, the secretariat will hold a hearing session with the applicant of a successful proposal. Expert panel members will also attend this hearing session and ask the proposal applicant professional questions in line with a questionnaire that has been already prepared at the plenary panel meeting. The panel members have some discussions and draw their final evaluation results. The ratio of successful proposals usually ranges from 10% to 20%.

After being notified of the evaluation result, applicants may raise an objection over the evaluation result. The secretariat deals with the applicant's objection, paying due attention to document records of the initial evaluation process.

Referring back to my own experience in attending the evaluation process, the European Commission retained 40 experts for a week and paid their fees and traveling expenses just for evaluating 100 proposals. From this perspective, the EU probably spends 2% of its total R&D expenditures for this evaluation process.

4 Reasons for the strict initial evaluation process

Why does the Framework Program require such strict process for the initial evaluation? There are several reasons for this.

The most important reason is that each member state contributes funds for the EU to operate its activities. If the evaluation process disproportionately adopts many proposals from a certain nation, other member states will surely make objections. Impartial evaluation by expert panel members is necessary for the successful defense against such objections. In short, the initial evaluation process is very strict because the European Commission assumes and intends to fulfill its accountability to the EU member states.

The evaluation process is disclosed as a document format. Everyone is allowed to review this document. This, as well, is because the EU assumes accountability. On the other hand, the EU maintains secrecy on panel members' names in order to maintain neutrality in the evaluation process.

Similar to Japan, the EU obviously intends to adopt proposals submitted by motivated researchers. Researchers are working on their R&D activities in international competitions. If a panel exclusively consists of members from EU member states and makes the final decision, the evaluation process will yield a biased decision. To solve this potential problem, the European Commission invites experts from non-EU member states and respects their opinions.

The secretariat sometimes appoints panel members from non-EU member states in order to increase the number of experts who have appreciation of Europe. This is because these experts will spread European point of view to the rest of the world. The United States, Asia and Europe have been frequently pursuing initiatives in the R&D fields. The EU implicitly aims at giving positive impacts on this competition in its favor.

It should also be noted that all proposals are written in English. The EU usually designates all of its member states' official languages as

Table 4 : Statistics of external trades in telecommunications, audio, TVs and VCRs
(Unit: € million)

Year	1990	1996	1997	1998	1999	2000	2001
Export value	5969	20316	27272	28076	31282	44295	41879
Import value	14044	19665	22963	26475	32381	49294	48729
Balance	-8075	651	4309	1601	-1099	-4999	-6913

Source: Author's compilation based on European Commission documents.

its own official languages. However, so far as the Framework Program is concerned, all the proposals are written in English. This means English is the only “official language” in the science and technology field. By doing so, the EU intends to obtain objective evaluation results from many evaluation experts who have different nationalities.

5 Ex post evaluation in Framework Program

The committee in charge of the Framework Program's ex post evaluation was established outside the European Commission in order to maintain neutrality. The committee's evaluation results were published in July 2000^[3]. This report commends project outcomes and strongly encourages the Program's continuity. It attaches high value to the Framework Program because the Program has encouraged R&D activities in industry-academic collaboration and provided SMEs with opportunities to join the Program. On the other hand, the report criticizes the European Commission's complex and time-consuming process management.

Let us use ACTS as an example to examine in detail the ex post evaluation. ACTS is an information/telecommunication project that took place from 1994 to 1998 as part of the fourth Framework Program^[4].

ACTS covered a wide variety of R&D fields, such as interactive digital multimedia services, optical technologies, high-speed networking, mobile communication networks, more sophisticated networks and services, as well as quality and security in communication networks/services.

The fourth Program also had other information/communication projects such as microelectronics-related ESPRIT and an

educational project called TELEMATICS. The total research expenditures for the information/communication fields stood at €3,646 million, or 28% of the Program's total budget. Out of this research fund, the EU spent €671 million for ACTS.

Under ACTS, the EU adopted 89 proposals, and about 1,060 organizations participated in ACTS. Research institutions and universities accounted for 30% of the total participating organizations, while private corporations occupied 48%. In this sense, ACTS was a corporate-driven project.

ACTS website provides the results of a corporate survey, asking participating organizations the following question: “How would you evaluate your own research outcomes when based on a worldwide perspective?” According to this website, the projects that “successfully achieved top world-class” accounted for 55%, while a third of the respondents answered that their projects “exceeded the research levels in the US or Japan.” In addition, almost half of the respondents gave favorable answers such as “investment risks have been lowering” or “Business strategies have been successfully narrowed down.”

Based on the statistics of external trade, let us examine to what degree European industrial competitive edge has been successfully enhanced in the information/communication fields^[5].

According to Table 4, some product items suffered from a significant trade deficit in 1990, recovered to a trade surplus in the late 1990s, and fell into significant adverse trade balances again thereafter.

The EU's import and export statistics against the United States and Japan also represent similar trends. The trends are shown in Tables 5 and 6. These charts show a gradual increase in trade deficit against the US. They also illustrate that the sectional trade deficit against Japan dropped by half in 1996 but has been suffering a gradual rise

Table 5 : Statistics of trade with the US in telecommunications, audio, TVs and VCRs
(Unit: € million)

Year	1990	1996	1997	1998	1999	2000	2001
Export value	705	1743	2646	3109	3802	5402	5437
Import value	1550	4436	5860	7033	8405	12366	10677
Balance	-845	-2693	-3214	-3924	-4603	-6964	-5240

Source: Author's compilation based on European Commission documents.

Table 6 : Statistics of trade with Japan in telecommunications, audio, TVs and VCRs
(Unit: € million)

Year	1990	1996	1997	1998	1999	2000	2001
Export value	86	995	912	645	1022	–	–
Import value	6579	4136	4307	4613	5793	8103	7335
Balance	-6493	-3141	-3395	-3968	-4711	–	–

– : No data

Source: Author's compilation based on European Commission documents.

thereafter.

The trade statistics only represent rough categories such as “telecommunication, audio, TVs, and VCRs.” In this sense, the EU's trade deficit against Japan might represent adverse impacts of commodity products such as TVs and VCRs. However, the trade deficit against the US surely illustrates a gap between the United States and the EU in their competitive edges in high-tech fields such as the Internet.

Of course, there is a time lag between successful R&D activities and improvements in trade accounts. On the other hand, all the Framework Programs have recognized information/communication as a priority area. From this perspective, the trade statistics shown in these charts would represent outcomes of the fourth Program as well as those of previous Framework Programs.

ACTS report optimistically shows successful improvements in the EU's industrial competitive edges. However, the EU still has trade deficits against other developed nations such as the US and Japan. This fact indicates that the EU suffers from deficits in overall external trades in the information/communication fields.

Despite positive responses from participating organizations, what is the reason the trade statistics do not indicate the successful enhancement of the EU's competitiveness?

The answer is obvious. Usually, participating organizations would welcome receiving R&D subsidies and have no reason to refuse them.

Table 7 : Major communication equipment manufacturers' R&D expenditures in 1998
(Unit: € million)

Year	1998
Alcatel	1809
Siemens	4664
Ericsson	3143
Bosch	1778
Nokia	1150
Total	12550

Source: Author's compilation based on annual reports of manufactures.

If a fund allocation entity asks them about a Program's outcome, they would naturally answer the Program “went successful” or “gave positive effects.”

However, actual subsidies do not represent significant amounts. Based on annual reports released by the top five European information/communication firms, Table 7 illustrates these five major firms' R&D expenditures in 1998 when the EU carried out ACTS.

In total, these five corporations spent R&D expenditures 3.4 times as much as €3,646 million, the total information/communication expenditure under the Framework Program. Because the Program has also provided subsidies to other corporations during its five-year term, the Framework Program's R&D subsidies have probably pushed up corporate R&D expenditures only by a few percent.

A region-wide R&D program seemingly

provides a significant amount of total funds. However, as these funds are usually allocated and diluted to many entities, each firm receives a tiny R&D fund amount. From this viewpoint, it is difficult to expect that such regional R&D program would naturally enhance the industrial competitive edge.

Even in Japan, when the government announces R&D support measures, the business community supports it. However, sober perspectives are necessary to correctly judge whether or not such government measures would effectively yield positive results.

6 Conclusions

Focusing on the EU Framework Program, this paper has so far explained the evaluation process for the “open-type” R&D program.

As already mentioned at the beginning, Japan has been expanding its competitive R&D fund scheme. According to the CSTP document mentioned earlier, Japan’s largest R&D support project (49%) is the “Grant-in-Aid for Scientific Research” provided by MEXT (Ministry of Education, Culture, Sports, Science and Technology) and JSPS (Japan Society for the Promotion of Science). The second largest project is the Basic Research Program by the Japan Science and Technology Agency.

The Japanese government grants subsidies for two types of scientific research activities: Large-scale special promotion research activity on one hand, and specific foundation research activity on the other. Special promotion research activity has an initial evaluation process in the sequence of third party’s document review, panel-type examination, and, then, hearing session. If a proposal is rejected, the unsuccessful applicant will be notified of the reasons for rejection. The foundation research activities involve document review and panel-type examination. When the proposal is rejected, its applicant is able to know the rough position of the unsuccessful proposal, if he/she wishes^[6].

Japan’s scheme is more transparent than the EU Framework Program because it publishes the list of appraisers. On the other hand, there is no panel-type evaluation process in the document

review phase. Although Japan’s scheme has an advantage in cost reduction of the evaluation process, it is less transparent because appraisers have no chance to meet with each other to check on any possible conflict of interest.

As the government also incorporates document review, panel-type examination, and hearing session into many other projects, the Japanese government is making efforts, in a sense, to establish sound foundations for the initial evaluation process. In addition, notifying unsuccessful applicants of the reasons for rejection will surely contribute to fulfilling accountability.

Unlike the EU Framework Program, Japan’s scheme does not have any evaluation process that involves foreigners. This is partly because foreigners are not able to read proposals that are all written in Japanese.

As Japan has not so many experts available, the possibility for some type of conflict of interest is quite high. There is no national border for R&D activities. R&D activities fall under the international competition arena, rather than domestic competition. If Japan successfully establishes a proper system for impartially evaluating R&D proposals based on global standards and worldwide perspectives, such an evaluation process will successfully select excellent R&D proposals.

In order to establish an initial evaluation process having an international perspective, it is necessary to require applicants to submit their proposals in English. Because able Japanese researchers frequently write their papers in English and submit them to international journals, a new requirement to write proposals in English will only impose a marginal burden on researchers. Japan should establish a proper competitive fund system that requires R&D proposals and reports to be written in English.

Comparing with the European system, Japan’s scheme does not have enough objectivity in its ex post evaluation process. Japan needs to seek for a proper scheme that would properly maintain objectivity in the ex post evaluation process.

If establishment of a proper ex post evaluation process would take a long time, a secure framework for the initial/interim evaluation

process is necessary. Narrowing down excellent R&D proposals will surely give positive impacts on the R&D project's actual performance. From this viewpoint, Japan should put more emphasis on improving its initial evaluation process.

Notes

- *1 The opinion paper defines "competitive R&D funds" as follows: Competitive R&D funds mean "R&D funds allocated by a certain fund allocation entity that publicly solicits R&D proposals and selects proper R&D proposals based on a highly scientific and technical evaluation process that involves multiple panel members including experts."
- *2 About 100 proposals were examined in the evaluation process that I was involved with. This is only a part of the Framework Program. Since I entered into a contract that prohibits me from disclosing the specific contents and evaluation results of proposals, I would like to refrain from stating such information in this paper.

- *3 Fostering female researchers is one of the important political issues.

References

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