Science and Technology Research Project 2016

Transformation of Science and Technology Policies in the Post-Cold War Era

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Summary

Ⅰ　Transformation of Science and Technology Policies in the Post-Cold War Era

Military- and Civilian-Science, Technology and Innovation Policy in the Post-Cold War and Post-9/11

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This paper aims to examine how the end of the Cold War and the US Terrorist Attacks followed by the War on Terror have shaped today's science and technology as well as science, technology and innovation policies, especially in relationship to the US defense policy. Due to the end of the Cold War, science and technology policy to enhance the national prestige was replaced by science, technology and innovation policy to develop the national economy. Decline of the defense budget brought an idea of developing "dual-use" technology which satisfies both military and civilian purposes in parallel on the same industrial platform. Since 2000, both information technologies and biotechnologies have been growing, where entrepreneurial ventures have played increasingly critical roles in their Research and Development (R&D). To adapt such transformation in research enterprises, the US federal government introduced radical policy tools to accelerate the dual-use technology development: the government funded venture capital and prize competitions. Such radical tools would be efficient to promote IT innovations as well. Finally, it should be noted that making clear distinctions among military, civilian and dual-use technologies has become more and more difficult in these days.

The U.S. Department of Energy and the Human Genome Project

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The U.S. Department of Energy (DOE) is a federal agency which is mainly in charge of energy security, nuclear security and developing science and innovations in the United States. The DOE is also well known for having the Manhattan Project as its institutional origin. In the 1980s, the DOE became the first governmental institution which proposed the Human Genome Project (HGP), a Big Science in biology. This article aims to clarify how the DOE was involved in the HGP, mainly through surveying the historical documents made by the DOE. The results are as follows. (1) At first the DOE wanted to develop technologies to detect the gene mutations which the survivors of the atomic bombings of Hiroshima and Nagasaki and their descendants might have in their genes. (2) The DOE recognized that the HGP needed a giant leap in the technologies of automated genome sequencing, and the DOE could utilize its strength in computer science and Big Science. (3) The DOE researchers who were in charge of the negative side of nuclear development wanted to have a future-oriented health project. In the post-Cold War era, the DOE started the Microbial Genome Initiative, a spin-off from the HGP. Utilizing the results of microbial research, the DOE tries to develop technologies for clean-ups of nuclear polluted sites and for carbon reducing to prevent global warming, and so on.

Assessment of “Impacts”: Science and Technology Policy and Research Evaluation

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Research and Development (R&D) not only produces new knowledge but also has broader social impacts, such as creating innovation, new industry, and human capital, and improving security and evidence for policy-making. Advanced countries are in the process of trial and error in order to understand and evaluate those impacts. Considering these situations, this paper focuses on the general context of the assessment and evaluation of social impacts of research activities. Previous studies have pointed out limited understanding of the meanings of impacts among researchers and issues of political intervention in R&D. Attempts have been made to understand diversity of impacts, and to build a balance between politics and R&D simultaneously. More currently, process and relationship of “knowledge exchange” and “productive interaction,” have entered discussions on assessment and evaluation of impacts.

Ⅱ Impacts on Defense Equipment

Rising Maintenance Costs of Defense Equipment and Countermeasures: Cost Reduction and Improvement in Efficiency by PBL Contract

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The inflexibility of Japan's defense budget caused by increasing maintenance costs of defense equipment has been a problem in recent years. There are several reasons for the rising maintenance costs. The researchers point out that the extension of equipment life and rising unit costs due to the sophistication of defense equipment are the major reasons.

The increase of maintenance costs will bring negative effects not only on fiscal inflexibility but also on the readiness of Japanese Self Defense Forces (SDF). In recent years, the Ministry of Defense (MOD) has kept a strict budget control on the maintenance. As a result, several SDF units may suffer poor maintenance such as the lack of spare parts and the extension of maintenance interval.

MOD is considering adapting the Performance Based Logistics (PBL) contract to reduce costs and improve efficiency of maintenance. In the PBL contract, the contract amount is paid, not for the quantity of work, but for the performance. They have already launched several PBL pilot projects since 2012.

The U.S. introduced the PBL contract around 2000, and has achieved a number of successes. For instance, several units reduced their maintenance costs while improving operational availability. However, issues concerning the PBL have also been indicated by the research institutions at the same time.

Effective Utilization of Commercial Off-The-Shelf (COTS) in Defense Equipment

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There are many kinds of defense equipment including fighter aircraft, tanks, and various command and control computer systems. Technologies used for them have been yearly advancing and getting complicated. Accordingly, lifecycle cost, which is the sum of introduction cost and practical use cost, has been increasing. While there is no increase of the defense budget, effective use of Commercial Off-The-Shelf (COTS)-based products or systems is desired. However, fragile COTS-based products or systems do not assume long use. This means that defense equipment needs to be replaced in shorter cycles, and there are possibilities that the performance gaps between updated products or system and existing ones may cause other troubles. This article focuses on the current state of the procurement process of defense equipment and summarizes the advantages and disadvantages of military use of COTS-based products or systems in terms of cost, technology, quality, etc., and then discusses the importance of a change in attitude from using independently developed equipment to utilizing COTS-based products or systems on the assumption that they have many unknown parts. To overcome the disadvantages of using COTS-based products or systems, it is important i) to actively utilize the management technologies and enhance data gathering, ii) to monitor the trend of COTS-based products or systems in markets for continuous acquisition, and iii) to grasp information on defense use environment and product specification.

Ⅲ Issues on Dual-Use Technology

The Birth and Development of Dual-Use Policy

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This article aims to contribute to debates about dual-use technology by describing the historical development of dual-use policies and how the concept of dual-use has been taken into the policies, mainly in the United States. The concept of dual-use was generated by the separation of military and civilian technology, which derived from the institutional combination of the government and military industries constructed during the World War era and recognized as a political issue in the context of export control against the Communist countries. After the Cold War ended, the separation was obscured by technological development again and dual-use came to be considered as an object of economic policies to enhance global competitiveness. The present dual-use technology is caught in a dilemma among the national security, economy and scientific ethics; therefore careful discussions are required for making dual-use policies.

Defense Research at US Universities: A Framework for Supporting University Research through the Government's R&D Budget for Defense

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In the U.S., institutional arrangements that underlie today's science and technology at universities, as well as R&D for defense, were consolidated during World War II. The key element was the use of the federal contract, by which a research project or a laboratory was funded by a government agency while managed by a non-governmental organization. The Vietnam War, however, triggered a re-examination of the relationship between universities and defense, which had been positive from World War II throughout the Cold War years. Subsequently, academic research, where the norms of openness and sharing of scientific knowledge prevailed, and defense research, which aimed to utilize scientific knowledge for the purposes of national defense, became clearly distinct from one another. In the process, clear definitions of the ideas about fundamental research, which was judged by the presence or absence of restrictions on publishing and sharing of research outcomes, were developed and shared among relevant parties. The scope of funding targeting universities was confined to fundamental research, and laboratories for academic and defense research were differentiated from each other. Today, funding from the Department of Defense plays an important role in university research in the U.S., especially in engineering fields.

The Benchmark of Terahertz Wave Applications

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Terahertz wave located between radio wave and visible light has been dramatically developed in its technologies in the 21st century. Various kinds of possible practical usages have been expected and proposed especially for non-destructive inspections and ultra-high-speed telecommunication. In this report, we overview such applications in sensing and telecommunication as well as the current status of the recent technological developments. We focus in particular on the terahertz technology as a tool for providing solutions for various social problems, innovative applications in sensing, and high-speed telecommunication to solve the recent rapid increase of the usage of radio channels. We also introduce near-future prospects for the usage of the wave.