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Management and the effect of MITI's R&D project: case study from a supercomputer project

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Abstract

This report analyzes the results of the Supercomputer Project, which was executed as a government-sponsored R&D project starting in 1981. The conclusions of this paper are as follows: (1) There was not much need for the government to carry out the Supercomputer Project on a national-scale because three companies had already decided to introduce supercomputers and were ready to implement R&D for practical use when the national project was inaugurated. Therefore, there was little room for the government to intervene in this matter. (2) One possibly appropriate way to evaluate the quality of this project would be on the number of paper citations resulting from it. There were fewer for this project than for similar computer projects. We can therefore judge that this project had relatively little effect. (3) A high-speed computer with 10GFLOPS, one of the objectives of the project, was successfully made, but the devices that were developed to replace silicon have never been applied to computers. As stated above, we cannot say that the project has proven to be successful. However, we discovered that devices to replace silicon, such as JJ devices and HEMT devices, were not suitable for computer use. They were, however, used with mobile phones and high-speed devices for satellite broadcasting instead, resulting in a large profit. When evaluating an R&D project, it is important to evaluate the accomplishment of the objective set before the project is launched, but the indirect effects, which could not have been anticipated, also have to be evaluated.

Keywords: Technology policy; Research consortium; Supercomputer project

1. Introduction

Many people believe that Japan's sharp economic growth in the past was due to MITI's industrial technology policies.[1] The policies include government-sponsored R&D projects, which attract a great deal of attention.[2] The project involving the High-speed Computer Systems for Scientific and Technological Use (herein referred to as the Supercomputer Project) is one of the government-sponsored projects, established with the objective of improving and speeding up the computer's performance. This project ran from 1981 to 1989, and with the Scientific Computer Research Association as the leader, companies that joined the association and the Electrotechnical Laboratory carried out the R&D. The MITI coordinated the overall project and provided capital.

In 1982, one year after the Supercomputer Project was launched, the Fifth Generation Computing Project[3] was begun and both projects continued simultaneously for six years as government sponsored computer projects with the MITI in charge (Fig. 1). The Real World Computing Program,[4] which was started in 1992, took over the Fifth Generation Computing Project.

The necessity of government participation in R&D has

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[1] See Okimoto (1989), Watanabe et al. (1991), Watanabe and Honda (1991), Watanabe and Honda (1992).

[2] See Fransman (1990) and Callon (1995).

[3] See Nakamura and Shibuya (1996) and Odagiri et al. (1997).

[4] See Nakamura (2001).

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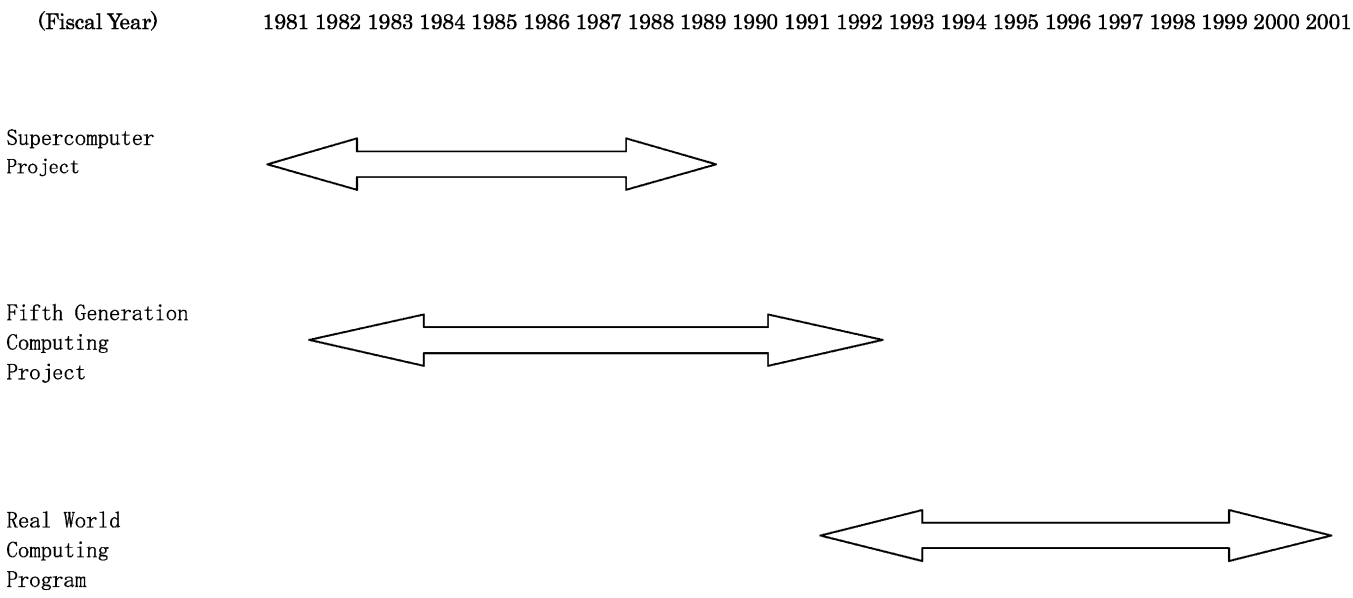

Fig. 1. Government-sponsored projects in the computer sector in the last 20 years.

been a subject of considerable debate in the past.[5] If an R&D project were left entirely to non-governmental organizations without government participation, the investment in R&D would not have been sufficient. One of the reasons would have been the inappropriateness of the outcome from R&D. Due to patent protection, the right to the outcome from R&D reverts to those who do the work in varying degrees. However, if the patent protection system is not well organized or if know-how falls outside the protection of the patent, non-government organizations will lose their incentive to conduct R&D, and ultimately the investment will be insufficient. The second reason is the uncertainty of the R&D. There is no assurance that R&D will end with a satisfactory outcome; therefore, non-governmental organizations tend to avoid uncertain R&D projects. As a result of this, the investment would also be insufficient. The third reason is the indivisibility of R&D. R&D has a minimum unit and it couldn't be carried out if the level went below this unit. Consequently, the investment would again be insufficient. Examples of this are development in nuclear energy and space.

Now we will consider the reason why government involvement in the Supercomputer Project is necessary. As mentioned above, the Supercomputer Project and the Fifth Generation Computer Project were carried out simultaneously. We would like to verify why these computer projects were performed at the same time, and if non-governmental organizations really wanted the project to be under the leadership of MITI. In this paper, we will examine closely how government-sponsored R&D projects have been developed and managed, make comparisons with the Supercomputer Project, and analyze the characteristics.

In Section 2, we will explain how government-sponsored R&D projects have been developed and what the characteristics of the Supercomputer Project are. In Section 3, we explain the objectives, expenses, and structure of the Supercomputer Project. In Section 4, we discuss the differences in management between common government-sponsored R&D projects and the Supercomputer Project. In Section 5, we will consider the results of the Supercomputer Project and analyze the results, and in Section 6, we will conclude and consider the ideal style of government-sponsored R&D projects for the future.

2. The process of project development

2.1. The process of carrying out a common government-sponsored R&D project (Fig. 2)

When the government directs an R&D project, it receives suggestions from various fields such as industry and academia, and also from national laboratories. Proposals from industry can be in areas that are considered important for future industry but in which R&D is not being currently carried out due to uncertainty and other reasons.

The proposals from academia and national laboratories tend to be for R&D projects that emphasize pure science, compared to the suggestions from industrial circles. The government also has input when the competitive power of some sectors in Japan is weaker than in other countries, and could have a large negative impact on the entire Japanese industry.

[5] See Nelson (1959) and Arrow (1962).