1. INTRODUCTION

Today, the impacts of science and technology extend over almost all areas like economy, industry, education, defense, and diplomacy. Government involvement in the research and development (R&D) is becoming active more and more, and the areas where government sustain the R&D activities are expanding. Of cause, the themes and contents of science and technology change with time.

Correspondingly, the role of government in the R&D of science and technology is also subject to change with the times. To understand it, just looking back only the last twenty years is enough.

In the 1970s to the 1980s, although signs of the relaxation of the Cold War appeared, the world was still in the midst of the Cold War structure. And, national science and technology programs were placed at high priority positions in each country as one of the basic policies for maintaining national prestige, security, and progress in industrial development. Therefore, each country has made efforts to promote science and technology programs with a view to enhance her own technology capability, although she has had many problems to be solved urgently. Today, the essential meaning of national science and technology programs in each country is still preserved, however, there are emerging needs to find some new approaches and to establish rules for progress in the national science and technology programs with the demise of the Cold War structure. Changes in the domestic societies also require the establishment of new approaches for national science and technology programs. Recent OECD's initiative concerning the development of international criteria for national R&D subsidies to private industry's R&D activities, rising concern over aging population, and increasing concerns about global environment as reflected in the Brazil summit are only few examples of such changes.

Irrespective of its apparent increasing importance of government involvement in science and technology. such involvement has been often viewed as having negative influences on free and fair market competition and the development of sound market economies.

Behind this criticism, there has been a growing belief that efficient market economies are the only alternatives under the situation of the collapse of Communism in the former Soviet Union. In addition, growing concerns about global problems like environmental demolition and

population explosion have also called for new approaches to national science and technology programs. Under these circumstances, a new vision of national science and technology programs based on the unified efforts like a collaboration among government, industry and academia has begun to attract more attention from researchers and policy makers.

Such efforts, however, may bring about some controversies. For example, the political conflict over the opening of the Japanese telecommunications industry under the pressure of the "Super 301" provision of the 1988 Trade Act in the United States entails such concern of where the boundary between government R&D activity and commercial activities lies. Creating a new framework for international research cooperation must also deal with this boundary issue between governmental activity and market competition (Ref. 1).

In order to properly deal with the current problems related to science and technology policy as described above, it is mandatory to have clear understanding of the history and current status of national science and technology programs before proceeding to the analyses of the specific issues.

Here, let's review briefly the structure of science and technology promotions in Japan. Because of the scarcity of natural resources, Japan has been adopting a policy of paying much attention to develop technology since the Meijj Restoration. Nationbuilding on the basis of science and technology has been the central goal, and the goal has been pursued by each sector in the society with the collaboration of government, industry and academia. Economic, political and social systems have been integrated toward the establishment of its own indigenous technology system.

The developments of heavy industry, chemical industry, electronics industry were accelerated by the use of the basic technologies transferred from the United States and European countries, and the technology bases accumulated through these efforts caused today's advancement of the industries such as information and biotechnology industries, etc. Many high-tech products have become to support our daily life. For instance, Japanese people now enjoy the services of geometeorological, broadcast ing and communications satellites. which are a typical outcome of national science and technology programs. In sum, Japan has been able to build various technology bases and obtained today's prosperity by promoting the

R&D of science and technology in national scale with the adaptation of social needs to international environment in each era.

To define the problems and to clarify the historical necessities of national programs progressed under a complex of economic, political and social systems, we need a multi-disciplinary approach that covers related disciplines such as economics, politics, sociology, natural sciences and engineering. Preliminary development of such multi-disciplinary approaches to build theoretical frameworks for this type of problems have been proposed in several concepts such as "system politics" (Ref.2), Wallerstein's "world system analysis" (Ref. 3), etc., even though none of them have still reached the stage of containing science and technology problems in that domain explicitly. By understanding national science and technology problem as a multi-disciplinary problem, we begin our study with a review of the science and technology system in Japan and then identify the characteristics of national science and technology programs by adopting the systems approach backed up with historical and empirical approaches.

More specifically, we will look into national R&D organizations as core promoters of national science and technology programs and some typical cases of the programs, by making the most of statistical approaches to clarify the dynamic behavior of these progams. The purpose of this endeavor is to find some general tendencies and laws governing the science and technology activities and to present them as a clue to establish a guideline of the future national R&D programs. In addition, systematic considerations through this study will effectively work to extract essential subjects immanent in the process of national R&D activities.

The next chapter, i.e. chapter two presents a brief discussion about framework of the analysis, where the territory of this study will be clarified. And also the basic architecture of this research will be described. The framework to be presented here is essentially to intend to specify the general territory and direction of the research. More rigorous framework and its details will be discussed and set as complete form in the later stage when we will analyze each specific problem.

In chapter three, the current activities of national research organizations as implementers of national science and technology programs will be analyzed to identify the areas of essential problems common in particular national science and technology programs. Because it was

conjectured that the understanding of the realities of national research institutes and research institutes of public corporations will help figure out basic characteristics in national science and technology programs. We will first review the historical outlook in the development in science and technology infrastructure including the establishment of national research institutes and research institutes of public corporations after World War 11. Then, based on a questionnaire survey and interviews, current feature of these national research organizations will be analyzed.

In chapter four, a case study of a typical national science and technology program, i.e. space program will be presented, where we stress an important aspect of national program problems, that is the cooperative activity among three sectors: government, industry and academia beyond the traditional theories of the cooperation between two sectors like industry-academia or government-industry.

Finally in chapter five, the results of the research as the first phase is summarized.