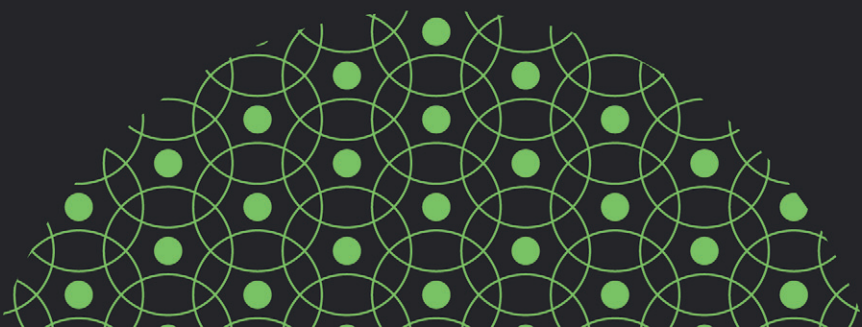




EMERALD POINTS

**PRELIMINARY  
FEASIBILITY  
FOR PUBLIC  
RESEARCH AND  
DEVELOPMENT  
PROJECTS**

**DONGHUN YOON**



PRELIMINARY FEASIBILITY FOR  
PUBLIC RESEARCH AND  
DEVELOPMENT PROJECTS

This page intentionally left blank

# PRELIMINARY FEASIBILITY FOR PUBLIC RESEARCH AND DEVELOPMENT PROJECTS

BY

**DONGHUN YOON**

*Kyonggi University, South Korea*



United Kingdom – North America – Japan – India  
Malaysia – China

Emerald Publishing Limited  
Howard House, Wagon Lane, Bingley BD16 1WA, UK

First edition 2021  
Copyright © 2021 Emerald Publishing Limited

**Reprints and permissions service**  
Contact: [permissions@emeraldinsight.com](mailto:permissions@emeraldinsight.com)

No part of this book may be reproduced, stored in a retrieval system, transmitted in any form or by any means electronic, mechanical, photocopying, recording or otherwise without either the prior written permission of the publisher or a licence permitting restricted copying issued in the UK by The Copyright Licensing Agency and in the USA by The Copyright Clearance Center. Any opinions expressed in the chapters are those of the authors. Whilst Emerald makes every effort to ensure the quality and accuracy of its content, Emerald makes no representation implied or otherwise, as to the chapters' suitability and application and disclaims any warranties, express or implied, to their use.

**British Library Cataloguing in Publication Data**  
A catalogue record for this book is available from the British Library

ISBN: 978-1-80117-267-7 (Print)  
ISBN: 978-1-80117-266-0 (Online)  
ISBN: 978-1-80117-268-4 (Epub)



ISOQAR certified  
Management System,  
awarded to Emerald  
for adherence to  
Environmental  
standard  
ISO 14001:2004.

Certificate Number 1985  
ISO 14001



INVESTOR IN PEOPLE

# CONTENTS

<i>Abstract</i>	<i>vii</i>
Chapter 1. Introduction – <i>R&amp;D and R&amp;D Budget</i>	1
Chapter 2. Government R&D Project	3
Chapter 3. Technology Innovation and Government	5
Chapter 4. Public Decision-making and Policy Analysis	7
Chapter 5. Public Investment Analysis and Theoretical Debate	11
Chapter 6. Social Discount Rate	13
Chapter 7. Global Sensation	15
Chapter 8. Preliminary Feasibility Study Trend	23
Chapter 9. Discussing the Role of Policy Analysis in Preliminary Feasibility Study	27
Chapter 10. Economic Feasibility Analysis Model	31
Chapter 11. Policy Feasibility Analysis Model	49
Chapter 12. Technical Feasibility Analysis Model	59
Chapter 13. Comprehensive Feasibility Analysis Model	71
Chapter 14. Impact Analysis Model on Public Sector R&D Investment	75
Chapter 15. National Large-Scale Research Facilities and Equipment	77
Chapter 16. Policy Discussion	81
Chapter 17. Conclusion	87
<i>References</i>	<i>89</i>
<i>Index</i>	<i>99</i>

This page intentionally left blank

# ABSTRACT

*The state conducts feasibility studies by adjusting the priority among policy projects in a reasonable manner for new R&D projects, in which large amounts of cost are invested in the budgeting process to allocate state funds with a limited budget. If the feasibility study examines the adequacy of project and the method of financing it, then the preliminary feasibility study verifies whether R&D projects are being pursued, focusing on the economic feasibility. R&D projects should be carried out at the stage of conception to review the economic feasibility and necessity to promote the sustainability of projects. For government-led public R&D projects, the feasibility should be reviewed in the prebudget phase, and the R&D preliminary feasibility study system performs its role as an evaluation system. The R&D preliminary feasibility study requires the establishment of fairness and the social credibility of plan, including the expert review, the information disclosure, and the alternative setting. In this study, we would like to present policy measures to ensure the sustainability of R&D projects by developing strategic action plans for R&D preliminary feasibility studies, thereby enhancing the effectiveness of R&D preliminary feasibility study.*

This page intentionally left blank

## INTRODUCTION – *R&D AND R&D BUDGET*

The R&D is a creative activity that obtains how the new knowledge of things applies using the knowledge already obtained. It can also be defined as creative efforts and exploration to acquire the new knowledge or to use the existing knowledge to find new ways. It is not easy to define the nature of activities as development or commercialization if they directly support private innovation activities. In an increasingly competitive economy, the R&D can be a source of competitive advantage (Lorca & Andrés, 2018). Although the strategic management of R&D portfolio is common practice in the private sector R&D, the government R&D management tends to be more discrete and ad hoc, focusing on generating maximum output from individual projects (Bozeman & Rogers, 2001). It is well known that the government R&D and the private R&D have a complementary relationship (Leyden & Link, 1991). Although larger firms are less efficient innovators, they spend more on the R&D investment and earn more from the R&D investment (Wu, Thomas, & Wright, 2020). In particular, the government R&D investment should review the commercialization of private sector in conjunction with the appropriateness of government support. The target of R&D budget application may be defined as the budget required for institutions whose main purpose is to carry out R&D activities, repair and establish facilities for the R&D, and the research. The government R&D budget can basically be defined as a budget that the government supports in promoting the new knowledge accumulation and technological innovation. The government R&D budget aims to supplement private R&D activities and develop technologies in basic, public, and welfare sectors, which are areas of the technology that may lead to prior development of future core technologies and market failures. From a financial perspective, the R&D budget is the budget required to support institutions whose main purpose is to carry out R&D activities and establish equipment and facilities for R&D. The

government R&D budget is supported internally for the purpose of developing highly specialized technologies and fostering advanced manpower, so the asymmetry of information is relatively high compared to other budgets. Government R&D budgets are generally funded in the form of contributions, a type of government transfer expenditure that the government funds universities, research institutes, and private companies. Subsidies for R&D are an important tool of the public R&D policy, which motivates extensive scientific analyses and evaluations (Broekel, Brachert, Duschl, & Brenner, 2015). Contributions are a kind of subsidy that the government provide to the private sector based on statutes for those who carry out such projects when it is difficult for the government to directly carry them out or when it is deemed effective for the private sector to act on behalf of the private sector. It can be understood that contributions should have a clear legal basis, have no fixed use, and shall not be made in principle, and the balance of execution shall be attributed to the period of receipt of contributions. The public funding of R&D expenditure through subsidies have a positive impact on internal R&D and especially in the decision to conduct R&D internally and externally simultaneously (Afcha & López, 2014).

## GOVERNMENT R&D PROJECT

Most literature on the impact of R&D on the economy has been on advanced countries, where the R&D expenditure as per cent of the GDP has been relatively high and stable for many years (Perrot, Mosaka, Nokaneng, & Sikhondze, 2013). The concept of a national R&D project is that the government sets specific directions and goals, strategically collects, and promotes R&D resources to solve science and technology problems in areas requiring R&D at the national level. Legally, it is defined as an R&D project in the science and technology in which the central administrative institute contributes all or part of its R&D expenses or is funded by public funds by specifying R&D tasks based on statutes. The national R&D projects consist of a number of research tasks or detailed projects. In general, technical development support projects, R&D training projects, and research-based construction projects are common within national R&D projects. Not all national R&D projects are subject to preliminary feasibility studies. Requirements of the national R&D project shall be the project promoted by the head of central administrative institute in accordance with the legal or statutory orders. The method of promotion is the R&D project unit, and the method of cost bearing is to provide all or part of R&D cost to the head of the central administrative institute or the public fund, and the scope of cost support is limited to the science and technology. National R&D projects subject to the preliminary feasibility study are limited to the science and technology among government projects related to the R&D, and the method of project implementation is stipulated to be supported by public funds in principle. National R&D projects are only applicable if they are clearly the government's role on the basis of statute. As a result, national R&D projects subject to preliminary feasibility studies are strictly required to have legal grounds for their implementation. The national R&D project is originally intended to allow other

entities to perform the role of government on their behalf, so the project plan should be presented very specifically. It is stated in the law that R&D tasks should be specified. Tasks can include not only tasks for the research support but also tasks for introducing or building research equipment facilities, and these tasks can be specifically specified in various ways. The task refers to the entity whose activities are objectively specified by the entity acting on behalf of the government in the national R&D project. The R&D project success and value is often difficult to predict at the proposal stage. Evaluation methods and their effectiveness vary considerably and are influenced by specific organizational cultures and managerial skill sets (Thamhain, 2015). In the project planning and scheduling literature, this technological uncertainty has typically been ignored and project plans are developed only for scenarios in which the project succeeds (Reyck & Leus, 2008). The planning of national R&D project falls under the stage of policy planning and research evaluation that carries out the planning of national R&D goal setting and portfolio setting and the allocation of national resources. The national R&D project is an organically linked and detailed representation of activities aimed at common goals derived from the policy planning, rather than a set of detailed tasks or a bundle of budget standards. There are a variety of things to specify for national R&D projects, such as presenting technical goals and methods to reach them, specifically identifying requirements for achieving them, or presenting successful research and management methods. It is necessary to conduct the preliminary survey or the planning research on the technical and economic feasibility of the project in order to plan a faithful project with high possibility of success. The government can seek to strengthen the R&D by making it mandatory to plan new projects in advance. Objectives of the project, detailed implementation and implementation system for components for planning national R&D projects, adjustment plans for matters related to affairs of other central government agencies, evaluation plans for projects, measures to secure the size and manpower required, feasibility studies of government support, the utilization of expected effects and R&D results, domestic and overseas patent trends, technological trends and standardization trends are included. R&D project risks have become even more important given today's tight schedules and limited resources. Risk management has to be an integral part of the development process (Sharma & Chanda, 2017).

## TECHNOLOGY INNOVATION AND GOVERNMENT

In order to verify the feasibility of government support, new technologies must generate economic growth and scientific researchers must generate new technologies. The importance of technological innovation and strategy guiding the acquisition and deployment of technological resources for competitive growth has been increased (Dasgupta, Gupta, & Sahay, 2011). R&D centers face new challenges in responding to firms' technological needs (Rabiela & Corral, 2004). Promoting the R&D and the innovative activity is a key element of the EU Lisbon Agenda and is seen as playing a central part in stimulating economic development (Haapanen, Lenihan, & Mariani, 2014). In free markets without the government support, the supply of scientific research results should be insufficient. The government logic for supporting R&D should be judged individually according to suitability. Indeed, while new technologies are important factors for economic growth, it is difficult for all developed new technologies to be linked to economic growth. Since it is common for governments to be less efficient than free markets in industrial development, government support for the development of new technologies does not generate all economic growth. For example, market participants to support them economically is less likely to appear efficiently. Although scientific research results play an important role as a source of new technology, most new technologies are driven by the innovation in existing technologies, and the science and technology often develop in their own areas. Therefore, if the large-scale R&D investment is carried out without considering specific R&D environments, it can result in the inefficiency of investment by producing only results that are not utilized due to low suitability in certain areas. On the fact that the supply of scientific research results is insufficient in the free market without the government support, financial authorities may set a low priority

on investment in R&D projects. The direct government funding of R&D performed by firms has a positive effect on the business financed R&D (Guellec & Potterie, 2010). Market failure can be cited as a theoretical basis for the government's funding of R&D activities. First of all, we can cite the excessive supply and development efforts of science and technology. Under the logic of maximizing profits, it is difficult to attract the investment in areas where the profitability is difficult to guarantee, such as the basic science, if the R&D is completely left to the market. The second is the risk and uncertainty of technology development. For companies, the development of new technologies is a great adventure, but even if new technologies are successfully developed, there is a great deal of uncertainty and risk associated with market exploration. It is why the government implements financial support policies related to technology development, tax reduction measures, and technical innovation support systems. Third, R&D activities have external effects due to the nature of the public. External effect is a factor that justifies the government's R&D investment. Finally, the government's R&D investment is required to acquire the technical skills necessary to protect national security. Most defense-related R&D achievements are often used to mass-produce various weapons needed for national security rather than producing products that conform to market principles. Recently, it has developed from the perspective of market failure to the view of system failure, and the logic of justification for the government's R&D intervention has developed. This view is based on the limited rationality assumption of evolutionary economics. The government intervention can be made even to address the failure of the innovation system, which lacks the overall efficiency of innovation due to the absence of a cooperative network and the immaturity of technology financing market. It requires a new government role beyond the correction level of market failures that can be caused by the underinvestment in private R&D, such as basic research. In general, the legitimacy of government support for the promotion of science and technology is recognized, but the government intervention does not necessarily guarantee the success of science and technology. The incomplete political and administrative system may result in government failure. It mainly results from the inefficient operation of government budgets or the failure of certain science and technology promotion policies. The preliminary feasibility study should examine whether it constitutes such a government failure. The preliminary feasibility study should examine whether the true common needs of society differ from the direction and purpose of the government's science and technology policy (Link & Scott, 2013).

## PUBLIC DECISION-MAKING AND POLICY ANALYSIS

Public decision processes in planning and environment management, in particular, should be creative in order to solve frequent intractable conflicts that they cause (Carlo, 2006). The decision-making by decision-makers is a process that is influenced by the amount of prior knowledge, the value system, the decision-making environment, and psychological factors, where the objective function of decision-makers is also affected. The decision-making competence refers to the ability to make better decisions, as defined by decision-making principles posited by models of rational choice (Bruin, Parker, & Fischhoff, 2020). The criticism has been raised in many respects over the ideal argument that policy analysts can provide the accurate information using analytical models that quantify factors needed for policymaking and minimize errors in subjective judgments. First, it is argued that the information is not a sufficient condition for decision making. The decision-making may be more important to the decision-maker than the information gathered for the decision-making process. Decision-makers, who need to make quick decisions, show very quick and intuitive decision-making behavior through the behavior of recognition primed decision without reviewing or collecting information on various alternatives. Due to various cognitive and psychological problems, problems arising from the interpretation process regardless of the quality of information become important because decision-makers, unlike rational decision-making models, make systematic errors in the reasoning process. The relationship between the quality and quantity of information claimed by rational decision-making is not always valid in real-world decision-making. Rational decision-making requires executing an appropriate decision-making process to select the best alternative (Herrmann, 2017). Next are the problems with the value

orientation that the public policy has. Many argue that the value-independent analysis is difficult because the public policy cannot be value-neutral. The policy analysis begins at the stage of defining policy issues presented to policy analysts, and the policy analyst's judgment becomes important from the stage of defining the problem. The rational decision-making model also has limitations because policy analysis processes cannot minimize the uncertainty of policy issues. In addition to requiring a lot of money and time to obtain the information needed for decision-making, the presence of such information will inevitably result in the value-inherent context information and does not necessarily result in a reasonable decision of the course of policy implementation. Therefore, if the policy analysis process of policy analysts focuses solely on the production of information using a technical analysis model, the actual policy analysis process will be disconnected from the interpretation and utilization process of information. Various opinions are being suggested whether policy analysts simply stay in the role of providing technical information or go beyond the scope of policy analysis to make policy judgments. Unlike the social engineering view of policy research, which used to view policy analysts as technocrat and value neuter experts, many leading studies point out that policy analysts are involved in the policy process with various values. Policy analysts are basically dividing the behavior of policy analysts into the entrepreneur, the technician, the politician, the pretender, and the technology. Policy analysts have a variety of purpose functions and technical levels, and the image of value-neutral policy analyst can be seen as limited. From this point of view, the policy analyst's judgment is not objective, but rather subjective, reflecting their interests. The policy analysis is more of an art than an area that can be defined by a defining definition, so analysts constantly react to the political and social environment. Policy analysts, as technical advisors, need a normative role in providing truth in the policy process rather than engaging in it. In particular, there is a great need for the empirical research on how experts with different value systems and expertise judge policy issues. In the case of public investment projects, the policy analysis has been widely used based on benefit–cost (B/C) techniques. As for the interpretation of actual policy analysis results, empirical studies have been relatively less conducted. Decisions on public investment projects and unlike private investment decisions are a comprehensive process for promoting the public value through the supply of public goods, the response, the equity, and public goods that go beyond simply economic efficiency or effectiveness. Therefore, the criteria used in decision-making are more diverse than those used in private investment decisions. The discontinuity between the first stage of