MAJOR FACTORS AFFECTING THE IMPLEMENTATION AND EFFECTIVENESS OF THE R&D TAX INCENTIVE POLICY

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ABSTRACT

Title of Dissertation	Major Factors Affecting the Implementation and Effectiveness of the R&D Tax Incentive Policy
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The Thai government began to offer an R&D tax incentive in 1996 with the objective, as declared in the policy statement, of encouraging the private sector to do more research and technology development. The tax incentive is given in the form of an exemption of corporate income tax for an amount equal to 100% of the expenses incurred in the form of fees for research and technology development paid to registered R&D service providers. Using the goal-attainment model, it was concluded that the policy has low effectiveness in stimulating R&D investment. The result of the evaluation led to the conclusion that the tax incentive did not cause the private firms to make any serious changes in their behaviors in R&D spending or investment, and the firms did not respond to the tax incentive in any predictable fashion.

The factors relating to the policy formation and its direction of impact are support and willingness to act on the part of the implementing organization (-), valid theory of cause and effect (+), assumption behind policy design (-), and clarity and consistency of policy design (-).

The factors relating to the policy implementation and its direction of impact are:

(1) Characteristics of the implementing organization, comprising alignment of organizational goals and culture (-), clarity and consistency in communication of policy objectives (-), and availability of the monitoring mechanism (-).

(2) Behaviors of implementing officers, comprising degree of understanding and commitment (-), attitudes of the Officers towards taxpayers (-), and technical ability (-), and

(3) Behaviors of the target group, comprising awareness of the right to services (-), attributes of the target group: leadership (+, -), entrepreneurship, vision (+), cash flow and profitability (-), and extent of change in behaviors (+, -).

Finally, the factors in the environment that impacted the effectiveness of the policy and its direction are the tax system (-), lack of skilled labor (-), government industrial policy (-), economic conditions (-), and market competition (+).

The research made a contribution to this field of public administration by identifying hypothetical linkages between the factors relating to policy formation and policy implementation and environments that impact effectiveness, which can be used for future research in the analysis of the R&D tax incentive policy and other similar policies. The research also made recommendations to modify the policy and to improve its implementation in order to enhance the effectiveness of the policy in the future.

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For my parent, my family and all of my teachers.

Anuphan Kitnitchiva

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ABBREVIATIONS

Abbreviations	Equivalence
BOI	Board of Investment
MOC	the Ministry of Commerce
MOF	the Ministry of Finance
NSTDA	the National Science and Technology Development Authority
OECD	Organization for Economic and Co-operation Development
RD	the Revenue Department
R&D	Research & Development
SET	the Stock Exchange of Thailand

CHAPTER 1

INTRODUCTION

1.1 Introduction

This chapter firstly provides the necessary background for understanding the rationale for governments to provide a tax incentive for private R&D and to justify why governments should use tax-payer money to stimulate private R&D activities. It also discusses how governments can intervene and the advantages and disadvantages of the key measures in order to form a grounded understanding of how to define the effectiveness of the tax incentive policy. It then discusses on how R&D tax incentive program should be designed and the best practices to be used in designing the incentives and how the Thai tax incentive was designed.

This chapter then provides the significance of the problem, the research problem, the objectives and limitations of the study, and finally the expected contributions of the study under this proposal.

This chapter provides an important foundation in understanding and analyzing the factors that may affect the performance of the Thai R&D tax incentive policy. This chapter will also help to determine the factors that may affect the performance and how it affects as necessary for this study.

1.2 Background on R&D Tax Incentive

Innovation drives economic growth. R&D is known as a key component of the innovation process, and it ensures the generation of new knowledge and technologies. Organizations that perform R&D stay in front of leading-edge technologies and make more informed decisions about diffusion and commercialization. New technologies resulting from the R&D effort boost productivity and lead to the economic growth of a country.

However, technology has the nature of a public good. The rate of return from R&D investment in the private sector may not justify the investment, and at the same time the public receives benefits without or with minimal investment. This market failure justifies the government's intervention in business R&D. The governments in many countries use different measures for such intervention. One of the main and most effective measures used is grants for tax incentives. Empirical evidence supports the notion that each dollar of tax revenue forgone as a result of a tax incentive generates about the same amount in additional R&D spending, plus the impacts of spillover benefits (Hall and Van Reenen, 2000). Therefore, to have an effective R&D tax incentive policy is important for the long-term economy of a country.

Next is provided a theoretical discussion of why and how a government should intervene in R&D activities in the private sector.

1.2.1 Why Government Should Intervene

Endogenous growth theory underlines the justification of the government to intervene in business R&D as necessary for economic growth. It is appropriate to discuss the economic models that explain economic growth. There are two main schools of thought on economic growth: neoclassical growth theory and endogenous growth theory.

1.2.1.1 Neoclassical Growth Theory

The neoclassical growth theory of economic growth, as first formalized by Solow (1956), is based on the accumulation of physical capital as the key factor underlying growth in a perfectly competitive economy, with constant returns to scale and an exogenous savings rate assumed to be a constant fraction of the total national income.

The economy starts at a low capital-labor ratio, and new capital is paid for out of aggregate savings. Because marginal returns to capital diminish and the capital ratio rises, the marginal product of capital falls and so does the incentive to invest in new capital. Therefore, each additional unit of capital generates less return and less savings, which in turn means that less income is available for capital accumulation. In the long-run, the capital-labor ratio reaches a level where the return to capital equals its depreciation—savings are sufficient only to pay for the physical

depreciation of capital and there is no incentive to invest in new capital. Capital accumulation and growth cease and the economy is in the long run steady at the stage of equilibrium. Technological progress as an exogenous factor grows at a constant rate and is essential to economic growth in the long run. The advancement of technology enhances the productivity of labor so that the marginal product of capital does not decline as the capital-labor ratio increases. In the long run, as there is no upper limit to the growth of technology and thus to the growth of labor productivity, the growth rate of real income per capital does not decrease to zero. Economic growth is therefore sustainable. In other words, the long-run growth rate is equal to the assumed constant growth rate of technological progress.

The assumption underlying the neoclassic theory implies that resources are allocated efficiently in the economy. This means that it is not possible to change that allocation or to make one person better off without at the same time making at least one other person worse off. Therefore there is no reason on efficiency grounds for government intervention in such an economy.

The assumptions underlying neoclassical growth theory have been criticized as being unrealistic. Firstly, technological change is not always an exogenous factor outside the market or is determined by an unknown process. Many discoveries and technological improvements in production that have significantly increased living standards have been made in the commercial sector by firms seeking profits and not by governments or universities, in which research is driven by non-market forces. Secondly, markets are rarely perfectly competitive. They are often characterized by imperfect competition, increasing returns to scale, and asymmetric information. Finally, not all desired goods and services can be produced by private sectors. Some are public goods and some product externalities that benefit or cost other individuals in the society. In all these cases, marginal-cost pricing, which is the key characteristic of perfect competition, is not feasible and markets fail to allocate resources efficiently.

1.2.1.2 Endogenous Growth Theory

Endogenous growth theory, as first formalized by Romer (1986), relaxes many of the neoclassical assumptions mainly to incorporate market imperfections. Romer (1986) specified a model of long-run growth in which

knowledge is assumed to be an input in production that has increasing marginal productivity. Long-run economic growth is driven by the accumulation of knowledge-based factors of production, such as human capital, learning by doing, R&D, and innovation. In the long run, it is the accumulation of these factors that causes factor productivity to continue to increase and prevents the marginal return to physical from falling below profitable level.

According to Romer (1986), the focus on knowledge as the basic form of capital suggests natural changes in the formulation of the standard aggregate growth model. In contrast to physical capital, which can be produced one input for one forgone output, new knowledge is assumed to be the product of a research technology that exhibits diminishing returns. That is, given the stock of knowledge at a point in time, doubling the inputs into research will not double the amount of new knowledge produced. In addition, investment in knowledge suggests a natural externality.

The creation of new knowledge by one firm is assumed to have a positive externality on the production possibilities of other firms because knowledge cannot be perfectly patented or kept secret. Most importantly, production of consumption goods as a function of the stock of knowledge and other inputs exhibits increasing returns; more precisely, knowledge may have an increasing marginal product. In contrast to models in which capital exhibits diminishing marginal productivity, knowledge will grow without bounds. Even if all other inputs are held constant, it will not be optimal to stop at some steady where knowledge is constant and no new research is undertaken.

Romer (1990) has further argued that technological change takes place because of the actions of self-interested individuals, so improvements in technology must confer benefits that are at least partially excludable. Growth is driven fundamentally by the accumulation of a partially excludable, non-rival input. Non-rivalry has two important implications for the theory of growth. First, non-rival goods can be accumulated without bounds on a per capita basis, whereas a piece of human capital, such as the ability to add, cannot do so. Second, treating knowledge as a non-rival good makes it possible to talk sensibly about knowledge spillovers; that is, incomplete excludability. These two features of knowledge—unbounded growth and incomplete appropriability—are features that are generally recognized as being

relevant the theory of growth. What thinking about non-rivalry shows is that these features are inextricably linked to non-convexities.

Endogenous growth theory assumes that technological advancement is the result of R&D undertaken by profit-maximizing firms. However, technology has the nature of a public good, as it is partly non-excludable. Technology, and knowledge in general, are not fully appropriable in a market economy once produced; at least part of it can be obtained and utilized by others with no or minimum cost. Because of the externality, R&D activity provides benefits beyond the originators to society as a whole and benefits to the originators will be lower than benefits to the society as a whole. Government intervention in a market economy is usually justified by the market's failure to provide an efficient or socially desirable allocation of resources.

A private firm will not invest in an R&D project if it knows that it cannot appropriate potential revenues. If some portion of the revenues is appropriable and this portion is sufficient to make the investment profitable, the firm will then invest.

1.2.1.3 Policy Implications

Government intervention in a market economy is usually justified by the market's failure to provide an efficient or socially desirable allocation of resources. In the case of R&D investment, market failure is evidenced by the presence of externalities and market imperfections, the effect of which extends not only beyond individual firms but also beyond a country's borders. Government intervention is justified for long-term economic growth.

First, the main market failure is due to research spillovers or externalities. Technology is not fully appropriable in a market economy, since once produced, it can diffuse widely and be used by other firms. This is due to spillovers which exist between different R&D projects in the public and private sectors, between firms operating in the same industry, between different industries, and between countries. Econometric studies have shown that because of research spillovers benefiting firms in the same industry or in neighboring industries, be they domestic or foreign, the social rate of return on research and development (i.e., the return accruing to society as a whole or at least to a section of it) exceeds the private or internal return on R&D (i.e., the return accruing to the firm that financed the research).

Firms seeking to maximize their own profit make no allowance for these spillovers and thus do not perform the "socially optimal" volume of research. Econometric studies reveal that social rates of return to R&D can be up to five times higher than private rates of return (Salter et al., 2000). The fact that research is seen as a public good, technology being a non-exclusive, a non-rival good creates a need for mechanisms to enable firms to reap the benefits of research. A firm will not invest in a project if it knows that it cannot appropriate potential revenues. Research may sometimes require massive investment and be characterized by high uncertainty, which no single firm can handle. By changing the cost of those factors through, for example, direct subsidies, tax incentives or trade policies, governments can influence long-run growth.

Second, asymmetric information and imperfect competition are the market failures that lead to gaps in R&D expenditures. Because private R&D rapidly becomes a public good, firms are prevented from recouping all of the benefits of their investments. Market incentives alone are insufficient to produce an adequate supply of R&D, making it crucial for governments to stimulate private R&D spending. As with any investment decision, R&D is not undertaken by firms, unless there is an opportunity for profit. Some start-ups have trouble financing their research, owing to the asymmetry of information between the firm and the fund provider regarding the research project's expected value. R&D is funded primarily by internal sources because asymmetric information limits external sources. By changing the relative costs of research investments—through subsidies, taxes, trade or other policies—governments can influence the generation of research and knowledge for economic growth.

In conclusion, because of the market failure evidenced by the presence of externalities and market imperfections, the social rate of return on research and development exceeds the private or internal return on R&D, and private R&D rapidly becomes a public good Private firms are prevented from recovering all the benefits of their investments. Only market incentives are not strong enough to motivate private firms to produce an adequate supply of R&D. It becomes crucial then for governments to stimulate private R&D spending by changing the cost structure of knowledge and technology development through subsidies, taxes, trade or other policies so that governments can influence long-run growth.

1.2.2 How Government Can Intervene

The government's role in innovation, at least from an economic perspective, is to overcome market failure. An appropriate role for the government is to initiate policies to solve the market failure problem. Governments can use policy instruments to encourage investment in R&D or to increase private rates of return to R&D investment to a level closer to social rates of return. In order to stimulate and support private R&D, a government has a range of options, including fiscal measures and non-fiscal measures.

1.2.2.1 Fiscal measures

Governments may provide financial support directly or indirectly to private firms undertaking R&D.

1) Direct measures: research scholarships, subsidies to innovative firms or projects, procurement, and research contracts.

2) Indirect measures: tax relief, research tax credits, loans, and loan guarantees.

1.2.2.2 Non-fiscal measures

Other than providing fiscal support, governments can create am environment that encourages private firms to do R&D.

1) Regulation: rules to protect intellectual property (patents, brand copyright, royalties), cooperation agreements between universities and firms (or between firms), and the definition of standards.

2) Public R&D: comprises (1) R&D performed by government in public research laboratories, and (2) research in public-funded universities.

3) Infrastructure: all the factors relevant to social capital, i.e., venture capital, education, information highway, information centers, and technology-transfer centers.

The decision as to which form should be used depends on two elements; namely, the nature of market failure and the policy objectives pursued by particular countries. In most cases, market failure results from some combination of market imperfection, such as imperfect competition and asymmetric information. Thus, the policy response to a market failure is a combination of regulatory and fiscal measures.

Regarding fiscal measures, tax incentives offer unique advantages over subsidies. Firstly, tax incentives involve less interference in the market and thus allow private sector decision makers to retain autonomy in deciding their R&D strategies in response to market needs. Secondly, tax incentives require fewer layers of bureaucracy and entail less detailed requirements for receiving assistance than? Subsidies granted on a project-by-project basis. Thirdly, a policy that involves tax incentives is for the most part readily predicable and more stable than one that requires periodic appropriations from government budgets. Finally, tax incentives avoid the need to set nebulous and detailed requirements for receiving assistance. Avoiding detailed requirements has the distinct administrative benefit of efficiency and fairness.

On the other hand, tax incentives have disadvantages compared to other measures. Firstly tax incentives bring about unintended windfalls by rewarding what would have been done without tax incentives. Secondly, tax incentives lead to undesirable inequities, as the more successful the firm undertaking the R&D, the more it will benefit from tax incentives. Thirdly, tax incentives can raid the national treasury. There is an unpredictable element to any tax incentive because the effects are determined by numerous economic and political variables. Finally tax incentives are ineffective means to achieve focused results. Tax incentives promote only a level of R&D spending and explicitly ignore the fact that not all categories of R&D have the same effect on stimulating innovation and not all categories have the same measured impact on predictability growth (Link in OECD, 1996).

Understanding the advantage and disadvantage of tax incentives is important for designing a tax incentive program and also in analyzing the program and its impact.

Basically, tax incentives reduce the effective cost of conducting R&D and thus, at least in theory, increase its supply. Tax incentives can be classified into two broad categories:

1) Income Tax Allowances

R&D current expenditures are immediately and fully deductible in the year they are incurred. Extra concession allows private firms to deduct more than 100% of eligible R&D expenditures against their taxable income. Supplementary measures for tax deduction are necessary in a loss-making situation, e.g. allowing to

carry backward or forward losses or to claim a refund, to ensure that loss-making firms will also enjoy the benefits.

2) Investment Tax Credits

Tax credits permit the deduction of a certain percentage of R&D expenditures against the firm's tax liability. Extra tax concessions may provide an incentive proportional to the volume of R&D performed or based on incremental R&D expenditures or a combination of these two approaches. Supplementary measures for tax credits to remove a ceiling in the effective use of tax credits are as follows:

(1) Refundability of unused tax credits

(2) Carry-back and carry-forward of unused tax credits

(3) Flow-through mechanisms, i.e. transfer of unused tax credits to an eligible third party.

Tax incentives, both tax deductions and tax credits, can focus on specific types of R&D depending on the R&D function (environment, health, defense, agriculture, information), or depending on the R&D performer (university, small & medium enterprises, regional support, R&D conducted abroad). The incentive may have different treatment of parts of R&D expenses, e.g. labor, buildings, and equipment. It can have a permanent nature or year to year overhauls of the fiscal incentive system.

The next question is whether the tax incentive policy is effective in stimulating R&D. Because of the externalities of the knowledge and technology, what really matters is not only the amount of R&D generated per se, but also the social return from the additional R&D.

The ideal approach to the evaluation of the effectiveness of R&D tax incentives would be to do a proper cost-benefit analysis; namely, to evaluate in comparable terms, the costs and the benefits for the government to support R&D via tax incentives. Such a computation requires a great deal of information, which is not always available, i.e. the readiness of firms to engage in R&D with and without tax incentives, the social rate of return of the additional R&D, the forgone opportunities of alternative uses of government funds allocated to support R&D (e.g. for enjoyment of the arts, care of the sick, the homeless and the elderly, a lowering of income tax rates,

etc.), the cost of running the policy (auditors, tax officers), and the costs for the firms to apply for tax credits. Finally, the result may be misleading, as it is not possible to capture external benefits.

There are a number of alternative approaches to be used to evaluate the effectiveness of the R&D tax incentive.

1) To compute the additional amount of R&D that is generated by a marginal increase in foregone tax revenues. If for one Baht of forgone tax revenue, one additional Baht of R&D is forthcoming from the private sector, the tax policy is considered to be effective?.

2) To compare the R&D expenditures before and after implementing the R&D tax incentive.

3) To conduct a patent analysis.

4) To perform an econometric estimation of the relationship between R&D and tax incentive.

The methodologies that can be used range from history, case studies, bolo metric, peer review, to user surveys. The problem is that there are no effective tools. None of these techniques is reliable and if used alone, most are misleading. It is therefore normal to use multiple approaches in evaluating the tax incentive policy.

1.2.3 Design of a R&D Tax Incentive Program

There are two aspects that will be discussed related to the design of a tax incentive program: the elements of tax incentive policy and the best practice in designing R&D tax incentive provisions.

1.2.3.1 Elements of a R&D Tax Incentive Program

Based on the OECD countries' experiences (OECD, 2002), the design of a tax incentive program should cover the following aspects.

1) Administration

Clarity, consistency, and predictability are essential to assist enterprises in making R&D investment decisions partly on the basis of tax incentives. Certainty in R&D tax relief allows long-term corporate planning, while streamlined forms and procedures and information programs can enhance the accessibility of R&D tax provisions.

2) Tax incentive

Tax incentives can be given either in the form of income tax allowances or tax credits. Tax allowances allow firms to invest in R&D to deduct from their taxable income more than they actually spend on R&D. Tax credits are a specified percentage of R&D expenditures which are applied against payable income tax. An allowance is a deduction from taxable income, while a credit is a deduction against final tax liability.

The key distinctions between allowances and credits are the following: firstly, the value of a tax allowance depends on the corporate income tax rate, while a tax credit does not; and secondly, unused tax allowances may be carried forward to offset future taxes under normal loss carried-forward provisions, while the carried-forward of unused tax credits requires the creation of a special pool to track unused credits. R&D tax deductions and R&D tax credits tend to have differential effects on large and small firms, and on R&D decision-making, if they are taxed at different rates.

3) R&D volume or increment

Tax credits and tax allowances come in three main forms, depending on whether they are based on: (1) the entire volume of R&D expenditures in a given year; (2) the increment of R&D expenditures or, (3) a combination of volume and increment. A disadvantage of volume-based incentives is that they not only subsidize new R&D but also support the R&D that a firm would have done anyway with. Incremental incentives can help address the problem of windfall gains, and also confront the difficulty of defining a base period or base level of R&D to determine the increment or increase.

4) Targeted incentives

Targeted incentives are those that are eligible for tax incentives. R&D tax incentives may be offered as a general tax relief or given to only particular targets in order to achieve specific policy goals, such as assisting small, innovative firms or encouraging joint public-private research to achieve greater spillover effects.

5) Definition of qualifying R&D

The policy must specify what types of R&D should benefit from tax incentives, which will determine the generosity and the expense to

governments of the tax relief. Tax incentives can be directed to basic research, applied R&D, etc., depending on the research gap being addressed.

6) Avoidance provisions

The tax incentive policy should contain special provisions that can prevent firms from avoiding taxes by claiming unwarranted R&D tax relief.

7) Foreign eligibility

The tax incentive policy should contain a provision on the eligibility of foreign companies for local R&D tax incentives. The provision may be one of the following:

(1) Location provision—R&D must be carried out in the country that provides the tax incentive;

(2) National content provisions—there must be a certain amount of national content associated with the R&D (e.g. research staff, equipment);

(3) Exploitation provisions—the results of R&D must be exploited to the benefit of the country providing the tax incentive; and

(4) IPR provisions—the intellectual property rights (IPR) resulting from the R&D are owned by the country providing the tax incentive.

The above provides the seven elements that a tax incentive program should contain. The next topic to be discussed is the best practice in designing a R&D tax incentive program.

1.2.4 Best Practices in Designing an R&D Tax Incentive Program

Based on the experiences in the OCED countries, the following are identified as the best practices in designing R&D tax provisions (OECD, 1996):

1) R&D tax policy should be designed as part of an overall strategy to stimulate innovation in industry and should complement other science and technology policies. The R&D tax policy may be designed to further specific national goals, such as fostering basic research or the purchase of high-technology equipment.

2) R&D tax policy should generally include provisions for the deduction of all qualified R&D expenses in the year in which they are incurred, which has been shown to increase the additional research undertaken by firms.

3) R&D tax policy should be flexible in order to accommodate firms at

different stages of development. For example, the ability to carry deductions forward allows firms without tax liabilities in a given year to take advantage of R&D tax incentives.

4) The value of R&D tax credits must be assessed on a country basis. The design of these schemes differs broadly by country depending on whether they are volume-based or incremental, based on R&D expenditures or wage costs, and vary their treatment according to firm size, region or technology. Their benefits depend on overall tax systems, including the corporate tax rate and the time-lag associated with firm responses.

5) R&D tax policy should consider including special provisions relating to small and/or new firms in order to encourage entrepreneurship and innovative start-ups.

The above discussion on the elements of R&D tax incentive provision and best practice are important for this study because they will be used as a basis for understanding and analyzing the effect of the design of Thai R&D tax incentive policy discussed in the later chapter.

1.3 Significance of the Problem

The Thai government started to offer R&D tax incentives in 1996 with the objective, as declared in the policy statement, of encouraging the private sector to engage in more research and technology development. These tax incentives are given in the form of exemptions from corporate income tax of an amount equal to 100% of the expenses incurred in the form of fees for research and technology development paid registered R&D service providers. In other words, a tax allowance is given equal in amount to the fee paid for R&D services to registered R&D service providers.

On July 15, 1996, the Ministry of Finance, through the Revenue Department, issued a tax measure to stimulate R&D spending and investment under Royal Decree No. 297 B.E. 2539 (1996). The Royal Decree provides a policy statement and characterizes the rationale as follows:

As it is appropriate to exempt corporate income tax for juristic

partnership and companies at 100% of expense for fees paid for research and technology development to government agencies or private sector in order to encourage the private sector to do more research and technology development,. The Royal Decree is enacted.

The tax incentive is given in the form of exemption of corporate income taxes for an amount equal to 100% of the expenses incurred in the form of fees for research and technology development paid to registered R&D service providers, which can be government agencies or private firms.

On November, 16, 1996, the MOF issued the Notification on Income Tax (No.3) Subject: the Government or private agencies employed to conduct technological research and development provides a definition of the term "research and development," the nature of agencies eligible and the terms and conditions to be eligible for the exemption of corporate income tax for an amount equal to 100% of the expenses incurred in the form of fees for research and technology development paid to registered R&D service providers.

On February 5, 2001, the RD issued Departmental Order No. Paw. 103/2544 (1991) to provide Revenue officers with a guideline in conducting an investigation and giving advice on technological research and development, stating that if a juristic company or partnership that employs a registered R&D service provider submits a research and development project to the NSTDA before or after engaging in the project in order to verify that such a project is categorized as basic industrial research or applied research, and once the project has been inspected and verified by the NSTDA, such project will be treated as basic industrial research or applied research.

Under the above laws and regulations, the elements of the tax policy stipulated are as follows:

1.3.1 Administration

The tax incentive is offered to project owners/employers that are corporate income tax payers and want to employ registered R&D service providers to engage in research and development of technology for them. In order to claim the incentive the project owner must:

1) Submit a research and development project to the National Science and Technology Development Agency before or after engaging the project in order to certify that such a project is categorized as basic industrial research or applied research; and

2) Obtain a receipt from the registered R&D service providers.

Registered R&D service providers must be a government organization or private entities and enter a request to the RD for submission to the MOF who, acceding to the request, will announce the name in the government gazette. The registered R&D agencies have the following duty:

(1) To conduct R&D in Thailand;

(2) To compute the net profits and net losses of each business separately, but for the purpose of ascertaining net profits liable to corporate income tax, the net profits and net losses of both businesses shall be combined if it is a juristic company or partnership subject to corporate income tax;

(3) Issue a receipt for a fee to an employer in the name of the registered R&D service provider separate from that of other businesses if employed by another person or to itself as if it were employed by another person if the conduct is made for itself.

Corporate income tax payers can register their R&D divisions or centers as registered R&D service providers and engage them to do R&D provided that the above duties are complied with.

1.3.2 Form of Tax Incentive

The tax incentive is given in the form of an exemption of corporate income tax for an amount equal to 100% of the expenses incurred in the form of fees for research and technology development paid to registered R&D service providers. In other words, a tax allowance is given in an amount equal to the fee paid for R&D service to registered R&D agencies.

In the case of a loss-making situation, losses can be carried forward up to five accounting periods under the general provisions of the Revenue Code. As a result, loss-making firms will also enjoy the benefits.

1.3.3 R&D Volume or Increment

As a tax allowance is given equal to the amount of the fee paid for R&D service to registered R&D service providers, regardless of how much it was paid in the previous year, the Thai tax incentive is one of R&D volume and is not incremental.

1.3.4 Targeted Incentives

The incentive is offered to all corporate income tax payers. This means that all private firms, either owned or controlled by Thais or foreigners, are entitled to the incentive. As all juristic partnerships or companies subject to corporate income tax are eligible to claim the allowance, they, also referred to as business or private firms, are the target group of the policy.

1.3.5 Definition of Qualifying R&D

The nature of the technological research and development that IS eligible for the tax allowance is as follows:

1) Basic industrial research means formal research or objective enquiry with a view to discovering new knowledge, with an expectation that such knowledge will be useful in developing new products, manufacturing processes, or providing services or with a view to achieving evident progress in the existing products, processes or services; or

2) Applied research means the application of the result of the basic industrial research to be used as a model, blueprint or pattern of a newly-made, modified, or improved products, processes, or services, whether for sale or for own use, invention of a noncommercial prototype, conceptual formulation and creating designs in various forms of products, processes and services and a primary demonstration modified or pilot project with the condition that such project is not cable of being modified or applied for industrial or commercial purposes. However, applied research does not include normal or periodical change of products, manufacturing systems, manufacturing process, provision of services, or other activities of a going concern, even if the change does contribute to progress.

1.3.6 Avoidance Provisions

There is no specific tax avoidance provision related to the R&D tax allowance. However, if the project owners wrongly claim a tax allowance and this results in a tax short fall, the general tax avoidance provision will apply; namely, a penalty at 100% of the tax shortfall plus a surcharge of 1.5% of the tax shortfall with a maximum of the shortfall amount.

1.3.7 Foreign Eligibility

One of the conditions of the tax allowance is that registered R&D service providers must conduct R&D activities in Thailand. In other words, the Thai tax incentive contains only location provision.

Since the program was implemented in 1996, there is no full publicly-available study as to how the policy has been implemented and how effective the tax incentive is. In other words, there is no study on whether or not the policy has been implemented properly and whether or not the Thai R&D tax incentive has really stimulated R&D investment in the country in accordance with its objective, and if so or if not, why. As the tax incentive uses tax revenues, which are tax-payers' money, to support some businesses, it needs to find out whether or not it is worthwhile to do so. Statistical data about R&D expenditures in Thailand during 1997 -2001 are as follows:

1) GERD (General Expenditures for R&D)/GDP increased from 0.10% to 0.22% from 1997 to 2001.

2) GERD of private firms increased from 466.3 million Baht to 4,009.2 million Baht from 1997 to 2001.

3) Number of patents issued to Thais increased from 110 patents to 700 patents from 1999 to 2003.

The three indicators show the increment of R&D investment in the private sector, and the increase of patents issued to Thai firms. However, the increment might not be material or significant enough to make a change in the science and technology competitiveness of the country. This reflects the fact that the science and technology competitiveness of Thailand was declining relatively, i.e. from ranking 42 in 1994 to 55 in 2004 among 60 countries, according to the IMD's (2004). The World Competitiveness Yearbook 1994-2004.

Among the studies in many foreign countries (mainly OECD countries), for example, the Department of Finance and the Revenue of Canada conducted a joint evaluation of the performance of the income tax incentive for R&D. It was found that R&D plays a very important role in corporate strategies in order to remain competitive. In terms of cost-effectiveness, each dollar of tax revenues forgone as a result of the tax incentive generated $1.38 in additional R&D spending, plus impacts of the spillover benefits. An Australian study by the Australian Bureau of Industry Economics (1993) revealed that 17% of Australian R&D was performed in response to tax incentives, which implies an incremental growth of research between $0.60 and $1.00 per dollar of tax expenditure. Some other studies have reported that R&D tax credits induced $0.80 -1.74 additional R&D spending per dollar of forgone tax revenue (Hall, 1993).

If the Thai R&D tax incentive were to be effective, it should contribute to an increase of R&D investment in the country. It would be interesting to find out whether or not, and how, the R&D incentive had any impact on the increase of R&D general expenditures.

A pilot study was conducted in 2006 with 12 informants. The results initially indicated that the R&D tax incentive policy had very low effectiveness in stimulating private R&D investment. The question was why it was not as effective as it should have been, although the incentive offered by the government was very generous. The incident of one of largest companies in the country spending more than 200 million Baht a year with its R&D center implied a number of issues.

The company:

1) Set up an R&D center in 1993;

2) Became aware of incentive III 2001 (the incentive became available in 1996.);

3) Applied for registration? For R&D service provider status in June, 2002, was registered in the government gazette in January 2004, and was informed of their status in June, 2004;

4) Had an understanding that a project in applied technology that could obtain the incentive must not be used for commercial purposes.

5) Has not applied for any project to date because it cannot adjust its internal system to fit the statutory requirements.

The result is that up to now the company has never claimed any benefits from the incentive. This incident indicates some problems with the policy.

Firstly, it took a very long time for the company to become aware of the incentive. This implies that public awareness of the incentive was low, which may have been caused by the fact that the government may not have promoted the incentive sufficiently.

Secondly, it took the company, with a 200 million Baht R&D budget and 50 researchers, 18 months to obtain the status. The company was informed about their status 4 months after it was published in the government gazette. This suggests some problems in the administration and also concerning the willingness of the Revenue Department to act and support the incentive objective.

Thirdly, there may have been a misunderstanding about what kind of projects were eligible for the incentive. The informant understood that a project in applied research that is eligible for the incentive must not be used for industrial or commercial purposes and consequently, most of the research that the R&D center engages in are not qualified.

Fourthly, in order to meet the statuary requirement, the firms need to adjust their internal system and administration, which will be costly and not worthwhile to do so. It is required that the firm separate its accounting records and documents for applied and non-applied projects. In addition, they must allocate common costs of R&D, e.g. depreciation of machinery, electricity, staff costs, etc., for approved and non-approved projects.

There is a need to examine further what the problems of or barriers to the tax incentive scheme are. This study, therefore, aims at investigating the major factors that have affected the implementation and effectiveness of the policy in order to make recommendations for further improvement of policy implementation and effectiveness.

1.4 Research Problem

The evaluation of the implementation and effectiveness of the R&D tax incentive policy was chosen as the topic of investigation for this study. The main

research problem is as follows:

> "What are major factors affecting the implementation and effectiveness of the Thai R&D tax incentive policy?"

1.5 Objectives of the Study

The study has the following objectives:

1) To identify and analyze the factors affecting the implementation and effectiveness of the R&D tax incentive policy.

2) To evaluate the implementation and effectiveness of the R&D tax incentive policy.

3) To make recommendations for the improvement of the policy implementation and effectiveness of the policy.

In this dissertation, it is expected that the picture of these factors and their relationships will become clearer, so that a tax incentive scheme can be justified and a modification of the scheme and its implementation and administration can be put into place in order to enhance effectiveness.

1.6 Limitations of the Study

With the limited time and resources available, the sample size of the study is relatively small and narrow but is considered sufficient to confirm the data used for analysis. The scope is limited to the tax incentive policy under Royal Decree No. 297 B.E. 2539 (1996).

1.7 Contributions of the Study

This study aims to expand the understanding of factors affecting R&D tax incentive policy implementation and effectiveness, and to explore the relationships between these factors and the key determinants of the R&D tax incentive policy implementation and effectiveness. It will enhance further research by offering appropriate theories and models for analysis that are particularly suitable for the R&D

tax incentive. In addition, the theoretical framework and methodology employed in this study can be applied to the study of other tax incentive policies that are used to promote certain activities or investment in the private sector.

The results of this study can be applied to the improvement of the implementation of the R&D tax incentive policy or the modification of the policy in order to enhance its effectiveness.

1.8 Summary

The endogenous growth theory is used as a basis to justify government intervention in private R&D. The endogenous growth theorists have argued that market failure and externality, or spill-over, are the factors that lead to underinvestment in R&D by private firms. R&D activities provide benefits, not only to the originators but also to society as a whole. The benefits to the originators will be lower than benefits to the society. Government intervention in a market economy is usually justified in order to reduce the costs in doing R&D and to increase the rate of return to private firms in order to motivate them to undertake R&D activities at a level that is appropriate for the society.

The governments employ fiscal and non-fiscal measures to encourage private firms to invest in R&D, and each alternative has advantages and disadvantages. Tax incentives are commonly used in many countries, including Thailand, as they have many advantages; mainly, they exhibit less interference in the market and allow private sector decision makers to decide their own R&D strategies in response to market needs, they require minimum governmental administration, and finally, they are predicable and more stable. The design of a tax incentive should take best practice into consideration because the design can affect the effectiveness of the policy both directly and indirectly.

Since the R&D tax incentive program was implemented in Thailand in 1996, there are questions concerning whether or not the policy has been implemented properly and whether or not the Thai R&D tax incentive has really stimulated R&D investment in the country in accordance with its objective as prescribed in the policy

statement, and if so or if not, why. This study aims at expanding our understanding of the factors affecting the R&D tax incentive policy implementation and effectiveness and to apply this understanding to the study of other tax incentive policies that are used to promote certain activities or investment in the private sector. The results of this study can be applied to improve the implementation of the R&D tax incentive policy or the modification of the policy in order to enhance its effectiveness.

Overall, this chapter provides a fundamental background on the R&D tax incentive, which is essential for understanding and analyzing the factors that may affect the implementation and effectiveness of the policy.

CHAPTER 2

LITERATURE REVIEW AND A PROPOSED MODEL FOR ANALYSIS

2.1 Introduction

This chapter provides the result of the literature review, which led to the building of the conceptual model and research questions for this study. The review starts with the meaning of implementation and evaluation and then proceeds to the four models of policy implementation analysis. The review of the four models helps to form the independent and dependent variables and their relationships for this study. Last, a conceptual model is developed for the study of the Thai R&D tax incentive policy, which will serve as the initial hypothesis for the qualitative study.

2.2 Review of Literature

The review of literature comprises three parts: meaning of implementation and evaluation, model of policy implementation, and identification of independent and dependent variables.

2.2.1 Meaning of Implementation and Evaluation

Implementation is always connected to specific policies as particular to specific problems in the society. The implementation process is multifaceted. Its process involves various actors, organizations, procedures, and techniques working together to put adopted policies into effect in an effort to attain policy or program goals.

Implementation is what happens after laws are passed authorizing a program, a policy, a benefit, or some kind of tangible output. The term refers to the set of

activities that follow statements of intent about program goals and desired results by government officials. Implementation encompasses actions (and non-actions) by a variety of actors, especially bureaucrats, designed to put programs into effect, ostensibly in such a way as to achieve goals.

Van Meter and Van Horn (1974) indicate that policy implementation encompasses those actions by public and private individuals (or groups) that are directed at the achievement of objectives set forth in prior policy decisions. This includes both onetime efforts to transform decisions into operational terms, as well as continuing efforts to achieve the large and small changes mandated by policy decisions. They emphasize the linkage between policy and performance. The key question is "Why did it happen this way?"

Pressman and Wildavsky (1984) say that a verb like "implement" must have an object like "policy," and so on: "policy normally contains both goals and the means for achieving them." They state that implementation cannot succeed or fail without a goal against which to judge it. At the same time, policy analysis comes to focus on the process by which policies are translated into administrative actions.

One of the most influential definitions of implementation has been formulated by Mazmanian and Sabatier (1989):

> Implementation is the carrying out of a basic policy decision, usually incorporated in a statute but which can also take the form of important executive orders or court decisions. Ideally, the decision identifies the problems to be addressed, stipulates the objectives to be pursued and in a variety of ways, and 'structures' the implementation process. The process normally runs through a number of stages beginning with passage of the basic statute, followed by the policy outputs (decision) of the implementation agencies, the compliance of target groups with decisions, the actual impacts both intended and unintended – of those outputs, the perceived impacts of agency decisions, and finally, important revisions (or attempted revisions) in the basic statute.

According to Franklin and Ripley (1982), the implementation process involves many important actors holding diffuse and competing goals who work within a context of an increasingly large and complex mix of government programs that require participation from numerous layers and units and who are affected by powerful interest groups beyond their control. Implementation encompasses many kinds of actions. Agencies charged by law with responsibility for administering programs must acquire the resources needed to move ahead. These resources include personnel, equipment, land, raw materials, and, above all, money. Second, agencies engage in interpretation and planning. They expand the language of statutes into concrete directives, regulations, and program plans and designs. Third, agencies must organize their clientele or target groups. They provide the services or payments or limits on activity or whatever else represents the tangible output of a program.

Pressman and Wildavsky (1984) state that "evaluators are able to tell us a lot about what happened—which objectives, whose objectives were achieved—and a little about why—the causal connections."

This implementation and evaluation can be distinct by indicating that evaluation examines "how practice." Public policy and the people that deliver it may be appraised, audited, valued or controlled' while the study of implementation is about 'how policy is put into action. In short, the implementation analysis answers the question of "how policy is implemented" while the evaluation answers the question of "whether the implementation is succeed or failure towards the goals."

2.2.2 Models of Policy Implementation

There are four key models of implementation that can be used to analyze policy implementation systematically. They are the models of Van Meter and Van Horn, (1974), Mazmanian and Sabatier (1989), Winter (1990), and Hasenfeld and Brock (1991). The four models and their variables are as follows:

2.2.2.1 Van Meter and Van Horn's Policy Implementation Process

The model of Van Meter and Van Hon is one of the top-down approaches. The variables are: (1) standards and objectives, (2) resources, (3) inter-organizational communication and enforcement activities, (4) characteristics of the implementing agencies, (5) economic, social, and political conditions, (6) the

deposition of implementers, and (7) performance. The model is illustrated in Figure 2.1.

The primary interests are the factors that determine the performance of the policy. Performance indicators assess the extent to which the policy's standards and objectives which elaborate the overall goals of the policy decision are realized. Policies furnish per the goals if the resources that facilitate their administration are made available. These resources may include funds or other incentives in the program that might encourage or facilitate effective implementation.

Effective implementation also requires that a program's standards and objectives be understood by those individuals responsible for their achievement. Communication within and between organizations is a complex and difficult process.

In the context of inter-organizational or intergovernmental relations, two types of enforcement or follow-up activities are most important, i.e. technical advice and assistance, and positive and negative sanction.

The characteristics that may impinge on an organization's capacity to implement policy include the competence and size of an agency's staff, the degree of hierarchical control of subunit decisions and processes within the implementing agencies, an agency's political resources (e.g. support among legislators and executives), the vitality of an organization, the degree of "open" communication (i.e., networks of communication with free horizontal and vertical communication) within an organization, etc.

The impact of the economic, social, political conditions on public policy has been the focus of much attention. Those conditions include availability of economic resources, public opinion of the policy, support from the elite, and mobility of the interest group.

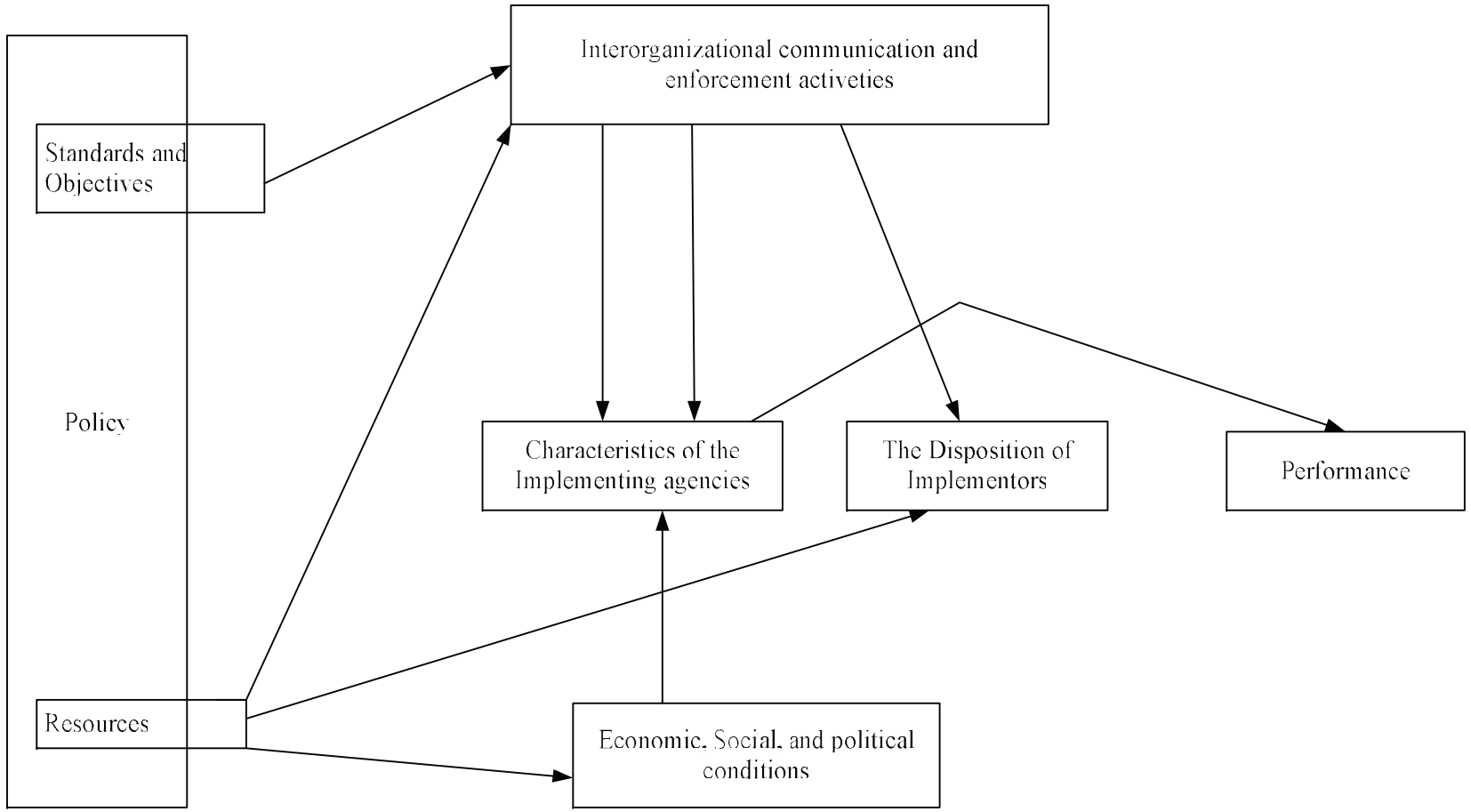

Figure 2.1 Van Meter and Van Horn's Policy Implementation Process
Source: Van Meter and Van Horn, 1974.

Three elements of the implementers' response may affect their ability and willingness to carry out the policy, i.e. recognition (comprehension, understanding) of the policy, direction of their response, and intensity of that response.

Van Meter and Van Horn hypothesized that there are linkages among each component of the model. The standards and objectives of policies have an indirect effect on performance and also have an indirect impact on the disposition of implementers through enforcement activities. The linkages between resources and the economic, social, and political environment of the implementing organization suggest that the availability of fiscal and other resources may create a demand for participation in, and successful implementation of, the program, which will affect the character of the implementing agencies, the dispositions of implementers, and performance itself. Several characteristics of implementing agencies may affect the dispositions of their personnel. The nature of communication network, the degree of hierarchical control, and the style of leadership may influence the individual's identification with the organization's goals and objectives.

2.2.2.2 Mazmanian and Sabatier's Statutory-Coherence Approach

Mazmanian and Sabatier's framework is comprehensive and combines top-down and bottom-up concerns. The framework comprises three broad categories of variables: (1) the tractability of the problem being addressed (four variables), (2) the ability of legislation to structure positive implementation (seven variables), and (3) the net effect of political variables relating to support for statutory objectives (six variables). The model is illustrated in Figure 2.2.

The tractability of problems is concerned with the difficulty of the issue being confronted by the government. The capacity of programs to be effectively implemented may be limited by constraints, such as technical difficulties, including technological requirements, the diversity of behavior being regulated, and the extent of behavioral change required from target groups.

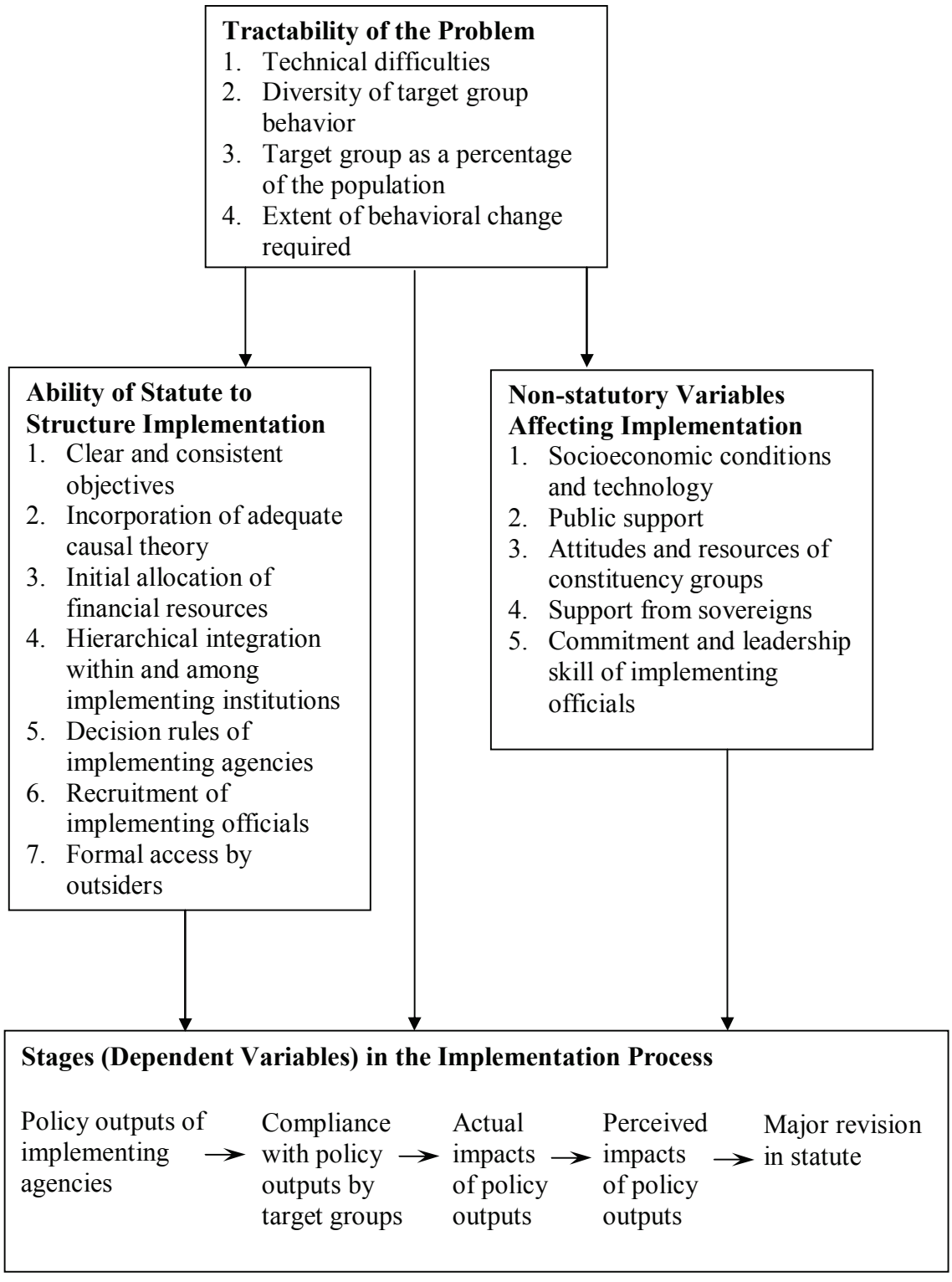

Figure 2.2 Mazmanian and Sabatier's Statutory-Coherence Approach
Source: Mazmanian and Sabatier, 1989.

The ability of legislation to structure implementation relates to the legal and institutional resources available to enforce program objectives. This category is concerned with implementation variables, such as the precision and ranking of program objectives, the allocation of financial resources, and the hierarchical integration of implementing agencies, regulations applying to implementing agencies, the commitment of officials to program objectives, and the legal mandates given to target groups. Non-statutory variables affecting implementation are concerned with external factors that may impact programs. Important influences include changes in technology, economic or social conditions, variations in public support, the attitudes and resources of constituency groups, and the commitment and legal skills of implementing officials.

Mazmanian and Sabatier synthesized these variables into six conditions of effective implementation: the clarity and consistency of program objectives, the extent to which programs incorporate adequate causal (cause and effect) theory; the extent to which implementation structures support the achievement of objectives; the commitment and management skills of implementing officials and agencies; the commitment and active support of organized interest groups, the public, politicians and/or senior officials; changes in socio-economic, public policy, or technological conditions that do not frustrate program objectives, negate causal theory, or diminish political support.

2.2.2.3 Winter's Systematic Limited Framework

Winter's framework provides comprehensive coverage of important implementation influences derived from both top-down and bottom-up approaches. The approaches taken contain factors affecting implementation outcomes within four socio-political process and conditions: (1) the character of the policy formation process prior to the law or decision to be implemented, (2) organizational and inter-organizational implementation behaviors, (3) street-level bureaucratic behaviors and (4) the response of target groups and other changes in society. The model is illustrated in Figure 2.3.

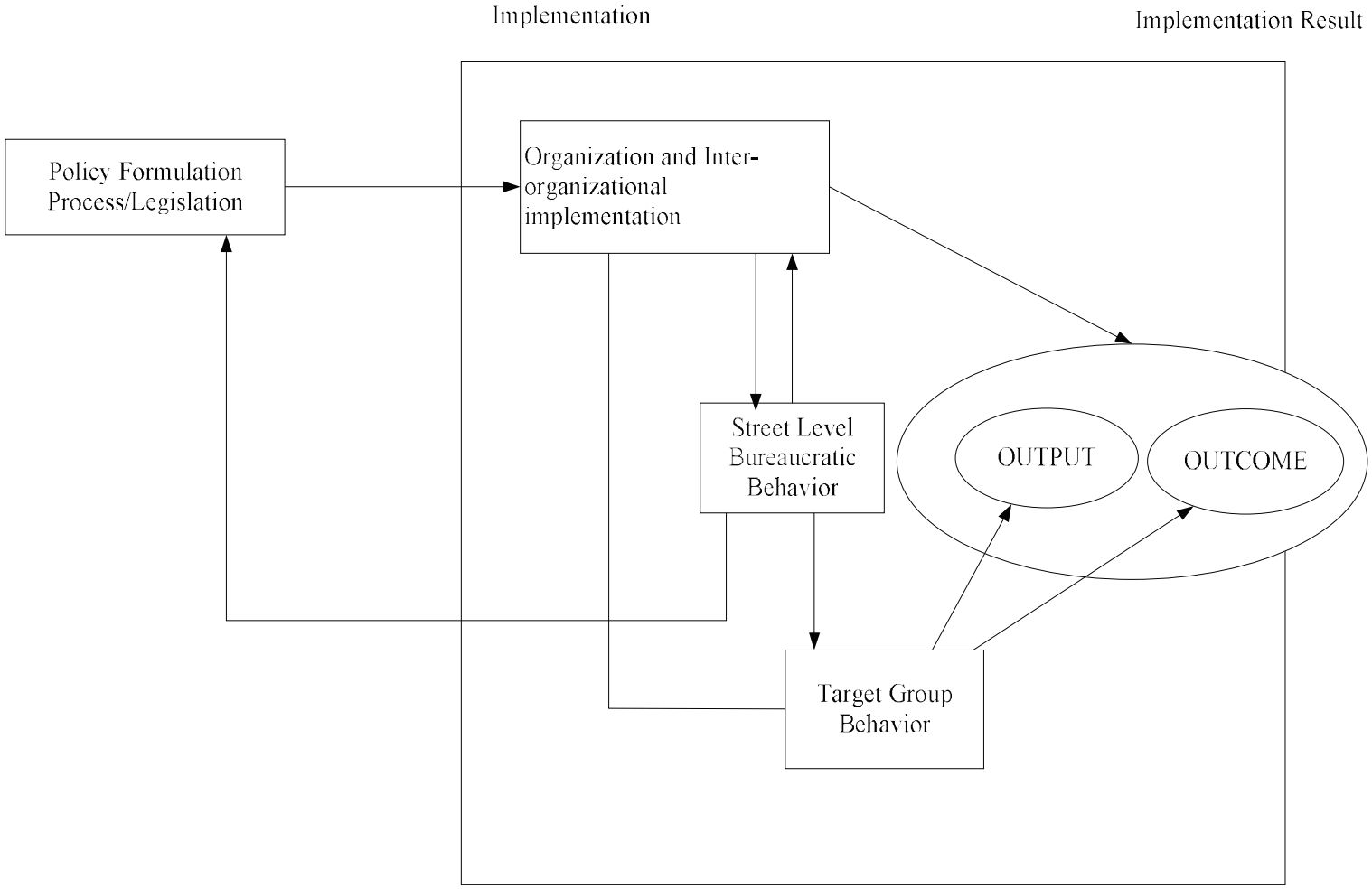

Figure 2.3 Winter's Systematic Limited Framework
Source: Winter, 1990.

Implementation outcome was defined as the dependent variable. The character and quantity of the outcome or performance of the delivering apparatus can be compared to the policy objectives and in a similar way the impact on larger target group behavior can be related to policy goals. Output and outcome impact are the most relevant variables, as neither process nor output compliance can assure goal achievement.

Policy formation affects implementation because policies are rarely designed in a rational way. So, it is necessary to understand how the policy was designed and constructed. Successful implementation is unlikely if the degree of conflict in the policy-formation phase was high and if the policy was adopted for symbolic reasons. It is likely if there is a valid casual theory on the problematic behavior to be regulated by the policy and the relationship between the policy instruments and that behavior, and if the level of attention by the policy proponents in the policy-formation phase is high.

The way in which organizations or their inter-organizational relationships respond to policy mandates affects the performance of the policy because their structures are rarely created from scratch. There are organizational interests and incentives that the organization participates in the policy during the implementation process. Implementation failures are more likely if the implementation structure includes organizations that have institutional interest and incentives that are conflicting with the policy goals.

The decisions of the street-level bureaucrats, the routines they establish, and the devices they invent to cope with uncertainty and work pressure effectively become the public policies they carry out. To cope with the pressures upon them, street-level bureaucrats develop methods of processing people in a relatively routine and stereotyped way, so called “coping” strategy or behavior. Winter (1990) has pointed out that if coping behavior is closely related to perceptions and attitudes, the understanding of the dynamics of street-level bureaucrat behavior might be improved by introducing organizational culture as an explanatory variable.

Implementation is very much affected by the way in which the target groups respond to the policy. This target-group behavior constitutes the primary focus of most policies. Most regulations and policy programs attempt to solve problems in

society by changing the behavior of the citizens, but people's behavior is determined by many other factors in addition to the policy. In fact, policies may often affect target group behavior only marginally.

The relationships between statues and target-group reactions vary according to policy area. Target groups expect greater benefits from services and the granting of allowance than from regulations. Accordingly, service-oriented policies are likely to enjoy a greater degree of goal attainment than regulatory policies. Compliance with regulations often involves considerable costs for the target group. The use of incentives may be a more effective tool to bring about changing behavior than prohibition or hypothetical sanctions.

Winter (1990) has argued that the four sets of variables are interrelated—the policy-formulation process influences the development of the other factors. Similarly, organizational and inter-organizational behavior is influenced by and influences the actions of street-level bureaucrats. This relationship also exists between target groups and street-level bureaucrats. In examining these elements, there are requirements with which to consider the impact of one set of variables on the others.

2.2.2.4 Hasenfeld and Brock's Political Economy Model

Hasenfeld and Brock's model is built from empirical work on existing implementation studies. The model has six variables: (1) policy output, (2) policy-making, (3) policy instrument, (4) critical actors, (5) driving forces, and (6) a service delivery system. The model contains many influences embraced by other models but provides the added dimension of incorporating technical, economic, and political driving forces. The model is illustrated in Figure 2.4: Hasenfeld and Brock's Political Economy Model.

Hasenfeld and Brock (1991) conceptualized policy output—the dependent variable—as the actual services being provided measured by: (a) the correspondence between the eligible, processed, and served populations, and (b) the correspondence between needs and services.

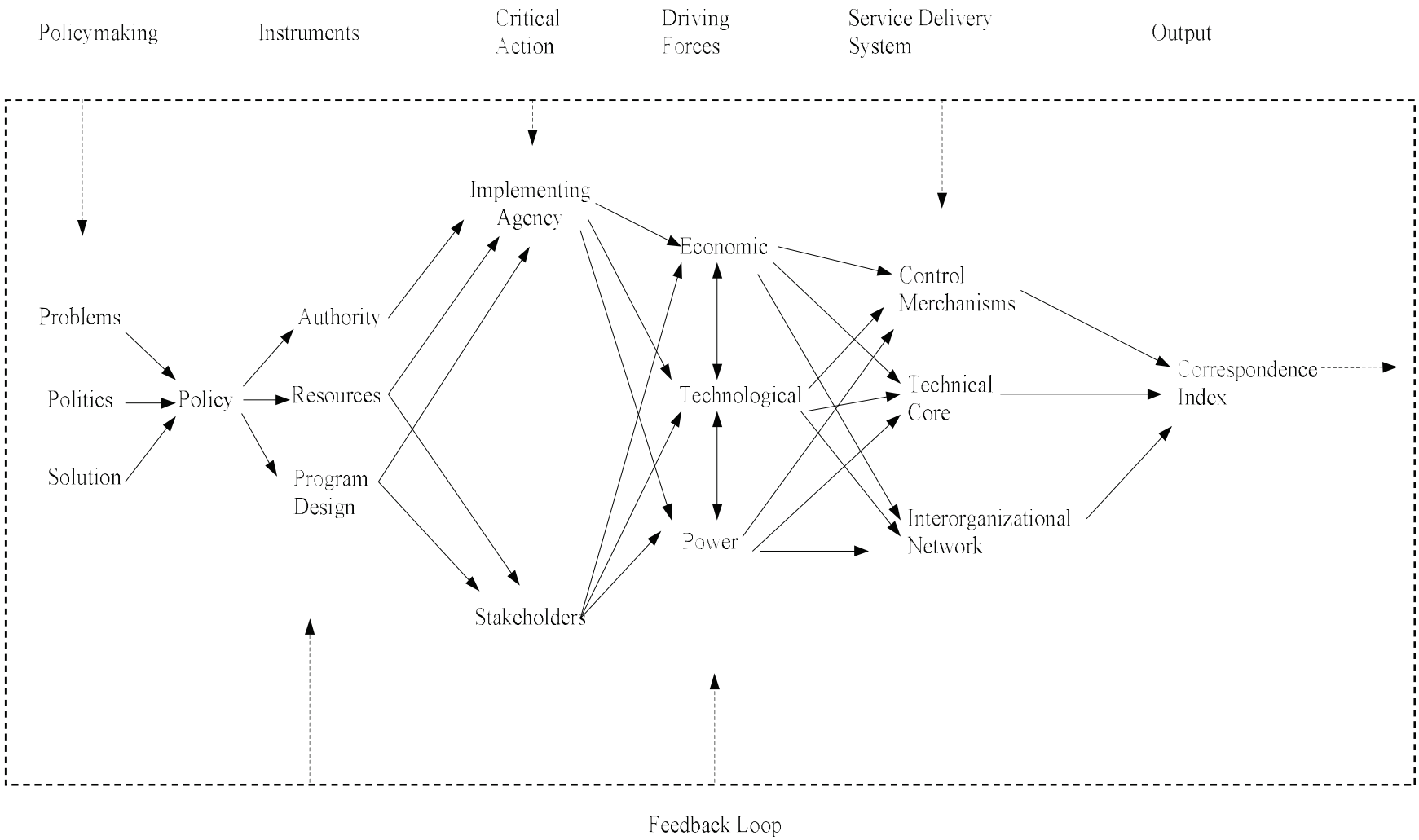

Figure 2.4 Hasenfeld and Brock's Political Economy Model
Source: Hasenfeld and Brock, 1991.

Policy-making can be viewed as a set of processes which include: (1) the framing of a problem or issue, (2) the specification of alternatives from which a choice is made, (3) an authoritative choice among the specified alternatives, and (4) the specification of the policy instruments.

They identified three policy instruments: authority, program design, and resources. Authority refers to the amount of legal power conferred on the implementers to elicit compliance. Program design indicates policy specifications regarding the target population, the needs to be addressed, and the services to be provided. Resources typically refer to the availability and allocation of money, personnel, expertise, skills, and facilities, and also include incentives or inducements for participation in the implementation process.

They differentiate between two sets of such actors: the implementing agency (ies) and the stakeholders. The implementing agency is typically a government bureaucracy in charge of assembling the program components. There are several characteristics of the implementing agency that influence the implementation process, especially the interests of the dominant coalition, internal structure, and availability of skills and expertise. Stakeholders comprise the groups and organizations whose participation and cooperation are needed to operationalize a policy.

The interaction of the critical actors with the policy instruments generates three forces that drive the implementation process: technological, economic, and political. The technological specifications seek to reduce design errors by specifying the components of the program and how they are to be assembled. The greater the technical rationality and coherence , the less is the potential for design errors.

There are three types of cost considerations that influence the implementation process: production costs (which include fixed and operations costs), opportunity costs, and transaction costs. When the resources are unstable, the implementers will attempt to minimize the fixed costs of the program because of fear· that these will become irrecoverable sunk costs. Transaction costs affect the organization of the service delivery system. The decision as to whether program components will be assembled within the boundaries of one organization or be obtained via the market (i.e., by contracting) is a function of the transaction costs

associated with their exchange.

Generally, the greater the uncertainty about the supply of a component or the greater the need to design is specifically for the program, the higher the transaction costs and the greater the advantage of incorporating the component into the organization's boundaries.

The mobilization of power—both within the implementing agency and among the stakeholders—is indispensable to the implementation process, for it is the currency with which cooperation and compliance are attained. The processes of power mobilization result in the structuring of the inter-organizational network, especially the flow of clients and services.

The four models of implementation analysis above are used as the framework for defining the independent variables and dependent variables, and their relationships, to be used as initial hypothesis for this study.

2.2.3 Identification of Independent Variables and Dependent Variables

The independent variables and dependent variables for this study are defined as follows.

2.2.3.1 Independent Variables

Based on the four models of implementation, the researcher, using his personal judgment, identified the factors that he felt had a potential effect on the implementation and effectiveness of the tax incentive policy, and classified them into six different independent variables, the details of which are discussed below.

1) Policy Formation

Policy formation is the stage of the policy process where pertinent and acceptable courses of action for dealing with public problems are identified and enacted into law. Policy formations are seldom initially clear and are viewed as a set of processes which includes: (1) the framing of problem or issue, (2) an authoritative choice among the specified alternatives, and (3) the specification of the policy instruments. Implementation studies cannot be isolated from studying the links or interactions between policy formation and implementation.

Winter (1990) derived a set of hypotheses about the linkage between the policy formation and implementation as follows: (1) successful

implementation is likely to be negatively related to the degree of conflict in the policy-formation phase. It is rare that the goals are clearly defined and if so the chosen implementation structure does not likely maximize any goal achievement; (2) successful implementation is more likely if the policy proponents in the policy-formation process have based their decisions on a valid theory about the problematic behavior to be regulated by the policy and the relationship between the policy instruments and that behavior; (3) implementation success is unlikely if the policy was adopted for symbolic reasons. Demonstrating a willingness to act may be more important than actually solving problems; and (4) successful implementation is likely to be positively related to the level of attention by the policy proponents in the policy-formation process. Most actors in a policy formation process are only part-time and are often exchanged with new ones.

Mazmanian and Sabatier (1989) also emphasized the importance of a valid theory of cause and effect in the policy formation process, but they viewed an inadequate structure of the issue to be of primary concern in setting policy and program objectives. They elaborated that the casual theory underlying a statute implies two separate components: technical validity and implementation effectiveness. Technical validity refers to the relationship between target group behavior and the attainment of statutory objectives, while the implementation effectiveness concerns the ability of implementing organizations to produce the requisite behavioral changes in the target groups, preferably with a minimum of adverse side effects. Both components must be valid if statutory objectives are to be attained. The causal theory links the relationship between the policy formation and the target group and implementing organizations.

As far as policy formation is concerned, Hogwood and Gunn (1984) also viewed that the preconditions of perfect implementation are: (1) the policy to be implemented is based upon a valid theory of cause and effect; that is, the policy must be based upon an adequate understanding of a problem to be solved, its causes and cure; or of an opportunity, its nature, and what is needed to exploit; and (2) the relationship between cause and effect is direct and there are few, if any, innerving links. Policies which depend upon a long sequence of cause and effect relationships have a particular tendency to break down since the longer the chain of causality, the

more numerous the reciprocal relationships among the links and the more complex implementation becomes. Interest in policy formation is limited to understanding how the formation process and the mandate that results enhance or detract from program implementability.

Based on the discussion above, it can be hypothesized initially for this study that as far as policy formation is concerned, successful implementation depends on: (1) the degree of conflict in the formation phase—successful implementation is likely to be related to the low degree of conflict in the policy-formation phase (Winter, 1990) (2) willingness to act and attain the objectives of the policy—implementation success is likely if the policy was not adopted only for symbolic reasons (Winter, 1990); and (3) valid causal theory successful implementation is more likely if the policy-decisions is based on a valid casual theory about the target group behavior to be regulated by the policy and the relationship between the policy instruments and that behavior and the ability of implementing organizations and the change of that behavior; and lastly, the relationship between cause and effect is direct with minimum innerving links (Winter, 1990; Mazmanian and Sabatier, 1989); Hogwood and Gunn, 1984).

2) Policy Instruments

Policy instruments are identified as program design and resources. Program design indicates policy specifications regarding target population, the needs to be addressed, and the services to be provided. Robertson (1984) emphasized that program design must not be taken for granted and implementation research requires a critical understanding of the chemistry of program design and legitimating. Implementation studies cannot be isolated from studying the links or interactions between policy formation and implementation.

In designing a public policy, policy architects cannot avoid making five substantive choices: (1) the direction of change they seek to bring about; (2) government resources to commit to the effort; (3) differentiation of the population to reap program benefits from those that will not; (4) governing organization and the degree of operational responsibility; (5) delegation of responsibility outside the initiating government (Robertson, 1984).

Policy design reflects the need for the clarity and consistency of

the objectives and directives (Van Meter and Van Horn, 1974; Mazmanian and Sabatier, 1989; Winter, 1990; Hasenfeld and Brock, 1991). Van Meter and Van Horn (1974) discussed this in terms of the "Standards and Objectives" that elaborate the overall goal of the policy and provide concrete and more specific standards for assessing program performance.

Mazmanian and Sabatier (1989) further suggested that statutory objectives that are precisely and clearly ranked the importance serve as an indispensable aid in program evaluation, as unambiguous directives to implementing officials, and as a resource available to supporters of those objectives. To the extent that a statute provides precise and clearly-ranked instructions to implementing officials and other actors, the more likely that the policy outputs of the implementing agencies and ultimately the behavior of target groups will be consistent with those directives.

From the above review, it is reasonable to set an initial hypothesis for this study as follows: the factors relating to program design that are clear and consistent; (1) the objectives to achieve, (2) instructions to the implementing officials; and (3) direction of change in the target group affects the implementation (Van Meter and Van Horn, 1974; Mazmanian and Sabatier, 1989; Winter, 1990; Hasenfeld and Brock, 1991).

Policy resources refer to the availability and allocation of money, personnel, expertise, skills, and facilities. They also include incentives or inducements for participation in the implementation process. The availability of resources and their allocation influence the behavior of the implementing organizations and officials (Hasenfeld and Brock, 1991; Mazmanian and Sabatier, 1989) and emphasize the availability of financial resources for the implementing agency. Basically, the threshold for the level of funding is necessary for achieving the policy objectives.

Therefore, it is initially hypothesized for this study that the availability of the resources will have an effect on the effectiveness of the policy (Hasenfeld and Brock, 1991; Mazmanian and Sabatier, 1989).

3) Characteristics of Implementing Organizations

Implementing organizations for this study are defined as

organizational characteristics that influence the implementation process comprising organizational goals, availability of skills and expertise, the inter-organizational network, and communication and control or monitoring mechanisms.

Organizational goals are the mandate or mission for the establishment of the implementing organization. That mandate determines the interest and behaviors of that organization. The way in which the implementing organizations respond to and participate in the policy mandate affects the effectiveness of the policy implementation. The organization trends to give priority to the policies that are consistent goals with organizational goals.

On the other hand, if the goals of the policy seem to be in conflict with the organizational goals, this will lead to problems of coordination, delays, implementation failures, and the spending of public funds fro purposes other than those prescribed. Goal attainment will be improved if the implementation is assigned to agencies that support the objectives and give them a high priority (Winter, 1990). Goggin et al. (1990) further viewed that the greater the compatibility among the goals of the implementing organizations and the policy goals, the greater the success of a program implementation will be.

The relationship between goals and implementation is particularly important and proposed five propositions that concern the nature of the interrelationship between goals and implementation.

(1) The implementation with no incremental change is facilitated by the establishment of clearly-defined organizational goals and the support of organizational leaders for those goals.

(2) The possibility of successful implementation; that is, the ability of the organization to achieve its goal is enhanced by allowing the implementing organization some discretion in choosing its goal.

(3) Goals are more likely to be attained if policies are implemented by new organizations rather than established ones.

(4) Goals are more likely to be attained if organizations are given discretion over the means by which they implement policy.

(5) Organization that have clearly-articulated goals to which their leaders subscribe will respond to external pressures to change their

implementation practices only when their goals are threatened.

The availability of the expertise and skills needed by the program design will influence the agency's ability to translate program requirements into coherent technical specifications (Hasenfeld and Brock, 1991). It is the ability of the implementing organizations to "get its act together" to convert the policy message into a set of real achievements.

Inter-organizational network and communication refer to the relationship and communication systems among the implementing officials that operate the program, and its effectiveness can be measured by the degree of coordination (Hasenfeld and Brock, 1991). Van Meter and Van Horn (1974) argued that effective implementation requires that a program's objectives be clearly and consistently understood by the implementing officials for their achievement.

Hogwood and Gunn (1984) viewed that perfect implementation requires that there be a single implementing agency that need not depend on other agencies for success. The greater the number of clearances required among other bodies involved in implementation, the lower will be the chances of full implementation—in other words, there is perfect communication and co-ordination of the various elements or agencies involved in the program.

Control or monitoring mechanisms may be either structural (e.g. adequacy of facilities and qualification of personnel), process (e.g. number of clients processed by each component), or outcome (e.g. proportion of clients rehabilitated) (Hasenfeld and Brock, 1991). A control or monitoring system is required for enforcing the behavior of the implementing officials so that they act according to the policy and the behavior of the target group to comply or change as prescribed by the policy.

Van Meter and Van Horn (1974) discussed this in terms of enforcement or follow-up activities, from superiors to subordinates: firstly, technical advice and assistance to facilitate implementation aiding in the interpretation of regulations and guidelines, structuring responses to policy initiatives and obtaining the physical and technical resources required to carry out the policy; and secondly, the superior can rely on a wide variety of sanctions, both positive and negative. Mazmanian and Sabatier (1989) emphasized the importance of the hierarchical integration within and among implementing organizations, combined with the

specification of the formal decision rules of the implementing officials. For effective implementation to be achieved, it would be necessary to have a completely unitary administrative system with no conflict within it. Those in authority can demand and obtain perfect compliance. This means no resistance to command at any point in the administrative system.

Based on the above discussion, the factors relating to the implementing organizations that affect the implementation to be used as an initial hypothesis for the analysis in this study are: (1) the consistency of the organizational goals and the policy goals or objectives (Winter, 1990; Goggin et al., 1990; (2) clear and consistent communication about policy objectives and procedures (Hasenfeld and Brock, 1991; Hogwood and Gunn, 1984); (3) an enforcement mechanism to enforce or motivate the implementing official to perform (Van Meter and Van Horn, 1974); and (4) a monitoring mechanism to facilitate and control the behavior change and the compliance of the target group (Mazmanian and Sabatier, 1989).

4) Behaviors of Implementing Officials

Implementing officials or implementers also referred as street-level bureaucrats are public officials who, in their work interact directly with members of targets groups and who often enjoy considerable discretionary powers in their services (Winter, 1990). They are the ones that translate laws and programs into action, aimed at delivering services to or regulating the behavior of the target group. Their behavior regarding the policy may affect its implementation.

The behaviors of implementers are arranged in degrees, from conforming behaviors which they think conform to the goals and procedures expressed in the policy statement, to non-conforming behaviors which they judge not to be in conformance with the goals and procedures expressed in the policy statement (Sorg, 1983).

The factors that affect the behaviors of the implementing officials are their understanding and commitment to the policy's objectives and procedures, and the ability to perform the required behaviors (Van Meter and Van Horn, 1974). With these two factors, the implementing officials will exhibit conforming behavior whereby goals and procedures are correctly translated into behaviors by them. On the other hand, if these factors are impaired, the implementing

officials will have deficient behavior, whereby the implementation will be impaired.

The factors regarding the understanding of policy objectives and procedures reflect the linkage with the factors on the clarity and consistency of the policy design and inter-organization communication. Mazmanian and Sabatier (1989) argued further that the implementers need to have commitment to the policy objective, which is the variable that most directly affects the policy output of the implementers. This comprises two components: (1) the direction and ranking of the policy objectives in the officials' order of preferences, and (2) their skill in realizing those preferences, i.e. their ability to go beyond what could reasonably be expected in using the available resources. Hogwood and Gunn (1984) viewed that one of the preconditions of perfect implementation is the perfect communication and co-ordination of the various elements or agencies involved in the program.

The ability to perform the required behaviors requires skill and expertise needed for the program design (Hasenfeld and Brock, 1991). Lacking the ability to perform, street level bureaucrats tend to develop methods of processing people in a relatively routine and stereotyped way, the so called "coping" strategy or behavior. Winter (1990) summarizes this coping behavior as follows:

(1) Street-level bureaucrats will use tricks such as limiting information about services, making clients wait, making access difficult, and imposing a variety of other psychological costs on clients.

(2) Street-level bureaucrats tend to dominate more loosely programmed routine cases at the expense of more complicated, non-programmed and time-consuming costs.

(3) High priority is given to cases where the client is demanding a decision that cases involve preventive action, reaching out, or follow-up activities likely to succeed in terms of bureaucratic success criteria but who may not be the neediest ones.

(4) Other coping mechanisms are the rough categorization of clients, routinization, domination of clients, passing clients on to other authorities, and down-grading of clients' perception and program objectives.

Winter (1990) has further pointed out that if coping behavior is closely related to perceptions and attitudes, the understanding of the dynamics of

street-level bureaucratic behavior might be improved by introducing organizational culture as an explanatory variable.

The above review suggested an initial hypothesis for this study: that the factors from which the behaviors of the implementing officials that affect the implementation performance derive are: (1) their understanding and commitment to the policy's objectives and procedures (Van Meter and Van Horn, 1974; Mazmanian and Sabatier, 1989), and (2) the ability to perform the required behaviors (Hasenfeld and Brock, 1991).

5) Behaviors or Responses of the Target Group

The target group is defined as the group of citizens that is required to change their behavior needed by the policy design or is needed to operationalize the policy. Policy implementation is very much affected by the way in which the target groups respond to the policy. This target group behavior constitutes the primary focus of most policies. Most regulations and policy programs attempt to solve problems in society by changing the behavior of the citizens, but people's behavior is determined by many factors.

The factors influencing the behaviors of the target group and that affect policy implementation are: (1) the attributes of the target group, (2) the extent of behavioral change required of the target group, and (3) communication of regulations and right to service.

Winter (1990) has pointed out that the behavior of target group varies between individuals according to such attributes as educational and social background. For example, it has been demonstrated that people with little education and a poor social background are less likely to benefit from social services than more educated and wealthier people, even when those social services are targeted primarily at the former society.

Mazmanian and Sabatier (1989) raised the issue that the amount of behavioral modification required to achieve policy objectives is a function of the number of people in the ultimate target groups and the amount of change required of them. The greater the amount of behavior change, the more problematic successful implementation will be. In order words, successful implementation of the policy is more likely when its prescriptions are in accord with already existing and norms.

Winter (1990) raised the point that the degree of the response of the target group depends on the level of communication of regulations and right to service. This reflects the linkage between the implementing agency's function to communicate the policy's objectives and regulations to the target group clearly and consistently.

Winter (1990) also reflected that the linkage between target group behavior and the policy design target groups expects greater benefits from services and the granting of allowances than from regulations. Accordingly, service-oriented policies are likely to enjoy a greater degree of goal attainment than regulatory policies. Compliance with regulations often involves considerable costs for the target group. The ability of these costs to impede compliance depends not only on their size but on the perceived likelihood that the general public will apply negative or positive sanctions. The use of incentives may be a more effective tool to bring about a change in behavior than prohibition or hypothetical sanctions. A policy that provides subsidies or protection does not imply costs but benefits for the target group. The chance for successful implementation is much better even if a considerable change in behavior is required.

The above review suggests an initial hypothesis for this study. The successful implementation is likely if: (1) the attributes of the target group are aligned with the policy (Winter, 1990); (2) the extent of the behavioral change required of the target group is minimum in case of subsidy policy (Mazmanian and Sabatier, 1989); and (3) communication of regulations and right to service is made clearly and consistently. The chance of success will be high even though the requirement for change is high for the subsidy policy that provides only benefits to the target group (Winter, 1990).

6) Social, Economic, and Technological Conditions

Social, economic, and technological conditions are exogenous variables that affect the policy output and ultimately the attainability of the policy objective. Van Meter and Van Horn (1974) addressed the issue that in implementation study, it is necessary to consider the extent to which and how prevailing economic conditions will be affected by the implementation of the policy in question.

Winter (1990) pointed out that as a matter of fact, people's

behavior is determined by many factors—changing socio-economic and other conditions in society may affect implementation. For example, the implementation of both social welfare and employment policies is very much dependent on changes in the economy and on the labor market. Target group behavior may also vary with different types of target groups. Behavior and norms vary with education and social background.

Hogwood and Gunn (1984) viewed that the precondition of perfect implementation is that the circumstances external to the implementing agency not impose crippling constraints. These constraints are obvious and there is little that administrators can do to overcome them, except in their capacity as advisors, by ensuring that such possibilities are borne in mind during the policy-making stage.

Mazmanian and Sabatier (1989) argued that the effect will come about in four ways. Firstly, variation of socio-economic conditions can affect perceptions of the relative importance of the problem addressed by a statue. Secondly, successful implementation is rendered more difficult by local variation in socio-economic conditions and in the seriousness of the problem being addressed. Thirdly, the more diverse the economy and the more prosperous the target groups, the more probable the effective the implementation of statues imposing nonproductive costs on them. Finally, in the case of policies that are directly tied to technology, changes or lack of changes in the technological state of the art over time are obviously crucial. The primary linkage is through changes in the interest group and in public support for policy objectives, or through the legislative and executive sovereigns of the implementing agencies. Alternatively, implementing officials may respond directly, without any intervening variables, to change in environmental conditions, particularly if they perceive those changes to be supportive of their programs or preferences.

The review above suggests an initial hypothesis for this stud: that social, economic, and technological conditions are exogenous variables that affect policy output and ultimately attainability of the policy objective (Van Meter and Van Horn, 1974; Mazmanian and Sabatier, 1989; Hogwood and Gunn, 1984). The conditions that may affect the performance of the R&D tax incentive policy are, for example, interest rate, economic condition, market competition, etc.

This discussion concludes the six independent variables that can

affect the effectiveness of policy implementation. Next will be a discussion of policy performance as dependent variable.

2.2.3.2 Dependent Variables: Policy Performance—"Output" and "Outcome"

For implementation research, dependent variables are generally defined as outputs or outcomes, after the implementation process, but where they are the latter it is particularly important to identify influences that are quite independent of that process (Hill and Hupe, 2005).

Mazmanian and Sabatier (1989) described dependent variables in implementation as a process with several stages: (1) the policy outputs (decisions and actions) of the implementing agencies, (2) the compliance of target groups with those decisions, (3) the actual impacts of agency decisions, (4) the perceived impacts of those decisions, and finally (5) the political system's evaluation of a statute in terms of major revisions (or attempted revisions) in its content. Each of these stages can be thought of as an end or dependent variable.

The achievement or effectiveness of policy performance can be compared to policy objectives (Van Meter and Van Horn, 1974) and in a similar way the impact on target group behavior can be related to policy goals (Mazmanian and Sabatier, 1989). Outputs and even more, outcomes, are the most relevant variables, as neither process nor output compliance can assure goal achievement (Winter, 1990).

The question is whether output or outcome should be chosen. Hill and Hupe (2002) responded that, in principle, it seems desirable to choose the outcome wherever possible, inasmuch as the objective is to judge policies in terms of what they really achieve, but there are three problems that follow from that.

First, outcomes may be influenced by factors that have nothing to do with the policy intervention. Therefore, research models can try to factor in the environmental variable.

Second, a judgment about outcome may be a judgment about the appropriateness of the policy, not about its implementation—the policy may be an inappropriate response to the problem. The classic issue here concerns "symbolic policy." When a symbolic policy fails, this should not be seen as implementation failure if there is simply no realistic consideration of the relationship between the

mean and the end.

Third, the question is whether or not unambiguous and agreed outcome variables can be established. The choice of an outcome variable may require the researcher to recognize competing employ goals and indeed perhaps make a choice as to "whose side one is on."

However, they do not arrive at any clear recommendation but point out that it is necessary for careful consideration of choice of the dependent variable, recognizing goal ambiguity and the normative conflict that may surround this subject. Winter (1990) argues the case for focusing upon "implementation behavior" (essentially "outputs") rather than "goal achievement" (outcomes).

In conclusion, outputs are the decisions or actions of the implementing agencies and the compliance of target groups, while outcomes are the things that are actually achieved, whatever the objectives of the policy may have been. Outcomes are real results, whether intended or unintended, at the same time that outcomes are not government action. Either or of them can be dependent variables of policy implementation.

2.3 Previous Studies on R&D Tax Incentive Implementation and Effectiveness

There are some local and international studies that have investigated the factors that impact the implementation of R&D tax incentives policy. The study of these investigations will help to identify and make conclusions about the variables and conceptual model for this study.

2.3.1 Previous Local Research

Arnold, Bell, Bessant and Brimble (2000) have made a report on "Enhancing Policy and Institutional Support for Industrial Technological Development in Thailand." A part of this report touched on the tax incentive policy under Royal Decree No. 297. They commented that although a 100% credit is relatively high, it is questionable whether the scheme does or even could have a substantial impact on shifting R&D investment for a number of reasons.

(1) Firms are apparently reluctant to claim tax allowances because of

uncertainty about the eligibility of their technological activities.

(2) The basic definition of R&D follows fairly conventional "narrow" lines

(3) The scheme is based on a highly restrictive operational procedure.

(4) The R&D stimulating role of the scheme is constrained by its close linkage to revenue collection.

(5) The incentive effect may be attenuated at least in principle, by that is based on firms' total, not incremental, R&D expenditure.

They proposed that further study be made to examine whether and how to simplify the mechanism to stimulate firms to undertake technology development activities involving forms of design and engineering work that would not meet the eligibility of the current incentives.

Their report reflected that the design of the current incentive may by one of the impacts on the effectiveness of the policy. However it did not explain how it was related to other factors or whether there were other factors that may also have affected the effectiveness.

2.3.2 Previous International Research

There are a number of international studies about R&D tax incentive policies, some of which are discussed below.

McCutchen (1993) did a study about factors of private firms in the pharmaceutical industry that had impact on the effectiveness of the R&D tax incentive policy. The evidence indicated that there was a positive change in spending pattern of firms after the tax credit went into effect due to two factors: taking advantage of the tax credit and a desire to maintain their relative position in research intensity. Among the two variables, interest rate and firm size, it was found that the interest rate had a negative impact on research intensity while firm size had no statistically measurable impact. Firms with high cash flow margins prior to enactment of the tax incentive made the largest change in R&D expenditures.

In 1995 and 1996, the Department of Finance and the Revenue of Canada conducted a joint evaluation of the performance of the income tax incentive for R&D. It was found that R&D played a very important role in the corporate strategies in order

to remain competitive. Internal cash flow is an important precondition in the decision to undertake R&D, and government support improves cash flow. There is a strong correlation between firm size, as measured by the number of employees and the size of the tax incentive claims. In terms of cost-effectiveness, each dollar of tax revenue forgone as a result of the tax incentive generated $1.38 in additional R&D spending, plus impacts of the spillover benefits.

The Department of Industry of Australia made a survey with 116 firms on the R&D Tax Concession—impact on the Firm in 2005. It was found that the tax concession helped the recipient companies to overcome financial constraints while otherwise the cash flow would have been a barrier to R&D performance. Strong economic conditions underpinned levels of investment in R&D and R&D is often the first cost to be cut during an economic downturn. Compliance costs have a negative impact on the program. The R&D tax incentive influences the size of investment in individual R&D projects, brings forward R&D expenditure on projects to enable faster completion, and induces additional R&D expenditure through increased investment in projects.

Dagenais, Mohan, Pierre and Therrien (1997) studied the effectiveness of the R&D tax incentive using an unbalanced panel of 434 Canadian firms and concluded that one dollar of fiscal support to R&D yields $0.98 in additional research. They pointed out a possible flaw in the system. A proportion of this money (which they estimate at over 80%) finances research that would be performed even without assistance and thus resembles a disguised policy of subsidies for research.

Knoll (2003) conducted a qualitative study based on semi-structured interview which was carried out with Austrian companies about business R&D and the role of public policies for innovation support. It was found that internal attributes had an influence in deciding to invest in R&D, e.g. a vision-led strategy and diversification. The future product portfolio and the timing of introducing new products became a driving force of R&D investment irrespective of external factors, such as a downturn in the business cycle, market competition, and temporary lower demand. The tax incentive is one of the preferred R&D supporting policies, but improving a country's research infrastructure, including organizations and education, should play crucial role when it comes to formulating policies to support industrial R&D.

The above research echoes some internal attributes and external factors or variables that affect the effectiveness of the R&D tax incentive policy. Internal attributes are, for example, cash flow and corporate strategies—future product portfolio, the timing of introducing new products, diversification, and firm size. External factors are, for example, interest rate, market competition, and economic conditions. Compliance costs to claimers and policy design can also affect the effectiveness. The policy affected the private firms by increasing the size of investment in individual R&D projects, thus expediting R&D spending on projects and inducing additional R&D expenditure through increased investment in the project.

No study explained systematically how those factors were related and how they affected the effectiveness. Further, there are no studies no how the factors on policy formation, program design, characteristics of implementing organizations, or behaviors of the implementing officials that affect effectiveness.

2.4 Proposed Model for Analysis and Research Questions

This study attempts to explain systematically the major factors that affect the implementation and effectiveness of the R&D tax incentive policy in Thailand, as described in the research problem: "What are major factors affecting the implementation and performance of the Thai R&D tax incentive policy?" The above literature review and the studies of the previous researchers on the subject can lead to an initial hypothesis for the variables, the model for analysis, and the research questions relating to each variable for this study. The research questions are formulated as a way of explicating theoretical assumptions and orienting the researcher to the primary goals and tasks of the study.

The methodology of the study is a qualitative research. Developing a model for analysis was necessary as an initial theoretical basis for data collection and analysis. As this study is a qualitative study, the conceptual model represents the current version of the map of the territory being investigated. This means that the model may change as the study evolves and thus lead to new sets of working hypotheses.

Based on the above literature review and the studies of the previous researchers on the subject, the conceptual model classified the variables into four

groups, using the system model of policy analysis, i.e. Input, Process, Output, and Environments (Dye, 1995).

The variables and the related research questions are described as follows:

2.4.1 Input

There are two Independent Variables under the Input. The operational definitions and research questions of each variable are as follows:

1) Policy Formation

The factors relating to the policy formation that affect the implementation of the policy are: (1) degree of support during the formation phase, particularly from organizations that would have the responsibility to govern the policy; (2) willingness to attain the objective of the policy of the implementing organizations; and (3) the causal theory that tax incentives can stimulate private firms to invest or invest more in R&D.

Therefore, the research questions regarding the policy formation are as follows:

RQ 1: How serious did the implementing organizations support the R&D tax incentive policy when the policy was formulated?

RQ 2: How strong is the willingness of the implementing organizations to act and attain the objectives of the policy?

RQ 3: How would the R&D tax incentive policy affect the behavior of the target group in investing in R&D?

In order to explore RQ I and 2, the policy statements, as reflected in numerous documents, such as program regulations and guidelines which spell out the criteria for an evaluation of policy performance, will be reviewed and analyzed and their behavior will be observed by interviewing the relevant officials and experts. In order to observe RQ 3, the behaviors of the target group will be observed mainly through an interview with decision-makers.

2) Policy Instruments

The factors relating to a program design that is clear and consistent are: (1) objectives to achieve, (2) instructions to the implementing officials, and (3) directions for change in the target group that affect implementation.

Therefore, the research questions relating to the program design are as follows:

RQ 4: How clear and consistent is the design of the R&D tax incentive policy in terms of the objectives to achieve, instructions to the implementing officials, and directions for change in the target group?

In order to explore RQ 4, the content of the policy statements, program regulations, and guidelines will be reviewed and analyzed. Opinions of experts about the clarity and consistency of the policy will be obtained through an expert interview or panel discussion.

Regarding policy resources, the Thai R&D tax incentive is given in the form of a tax allowance, i.e. deduction of the tax payment. The government is not required to set aside a budget for it. The resource that is required is, therefore, an incentive or inducements for the implementing officials for participation in the implementation process. In other words, the availability of the incentive for the implementing officials for participation in the implementation process is a factor that affects the implementation.

Therefore, the research questions related to policy resources are as follows:

RQ 5: What are the resources available or allocated for the implementing officials for participation in the implementation?

RQ 5 will be explored by content analysis of the policy documents and interview with the relevant officials.

2.4.2 Process

There are three variables under the Process. The operational definitions and research questions of each variable are as follows:

1) Characteristics of Implementing Organizations

The factors relating to the implementing organizations that affect the implementation are (1) the consistency between the organizational goals and policy goals or objectives; (2) clear and consistent communication about the policy objectives and procedure; (3) the enforcement mechanism to enforce or motivate the implementing official to perform; and (4) the monitoring mechanism to facilitate and

control the behavior change and the compliance of the target group.

The goals of the R&D tax incentive seems to be in conflict with the organizational goals of the Revenue Department in collecting revenue for the government but consistent with those of the National Science and Technology Development Agency in promoting science and technology development. The National Science and Technology Development Agency has the responsibility of approving R&D projects, while the Revenue Department has the responsibility of monitoring that the claimers of the incentive claim the allowance correctly. The study will explore how this factor affects the implementation of both agencies and how they communicate the policy objective within the organizations and set the enforcement mechanism to obtain coordination from the officials, and lastly, how the monitoring mechanisms are set up to facilitate and control behavior change and compliance of the target group.

Therefore the research questions relating to the policy instruments are as follows:

RQ 6: How do the organizational goals of the implementing agencies affect the implementation of the policy?

RQ 7: How clearly and consistently do the implementing agencies communicate the policy objectives within the organizations and set an enforcement mechanism to obtain co-ordination from their officials?

RQ 8: How are the monitoring mechanism set up to facilitate and control the behavior change and compliance of the target group?

The three research questions will be explored and observed through content analysis of documents relating to the implementation of the policy within the implementing organizations and through interviews with the relevant officials.

2) Behaviors of Implementing Officials

The factors from which the behaviors of the implementing officials that affect the implementation performance are derived are: (1) their understanding and commitment to the policy objectives and procedures, and (2) ability to perform the required behaviors.

Similar to other types of policy, the R&D tax incentive policy requires the understanding and commitment of the implementing officials to the policy's

objectives and procedures. The R&D tax incentive policy requires long-term commitment so that the policy becomes familiar to the target group and becomes effective.

The implementing officials need technical ability in order to classify whether the R&D project is qualified for approving the project and monitoring the tax claim. Therefore, the research questions regarding the behaviors of implementing officials are as follows:

RQ 9: Do the implementing officials have understanding of and commitment to the policy's objectives and procedures?

RQ 10: Do the implementing officials have sufficient technical ability to approve the qualified R&D projects and to monitor the tax claim?

3) Behaviors or Responses of Target Group

The factors of the behaviors and responses of the target group that affect the performance of the policy are: (1) the attributes of the target group are aligned with the policy; (2) the extent of behavioral change required of the target group is minimum, except in the case of subsidy policy; and (3) communication of regulations and the right to service re made clearly and consistently.

As the R&D tax incentive is one of the subsidy policies that provides only benefits to the target group, the chance of success should be high even though the requirement for change is high. This is under the condition that the attributes of business firms in Thailand align with the policy, change of behaviors can be derived by the incentive offered under the policy, and communication of regulations and right to service are made clearly and consistently.

Therefore, the research questions regarding the behaviors or responses of the target group are as follows:

RQ 11: What are the attributes that the target group should have in order to align with the policy?

RQ 12: Is the incentive offer under the policy sufficient to derive the change of the behavior as desired under the policy and what are the behavior changes?

RQ 13: Are regulations and right to service communicated clearly and consistently to the target group?

The RQ 11-13 will be explored mainly thorough interviews with the

target group and experts.

2.4.3 Output

Outputs of the policy implementation are the decisions or actions of the implementing agencies and the compliance of target groups, while outcomes are the things that are actually achieved, whatever the objectives of policy may have been and whether intended or unintended. Outcomes are not government action.

The goal of the R&D tax incentive policy is to promote the private sector to do more research and technology development. Therefore the outputs of the R&D tax incentive are the number of registered R&D agencies and the number of R&D projects approved. The outcomes of the R&D tax incentive are how the target group responds to the policy in terms of R&D investments increased due to the incentive and amount of tax allowance claimed.

RQ 14: How many R&D agencies were registered and how many R&D projects were approved?

RQ 15: How does the target group respond to the policy in terms of R&D investment stimulation due to the incentive and amount of tax allowance claimed? In other words, how and under what conditions does the R&D tax incentive and its implementation stimulate the decision of the target group in making their R&D investment?

The last research question is the key and ultimate research question for this study. Research questions 14 and 15 will be observed by statistical data collection, patent analysis, and interview with the target group.

2.4.4 Environments

Social, economic, and technological conditions are exogenous variables that affect policy output and ultimately the attainability of the policy objective. The conditions that may affect the performance of the R&D tax incentive policy are, for example, culture and values, interest rate, economic condition, market competition, level and ability of technological development, etc.

Therefore, the research question regarding the social, economic, and technological conditions is:

RQ 16: What are the social, economic, and technological conditions that affect the performance of the R&D tax incentive policy and how strong are they?

This research question will be observed through interview with the target group and the implementing officials.

2.5 Summary

The initial conceptual model for analysis of the major factors that affect the implementation and effectiveness of the R&D tax incentive policy in Thailand is illustrated in Figure 2.5, as follows:

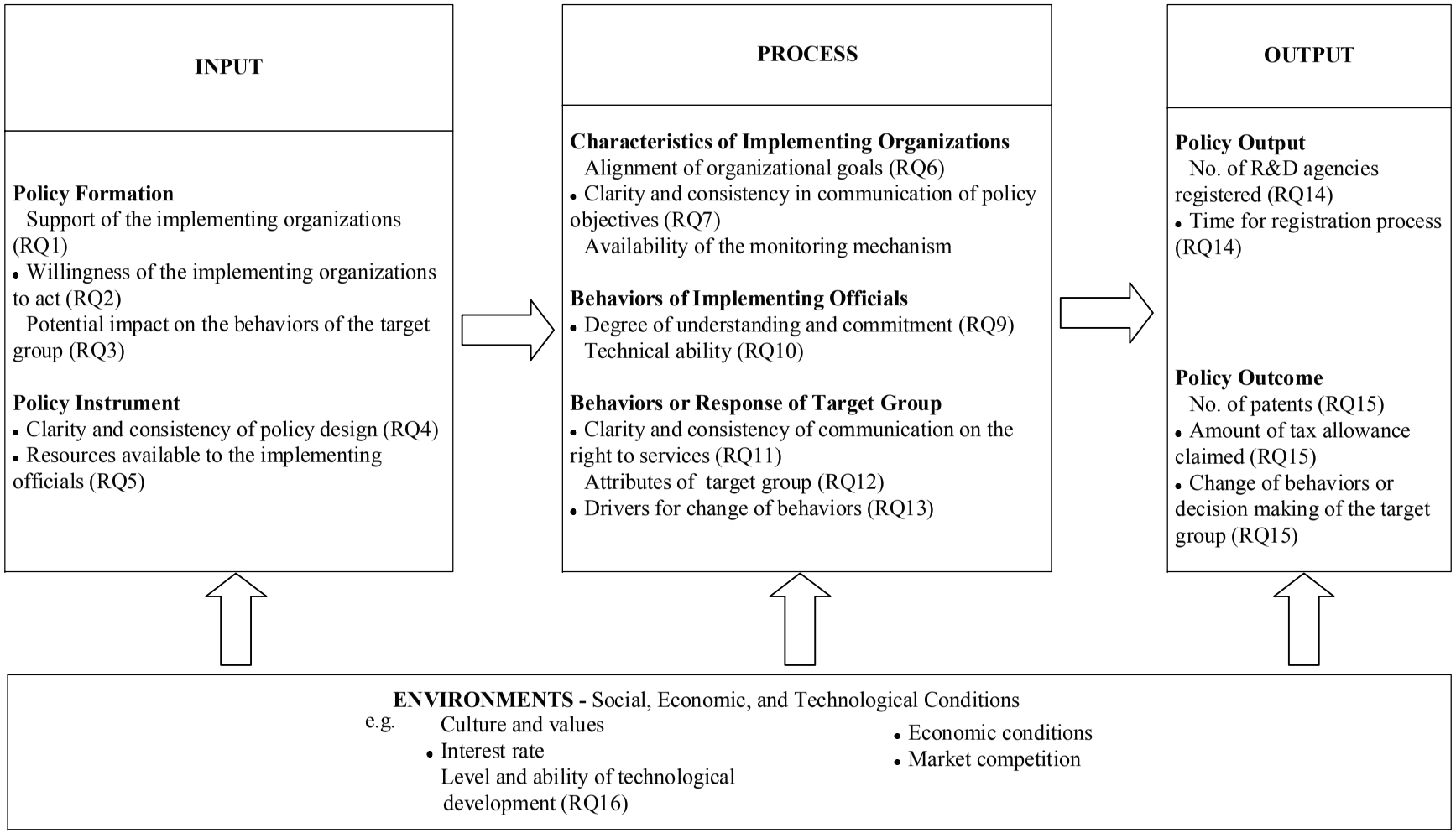

Figure 2.5 Conceptual Model for Analysis of the Implementation and Effectiveness of the R&D Incentive Policy

CHAPTER 3

RESEARCH METHODOLOGY

3.1 Introduction

This chapter presents the research methodology used for this study. The research designs with the significance of the qualitative method using several inquiry techniques i.e.in-depth interviews, content analysis of relevant documents, patent analysis, and expert interviews. During the data collection process, in order to speed up the process, and in order to confirm the information that had been collected by other methods and to increase the reliability of the study, a questionnaire was also prepared and sent. The second and third sections specify the unit of analysis and population, including sample and sampling procedures. The fourth and fifth sections provide more details on the data collection methods; namely, how the data were collected and analyzed. Finally, the limitations of the methodology are discussed.

3.2 Research Design

The qualitative method was chosen for this study. For qualitative research, the researcher is the data-gathering instrument and enters the setting without preconceived ideas about the crucial variables and merely seeks to understand the operation of the policy and its effect on the target group. Having said so, the conceptual model presented in Chapter 3 formed the guidance in designing the enquiries during the interview; also the data collection and analysis were revised, dropped, and added during the course of the study.

Qualitative research methodology is particularly useful here because it allows the researcher (1) to gain insight into how the R&D tax incentive affects the decisions of each individual player in the target group in the R&D investment. (2) to understand the attitudes and behaviors of the implementing officials towards the policy and policy

implementation through their own views and also through the eyes of experts, and (3) to observe the outcome of the policy through the response of each individual player in the target group. These incidents cannot be quantified in terms of number.

In addition, it may not be possible to obtain reliable quantitative information to conduct a quantitative study. The public information to be used an indicator of the R&D investment in the private sector is very limited. Further, information about the R&D of each firm is normally treated as confidential and consequently, information obtained from a survey alone is not sufficient or reliable.

In order to obtain the best possible an observable data, four methods were initially planned to be used in the study: document or content analysis, patent analysis, in-depth interviews, and expert panel or interviews. During the process, one more method, a questionnaire, was added in order to speed up the process and to increase the number of informants.

In the study, the analysis of the R&D tax incentive performance was processed according to the principle of summative evaluation; in other words, it was designed to assess the program's results after the program had been established. The summative evaluation seemed to produce the most meaningful results as it requires comprehensive evaluation followed by evaluation of both outputs and outcomes of the policy.

The outputs of the review of the literature were 16 research questions under 7 variables. These research questions were initially specific queries to be addressed in this research that set the parameters of the project and suggested the methods to be used for data collection and analysis. The variables, research questions, and data collection methods for this study are summarized in Table 3.1 below.

Table 3.1 Variables, Research Questions and Observation Methods

	Variables	Research Questions	Data Collection Methods
1)	Policy Formation	RQ 1: How seriously did the implementing organizations support the R&D tax incentive policy when the policy was formulated? RQ2: How strong is the willingness of the implementing organizations to act and attain the objectives of the policy? RQ3: How would the R&D tax incentive policy affect the behavior of the target group in investing in R&D?	Documentary review, interview with the implementing officials, expert interview, or panel.
2)	Policy Instruments	RQ 4: How clear and consistent is the design of the R&D tax incentive policy in terms of the objectives to be achieved, instructions to the implementing officials, and directions for change to the target group? RQ5: What resources are available or allocated for the implementing officials for participation in the implementation?	Documentary review, interview with the implementing official, expert interview, or panel.
3)	Characteristics of Implementing Organizations	RQ 6: How do the organizational goals of the implementing agencies affect the implementation of the policy? RQ 7: How clearly and consistently do the implementing agencies communicate the policy objective within the organizations and set the enforcement mechanism to obtain co-ordination from their officials? RQ 8: How are the monitoring mechanisms set up to facilitate and control the behavior change and the compliance of the target group?	Documentary review, interview with the implementing officials and questionnaire.

Table 3.1 (Continued)

	Variables	Research Questions	Data Collection Methods
4)	Behaviors of Implementing Officials	RQ 9: Do the implementing officials have understanding of and commitment to the policy's objectives and procedures? RQ 10: Do the implementing officials have sufficient technical ability to approve the qualified R&D projects and to monitor the tax claim?	Interview with the implementing official, expert interview, or panel and questionnaire.
5)	Behaviors or Responses of Target Group	RQ11: What are the attributes that the target group should have to align with the policy? RQ 12: Is the incentive offered under the policy sufficient to bring about the desired change in behavior under the policy and what are these behavioral changes? RQ 13: Are the regulations and rights to service communicated clearly and consistently to the target group?	Interview with target group and expert interview or panel and also questionnaire.
6)	Policy Performance – "Output" and "Outcome"	RQ 14: How many of the R&D agencies are registered and how many R&D projects approved? RQ 15: How does the target group respond to the policy in terms of R&D investment stimulation due to the incentive and the amount of tax allowance claimed? In other words, how and under what conditions does the R&D tax incentive and its implementation stimulate the decision of the target group in making their R&D investment?	Documentary review, patent analysis, and interview with the target group and questionnaire.

Table 3.1 (Continued)

	Variables	Research Questions	Data Collection Methods
7)	Social, Economic, & Technological Conditions	RQ 16: What are the social, economic, and technological conditions that affect the performance of the R&D tax incentive policy and how strong are they?	Interview with target group and questionnaire.

3.3 Units of Analysis

As the study was made on the analysis of the implementation and performance of the policy, the units of analysis under this study are both the implementing organizations and the target group. The implementing organizations are the Revenue Department (RD) and the National Science and Technology Development Agency (NSTDA), while the target group is comprised of the juristic partnerships or companies subject to corporate income tax, also referred to as business or private firms.

As both units of analysis are organizations, their behaviors were expressed or represented by the individuals who were their representatives. In the case of the RD and the NSTDA, the representatives are the officials who are in charge of the policy and implementation, and also of monitoring. In the case of business firms are the executives or entrepreneurial owners that can make decisions on their behalf and the heads of the R&D function in the firms.

3.4 Target Population and Sample of the Study

There are three groups of the unit of analysis, as follows:

The first group of the unit of analysis is comprised of the implementing organizations, the RD, and the NSTDA. Both constitute the? Target population and sample. Introduction letters from The National Institute of Development Administration were sent to both organizations to request cooperation and support for

the research. A few interviewed officials were assigned by them.

However, the assigned officials did not provide information that was sufficient to comfort and satisfy the researcher. The researcher therefore asked them to refer and introduce other officials who they thought were appropriate and involved in the policy. In addition, the researcher identified more informants that were involved in the policy implementation and used personal contact to gain access to them. As a result, two officials at the policy level and 5 officials at the operational level of the RD were interviewed. One official at the policy level and 3 officials at the operational level of the NSTDA were interviewed on different occasions. In total, there were 10 informants from this group.

The second group of the unit of analysis was the target group of the policy. The target population consisted of juristic partnerships or companies subject to corporate income tax or business firms that were eligible to claim the R&D tax incentive. The sampling procedures were based on the combination of the concepts of several sampling approaches: purposive sampling, theoretical sampling, snow-ball sampling, and sequential sampling.

1) Purposive sampling: a judgment with a specific purpose in mind was used in selecting the initial samples.

2) Theoretical sampling: additional samples were selected based on the grounded theory developed during data collection and analysis.

3) Snow-ball sampling: additional samples were identified and selected through the network or chain referral of the initial samples.

4) Sequential sampling: samples were gathered until the amount of new information or diversity of cases was filled.

The sampling procedures were as follows:

First of all, the researcher reviewed the list of the registered R&D service providers of the Ministry of Finance in order to identify and classify the industry in which most of them are to identify the targeted industry. Initially, three industries were targeted: agriculture, petroleum, and petrol-chemical and construction materials.

Secondly, the researchers identified the names of registered R&D service providers with personal contact or relationship and then carefully created a first list of the targeted samples. The researcher then identified other companies in the same or

similar industry who were not registered as R&D service providers to find out why they did not register as R&D service providers. The researcher added them in the list.

Thirdly, the researcher used snow-ball technique to expand the targeted samples and carefully select the samples based on the grounded theory developed during the data collection.

Fourthly, as growing theoretical interest guided the selection of sample informants, the researcher diversified cases based on the new insights that they provided. Additional samples were carefully selected, as the researcher developed the grounded theory. A growing theoretical interest guided the selection of sample cases. As a result, the list was diversified purposively into other industries, i.e. pharmaceutical, services, electronics, and furniture, both in and outside the R&D service provider list basically to see whether the data collected from them were same or different from that collected from the first three targeted industries.

The researcher continued to gather data through the interview process until the amount of new information or diversity of data was filled and when they became repetitive. When the researcher was comfortable and satisfied that the number of samples was sufficient and reliable of the data obtained for analysis within appropriate and reasonable timeframe, the searcher stopped the data collection process.

In order to expedite the data collection process, a questionnaire was prepared with the intention of sending it to the heads of the R&D of all of the 164 registered R&D service providers. However, after reasonable effort to obtain mailing addresses and contact persons from many sources, only 106 names could be found. The questionnaire was sent to all of them. At the first attempt only 13 questionnaires were filled and returned. The questionnaires were then resent to the ones that did not respond in the first request. Only 2 more were filled and returned. However, this was viewed as sufficient because the data from that questionnaire were consistent or supported the data collected from the interview. Further, the purpose of the questionnaire was not to measure the results quantitatively but only to obtain information to support and confirm the information from other sources.

Three informants did not want to fill in the questionnaire and asked for an interview instead, so interviews were arranged with them. Further, two other informants, which were educational institutes, requested and did telephone interviews.

Some of the samples were initially based on personal relationship and referral. There was no bias in the information obtained from them. Information about R&D was very sensitive for most of the organizations, and the connection and referral helped to obtain the necessary access. It appeared that the informants with good connection or referral were more open and informative than those without it.

As a result, there were in total 36 informants in this group, composed of:

1) 10 in the agriculture industry and related businesses, e.g. packaging.
2) 5 in the petroleum and petrol-chemical industry.
3) 6 in the construction and household appliance industry.
4) 15 in other industries.

Among the 15 other industries, they were comprised of 1 in the pharmaceutical industry, 2 in electronics, 2 in software implementation and services, 1 R&D service providing firm, 2 engineering faculty of universities, and 2 governmental research organizations. Although there was only one informant from the pharmaceutical industry, it is viewed as sufficient for developing a conceptual category for the grounded theory (Glasser and Strauss, 1967).

A list of the informants in this group with their background information can be seen in Table 3.2: List of Informants in the Target Group.

Table 3.2 List of Informants in the Target Group

No.	Industry				SET Listing		Size		R&D Investment			Registered R&D		Information	
	Petrol.	**Agri.**	**Cons.**	**Others**	**Yes**	**No**	**LE**	**SME**	**High**	**Low**	**No**	**Yes**	**No**	**Exec.**	**R&D Head**
1	*				*		*			*		*			*
2	*					*		*	*				*	*	
3	*				*		*			*		*			*(q)
4	*					*	*			*		*			*(q)
5	*					*		*		*		*			*(q)
6		*				*	*			*		*			*
7		*				*	*		*				*	*	
8		*			*		*		*				*	*	
9		*				*	*				*		*	*	
10		*				*	*			*		*		*	
11		*				*	*		*				*	*	
12		*				*	*			*			*	*	
13		*				*		*			*		*		*(q)
14		*						*			*		*		*(q)
15		*				*	*			*		*	*		
16			*				*			*		*			*
17			*				*				*		*	*	
18			*			*	*			*			*	*	
19			*			*		*			*		*	*	
20			*			*	*			*		*			*(q)
21				*		*		*		*			*	*	
22				*		*		*		*		*			*
23				*		*	*		*			*			*
24				*		*		*		*			*	*	
25				*		*	*			*		*		*	
26				*		*		*			*		*	*	
27				*		*		*					*	*	
28				*		*		N/A				*			*
29				*		*		N/A				*			*
30				*		*		N/A				*			*
31				*		*		*				*			*(q)
32				*		*		*				*			*(q)
33				*		*		*				*			*(q)
34				*		*		*				*			*(q)
35				*		*		*	*			*			*(q)
36				*		*		*				*			*(q)
Total	5	10	6	15	6	30	17	16	6	14	7	19	16	16	19

Note: *(q) = participating with questionnaire.

The 36 informants in this group can be classified according to different characteristics, as follows:

1) **Listed on the Stock Exchange of Thailand**: 6 informants were listed and 30 were not.

2) **Size**: 17 large enterprise, with an annual revenue higher than 500 million Baht, while 16 other were small and medium enterprises and 3 others governmental organizations and education institutes. The 500 million Baht was used as a benchmark because the RD uses it in classifying a large taxpayer for their tax administration purposes.

3) **Level of R&D investment**: 6 informants had high investment (R&D investment higher than 0.5% of annual revenue, while 17 had low investment, and 7 have no investment at all; 0.5% of the revenue was used as a benchmark because the R&D investment target according to the National Social and Economic Development Plan was 0.5% of the GDP.

4) **Registered R&D service provider**s: 19 informants were and 16 are were not.

5) **Informants**: 16 informants were executives or entrepreneurial owners, and 19 were heads of the R& D division.

As described above, the data from the informants in this group were collected by in-depth interview, telephone interview, and also questionnaire.

The third group was the group of experts defined as individuals that were professional tax consultants. They advised or assisted their clients in complying with tax laws and regulations, including in claiming the incentive and negotiating with the Revenue officials to settle disputes that may incur when the officials monitor the deduction of the expenses and allowances. The informants in this group were purposively selected from their profile in the industry. Through personal connection, five informants that were selected and interviewed had experience as tax consultants for more than 15 years and worked with leading accounting and law firms. Two of them also worked with the RD for more than 10 years before leaving and joining the existing firms. Each of them worked with more than 400 companies in the target group. Their views represent more than 2,000 companies in the target group as far as tax matters are concerned.

The researcher is also qualified as one of the experts under the criteria mentioned above. However, the view of the researcher was not combined with the experts' opinions. In this study, if the researcher expresses his opinion, it will be clearly indicated.

In addition, it was decided during the data collection and analysis process to diversify this group to professional management consultants because they would likely be able to provide insight into what their clients did as far as R&D investment or spending was concerned. The two management consultants were purposively selected. Without a personal relationship with them?, it would have been difficult for them to openly disclose information and insights concerning their clients. Those selected provided management, strategic, and business consulting to their clients in both Thai and multinational companies. Both had worked in international management consulting firms for over 10 years before setting up their own firms during the last five years. Each of them handled more than 100 clients during the last five years, so their views represent more than 200 firms in the target group. In total, there were 7 informants in this expert group.

Within a reasonable time frame and with effort, the researcher viewed that the information had become repetitive enough and sufficient for interpretation; the researcher therefore stopped the data collection process with a total 53 of informants for this study.

3.5 Data Collection Method

The researcher captured specific aspects of the phenomena by observing patterns of behavior. The focus was on obtaining full and detailed descriptions from the informants. This study employed the qualitative method in order to obtain the best in-depth data possible through document or content analysis, patent analysis, in-depth interview and to limited case, telephone interview, expert interview and also questionnaire.

3.5.1 Documents or Content Analysis

Documentary data were important for this study because the key variables

included policy formation, design, and implementation. It was necessary to study documents in order to analyze how and why the policy was formed, designed, and implemented. There were three main sources of documents:

1) RD and NSTDA

The official documents of the RD and the NSTDA relating to the formation and design of the policy and the policy implementation were the primary sources of information. Documents included letters, correspondences, notes and minutes of meetings, strategic plans, annual reports, laws and regulations, internal working procedures and rules, seminar papers, training materials, and internal communications about the policy. The documents became available through introduction letters of NIDA and in their websites.

Most of the documents were governmental and were not allowed to be photo-copied. Upon the review of those documents, key notes were made and also key messages were also copied by hand for future reference.

2) Target Group

After the list of the targeted informants was developed and before the interview of each informant took place, documents about them that were publicly available or at their website were obtained and reviewed to prepare for an interview. Some informants also provided their documents for further information. Various documents, such as annual reports and firm profiles or brochures were investigated to supplement the data analysis.

3.5.2 Patent Analysis

Data about the patent applied for and registered by the registered R&D service providers were collected from the database of the Intellectual Property Department, the Ministry of Commerce. It covered the periods before and after the registered R&D agencies were registered with the Ministry of Finance.

3.5.3 In-Depth Interviews

The in-depth interview was used as the main source of data collection in this study. An in-depth qualitative interview means repeated face-to-face encounters between researchers and informants directed towards understanding informants'

perspectives on their experiences or situations as expressed in their own words. The in-depth interview was semi-structured so that it would allow for the free flow of the ideas of the informants in order to obtain rich and insight data..

The interview was properly and consistently planned and semi-structured based on the research questions that were modified over time, if and after the working hypothesis was modified. Guiding questions were made and changed over the period of the data collection process. The list of the final guiding questions can be found in Appendix A.

Before each interview, more detailed questions were prepared to fit each informant and also based on information about them obtained before the interview. They were used only as a guide. The actual questions asked very much depended on the informants' responses and upon the atmosphere during the interview. Before the end of the interview, the prepared guiding questions were reviewed in order to ensure that all questions were covered and that the expected information had been obtained.

The interview was conducted with individuals whose view could represent the views of the sample organizations and lasted for about one to one and a half hours. Notes on key issues were taken during the interview. All of them were recorded and transcribed. The interview transcripts were reviewed by comparing with the notes soon after the interview. At the same time, the information was coded per the research questions or those modified. The review and coding of each interview report took about the same time as the interview itself.

Two telephone interviews were made as specially requested by the informants, who were hesitant to fill in the questionnaire. Each interview took approximately 10 minutes and the notes were immediately made after it was completed. It was short because the informants were educational institutes that had applied for the registration for a symbolic reason and never applied for approval of any R&D projects.

3.5.4 Expert Interviews

The experts were tax professional tax consultants that were highly experienced in dealing with the officials of the RD in tax affairs on behalf of their clients. Their opinions or views were very useful and fruitful for this study because they had helped clients in interpreting tax laws and regulations and advised them in how to comply

with the laws and regulations and whether and how to obtain special allowances.

They not only provided rich insight about the tax compliance of their clients but also expressed their view on what they thought of the design of the R&D regulation, how clear it was, how consistently it as implemented, and whether it fit their clients' attributes. They shared their views on how their clients responded to the R&D tax incentive policy. They also shared their experience in dealing the monitoring mechanism of the R&D tax incentive policy; namely, how the registration was made, how the R&D project was made, and how the Revenue officials monitored the claim of the incentive.

The experts were expanded to management consultants who provided management, strategic, and business consulting services for their clients, both in Thai and multinational companies. For this study, they provided insightful information about their clients' perception and views on R&D investment or spending and on the R&D tax incentive.

3.5.5 Questionnaire

In order to expedite the data collection process, at the time when the interview process was nearly completed it was decided to prepare and send a questionnaire to the heads of the R&D of all of the 164 registered R&D service providers, although this was not initially planned. The questionnaire was prepared based on the working hypothesis at that time, which was modified from the initial hypothesis based on the information collected to date, an English version of which is enclosed in Appendix C and D.

The questionnaire had two formats: one for the service providers that conducted R&D for in-house use and the other for those that provided R&D services for others. This was carried out in Thai in order to make it easier for the informants in answering it. The questionnaire was decided in such a way that the informants would provide prescriptive answers similar to answering an interview questions. Therefore, no scale was used for the quantitative measurement.

It was intentionally addressed and mailed to the heads of the R&D division of the registered R&D service providers searched through several sources, including telephone calls. The heads of the R&D division were selected because most of the

informants that participated in the in-depth interview were top management or entrepreneurial owners of the target group. The researcher viewed that the heads of the R&D function could provide information from different points of view, which could support or challenge the information obtained in the interview with the top management or entrepreneurial owners. This would increase the reliability of this study.

The data collection by these five methods was made simultaneously with the data analysis, the process of which is described below.

3.6 Data Analysis Method

In a qualitative study, data collection and analysis go hand-in-hand. As advised by Taylor and Bogdan (1984), the researcher gradually made sense out of what was being studied by combining insight and intuition with an intimate familiarity with the data until the researcher recognized the patterns that emerged in the data.

Data analysis was done simultaneously with data collection. The 16 research questions were used as an initial conceptual model for data collection and analysis. Once the data had been collected, they were organized into categories and created themes or concepts, based on the initial model. The researcher analyzed the data by organizing it into categories on the basis of themes, concepts, or similar features and developed new concepts, formulated conceptual definitions, and examined the relationships among concepts. If the data to be collected differed from the initial model, new research questions and working hypothesis were developed and challenged until they could be firmly falsified (Neuman, 2000).

Collected data were coded as guided by the research questions initially. Coded data may lead to new working hypothesis or questions. Data analysis involved examining, sorting, categorizing, evaluating, comparing, synthesizing, and contemplating the coded data, as well as reviewing the raw and recorded data. Through coding, the data were mechanically reduced and categorized into themes. As guided by Strauss and Corbin (1998), the coding was done in three steps.

3.6.1 Open Coding.

Open coding was carefully and consistently performed during the pass through, reading and re-reading the data collected in the form of documentary and the printed – out transcripts and notes. The raw data were sorted into manageable conceptual categories using an open coding approach (Strauss, 1998). Themes and initial codes were consistently assigned based on the initial research questions as the first attempt to condense the collected data into categories.

Open coding is so named because the categories or concepts are flexible and open to modification as analysis progresses. The use of the conceptual model was therefore flexible. After the open coding, a list of the themes and working hypothesis was developed, which was basically modified from the initial conceptual model and the research questions.

3.6.2 Axial Coding

During open coding, certain "patterns" or repeated relationships between properties and dimensions of categories begin to appear (Strauss and Corbin, 1998). Axial coding was the second pass through of the data collected. Thus, in the second phase of coding, the re-reading across all the interview transcripts and other documents to specifically identify such similarities and differences using a pattern coding approach. At this level, the researcher focused on the actual interview responses in the context of the interview questions asked and assigned code labels for thematic categories one category at a time.

This coding stage is useful for identifying patterns or ways in which key concepts cluster together or relate to one another (Neuman, 2000). The focus was on the list of the themes or working hypothesis developed during the open coding more than on the data. Additional codes or ideas also emerged and were noted and this led to dropping some themes and examining others in greater depth. The focus was on the causes and consequences, conditions and interactions, and the strategies and processes, and the categories and concepts that clustered together. Data were then put back together in new ways by making connections between categories (Strauss and Corbin, 1998).

3.6.3 Selective or Thematic Coding

Selective or thematic coding was the last pass through the data, which involved scanning the data and previous codes. During the final review of the data, identified themes were used to aid in its analysis and interpretation and to identify structural relationships between the thematic categories. Cases that illustrated themes and that made comparisons and contrasts were selected after most or all of the data collection was completed. The major themes or concepts that ultimately surfaced were generalized and discovered through the coding.

Throughout this process, the researcher attempted to link emerging themes and patterns, particularly with the literature on policy analysis theory, with the preliminary propositions. The literature review was simultaneously conducted once again during the coding process in order to find the well-established concepts or theories to support or challenge the themes and concepts discovered during the data analysis process. If the well-established concepts or theories challenged or conflicted with the discovered themes and concepts, additional data were collected or archived until the researcher was satisfied that one of them could be falsified.

The data analysis was undertaken mainly under the successive approximation approach, whereby the modified concepts and the model approximated the full evidence and were modified over and over to become successively more accurate (Neuman, 2000). The researcher began with the research questions and a framework of assumptions and concepts, and then probed the data, asking questions of the evidence to see how well the concepts fit the evidence and revealed features of the data.

New concepts were created by abstracting from the evidence and by adjusting the concepts to fit the evidence better. The researcher then collected additional evidence to address the unresolved issues that appeared during the first stage, and repeated the process. At each stage, the evidence and the theory shaped each other.

3.7 Limitations of the Methodology

The study was made under the following evaluation criteria and in such a way that the reliability and validity would be maximized; also ethical considerations were

taken into account.

3.7.1 Evaluation Criteria

The evaluation criteria that were used in this study are an effectiveness model or a goal-attainment model that aims to evaluate whether the goal of the policy is attained. As the goal of the policy was to encourage the private sector to engage in more research and technology development, the study evaluated the stimulation effect of the tax incentive on private R&D investment.

The study created no side-effects (side-effects model) of the policy nor exercised an influence on the efficiency of the policy (cost-effective model). Further, the study did not attempt to find out whether the benefit of the R&D tax incentives (spill-over effect) exceeded the cost to government.

3.7.2 Validity and Reliability

Within a reasonable time frame and financial resources, best effort was made to ensure validity and reliability.

Validity in qualitative research is defined as the extent to which the data are plausible, credible, and trustworthy (Neuman, 2000). The validity was achieved by 'being consistent in coding the raw data in such a way that another person could understand the' themes and arrive at a similar conclusion. Internal validity was enhanced by providing the validity of a causal inference. Although a variety of techniques was used, best effort was made to ensure that they collected information consistently. External validity was enhanced by generalizing the findings and through the purposive and theoretical selection of informants rather than by statistical selection.

Furthermore, the validity of data interpretation was improved throughout the dissertation by continually linking observations and interpretations with the literature that framed this study. In this manner, it can be seen that such interpretations are, in fact, the product of conscious analysis. Interpretations and findings were further substantiated with the actual words of the research informants where possible.

A major assumption about reliability when conducting qualitative research is the acceptance that different researchers or researchers using alternative measures will obtain distinctive results because each researcher sees data collection as an interactive

process (Neuman, 2000). This was achieved in this study through the use of audit trail and triangulation.

Meticulous records of the process of the study were kept so that others can recapture the steps and reach the same conclusions. An audit trail was made on the raw data to evidence how the data were reduced, analyzed, and synthesized. The researcher's process notes were made to reflect the ongoing inner thoughts and reactions. Data were solicited from multiple and different sources as a means of corroborating evidence and illuminating a theme or a theory.

The reliability was enhanced by triangulation—collecting data from multiple and different methods and data sources. Increased agreement between the sources permitted a more reliable interpretation of data. The data were collected using five different methods: document or content analysis, patent analysis, in-depth interview and to a limited extent, telephone interview, expert interview, and finally questionnaire. The views of the experts were also collected particularly in order to gain rich insight perceptions concerning policy formation and implementation from different angles.

Furthermore, in selecting the informants, an attempt was made to gain data from different viewpoints; namely, from the RD and the NSTDA. Officials at both the policy level and the operational level were selected and interviewed. For the target group, the informants were both top management or entrepreneurial owners and the heads of the R&D division. And finally, for the experts, the data were collected from tax consultants and also management consultants.

3.7.3 Ethical Considerations

The researcher considered several approaches for how to identify and select the informants in this study. In order to maximize participation and to provide necessary environments in which the informants would be comfortable, and to provide maximum insight from their experiences and views, the researcher opted to provide full confidentiality.

This decision was reaffirmed by repeated expressions from several informants, that they did not want their names, positions, or organizations, and most importantly information about their organizations, to be disclosed. For that reason, the researcher

ensured them that no name or identification would be mentioned or referred to in the dissertation, and that the information and results would be used for academic purposes only. This statement was clearly made before the interviews and in the letters requesting the informants to fill in the questionnaire.

Furthermore, no specific reference would be made to governmental documents that were not available to the public. Although some documents were copied by hand, no specific reference would be made in order to protect the sources.

3.8 Summary

The research methodology was designed and used for this study to ensure that reliability and validity would be enhanced and that ethical considerations were taken into account. Best effort was made to ensure reliability and validity by being consistent through data collection and coding and in interpreting the raw data. This was achieved by the use of audit trail and triangulation. An audit trail was made on the raw data to evidence how the data are reduced, analyzed and synthesized and process notes were made to reflect the ongoing inner thoughts, hunches and reactions.

The data were collected from multiple and different methods and data sources. The data were collected using five different method: document or content analysis, patent analysis, in-depth interview and to a limited extent, telephone interview, expert interview, and as finally expanded, questionnaire.

The informants were selected purposively and theoretically. Effort was also made to have a variety of informants; namely, officials at both the policy and operational levels for the governmental organizations. The top management or entrepreneurial owners and heads of the R&D division in the target group, and finally both tax and business consultants.

Data analysis involved examining, sorting, categorizing, evaluating, comparing, synthesizing, and contemplating the coded data, as well as reviewing the raw and recorded data. Through coding procedures - open coding, axial coding, and selective or thematic coding, data were reduced and categorized into the themes, concepts, and models present in the next chapter.

CHAPTER 4

EVALUATION OF R&D TAX INCENTIVE POLICY

4.1 Introduction

This chapter analyses the data collected in order to evaluate the effectiveness of the Thai R&D tax incentive policy and to initially identify the key factors that impact its effectiveness, which is the objective of this study.

The data analysis begins with the evaluation of the policy in order to conclude how effective the policy has been. After the result of the evaluation is concluded, the implementation analysis will further discuss the key factors relating to the formation and implementation of the policy that cause such a result.

4.2 Evaluation of the Effectiveness of Policy

The evaluation criterion that is used in this study is the effectiveness model (goal attainment model), aiming to evaluate whether the goal of the policy has been attained. The evaluation of the effectiveness of the policy is to answer the question of "whether the goals of the implementation of the policy have succeeded or not?" The question is whether output or outcome should be chosen. Hill and Hupe (2002) respond that in principle, it seems desirable to choose the outcome wherever possible, inasmuch as the objective is to judge policies in terms of what they really achieve; but there are three problems that follow from that.

First, outcomes may be influenced by factors that have nothing to do with the policy intervention. Therefore research models can try to factor in the environmental variable.

Second, a judgment about outcome may be a judgment about the appropriateness of the policy, not about its implementation—the policy may be an

inappropriate response to the problem. The classic issue here concerned “symbolic policy.” When a symbolic policy fails, this should not be seen as implementation failure if there is simply no realistic consideration of the relationship between the mean and end.

Third, the question is whether or not unambiguous and agreed outcome variables can be established. The choice of an outcome variable may require the researcher to recognize competing employ goals and indeed perhaps make a choice as to “whose side is on.”

Outcomes are real results that are actually achieved, whatever the objectives of policy may have been intended or unintended. At the same time, outcomes are not government action (Lane and Ersson, 2000)). The remark of Royal Decree No. 297 B.E. 2539 (1996) provides a policy statement, stating the rationale as follows:

> As it is appropriate to exempt corporate income tax for juristic partnership and company at 100% of expense for a fee paying for research and technology development to government agencies or private sector in order to promote the private sector to do more research and technology development, the Royal Decree is enacted.

The expected outcome of the policy is for the private sector, as the target group, to do more research and technology development. Therefore, the measure for the evaluation under this study will be whether the R&D incentive policy results in stimulating R&D investment in the private sector. In order to address the three concerns mentioned, the analysis will take the following into consideration.

First, the conceptual framework under this study takes into account the environments as one of the independent variables. Second, the appropriateness of the policy will not be taken into account. Third, the goal seems to be simple, i.e. whether the target group does more R&D as a result of the policy. In reality, it is very difficult to find out the answer. The only way seems to be to ask the target group one by one whether they do R&D more than what they would have done without the policy. From the interview, it was difficult to obtain and exact yes or no answer, but the best attempt was made to reach a conclusion.

Although the evaluation focuses on the outcome of the policy, the output is discussed and evaluated. The evaluation of the output is an important indicator for a proper evaluation of the outcome. The evaluation begins with the overview on national R&D investment as the big picture so that the extent to which the policy contributed to this big picture can be evaluated.

4.2.1 Overview on National R&D Investment

An overview of R&D investment in the country is useful for the evaluation of the policy; namely, if the overall R&D investment of the country has improved, then whether and how much the tax incentive policy has contributed to such improvement over the policy period will be analyzed. On the other hand, if the overall R&D investment of the country has not been improved, then why the tax incentive policy has not resulted in the stimulation of R&D investment as expected will be analyzed.

The NSTDA has provided an overview of R&D investment in Thailand at their website, as follows:

4.2.1.1 Investment in Research and Development

1) Thailand's total expenditure in research and development in terms of percentage of GDP is Low.

(1) For 2005: 0.24 %.

(2) At the same time, Malaysia invested 0.63%, which is 2.5 times more than Thailand. Furthermore, industrialized and newly industrialized countries invested 8-10 times more in research and development (as compared to Thailand) (Singapore 2.36%, Taiwan 2.52%, Korea 2.98%, United States 2.67%, and Japan 3.17%).

2) With each year, Thailand's total expenditure in research and development in terms of percentage of GDP has increased very minimally

(1) Total expenditure in Research and Development in terms of percentage of GDP has been around 0.24 -0.28 since 1999.

(2) When compared to the same period, other countries, such as Korea, China, and Israel, spent twice as much on research and development.

3) In 2005, Thailand spent 16,560 billion baht on research and development

(1) Approximately 60% of this investment was contributed by the state, while 40% came from the private sector.

(2) In many counties, the private sector invests more in research and development than does the government sector.

4.2.1.2 Research and Development Personnel

1) As compared to the total population of Thailand, the number of people involved in research and development is low.

(1) In 2005, 5.7 out of every 10,000 Thais were involved in research and development.

(2) This is compared to other newly-industrialized countries where out of 10,000 people, 44.8 in Korea, 65.5 in Taiwan, and 65.8 in Singapore were involved in research and development. And in industrialized countries such as Japan, 70.2 people out of 10,000 were involved in research and development.

(3) In 2005, Thailand had 37,000 personnel working in research and development.

(4) This number has almost doubled from 1999, when there were only 20,047 people.

4.2.1.3 Patents and Intellectual Property

1) Compared to the total population of Thailand, the number of Thai patents is low.

(1) In 2005, Thailand registered less than 1 patent per 100,000 people.

(2) This is compared to 874 for Korea, 991 for Singapore, and 1,230 for Taiwan.

2) In 2007, Thailand registered 1,824 new patents, down from 1,878 in B.E. 2006, and 2,044 in 2004, but more than the 1,322 registered in 2005.

This information implies that the NSTDA depresses with the R&D investment of the country. With the effort that has been made to stimulate R&D investment, Thailand falls far behind the comparable countries, i.e. Japan (3.17%), U.S.A. (2.67%), Korea (2.98%), Taiwan (2.52%), Singapore (2.36%), China (1.33%), and Malaysia (0.63%).

The National Economic and Social Plan No. 5 (1983 -1986) to the Plan No. 10 (2007 -2011) set the target on the R&D investment at 0.5% of GDP. The target is not high compared to that of comparable countries. Throughout the period, the actual investment was about half of the target, or 0.25%. In 2005, Thailand spent only 16,560 million Baht for R&D counting at 0.24% of GPD, which represents again less than half of the target.

The overall picture of R&D seems to be even worse and more depressing when taking into account that about 60% of the R&D investment was made by the government sector and the other 40% made by the private sector. In other words, the private sector invested only approximately 6,624 million Baht, representing 0.096% of GPD in 2005.

A depressingly noted in the NSTDA's website, in many countries, the private sector invests in R&D more than the government sector.

Statistical data about R&D expenditures in Thailand from the Thailand Annual Research Report 2003, the National Research Council of Thailand, showed that R&D investment increased from 0.10% to 0.22% of the GDP, and RD investment of private firms increased from 466.3 million Baht to 4,009.2 million Baht in the years 1997 to 2001. This means that from 2001 to 2005, R&D investment increased from 0.22% to 0.24% of the GDP, and RD investment of private firms increased from to 4,009.2 million Baht to 6,624 million Baht.

From the above analysis, it can be concluded that R&D investment in the private sector in the past 10 years was still very low. The R&D tax incentive, which has the main goal of stimulating R&D investment in the private sector, appears to have low effectiveness. However, the incentive should help the private firms to improve their cash-flow, at least in theory. Thus, the policy should have some effect, more or less, which will be further examined.

4.2.2 Policy Output

The goal of the R&D tax incentive policy is to promote the private sector to do more research and technology development. RQ 14 describes the output as "how many of the R&D service providers have registered and have had R&D projects approved?" The outputs of the R&D tax incentive are initially determined as the number of

registered R&D service providers and the number of R&D projects and the amount approved.

As due consideration that the output is described as the decisions or actions of the implementing agencies and the compliance of target groups, the output should include the amount of tax allowance claimed and the number of patents applied by the R&D service providers, which were included as the outcome in the initial conceptual model of this study. Therefore the evaluation of the output of the policy is as follows:

4.2.2.1 Number of registered R&D service providers

As of December 2008, there are 167 names registered as R&D service providers with the MOF. From a review of the list, it appears that four names are the same firm but different branches. Therefore, there are 164 firms registered as R&D service providers with the MOF. Among them, there are 154 organizations in the private sector, 6 governmental organizations, 3 government universities, and 1 private university.

Since NSTDA began to be involved in the implementation of the policy in 2001, another dimension to be looked at is the time dimension before and after NSTDA involvement. From 1996 to 2000, there were 33 organizations registered as R&D service providers with the MOF or, in average, 6.6 organizations a year. During 2001 - 2008, there were 131 organizations registered as R&D service providers with the MOF,, or in average 16.4 organizations a year. From the period when NSTDA became involved in the implementation, the average number of organizations registered as R&D service providers with the MOF increased from 6.6 to 16.4 organizations a year.

4.2.2.2 Number of R&D projects and amount approved

During the period of 1996 to 2000, when the NSTDA was not involved in the implementation, there was no requirement to obtain a pre-approval for an R&D project that would be eligible for a tax incentive. Employers of the registered R&D service providers could claim any amount of fee paid to the service provider for a R&D project, as they considered as qualified for the incentive that their own discretion and risk. There was no information about the number of projects available during this period.

From 2001 onwards, if the employer obtained a pre-approval from NSTDA, it was considered that the project was qualified as R&D under the definition under the law, and that the fee was eligible for a 200% deduction. The number of projects and the value of the project applied for and approved by NSTDA during the period of 2001 to 2008 are shown in Table 4.1: Numbers of projects and value of the project applied for and approved.

Table 4.1 Number of Projects and Value of the Project Applied for and Approved

	Projects Applied		Project Certified	
Budget Year	Number	Value (M Baht)	Number	Value (M Baht)
2002	102	607.42	23	55.86
2003	45	190.03	71	165 .68
2004	73	282.42	49	141.16
2005	79	208.01	78	168.19
2006	118	284.23	111	179.84
2007	172	593.11	130	337.81
2008	143	552.30	136	464.97
Total	732	2,717.52	598	1,513.52

The above information was given by the NSTDA officer in charge of the policy during the interview.

In seven years of the NSTDA's involvement in the implementation, 732 projects with the value of 2,717.52 million Baht were applied for and considered, and 598 projects with the value of 1,513.52 million Baht were approved.

1) Average per year: 104.5 projects applied for and 85 .5 projects approved in a year.

2) Value per project: 3.7 million Baht for the project applied for and 2.5 million Baht for the project approved.

3) Success rate: 80.5% in terms of number of projects and 55.7% in terms of value of the project.

4) Trend: increasing both in terms of number and value of project applied for and number and value of projects approved.

The NSTDA's officers in charge of the policy both at the operation and policy levels seem to be satisfied with their performance. The 5 officers can review and make proposals to the Committee approximately 12 projects a month, which is just enough to handle the present workload.

4.2.2.3 Amount of tax allowance claimed

The data about of the actual amount of tax allowance claimed are not available at the RD or the NSTDA. Obviously, the NSTDA does not have such data, as the R&D registered R&D service providers need not claim the allowance, nor disclose the amount claimed by them.

They claim the allowance in the computation of their corporate income tax and file a tax return with the RD. However, in the tax return form (PNR. 50) used until 2004, the claim of the R&D allowance was combined in one item with other allowances. So, it was not possible to find out how much R&D allowance was claimed. Since 2005 onwards, the corporate income tax return form (PNR. 50) was revised and the claims of different allowances under the Revenue Code have been separate items. Data on the about of the actual amount of tax allowance claimed should have been available at the RD. Unfortunately, the RD did not input data in every item in the tax returns in the computer system. No data about the actual amount of tax allowance claimed was available at the RD for this study.

It is reasonable to assume that the value of the project approved by the NSTDA is the amount of the tax claimed, because the applicants may not actually spend or accordingly claim the full amount of the approved value. The value of the project approved should be considered as the maximum amount of the tax claimed because it is understood that the applicants cannot claim about of the actual amount of tax allowance claimed is not eligible at the RD. Therefore, the maximum value of an R&D project eligible for an incentive during the period from 2001 to 2008 was 1,513.52 million Baht. Using the normal rate of corporate income tax of 30%, the amount of tax allowance granted under the policy from 2001 to 2008 would not exceed 454.05 million Baht or, in average, 64.86 million Baht a year.

4.2.2.4 Analysis of the Output Indicators

It is difficult to evaluate how well the policy has performed without a benchmark. From a review of the literature, there appears to be a comparison available in the case of Australia. In 1985-86, Australia introduced one of the most generous tax incentives in the world: the R&D taxation concession, which allowed firms to deduct a range of expenses at up to 150 percent (but now 125 percent). The trends in the use of the R&D tax concession in Australia from 1985 - 1996 are shown in Table 4.2.

Table 4.2 Trends in the Use of the R&D Tax Concession in Australia

Year	Registrants	Eligible R&D	BERD	Eligible share	Eligible R&D Per firm
	No.	A $m	A $m	%	$
1985-86	2 561	..	948.0	..	..
1986-87	1 674	734.7	1 288.6	57.0	438 889
1987-88	2 092	1 103.3	1 505.8	73.3	527 390
1988-89	2 158	1 293.1	1 798.3	71.9	599 212
1989-90	2 363	1 595.9	1 989.6	80.2	675 370
1990-91	2 510	2 241.4	2 099.8	106.7	892 988
1991-92	2 818	2 576.0	2 364.6	108.9	914 123
1992-93	2 738	2 723.3	2 862.6	95.1	994 631
1993-94	3 277	3 324.5	3 120.0	106.6	1 014 495
1994-95	3 704	4 000.9	3 489.5	114.7	1 080 157
1995-96	3 963	4 489.7	4 242.9	105.8	1 132 904
Trend growth rate 1985-86 to 1990-91	0.028	0.511	0.156	0.355	0.483
Trend growth rate 1990-91 to 1995-96	0.094	0.143	0.136	0.006	0.049

Source: Mohnen, 1999.

The table shows that there were 1,674 registrants claiming 734.7 million A$ for an R&D tax allowance in the first year of implementation and this increased to 3,963 registrants claiming 3,963 million A$ R&D for a tax allowance in 1995-96, ten years later. This was far higher than what happened in Thailand, which had 5 registered R&D service providers in the first year and this increased to 164 registered R&D service providers for 136 projects with a value of 464.97 million Baht, about 10 years later.

Australia introduced the R&D tax incentive approximately 10 years before Thailand, with the lower incentive of 150% compared with 200% in Thailand. However, Australia appears to have significantly more claimers and higher amounts of allowance claimed than Thailand. It could be argued that Thailand was less-developed than Australia and therefore it is not comparable.

But taking into account that Australia introduced the incentive in 1986 and its data started from 1986, compared with the data of Thailand in 1996. The level of development of Australia in 1986 should not have been much different from Thailand in 1996. This comparison reasonably implies that the R&D tax incentive in Australia was more effective than in Thailand.

The Australian study by the Bureau of Industry Economics in 1993 revealed that only 17% of Australian R&D was performed in response to tax incentives, which implies an incremental growth of research between $0.60 and $1.00 per dollar of tax expenditure. In 2005, the private sector in Thailand invested only approximately 6,624 million Baht, representing 0.096% of the GPD. The NSTDA certified 78 projects with a value of 168.19 million Baht, representing only 2.54% of total R&D investment. This implies that most of the R&D investors in Thailand still did not respond to the tax incentive.

The Australian Bureau of Industry Economics Study in 1993 reported an incremental growth of research between $0.60 and $1.00 per dollar of tax expenditure. Some other studies have reported that R&D tax credits induced $0.80-1.74 additional R&D spending per dollar of forgone tax revenue (Hall, Bronwyn H. and Van Reenen, 2000).

In 1995 and 1996, the Department of Finance and the Revenue of Canada conducted a joint evaluation of the performance of the income tax incentive for R&D. It was found that R&D played a very important role in corporate strategies in order to remain competitive. In terms of cost-effectiveness, each dollar of tax revenues forgone as a result of the tax incentive generated $1.38 in additional R&D spending, plus impacts of the spillover benefits.

From the studies in foreign countries, mainly in OECD countries, it could be roughly concluded that one dollar of tax revenue forgone in the R&D tax incentive policy stimulates about the same amount of additional R&D investment. As the amount of tax allowance granted under the policy from 2001 to 2008 would be about 454.05 million Baht in total, or 64.86 million Baht a year. Therefore the incentive might have increased the R&D investment at approximately 65 million Baht a year from 2001 to 2008.

In 2005, the private sector invested only 6,624 million Baht in R&D. The value of the R&D projects approved by the NSTDA eligible for the incentive was only 168.19 million Baht, representing only 2.54% of the total R&D investment by the private sector. This may imply that the incentive might have increased the R&D investment at approximately 2.5% of the total R&D investment in 2005.

From the above analysis of the output variable, it is reasonable to conclude, initially, that the effectiveness of the R&D tax incentive in Thailand has been low and the amount of additional R&D investment stimulated by the policy was about 454.05 million Baht in total, or only 64.86 million Baht a year, on the assumption that one Baht of tax revenue forgone in the R&D tax incentive policy stimulates about the same amount of additional R&D investment. This initial conclusion will be examined further.

4.2.3 Policy Outcome

Given the policy objective, the study examines research question RQ 15: How does the target group respond to the policy in terms of R&D investment stimulation due to the incentive and amount of tax allowance claimed? As the term outcome for this study has been redefined as the results that are actually achieved, whatever the objectives of policy may have been, whether intended or unintended, the expected

outcome of the policy is for the private sector, as the target group, to do more research and technology development. The amount of tax allowance claimed was considered as output, as discussed above. Therefore, the research question regarding the outcome can be elaborated into two questions. First, did the tax incentive cause firms to make changes in their behaviors on R&D spending or investment? Second, did firms respond to the tax incentive in a predictable fashion?

The R&D incentive policy is one of the distributive programs that provide tangible government benefits in the equivalent form of payments to the private firms, from which the government is hoping to obtain the desired activity; namely, to do more R&D. The policy provides a benefit at 30 Baht for every 100 Baht spent by the private firms for R&D. The benefit represents a reduction of their tax liability and consequently increases their cash flow. The policy should at least in theory have high effectiveness (Franklin and Ripley, 1982).

An examination was made by a review of the views of the officials in charge of the policy, the tax experts on the performance of the policy, and then the responses of the private firms in the target group towards the policy were explored in order to evaluate whether the policy has high effectiveness, as hypothesized.

4.2.3.1 RD and NSTDA Officials

The RD, as the agency governing the policy, did neither conduct any formal evaluation of the policy, nor did it have a plan to do so. The examination in this study was made by requesting the personal views and opinions of the officials at the RD and the NSTDA, who have been heavily involved in the implementation of the policy, and the reasons for such views and opinions. This could lead to insights not only into whether or not they view the policy as effective, but also the factors that led to the performance of the policy.

The examination started with the two officials of the RD at the policy level. The immediate response of a high-ranging official at the RD and also at the MOF to the question of how effective the policy has been was the following:

> No, not effective, not useful at all. What a waste of government revenue it is.

Then, asking him why he gave such a bad evaluation of the policy, he provided a number of reasons. Firstly, he viewed that the RD has no knowledge about technology research and development. The administration of the RD stressed only control and investigation and did not support taxpayers to do R&D. Secondly, it is not the culture of the RD to provide an incentive but to pinpoint mistakes and to collect more tax. That culture now is out of date. Finally, whether the taxpayers invest in R&D depends on the vision of the management. If the management views R&D as important, necessary, they will do it regardless of whether the government gives an incentive or not.

Another official at the RD, who was in charge of the policy from the formation of the policy to its implementation, for more than 10 years until recently transferred to a new function, responded to the same questions as follows:

> It is better than not having any thing, isn't it? At least it ought to stimulate some R&D activities. Foreigners ought to see that Thailand tries to promote. It ought to stimulate, as tax directly impacts the private sector. He further said that:
>
> Most people don't even know what “research and development” is, much less actually carry it out. And if the benefit is wrongly applied, they face fines. Some may even carry out the R&D but are afraid to utilize the benefits, while others have no motivation to jump into the research and development arena at all. Thais, in general, do not place much importance on this field, with most of the R&D being carried out by large companies who have the benefit of legal counsel and some even have retired revenue department officers acting as advisors to bolster their confidence in utilizing the benefits. Aside from this, there is no motivation. There may be some incentive, but it is not enough.

It seems as though the RD official, who heavily worked on the policy for more than 10 years, hesitates to claim the success or effectiveness of the policy. He did not give clear reasons but some of his statements may imply them. He argued that some taxpayers may not know how to obtain the incentive, while some may know but view that if they claim the incentive wrongly, they will be penalized. He further stated that it is not the direct responsibility of the RD to promote the policy. The RD has not been proactive and would only join the seminars organized by the NSTDA when asked for cooperation. Finally, he said that the RD officials will not advise the taxpayers to claim the incentive if they encounter a case where the taxpayer does the R&D. the RD has no policy to go that far. The officials may not know whether the R&D activities undertaken by the taxpayer qualify for the incentive.

The NSTDA officer who is in charge of the policy responded to the question whether the policy has been successful:

> The number of the projects and also the value of the projects applied for our approval have gradually increased. I think it fairly motivates but it is not that convenient.

There were a number of causes for such inconvenience mentioned during the interview.

Firstly, the claimers are required to separate the account books for R&D activities. Such requirement incurs expenses and it may not be worthwhile to do, especially for medium-size companies.

Secondly, the approval process is a project basis. Some firms argued that their R&D activities are continuous activities and cannot be divided into many small projects and consequently, cannot meet the requirement. He named a firm, which is one of the largest companies in the country and which is listed in the SET, as an example. (Such a firm was one on the participating informants and the head of its R&D center was interviewed. This is one of many reasons that the firm did not or cannot claim for the incentive, although the firm spent a great deal of money on R&D every year.)

Thirdly, the firms perceive that if they disclose more information to the RD officers, the officials may pay more attention to them and consequently will be audited more often. Because the audit is done on the past, they will be penalized for mistakes.

Fourthly, the attitude of the RD officers also has a big impact, as they seem to emphasize investigating rather than promoting. Such an attitude scares firms away from the incentive. Similar questions were asked of two NSTDA officials in charge of the administration of the policy. They were asked the incentive motivate the private firms to decide to do or to increase their R&D investment. They responded with the following:

> It does not have much impact. Actually, the tax measure is at the end of the process (for making decisions). If the management sees the importance of R&D, they may do it even though there is no tax incentive. There may be impact on some groups to increase their R&D investment. ..... . From the statistic, there are thousand of firms that do R&D, but if asked why they do not claim the tax incentive, most of them would respond that they do not want to involve the RD.

It is reasonable to conclude at this stage that the officials who are involved with the policy in both the RD and the NSTDA evaluated the policy as having low effectiveness. From their views, the factors that impact the effectiveness are as follows:

1) The requirement of the policy to separate the account books for R&D activities from others and the approval process that is based on project by project.

2) The administration of the RD culturally stresses only control and investigation and does not support taxpayers to do R&D. Private firms perceive that the culture of the RD is not to give an incentive to collect more taxes, and they will be penalized if they make mistakes. The firms view that the RD is not sincere in granting the incentive.

3) Whether the taxpayers invest in R&D depends on other factors, e.g. the vision of the management impacts the R&D investment decision more than the tax incentive. If the management views the R&D as important, as necessary, they will do it regardless whether the government gives an incentive or not.

These three factors are examined and explored further in the following relevant variables.

4.2.3.2 Tax Experts

All five tax experts participating in the study (six, if including the researcher) shared the same view—that the policy has very low effectiveness, for different reasons.

First, four of them complained about the lack of clarity. It is not clear which R&D activities qualified for the incentive. The definition of R&D is not clear and not even understandable. Further there are no details on what kind of expenses can be included, and more importantly when and how to deduct the incentive; namely, whether such expenses and the incentive attached to it need to be capitalized and amortized over the period of 10 years or can be deducted when they incur or when the NSTDA approves the project.

Second, they expressed the notion that private firms have serious concern about the attitude and culture of the RD, which focuses on investigation in order to collect more taxes. The incentive results in lower taxes, which? they do not encourage. It is a conflict.

If the two factors combined, it would be difficult for the policy to be effective. One commented that:

> The RD typically enacts the law without details and leaves taxpayer to blindly comply and practice. If later they dislike it, they will disallow it (to deduct related expenses) and penalize the taxpayers. Their attitude cannot be changed. If later on, they issue the details, such details would make the incentive not workable, like what happened with the incentive on ROH (Regional Headquarter) and training.

Third, three of them commented on the procedures on the registration of R&D service providers. One shared that it took 5-6 months for this painful bureaucratic process, while it should not take more than a month. One (who used to be an RD official) commented that she could not understand why the RD required a lot of details from the researchers, as she viewed that they had no ability to assess them anyway. With that experience, her client withdrew the application. She shared another case where she helped a client to follow up on an application submitted for nearly 2 years. She met the official in charge, who admitted that he had lost the application and asked her to resubmit it again; her client gave up.

It is not surprising that two experts strongly suggested abolishing these registration requirements, as they viewed that they do not add any value and are not necessary, and because the NSTDA will approve the project at the end anyway. If so, it would be more open for anyone to apply for approval from the NSTDA for the incentive.

Fourth, another commented that the design of the policy is based on the wrong concept-that the private firms cannot do R&D by themselves but must engage those that have the ability to do what the universities do. The design required complicated compliance that are difficult for private firms to do R&D by themselves to comply., e.g. to issue a receipt for itself as if it were employed by another person. Many firms separated their R&D function and put it in another company, which incurs costs in setting up and maintaining another company.

The tax experts were asked whether or not they had proactively promoted this program to their clients. None of them would do so. They only responded to their clients if they were asked about the incentive. The study of the Department of Finance and the Revenue of Canada in 1995 and 1996 reported that a large number of taxpayers in Canada became aware of the R&D tax incentive from their tax consultants. But the Thai tax consultants seem to hesitate to act proactively on this. When being asked why, one of them responded:

> Khun Anuphan, how can I be proactive? I am not even sure how to deduct it correctly. If there is anything wrong with it, I cannot take responsibility with my clients.

It can be concluded that the tax experts viewed that the policy has low effectiveness for the following reasons:

1) The concept behind the policy was wrong and led to requirements that are difficult to comply, especially by the private firms that do R&D for themselves. Further, the policy lacks clarity on what, when, and how the R&D expenses and the incentive attached to them will be deducted.

2) The attitude and culture of the RD that focus on investigation to collect more taxes and not to support the incentive can be a barrier to building trust with taxpayers in claiming the incentive.

3) The registration requirement is not necessary and should be abolished.

These reasons could be used as a working hypothesis to be examined in the implementation analysis.

4.2.3.3 Target Group

As this study tries to achieve the triangulation, data were collected from many sources, including the official in charge and the experts, as analyzed in the above section. The best way to know how the target group would respond to the policy is by asking the firms in the target group—basically, to find out whether or not the tax incentive causes private firms to make changes in their behaviors on R&D spending or investment, and whether they respond to the tax incentive in a predictable fashion.

This section analyzes the data collected from the target group, representing 34 private firms and also the engineering faculty of 2 universities and 1 governmental research organizations. Data were collected by in-depth interview and questionnaire. Among the 34 private firms, they can be categorized by the amount of R&D investment: high, low, and no investment. The criterion of 0.5% of R&D investment/revenue was used, as the country's R&D investment target is 0.5% of the GDP. If the investment was equal to or higher than 0.5%, it was considered as a high investment, and if lower, it would be considered as a low investment. No investment was for the firm that made no R&D investment at all.

The 34 private firms also included 2 firms that provide R&D services to other firms. So, their data were also included. In addition, one way in which to examine the private response to the policy is how many patents they applied for before

and after their registration as the registered R&D service providers. This section therefore includes a patent analysis.

1) High R&D Investment Firms

There are 6 firms in this group, comprising 4 firms in agriculture and related industry, 1 in petroleum, and 1 in the electronic industry. The data were collected through interviews with the executives or entrepreneurial owners of the firms. It was found that these firms have a number of characteristics in common with other than having heavy investment in R&D.

Firstly, the founders of their firms, who were their grandfather, father, or themselves, paid serious attention to R&D from the very beginning of their business. One executive said:

> My grandfather who founded this business was a technician. He decided and built our sugar mills by himself and did research and development continuously. So, the costs of our mills were lower than others. After my generation took over the business, we continue this culture. R&D is our core competency.

Another shared that:

> When I became in charge of this business from my father, we already had strong R&D function. But, I have done it even more. Our R&D budget was as high as 6 -8% of revenue; in some years may be 13% as and when it was needed. (Their revenue was nearly 10 billion Baht a year.)

Secondly, none of them except one applied to be a registered R&D service provider. The one that obtained the registration never claimed the incentive, as it was a company promoted by the Board of Investment and was exempted from corporate income tax for the period of 8 years. The R&D incentive was not useful for them.

Thirdly, they all knew about the availability of the incentive, and 5 out of 6 firms had no interest in claiming it. The only one that registered as an R&D service provider had not applied for the incentive yet because they were in a loss position.

Dagenais, Mohnen and Therrien (1997) argued that firms with a relatively high R&D intensity (R&D/Sales) prior to the tax credit obviously regard R&D spending as an important strategic dimension. Thus, it seems very likely that management will try to maintain its current relative position and will respond significantly and positively to the tax credit. It should therefore examine why the five executives of the high investment firms did not have such a response.

When being asked why they have no interest in the incentive, they express similar reasons. All of them stated that they reviewed the bureaucratic procedures as complicated and too costly to comply with. They also had a concern about confidentiality, as they had to disclose a lot of information and were not confident in a measure to prevent the leakage.

When being challenged further about the question whether the incentive would help them to reduce their costs and whether they could spend more on R&D, two of them clearly stated that they did not want the Revenue officers to pay attention to them. One stated that:

> I do not trust the Revenue officers. They try to find mistakes and fine us, although we had no intention of evading taxes.

Another one commented in the following way:

> The assumption of the policy, that Thai private firms had no ability to do R&D, was wrong from the beginning. A lot of Thai firms like us had conducted R&D for a long time before the policy was enacted. I do not know whether what I do (his R&D activities) is qualified as R&D under the definition. I do not know what expenses

can be deducted. I better not take a risk (of being fined).

The study of Dagenais, Mohan, and Therrien, (1997) argued that firms with a relatively high R&D intensity will respond significantly and positively to the tax credit. The finding from this study indicated the opposite; namely, that the tax incentive had no impact on the R&D high investment group basically they consider R&D as their core competency and would do it regardless of whether or not they get benefit from the incentive. The incentive does not motivate them to do more R&D investment for the following reasons:

(1) The concept behind the policy was wrong. Further, the policy is not clear and is complicated.

(2) The attitude of the Revenue officers toward pinpointing mistakes to collect more taxes is a barrier to building trust with taxpayers to claim the incentive.

(3) The procedures to claim the incentive are too complex and costly.

These reasons would be used as a working hypothesis to be examined in the implementation analysis.

2) Low R&D Investment Firms

There are 14 firms in this group in 6 industries. They are comprised of 3 firms in agriculture, 4 in the petroleum and petrol-chemical industry, 3 in construction materials, 1 in pharmaceuticals, 1 in electronics, and 2 in the software implementation and services industry. The data were collected by the interviews of 6 executive or entrepreneurial owners or 4 heads of the R&D function of the firms, and through 4 questionnaires answered by the heads of the R&D functions. The responses of this group can be classified according to the position of the informants, the responses of the executives or owners, and of the heads of the R&D functions.

(1) Responses of the Executives or Owners

Five out of 6 executives or owners in this group were aware of the availability of the incentive, but they seemed to share the idea that the incentive had some effect on their decisions in investing in R&D.

Among the 6 of them, 3 firms were registered R&D service

providers. Two out of 3 firms that did not register tried to register but failed. One firm was in the software application business. They sought to claim an incentive for the development of their own software application, but they received advice from the NSTDA official, stating that they needed to develop "new software" in order to obtain the incentive. They tried to argue that no Thai firms have the ability to develop "new software" like the new Microsoft system; all they can do is to develop software applications. After trying to argue for 4 months, they gave up.

Another firm seriously invested in developing new construction materials and submitted an application to be a registered R&D service provider at the Revenue Office. After reviewing the application for 6 months, the Revenue Officer commented that his researchers were not qualified because most of them did not have a bachelor degree. They argued that they were qualified based on their over 10 years of experience, but their argument was not paid attention to. At the end, they were requested to withdraw the application and disappointedly did.

Both of them continued to invest in R&D at the same level as they did, but they said that if they were to be eligible for the incentive, they should have increased the size of the investment.

The last firm was in the agriculture business. The owner was not aware of the incentive and accordingly did not apply for it. The firm used to heavily invest in R&D, like other firm in the industry. But after the crisis in 1996, the firm significantly reduced its investment. Here is what he said:

> Before the economic crisis (1997), I set aside a specific budget for R&D, in some years, more than 10 million Baht. After the crisis, I had to reduce R&D spending and used it as necessary. I had no specific budget but still spent some money on R&D all the time... .When the company has better cash flow, I will do more R&D and set aside a budget for it.

Then, he was briefed on the details of the incentive and learnt that the incentive should ease the cash flow and that he could invest more. He responded that he would be interested if the procedure for claiming the incentive were not so complex. For this reason, he would not apply.

In responding to the question posed to the 6 executives regarding whether they could successfully claim the incentive and whether they would invest more in R&D, all of the executives of the 3 registered firms seemed to say "yes." Then, the researcher tried to quantify this in terms of numbers, for example whether one Baht incentive could lead to one Baht more investment. The answer seemed to be "no." One of them gave a very good reason:

> At the time I set an annual budget (which included the R&D budget), I had no idea whether and how much incentive I would get. I cannot take it into consideration. But if I get some this year, I probably will increase the next year's R&D budget.

Her comment is consistent with OECD country experience and empirical studies, that predictability is essential in assisting enterprises in making R&D investment decisions partly on the basis of tax incentives. There is a need for a clear definition of what constitutes research and development costs qualifying for the tax incentive. Certainty in R&D, tax relief allows corporate planning over the longer term; evaluations show that R&D tax incentives are more effective when provided over a longer period (OECD, 2002).

The other two executives also reflected that only if it is certain how much tax incentive they will get, the increase of the R&D investment amount will reflect the amount of the incentive. This certainty is important for them.

(2) Responses of the Heads of the R&D Function

The heads of R&D function in the low investment group reflected the same things-that the incentive has some effects on R&D investment. But none of them could quantify this in terms of numbers. In responding to the question if there were no tax incentive, what would? the R&D investment be, one of the heads of

the R&D function said:

> I believe my company would still do R&D but on a smaller scale. We might use more co-operation or relationship (to obtain technology) so that we would not bear salary overheads.

It also appeared that they used the tax incentive to negotiate their budget for an R&D project. The statement below represents this view:

> When my boss wanted to cut my budget, I would remind him that the company will get the incentive of 30 Baht out of every 100 Baht spent. My budget was still cut but not as big as he initially intended to. I must make sure that I will get the incentive to continue to use it (the explanation) in the future.

In conclusion, the incentive seems to affect the firms in the low investment group in making their R&D investment. It is clear that the incentive will make them investment more in R&D, but how much more could not be quantified in numbers. They are the group of firms that tried to obtain benefits from the incentive, particularly by their heads of their R&D function. The incentive will be more effective for them if it is predictable; that is, whether and how much tax incentive they will get for their spending on the R&D project.

3) No R&D Investment Firms

There are 7 firms in this group, comprising 4 firms in the agriculture industry, 2 in construction materials and furniture, and 1 in software implementation and services. The data were collected through the interview of 5 executive or entrepreneurial owners or the heads of the R&D function of the firms, and with 2 questionnaires answered by the heads of the R&D functions. Although the questionnaires showed that the 2 firms had some investment and were registered R&D service providers, the value was very small, compared to their revenue, for

them to be counted as R&D investment firms.

None of the five executives or owners in this group was aware of the incentives. After briefing them about the incentive, the researcher asked whether the incentive gave them some motivation in doing R&D. The answer was simply the same: "no." They preferred to rely on foreign technology. Some bought it together with machines and equipment, and others preferred to copy with little development, so called "big C & small d."

Although the number of the informants of this group representing in this study is low, it is believed that in reality the informants in this group represents the largest population of the target group. The executives in the furniture business who were very active in the furniture association confirmed that no Thai furniture firms did R&D. The best case is "big C & small d." The researcher of a government agency doing R&D support for the iron and steel industry commented that private firms in the industry rarely do R&D. He said that:

> Don't talk about them doing R&D. It is very hard to get their co-operation in participating in an R&D project fully funded by the government. They only provided the facility. They get all benefits from the project if the project has some success. It has been very hard to get any interest from them. So, do not expect them to do R&D by themselves. One of the largest firms in the industry hired us to do some projects but they have very small value.

The 2 management consultants participating in the study advised that almost all of their 200 clients, which are Thai-owned firms, have no interest in doing R&D. Their clients include a number of very large firms in the country, for example leading firms in the beverage business and the construction materials business. Asking whether the tax incentive could motivate them to change their behavior, neither of them thought so.

It appears that in the no R&D investment group, which is believed to be the biggest group in the population, the tax incentive is not a factor in changing their R&D investment behaviors.

4) R&D Service Provider Firms

There are 7 R&D service provider firms, plus the engineering faculty of 2 universities and 2 governmental research organizations, that participated in the study through an interview with the executive or entrepreneurial owner, and telephone interviews and the questionnaire responded to by the heads of the R&D function. Among the 7 private firms, 4 firms did R&D service for outsiders, while the other 3 conducted it for related firms.

The focus here was made on the 4 firms that provide R&D services for outsiders. One of them responding to the questionnaire showed that the firm applied for only one project with a value of 298,000 Baht, although it was registered since 1997. Another two also responded that the firm had never submitted an application since their registration in 2003.

The owner of the other firm carrying out R&D services as their main business was interviewed. The firm was in the process of applying for the status of a registered R&D service provider and had not yet gotten feedback from the RD. When being asked whether his clients put pressure on him to obtain the status so that the clients could claim the incentive, he answered that the following:

> No, my clients do not give me any pressure. I try to obtain the status to offer a plus to my clients. A tax incentive gives some motivation to my clients to engage me to do R&D for them but only a little. There are other (business) factors that are more important… if they have too much concern about the incentive they will not engage me from the beginning.

The two universities said that they never got any engagement to do R&D for any firm in business but did it only for academic purposes. They applied for the status of a registered R&D service provider in order to support the government

policy. Neither of the two government agencies did.

This finding shows that the assumption of the policy, that the private firms did not do R&D but hired universities and government agencies to do so, might not be correct. Furthermore, the tax incentive is not a key factor affecting the decisions of private firms to hire an R&D service firm to do R&D, and that the decision very much depends on other business factors.

5) Patent Analysis

One indicator of the outcome of R&D is the number of patent applications, because private firms trend to get protection for the result of their R&D investment by obtaining a patent. A patent holder has a legal protection for the exclusive use of his or her new invention for a certain period of time. The holder must trade off the protection with the disclosure of information about the invention, at least to the extent that is sufficient for consideration.

It can be argued that the inventors may not want to get the legal protection perhaps because they prefer keep it as a trade secret or do not want to be involved in the bureaucratic procedures, etc. In that case, the patent analysis will not mean much. Therefore, for this study it will be assumed that private firms would try to get legal protection for their R&D investment by obtaining a patent.

The number of applications for a patent is considered a better indicator than the number of patents registered for. The number of patent applications reflects the output of the R&D activities and effort better. Whether such output is eligible for a patent depends on other factors that can be controlled by the inventors, mainly whether such output is new in the world. The output of the R&D may contribute some progress in terms of the body of knowledge, but may not be considered new enough to be patentable. The output may be new in the view of the inventor but not in the view of the relevant authority.

Among 164 registered R&D service providers, 3 were universities and 7 research arms of government agencies. Excluding these, there were 154 private firms. For this patent analysis, data about the patent applied for and registered for by the registered R&D service providers were collected from the database of the Intellectual Property Department, the Ministry of Commerce. It was covered the periods before and after the registered R&D agencies were registered with

the Ministry of Finance.

The data showed that:

(1) Only 30 firms applied for a patent. Eighteen firms did so before registration with the MOF, while the other 12 firms did it later.

(2) 180 applications were submitted by 30 firms.

(3) 122 applications were submitted before the applicants registered as R&D service providers with the MOF, and 58 applications were submitted after the applicants registered with the MOF.

(4) Out of 180 applications applied for, 96 were patented.

Such data can be analyzed as follows:

Only 30 firms out of 154 private firms applied for a patent. This represents only 19.5%. This may imply that a small number of registered R&D service providers sought legal protection for the outputs of their R&D activities or investment. It may also imply that a small number of the outputs were worthwhile in terms of obtaining legal protection.

It may be argued that some patent applications may be made by employers who hired the registered R&D service providers to do R&D, and no data are available. It is true but is based on the data from the interview and questionnaires responded to by the registered R&D service providers for other persons—they obtained? a few engagements which had very small value. It was very unlikely that that kind of engagement would result in an output that is patentable.

Only 180 applications were submitted by the 30 firms or, on average, 5 patents per firm. The 180 applications covered the period of 10 years, from 1996 to 2005. During the same period, there were 23,691 applications submitted by Thais. The registered R&D service providers contributed only 0.76% of the total applications. This shows that the registered R&D service providers represent a very small population of Thai inventors applying for a patent.

The fact that 122 applications were submitted before the applicants registered as R&D service providers with the MOF, and that 58 applications were submitted after the applicants registered with the MOF, shows that the tax incentive did not result in an increase in patent applications.

Having a closer look, there were 4 firms that submitted 88

applications before and 10 applications after they registered with the MOF. Twenty-six other firms submitted 34 applications before and 48 applications after the applicants registered with the MOF. This may imply that the incentive may result in a small increase in patent applications for the majority of registered R&D service providers.

In conclusion, the result of the patent analysis indicates that the incentive had very small impact on the number of patent applications. Only 30 firms out of 154 firms of registered R&D service providers, representing only 19.5%, submitted 180 patent applications during the period of 10 years from 1996 to 2005. The registered R&D service providers contributed only 0.76% of the total patent applications submitted by Thai firms.

4.3 Summary

The R&D incentive policy does not attain the objective of stimulating R&D investment in private sectors.

R&D investment in the private sector in the past 10 years was still very low. Throughout the period, the actual investment was about half of the national target, or 0.25% of the GDP, with only 40% made by the private sector. For example, in 2005, the private sector invested only approximately 6,624 million Baht, representing 0.096% of the GPD. In 2005, the NSTDA approved 78 projects, with the value of 168.19 million Baht and representing only 2.54% of the investment of the private sector.

During 2001-2008, the NSTDA approved 598 projects, with the value of 1,513.52 million Baht. On average, 85.5 projects were approved in a year, with a value of 2.5 million Baht per project.

Only 30 firms out of 154 private firms registered as R&D service providers submitted 180 applications for a patent from 1996 to 2005. During the same period, there were 23,691 applications submitted by Thais. The registered R&D service providers contributed only 0.76% of the total applications. One hundred twenty-two applications were submitted before the applicants registered as R&D service providers with the MOF and 58 applications were submitted after the applicants registered with

the MOF.

The officials that were involved with the policy in both the RD and the NSTDA shared the same view as the tax experts—that the policy has very low effectiveness.

The tax incentive had no impact on the high R&D investment group; basically they considered R&D as their core competency. The incentive did not motivate them to do more R&D investment. The incentive cannot motivate the no R&D investment group, which is believed to be the biggest group in the target group, to change their R&D investment behaviors.

The incentive seems to affect the firms in the low R&D investment group in making their R&D investment. The incentive would make them invest more in R&D, but it could not be quantified in number as to how much more. They are the group of firms that seek for benefits from the incentive, particularly by the heads of their R&D function. For them, the incentive would be more beneficial if how much tax incentive they would get for their spending on the R&D project were foreseeable.

The factors that are considered to have an impact on the effectiveness of the policy are as follows:

1) The concept or assumption behind the policy might be wrong and lead to requirements that are difficult to comply with, especially by private firms that do R&D for themselves. The requirements and procedures to claim the incentive are too complex and costly. The registration requirement is not necessary and should be abolished. The requirements of the policy to separate the account books for R&D activities from others and to issue receipts to itself are troublesome.

2) The policy lacks clarity concerning what, when, and how the R&D expenses and the incentive attached to them will be deductible in the computation of corporate income tax.

3) The attitude and culture of the RD, which focus on investigation to collect more taxes and not to support the incentive, can be a barrier to building trust with taxpayers to claim the incentive. The administration of the RD culturally stresses only control and investigation and does not support taxpayers to do R&D.

4) Private firms perceive that the purpose of the culture of the RD is not to give an incentive but to collect more taxes. The firms view that the RD is not sincere

in granting the incentive. If mistakes are made, they will be penalized.

5) Whether the taxpayers invest in R&D depends on other factors, e.g. the vision of the management. Other factors impact the R&D investment decision more than the tax incentive. If the management views the R&D as important and necessary, they will do it regardless whether the government gives an incentive or not.

The factors are used as a working hypothesis for the implementation analysis conducted in the next chapter.

CHAPTER 5

IMPLEMENTATION ANALYSIS

5.1 Introduction

The evaluation of the output and the outcome indicated that the R&D tax incentive policy had very low effectiveness in stimulating R&D investment in the private sector. The question is why it has not been as effective as it should have been, although the incentive offered under the policy was very generous. The purpose of this chapter is to answer this question; namely, to find out the factors relating to the policy formation and implementation that negatively impacted the effectiveness of the policy.

The purpose of the implementation analysis is to answer the question of "how policy is implemented." Implementation analysis must study the links or interactions between policy formation and implementation (Winter, 1990). This section will, therefore, start with an examination of how the policy was formed and then how it has been implemented.

5.2 Policy Formation

Policy formation is the stage of the policy process where pertinent and acceptable courses of action for dealing with public problems are identified and enacted into law. It should be clear and viewed as a set of processes which include to: (1) the framing of the problem or issue, (2) an authoritative choice among the specified alternatives, and (3) a specification of the policy instruments.

From the review of the literature, it was hypothesized that successful implementation, as far as policy formation is concerned, depends on: (1) the degree of conflict in the formation phase—successful implementation is likely to be related to a low degree of conflict in the policy-formation phase; (2) willingness to act and attain the objectives of the policy—implementation success is likely if the policy is not

adopted only for symbolic reasons; (3) resources available or allocated for the policy; and (4) valid causal theory—successful implementation is more likely if the policy decisions is based on a valid casual theory about the target group behavior and the relationship between the policy instruments and that behavior and the ability of implementing organizations and the change of that behavior, and lastly the relationship between cause and effect is direct with minimum innerving links.

It was found that the RD did not allocate human or other resources specifically for the policy but for the use of their officers and to adopt the policy in their normal procedures. As a consequence, the factor on resources available or allocated for the policy was intentionally dropped from the study.

Interest in policy formation should be limited to understanding how the formation process and the mandate that results enhance or detract from program implementability. The historical development of the policy will help to understand how the R&D tax incentive was formed; namely, how the authorities framed problems or issues, made authoritative choices among the specified alternatives, and determined the specification of the policy instruments. The analysis will begin with the historical development of the policy and then will analyze the factors in the formation that impacted the effectiveness of the policy.

5.2.1 Historical Development of the Policy

The review and analysis are based on data from documents relating to the formation of the policy and data from the in-depth interview with the RD officer that was involved in the policy from the very beginning. It appears that the RD tended to adapt decision-making strategies to the limited cognitive capacities of decision-makers and to reduce the scope and cost of information collection and computation, and to take small, incremental steps in using tax measures to promote R&D investment in the private sector, as outlined in the strategy of "disjointed incrementalism" advanced by Charles E. Lindblom (1963). Lindblom summarized the six primary requirements of the model as follows:

1) Rather than attempting a comprehensive survey and evaluation of all alternatives, the decision-maker focuses only on those policies which differ incrementally from existing policies.

2) Only a relatively small number of policy alternatives are considered.

3) For each policy alternative, only a restricted number of "important" consequences are evaluated.

4) The problem confronting the decision-maker is continually redefined: incrementalism allows for countless ends-means and means-ends adjustments which, in effect, make the problem more manageable.

5) Thus, there is no one decision or "right" solution but a "never-ending series of attacks" on the issues at hand through serial analyses and evaluation.

6) As such, incremental decision-making is described as remedial, geared more to the alleviation of present, concrete social imperfections than to the promotion of future social goals.

Incrementalist argues that incremental decisions tend to be remedial; small steps are taken in the "right" direction, or, when it is evident that the direction is "wrong," the course is altered.

With the incremental framework in mind, the historical development of the R&D incentive can be summarized as follows.

In 1988, the Board of Investment raised an initiative to the MOF. The BOI asked the MOF to consider to reduce the burden on corporate income tax for companies doing R&D by allowing: (1) to deduct expenses on R&D at a special rate, (2) to deduct deprecation on machine and equipment, including buildings used in R&D at special rates, (3) to exempt not more than 20% of profits allocated to be used for R&D, and (4) to exempt income tax on income from patent. The objective of the four measures was to promote the private sector to do more R&D by using the tax incentive as a motivation. The initiative was referred to as RD for action.

Reviewing the initiative, the RD identified the problem that Thailand had very small R&D investment. From 1983 to 1987, R&D expenditure was only 0.22% of the GDP. Expenses were mainly spent by the government sector at 73.6% of the total expenses. The policy alternatives proposed were as follows:

1) To allow deducting expenses related to R&D at a special rate.

2) To allow deducting depreciation on machines and equipment, including buildings used in R&D, at a special rate (so-called initial depreciation).

3) To exempt not more than 20% of profits allocated to be used for R&D.

4) To exempt income tax of income generated from patents due to R&D.

The four alternatives were evaluated only by the restricted number of important consequences without attempting a comprehensive survey or evaluation of all alternatives. In other words, it was evaluated that all of them could reduce their tax burden and promote R&D investment, but alternatives 1, 3 and 4 were not appropriate for the main reasons that they would result in losing tax revenue and increase the workload in controlling and investigation of the correctness in using the incentive. Alternative 2 was consequently considered as appropriate because it would not result in losing tax revenue but only defer the tax payment and would the reduce tax burden of the taxpayers at the initial stage of R&D investment, which should have resulted in motivating more R&D investment. The initial deprecation rate was fixed at 40%. The measure was known as "initial depreciation."

The draft of the Royal Decree enforcing the 40% initial deprecation was approved by the cabinet on July 9, 1991. The letter of the Secretary of the Cabinet to the Finance Minister made a very interesting note, saying that:

> On the next occasion, the MOF should consider using the tax incentive to promote R&D in the country seriously to reduce the purchase and dependency of foreign technology or to motivate foreigners to establish a laboratory or do R&D in the country so as to exempt not more than a certain percentage of profits allocated to be used for R&D or to exempt income tax on income from R&D, etc.

The note reflected the view that the initial deprecation measure was only the first small step in using a tax measure to promote R&D investment in the country and accordingly was not "serious" enough. However, the RD, through its Planning and Policy Division at that time, considered and provided feedback indicating that the approved measure was appropriate and sufficient to promote R&D and that no other measures needed to be considered at that time. This showed that there was no attempt

to evaluate the alternatives seriously and that there was resistance against the tax incentive measure that may have lowered tax collection.

Royal Decree (No. 226) B.E. 2534 (1991) was published in the government gazette on September 27, 1991 with an effect the following day. It took the RD about 3 years from the time after the BOI raised the initiative to take the first small move on R&D promotion.

As the measure was only to defer the tax payment, the RD officer in charge of the policy made comments that it had potentially low effectiveness.

> As an incentive, the policy offered an accelerated depreciation of 40% for the first year. Was it effective? Well, no. Because, at the end, you still get to deduct 100%. Most people don't even know what "'research and development" is, much less actually carry it out. And if the benefit is wrongly applied, they face fines. Who would be interested in it?

In 1992, the National Committee for Promoting the National Development of Technology resolved and asked the MOF once again to use tax measures to promote more R&D in the private sector to consider to allow private firms hiring government or private agencies to do R&D to deduct two times the actual expenses as tax expenses at the initial stage as R&D is very essential to the development of science and technology of the country, which will lead to the development of the country as a whole. In the future, after there is a greater number of researchers, allowing such deduction in general without the requirement to employ government agencies to do R&D should be allowed. This was the starting point of the assumption that Thai private firms at that time had no ability to do R&D by themselves and needed to hire mainly government agencies to do so. How this assumption influenced the design of the policy needs to be examined.

Without an attempt to consider or evaluate other alternatives, the RD through the Planning and Policy Division proposed that to allow private firms hiring government or private agencies certified by the Ministry of Science and Technology to deduct expenses on R&D but to reduce the proposed rate to 150% of actual expense

and accordingly to reduce the tax burden of the private firms at 15% of the fee. In other words, it resulted in the loss of tax revenue of only 15% of the fee. The reason was that the measure should not have affected tax collection.

After two years of consideration, Royal Decree (No. 271) B.E. 2537 (1994) was published in the government gazette on May 30, 1994, with an effect the following day. Section 3 of the Royal Decree provides exemption of corporate income tax to juristic companies and partnerships in an amount equal to 150% of the expenses incurred in the form of remuneration for research and development of technology paid to government or private agencies, as designated by Notification of the Ministry of Finance in the government gazette.

It was unfortunate that relevant documents from the middle of 1994 to the end of 1997 were not available for review. It could not be known for sure how the rate of the incentive was increased to 200% in 1996. Royal Decree (No. 297) B.E. 2539 (1996) was enacted and repealed Royal Decree (No. 271) B.E. 2537 (1994). However, the RD officer in charge of the policy told the story.

> So, first, we offered, spent 100, and got 150, applying a legal technique which circumvents by issuing it as an "exemption" under a Royal Decree. Essentially, we "exempt 50%." Is the end result the same? Yes. You pay 100 Baht but 50 of it are tax-exempt. This came into effect in 1996. Was it effective? Some, but not to the full effectiveness. It wasn't enough of motivation. Part of it is that our private sector doesn't really care about R&D, but only about profits. The Ministry of Science (and Technology) also concurred that the measure wasn't fully effective.
>
> Our department was asked by the government whether more could be done. So, we did further study on this issue, looking at Malaysia, for example, which offers double deduction. Under GATT, we can subsidize up to 50%. If we were to allow a 100% deduction, as our tax rate is 30%, what we would actually be subsidizing is 30%. So by allowing double deduction, for every 100 baht, we are only

> subsidizing 30—which does not violate GATT. We therefore suggested the amendment which led to the 200% tax deductible.

It was clear that the RD focused only on the incremental small step of the existing policy. After Royal Decree (No. 297) B.E. 2539 (1996) was enacted, the MOF issued its Notification on Income Tax (No.3) Subject: government or private agencies employed to conduct technological research and development on November, 16, 1996. The Notification provides a definition of the term "research and development," the nature of agencies eligible, and the terms and conditions to be eligible for the exemption of corporate income tax for an amount equal to 100% of the expenses incurred in the form of a fee for research and technology development paid to? registered R&D service providers. It took altogether 8 years for the RD to put the tax incentive into place. The question was whether the incentive functioned yet.

In 1999, the NSTDA made a study on the Fundamental Structure of Science and Technology relating to Relevant Laws and Regulations (only on R&D). The study commented about the R&D tax incentive, saying that:

> The incentive had not been widely known and those who knew about it still did not claim the incentive because the definition of applied research has a condition that a research and development project is not cable of being modified or applied for industrial or commercial purposes, which is difficult to interpret. Furthermore, in practice it depends on each individual officer who made a different interpretation. The private firms were not sure what expenses of the R&D project were eligible for the incentive.

The study suggested that in addition to post-audit, the private sector should be able to choose a pre-audit as well. The RD officer who was in charge of the policy further commented on this point:

> Also, some in the private sector were unsure whether their activities qualified as R&D, and therefore were discouraged from utilizing the

> benefit. Since our tax is self-assessed, if you are confident and you apply the deduction but are later audited to have included manufacturing expenses as part of R&D, you would face fines. This is what taxpayers are very afraid of, and is another obstacle to making this measure fully effective. The Ministry of Science advised us that private firms were still afraid of the Revenue Department, so we proposed that we could help alleviate this by offering a pre-audit, where we review it qualifies as R&D.

The study recommended setting up a joint committee comprising the representatives of the MOF, the government agency governing R&D, and the private sector to pre-approve the project eligible for the incentive and also to certify the budget for the project by classifying major items.

The Planning and Policy Bureau of the RD studied the pros and cons of the pre-audit with only a restricted number of important consequences evaluated.

Pros: (1) prevent wrong deduction of expenses, (2) build up confidence of private firms in using the R&D tax incentive, and (3) reduce disputes incurred from consideration of whether the case is qualified as R&D.

Cons: (1) increase complicated procedures, (2) waste time for approval, and (3) require private firm to disclose information about R&D for audit.

Finally, in order to make the problem more manageable, the RD issued Departmental Order No. 584/2542 (1999) on December 30, 1999 and appointed a Committee for Certifying and Approving Expenses for research and development in the private sector. The Committee was chaired by the Director General of the RD, plus the 5 and 6 representatives of the NSTDA and the RD, respectively.

The Committee's meeting resolved that the pre-audit would be applied on a voluntary basis first and during the consideration of the Committee the operator could carry on the R&D project.

It was unfortunate that documents during this period were not available for review. However, the RD officer in charge of the policy told what happened next:

> The Ministry of Science advised us that business operators were still afraid of the Revenue Department, so we proposed that they could help to alleviate this by offering a pre-audit, where they reviewed whether it qualified as R&D …. The Department of Science agreed to this proposal and assigned it to the National Science and Technology Development Agency, so we in tern issued Order No. Por. 103, which stated that the pre-audit had no binding effect on the taxpayer. If a particular project were approved by them, it was to be considered as qualified. But the project as rejected; the Revenue officer could not decide whether it qualified because we are not scientists.

The Cabinet later on resolved to assign the NSTDA to examine and verify the R&D projects eligible for the incentive. Consequently, the RD issued Departmental Order No. Paw. 103/2544 (2001) providing the Revenue officers with a guideline in conducting an investigation and giving advice on the technological research and development—that if a juristic company or partnership that employs a registered R&D service provider submits a research and development project to the NSTDA before or after engaging in order to certify whether project is categorized as a basic industrial research or applied research. If the project has been inspected and certified from the NSTDA, such project will be treated so as basic industrial research or applied research.

The NSTDA issued Order of NSTDA No. 03/2547 (2004) Sub: Appointment of the Committee for Certifying the Research and Development Projects, appointed a Committee chaired by the Director of the NSTDA with 12 other members from different agencies, including one from the RD.

From the evaluation of the output in Chapter 4, the average number of organizations registered as the R&D service providers with the MOC increased from 6.6 to 16.4 organizations a year after the involvement of the NSTDA. The incentive began after the NSTDA became involved. It took 13 years for the R&D tax incentive to be in function.

In 2002, the NSTDA advised the RD that the NSTDA had received advice from the advisory team for supporting an increase of the capability of the private

sector on R&D in order to:

1) Abolish the requirement to register as registered R&D service providers with the MOF.

2) Extend the definition of "research and development" to include design and engineering which do not directly result in the research conducted. (Presently, approval of only the design and engineering that are a direct result of the research.)

The RD made an analysis of the pros and cons of the proposed modification of the policy as follows:

1) Abolish the registration requirement.

The pros and cons for abolishing the registration requirement were evaluated as follows:

Pros: (1) convenience, (2) flexible for work, and (3) promote more R&D.

Cons: (1) easy to make mistakes as the operators do not do R&D as a profession, (2) creates tax loopholes, (3) hard to control and, (4) increase the workload for the Certifying Committee because a lot of applications may not be qualified as R&D projects.

2) Extend the definition of R&D.

The pros and cons for extending the definition of R&D were evaluated as follows:

Pros: (1) more types of projects to be eligible for incentives and (2) more adaptable to the nature of R&D in Thailand.

Cons: (1) may conflict with GATT regarding subsidy, (2) may be considered a dumping of exports, and (3) if the definition is not precise, it will create loopholes.

The RD concluded that it as not appropriate to make the modifications as advised, although it was clear to them that the modifications would promote more R&D investment. The RD Officials insisted on this? opinion in several meetings and occasions. Until now, no modification has been made. In their limited consideration, the RD recognized that the two proposed modifications would promote R&D, which is actually the objective of the policy. The denial showed that the RD outweighed the

attempt to attain the objective of the policy for reasons of control, workload, and investigation.

In 2003, another problem was raised about the requirement of the policy—that the applicant for registered R&D service providers must be a VAT registered operator. A large number of educational institutes and universities did not register because they did not register for VAT. A lot of them, including universities, were not ready to register as VAT operators because they did not carry out R&D services in their normal course of business but were hired to do R&D only occasionally. They were not ready to be in the VAT system, which requires them to register in the VAT system, prepare VAT documents and reports, and to prepare and submit a VAT return and pay tax monthly.

The Policy Bureau of the RD proposed a solution to exempt educational institutes from VAT for remuneration from R&D services engaged by the private sector because no tax would be loss from the VAT exemption because R&D as one of the services at the middle of the supply chain and the operators could use it as a credit anyway. (Actually, the RD would gain because the input VAT of VAT-exempted operators cannot be used as a credit.)

However, until now no change as such has been made, although it would improve the effectiveness of the incentive without losing tax revenue. Currently, the Notification of the Director General of the Revenue Department (NO. 12) B. E. 2534 (1991) Sub. VAT provides VAT exemption only for R&D services for academic purposes and not for business purposes, which has no impact on promoting R&D in the private sector.

As a conclusion, rather than attempting a comprehensive survey and evaluation of all alternatives, the MOF and the RD evaluated only the alternatives initially proposed by the BOI and other government agencies. with a small number of consequences being evaluated. Further, in evaluation of the pros and cons of the alternatives and also the proposal for the modification of the policy, there was no attempt to evaluate them comprehensively. The first small step to use tax measures to promote R&D in the private sector, so-called initial depreciation, was taken because the measure would not impact tax collection but only defer tax payment. With the pressure from the outside mainly from the Ministry of Science and Technology, the

second step was taken to allow deduction at 150% of the expenses incurred in the form of fees for research and development of technology paid to the government or private agencies as designated by Notification of the Ministry for corporate income tax. Two years later, the rate of the deduction was increased to 200% incrementally from existing policies.

The policy seemed to have problems because both the RD and the taxpayers were not certain what activities were qualified as R&D. The NSTDA was assigned to help to certify the R&D projects eligible for the incentive in order to make the problem manageable.

Up to now, the RD has ignored the three proposed modifications of the policy made in 2002-2003 that would make the policy more effective. The proposals were to abolish the registration requirement, expand the definition of R&D, and to exempt V A T for educational institutes and universities for a fee paid for R&D services for business purposes.

5.2.2 Factors Relating to Policy Formation

From the review of the literature in Chapter 2, the evaluation of the policy in the previous chapter, and the historical development of the policy mentioned above, three factors relating to policy formation that may impact its effectiveness should be examined. They are the valid theory of cause and effect, clarity and consistency of policy design and support, and the willingness to act on the part of the implementing organization. Below are the clarifications of such a conclusion and an examination of each factor.

5.2.2.1 Valid Theory of Cause and Effect

As initially hypothesized in Chapter 2, successful implementation is more likely if the policy has the potential to impact the target group. In other words, the policy needs to be based on a valid casual theory about the target group behavior to be regulated by the policy and the relationship between the policy instruments and that behavior and the ability of implementing organizations and the change of that behavior and lastly the relationship between cause and effect is direct with minimum innerving links (Winter, 1990; and Mazmanian and Sabatier, 1989).

The R&D incentive policy is one of the distributive programs that

provides tangible government benefits in the equivalent form of payments to the private firms from which the government is hoping to get the desired activity; namely, to do more R&D. The incentive is generally made dependent on the performance of the activity without any limit. All private firms in the category of recipients targeted for the incentive are beneficiaries if they become active participants in the implementation of the policy.

The policy provides a benefit at 30 Baht for every 100 Baht spent by the private firms for R&D. The benefit represents the reduction of their income tax liability and consequently increases their cash flow and profit after tax. At least in theory, firms should positively respond to the opportunity that presents in the external environment. As mentioned earlier, many studies in foreign countries have suggested that firms respond to an incentive by roughly increasing their R&D investment one dollar for one dollar of incentive received. These experiences show that the tax incentive has the impact of promoting R&D in private firms. The policy-decision to execute the incentive is therefore based on a valid theory of cause and effect concerning the incentive and changes in the target group behavior.

At the time when the RD evaluated policy alternatives, they studied the rates of allowances or tax credits granted in other countries. It was found, for example, that Australia, Austria, and Malaysia allowed deducting R&D expenses at the rate of 150%, 118%, and 200% of actual expenses, respectively. Some countries granted the incentive in the form of a tax credit, for example, Canada, France, and Taiwan, at the rate of 20%, 50%, and 5-20%, respectively.

The Thai R&D tax incentive allows the deduction of expenses at the rate of 200% of actual expenses. The 200% allowance is in effect equivalent to a 30% tax credit. The incentive is relatively generous. There should theoretically be a strong relationship between the 200% incentive and the increase of the R&D investment in the private firms. However, whether or not the policy will be effective also depends on whether the relationship between cause and effect is direct and if there are few, if any, innerving links (Hogwood and Gunn, 1984). Policies which depend upon a long sequence of cause and effect relationships have a particular tendency to break down, since the longer the chain of causality, the more numerous the reciprocal relationships among the links and the more complex implementation becomes.

As viewed by Winter (1990) and Mazmanian and Sabatier (1989), the policy should potentially have high effectiveness because it is based on the valid theory of cause and effect. However, the evaluation in Chapter 4 concluded that the policy has low effectiveness. This study confirms the view of Hogwood and Gunn (1984), that low effectiveness may be caused by the fact that there are too many innerving links in the chain of implementation or requirements. The following sections will examine such innerving links.

5.2.2.2 Clarity and Consistency of Policy Design

As initially hypothesized in Chapter 2, the factors relating to the program design that affect the implementation are clear and consistent in: (1) objectives to achieve, (2) instructions to implementing officials, and (3) direction for change to the target group.

It is more important to choose the "right" objective than it is to make the very best choice from among the alternatives. A wrong objective means that the wrong problem is being tackled. The policy problem for forming the R&D incentive policy was that Thailand had very low R&D investment, particularly in the private sector. The objective for the incentive is clear—that it is to promote R&D investment in the private sector. If the promotion were to be effective, the private sector should invest more in R&D and consequently the country's R&D investment should increase. The "right" objective has been chosen.

The next question is whether the instructions to the implementing officials and the direction for change to the target group in terms of what they have to do to get the incentive are clear and consistent. It should be considered whether the design of the policy is clear and consistent for the implementing officials to act and for the firm to comply in order to claim the incentive.

The clear and consistent design of the policy needs to be based on the right assumption. As noted by the National Committee Promoting the National Development of Technology at the time when the policy was initiated, the R&D tax incentive was based on the assumption that Thai private firms at that time had no ability to do R&D by themselves and needed to hire mainly government agencies to do so. That is why the incentive was granted for the private firms to hire government or private agencies to do R&D to deduct 200% of actual remuneration as a tax expense

during the initial stage. The assumption resulted in complicated requirements and procedures in claiming the incentive.

Such an assumption was challenged by one of the executives interviewed, who indicated that actually the private firms, including his firm, had invested in R&D at that time. Three firms in the high R&D investment group under this study did so long before the incentive was enacted. One of the reasons that they did not claim the incentive was that they viewed the procedure s too complicated and troublesome.

Furthermore, the assumption that the private firms should hire universities to do R&D may not be right either. The two government universities participating in this study advised that they did not accept any R&D engagement from the private firms, although they were registered an R&D service provider for a long time. One mentioned that the university could not accept an engagement for R&D for business because the university did not want to be in the VAT system or to comply with VAT requirements.

Probably, the assumption may not be right, but that should not be the main issue. The main issue is whether the design that was based on such an assumption impacted the effectiveness of the policy. The answer seems to be "yes, it does." The problems in the design that negatively impact the effectiveness of the policy are examined below.

1) Applying for status of "registered R&D service provider."

The incentive is granted in the form of a 200% deduction on a fee actually paid to hire registered government or private R&D service providers to do R&D. Therefore, claiming the incentive needs to begin with the registration of the status or to hire someone with the registration. According to data from the questionnaires and also from the interviews, the process took between 4 months and may last as long as 2 years for the registration. A tax expert that was involved in two applications commented that the process should have taken no longer than 2 months.

It is not only an issue of timing. With the short time available and considering the limited scope of this study, three cases were encountered where the firms failed to obtain the status, although they were qualified to do so.

The first one was an independent firm setting up with the objective of providing R&D services. Their application was pending for more than 2 years and finally lost during the registration process. The other two cases failed because their researchers were considered not qualified, as they did not have a bachelor degree in the related field, although they had more than 10 years' experience. Both firms made serious investments each year. The question to be examined further is whether the RD officials have technical ability to decide whether the researchers of the applicants are qualified as researchers. With this limited evidence, the registration requirement is an obstacle for the effectiveness of the policy.

The RD officers at the policy level expressed the personal opinion that the requirement should be abolished because the RD has no capability to decide whether the applicant is qualified or not, and the R&D projects are now examined and certified by the NSTDA. The incentive will now be more open to any firm. All six tax experts shared the same view.

2) Compute net profits and net losses of R&D activities separately.

The design was based on the assumption that private firms are required to hire an outside service firm to do R&D. Actually many firms do R&D by themselves for their own use and also want to claim the benefit of the incentive. The design has been distorted to serve that situation by allowing them to apply for the status. Basically, they must register and hire themselves to do R&D for their own use. The condition is that they must compute net profits and net losses of the R&D function separately from other business, but for the purpose of ascertaining net profits liable to corporate income tax; net profits and net losses of both businesses will be combined if it is a juristic company or partnership subject to corporate income tax.

From the review of the names of the 164 registered R&D service providers, it was found that a majority of them do R&D for their own use. They must set their accounting system to be able to serve this requirement. This requirement seems to be very simple, but actually it is very difficult and costly, particularly for the firms using a large computerized accounting system. The largest firm participating in the study was a registered R&D service provider for own use for many years but never claimed the inventive although it had very huge R&D investment annually. One of the reasons given was simply that their accounting system could not serve this requirement.

To avoid such a requirement, some firms separated their R&D function and put it in a separate company. That would increase their costing in setting and maintaining the new company. One of the good characteristics of good tax system is that it must be neutral for business decisions. A good system will not force taxpayers to decide how to choose the form or entity in doing business. However, there were some firms that strictly kept the R&D function within because they had a corporate policy to limit the number of entities within the group.

3) Issue a receipt for a fee to an employer

It is a normal requirement for a service provider to issue a receipt to an employer upon receipt of a fee payment, but not itself. Issuing a receipt to itself may not seem to be an obstacle in terms of complying with the requirement for registered R&D service providers providing the service for themselves.

That requirement was not simple for one firm, however, which had an R&D investment budget of more than 300 million Baht a year. The head of R&D of the firm advised that they never claimed an incentive since its registration in 2003 because their accounting system did not allow the issuing of a receipt to themselves. He further commented that "it was a pity as if he can get the incentive he could encourage the management to invest more."

It can be concluded that the assumption behind the design of the policy had an impact on the design. If the assumption is not right, the design will have a negative impact on the effectiveness of the policy.

Other than problems caused by the wrong assumption, the evaluation carried out in Chapter 4 hypothesized that there were two more problems related to the design: problems relating to definition and deduction.

1) Definition.

The nature of technological research and development that is eligible for the tax allowance is as follows:

(1) Basic industrial research means formal research or objective enquiry with a view to discovering new knowledge, with an expectation that such knowledge will be useful in developing new products, manufacturing processes, or providing services or with a view to achieving evident progress in the existing products, processes, or services; or

(2) Applied research means the application of the result of the basic industrial research to be used as a model, blueprint or pattern of a newly-made, modified or improved products process, or services, whether for sale or for own use, invention of a noncommercial prototype, conceptual formulation and creating designs in various forms of products, processes and services and a primary demonstration modified or pilot project with a condition that such project is not cable of being modified or applied for industrial or commercial purposes, however, applied research does not include normal or periodical change of products, manufacturing systems, manufacturing process, provision of services or other activities of a going concern, even if the change does contribute progress.

The NSTDA study done in 1999 identified that there were problems in the definition of R&D.

The definition was copied from GATT. Such a definition is quite limited and is not consistent with the R&D conduct of the private sector. There was the modification of the term "applied research" to cover the development of the method for analysis or control of products.

There are three problems relating to the R&D definition that should be examined.

Firstly, it is required that basic research must have a view to discovering "new" knowledge. The question is what is "new" and for whom? One electronic firm applied for the incentive for a project relating their raw materials but was rejected because it was not new. The firm accepted that this knowledge was not new in the world but it was very new in Thailand and if Thai firms cannot develop knowledge on this matter, they needed to continue to rely on foreign technology.

Another firm doing software application firm discussed with the NSTDA officer whether they could get the inventive for their software development project. They got the advice that they could not do so because they had not developed new software like the new Microsoft Office. They tried to argue that Thai software firms cannot develop new software but only new software applications but was not successful.

The interviewed NSTDA officers accepted that the term "new" was very subjective. They advised that they presently have relaxed their interpretation and

do not require bringing? new knowledge into the world. They further commented that the Certifying Committee members always have different opinions on what is considered "new."

Secondly, the definition of applied research had the condition that "such a project is not cable of being modified or applied for industrial or commercial purposes." The NSTDA made a study in 1999 that private firms that knew about the incentive still did not claim the incentive because the definition of applied research had the condition that the R&D project was not cable of being modified or applied to industrial or commercial purposes. If R&D cannot be used in business, there will be no use for them to do it.

The NSTDA clarified this point III the manual that only a prototype that was invented for the first time could not be used for commercial purposes but the knowledge obtained from the invention of such a prototype could. The problem remains because the manual is not the law and the RD officers may have different. Nevertheless, as the RD will follow the approval of the NSTDA for R&D projects, this problem should not incur in practice.

Thirdly, applied research does not include normal or periodical changes in product, manufacturing systems, manufacturing process, provision of services or other activities of a going concern, even if the change does contribute to progress. There were 4 firms in the low R&D investment group that regularly invested in the development of manufacturing systems and processes to improve their productivity. That nature of this development requires high skill in design and engineering but is not qualified for the incentive. One firm claimed that expenses for this development were in some years 4 to 5 times higher than the R&D expenses incurred in their laboratory and claimed for the incentive, and also had higher return for their business.

Thus, it was reasonable for the NSTDA to ask the RD in 2002 to consider reviewing and expanding the R&D definition to include design and engineering, which are not directly a result of the research conducted. Presently, the definition includes only the design and engineering that are a direct result of research. Such expansion can serve and be consistent with the practice of the industry, but till now no change has been made.

2) Deduction.

Royal Decree No. 297 provides only that 200% of the expense in the form of remuneration paid to the registered R&D service providers can be deducted. There are no details on what kind of expenses can be included, and more importantly when and how to deduct the incentive; in other words, whether such expenses and the incentive attached to it need to be capitalized or amortized over the period of 10 years or whether they can be deducted when they incur or when the NSTDA has approved the project. Consequently, the policy lack clarity on what, when, and how the R&D expenses and the incentive attached to them will be deducted.

Regarding which R&D expenses can be deducted, it should theoretically mean that any amount of the service fee agreed on by the employer and the registered R&D service provider at arms-length should be qualified for deduction. The scheme was distorted to serve the case where the firms do R&D for their own use and no amount of the fee will be agreed on. Furthermore, the RD asked the NSTDA not only to certify the project but also to determine the budget of the project, which will be considered as the maximum amount for the deduction. The NSTDA sets the regulation on expenses for R&D project to be applied in both cases. The regulation categorizes expenses into 8 categories, briefly as follows:

Not consistent in use of caps below.

(1) **Salary for research personnel.** The base amount must be consistent with their personal tax return and be allocated to the project by number of hours. Personnel at the management level can be allocated only a maximum of 60% of their time and at the operational level at 80% to the project.

(2) **Equipment and tools.** The base amount will be based only number of hours used in the project.

(3) **Consultant/Expert.** The amount of the fee will be as agreed on with a consultant/expert.

(4) **Training.** It allows only the course fee and does not include traveling or accommodation expenses.

(5) **Laboratory Service.** The amount allowed is the testing fee per unit.

(6) **Materials.** The amount is based on total price including

costs for transportation, insurance, etc.

(7) **Improvement/Repairing.** It is limited only to Improvement or repair of equipment and tools used for R&D.

(8) **Operating Expenses.** They include expenses for facilities, coping, report preparing, traveling and accommodations, project management, and other indirect expenses but in total not exceeding 30% of the total expenses of the project before including the operation expenses.

(9) **Other direct Expenses.** They include expenses for data collection, professional services, and outside personnel.

The category of expenses that was questioned most in the study was training expenses. One of the registered R&D service providers complained that he could not get the incentive for several million Baht of traveling and accommodation expenses for dispatching 9 engineers to Brazil to be trained for research relating to ethanol and other alternative fuels for 4 -6 months and had no tuition fee, as they were trained in the field. He mentioned that without that trip, his engineers could not do R&D as they were doing now.

The situation became even worse. Most of the interviewed RD officers except one who held the highest position among the officers participating in this study. had the opinion that training expenses were not eligible for the incentive. An RD officer who worked closely with the NSTDA on the issue mentioned that she already told the NSTDA officers to exclude the training expense from the list of eligible expenses and she was surprised when she knew that it was still included. She raised the concern that if the training expense were allowed, it would create a loophole, where taxpayers will claim personal traveling and accommodation expenses as part of R&D expenses.

Another category of expenses that was mentioned was the depreciation of equipment and tools. One of the registered R&D service providers complained that he bought expensive equipment for his laboratory and claimed depreciation in the application for the incentive. It was significantly reduced only to the number of hours used in the project. He argued without success that the equipment was depreciated every hour used or not used. He had a point.

From the review of the minutes of the Research and Development Certification Committee, it was found that the category of expenses that was adjusted most was operating expenses, basically down to 30% of the total expenses as regulated. When asked how the rate of 30% was determined, the NSTDA officers responded that it was from the views or experiences of the experts. When being asked if the applicant could prove that the project needed to spend more than 30% for operating expenses, he responded that "this is a strict rule and the operating expenses will be adjusted down to 30%." He, however, commented that this is very subjective consideration and actually the NSTDA did not want to certify the amount, but the RD insisted.

The expenses that seemed to have to a problem as to whether they would be deductible were training expenses, depreciation of equipment and tools, and operating expenses. The problem not only concerned what was to be deductible but also when and how they would be deducted. As commented by one of the tax experts, "the RD always enacts a law or regulations without details and leaves the taxpayer to blindly comply and practice." The R&D incentive is another example of that.

R&D expenditures can be separated into (1) current expenditures, which include the wages and salaries of research personnel, cost of materials, and other operating expenses; and (2) capital expenditures, which include the cost of equipment and facilities. All OECD countries allow for current expenditures on R&D to be deducted from income in the year they are incurred as a form of business expense. With regard to capital expenditures for R&D, some countries allow these to be written off in the year they are incurred, while others require that they (or some fraction thereof) be depreciated over their economic life (OECD, 2002).

The RD issued Operational Guideline No. MorKor. 5 B.E. 2546 (2003) Sub. Investigation of Expenses for Technology Research and Development, on July 2, 2003. Clause 2.2 of the Guideline stipulates that:

> (2.2) In the investigation of expenses for technology research and development, it must be investigated

> whether or not the record follows the accounting principles and complies with the condition under Section 65 ter (5) of the Revenue Code. And when the expenses are deducted in any accounting period at what amount, 100% of such amount will be exempt in that accounting period.

Section 65 ter (5) of the Revenue Code provides that capital expenditure shall not be allowed as tax deductible expenses. Section 65 bis of the Revenue Code further provides that wear and tear and depreciation of assets (including capital expenditure) may be deducted as expenses in accordance with the rules, procedures, conditions, and at the rates as prescribed by Royal Decree No. 145 B.E. 2527 (1984) Governing Deduction of Wear and Tear and Depreciation of Assets.

Under Section 4 (4) of the Royal Decree, deduction of depreciation of cost of acquisition of the right in a process, formula, goodwill, trademark, business license, patent, copyright, or any other right shall be made at the rate not exceeding 10% if the rate of useful rights is not limited.

This means that if the R&D project results in a product that can be used more than once during an accounting period but without limit, the expenses must be capitalized and depreciated at the rate not exceeding 10% a year, or in order words, it will be depreciated for at least 10 years. If the R&D project fails and does not result in any thing that can be used, the expenses will be deducted in the year when they are incurred.

Although there has been such a guideline, there appear to be three different opinions on it from 7 RD officers that were in the field.

The first opinion is consistent with the Guideline; namely, expenses need to be capitalized and depreciated for the period of 10 years. Three out of 7 officers had this opinion. One further considered that such a practice would be applied in all cases regardless of whether the project as successful or failed.

The second opinion as that the expenses need to be capitalized until the NSTDA certifies and approves the project and then deducts the full amount in the accounting period when the project is approved. Three out of 7 officers had this view.

The third opinion was that current expenses will be deducted in the accounting period when they are incurred and capital expenditure will be depreciated over the useful life regardless of when the NSTDA approves the project. The approval is only the condition that qualifies the project, which may be granted before or after the expenses are incurred. Only one officer had this opinion, but he held the highest position among all of the officers participating in this study.

The handout for the seminar organized by the NSTDA to promote the incentive explains the deduction in the same way as this opinion. It is worthwhile to note that the opinion of the RD officer that delivered the seminar was the first one.

Four out of 6 tax experts participating in the study shared the same opinion as the third one. The other 2 could not make comments as they viewed that the law was not clear.

After the highest ranking officers of the RD and the NSTDA participating in the study were explained the Guideline of the 10 year depreciation requirements, they made the same comment—that if that were to be the case, there would be no benefit and the incentive should be abolished.

According to the data from the interview of the registered R&D service providers and the questionnaire responded to by the registered R&D service providers, all of them deducted R&D expenses during the accounting period when the expenses were incurred. Therefore, if the Guideline had been practically enforced, all of them would have over-claimed the incentive and would have been exposed to a tax short, penalty, and surcharge.

Lack of clarity of the policy can have a serious impact of the effectiveness of the policy because the tax system under the Revenue Code is one of self-assessment, whereby the tax payer must calculate his or her own tax and pay the tax correctly. If the tax payers fail to do so, they will not only be liable for the amount of tax shortfall but have to pay a penalty at normally 100% of the tax shortfall, plus a surcharge at 1.5% per month of the shortfall but not exceeding the amount of the shortfall. The comment of the RD officer at the policy level stressed this issue in the following:

Since our tax is self-assessed, if you are confident and you apply the deduction but are later audited to have included manufacturing expenses as part of

R&D, you would face penalties. This is what taxpayers are very afraid of, and is another obstacle to making this policy fully effective.

As viewed by Van Meter and Van Horn (1974), Mazmanian and Sabatier (1989), Winter (1990), and Hasenfeld and Brock (1991), a successful policy design needs to reflect the need for clarity and consistency of the objectives and directives and provide concrete and more specific standards for assessing program performance. In order to do so, the successful policy needs to be based on the right assumption. The result of the examination of the design of the policy in this study described above confirmed this view, and also the hypothesis made in Chapter 4, that one of the reasons that makes the policy low in effectiveness is that the design is based on the wrong assumption, leading to requirements that are difficult to comply with, especially by private firms that do R&D for their own use. Further, the design lacks clarity in the definition of R&D and on what, when, and how R&D expenses and the incentive attached to them will be deducted for tax calculation. As the tax system is one of self-assessment, the lack of clarity thus has a serious impact on the effectiveness of the policy.

5.2.2.3 Support and Willingness of the Implementing Organizations to Act.

It was hypothesized in Chapter 2 that successful implementation is likely if the degree of conflict in the policy-formation phase is low and if willingness to act and attain the objectives of the policy of the implementing officer is high (Winter, 1990). These two factors show whether or not the policy is adopted only for symbolic reasons.

The fact that it took 8 years from the time when the policy was first initiated for the R&D tax incentive to be enacted, and 13 years to be in function, shows the strong conflict and resistance of the RD in the issuance of the policy. Furthermore, the facts that the RD ignored the three proposals to modify the policy knowing that they would make the policy more effective showed a lack of support and willingness to act and to attain the objectives of the policy.

From an examination of the historical development of the policy, it was learnt that the policy was initiated by the Board of Investment in 1988. The 200% deduction was one of four alternatives. Without attempting a comprehensive survey or evaluation of all alternatives, it was concluded to take a small step, that the initial

deprecation at the rate of 40% should be adopted because it would result in losing tax revenue and increase the workload in controlling and investigation of the correctness in using the incentive. More importantly the initial depreciation measure would not result in losing tax revenue but only defer the tax payment.

The Secretary of the Cabinet commented to the Finance Minister that the MOF should be more serious in considering the use of the tax incentive to promote R&D in the country. However, the RD resisted, saying that the approved measure was appropriate and sufficient to promote R&D and no other measures needed to be considered at that time. This shows that there was no attempt to enact the measure to promote R&D seriously and that there was resistance against any tax incentive measure that might have lowered tax collection.

As the initial depreciation measure was only to defer the tax payment, the RD officer in charge of the policy made comments indicating that it had low effectiveness. In 1992, the MOF and the RD came under pressure once again to use the tax measure to promote more R&D in the private sector and to consider allowing private firms to hire government or private agencies to do R&D to deduct two times the actual expenses as tax expenses at the initial stage of R&D. The RD proposed allowing only 150% of actual expenses. After two years of consideration, Royal Decree (No. 271) B.E. 2537 (1994) was enacted.

As the 150% deduction measure did not provide enough motivation for the private sector to do more R&D, the RD was pressured to do more. As a result, the RD was forced to take another small incremental step in the existing policy. All together, it took the RD 8 years to put the tax incentive into place by enacting Royal Decree (No. 297) B.E. 2539 (1996), but it was not in function yet.

After the policy was enacted, the problem confronting the RD was continually redefined. The process of countless ends-means and means-ends adjustments which, in effect, make the problem more manageable went on. In 1999, the NSTDA suggested that in addition to post-audit, the private sector should be able to choose a pre-audit as well and recommended setting up a joint committee comprising the representatives of the MOF, the government agency governing R&D, and the private sector in order to pre-approve the project. The RD issued Departmental Order No. 584/2542 (1999) on December 30, 1999, appointing the Committee for

Certifying and Approving Expenses for Research and Development in the private sector. The Committee was chaired by the Director General of the RD plus 5 and 6 representatives of the NSTDA and the RD, respectively. The RD still tried to retain the power and control to approve the projects, knowing that the RD had no ability to certify whether or not the project was R&D.

The Cabinet had a resolution in 2000 to assign the NSTDA to examine and verify the R&D projects eligible for the incentive. Then, the RD had no choice but to issue Departmental Order No. Paw. 10312544 (2001) accepting the certification of the NSTD by the Committee for Certifying the Research and Development Projects, chaired by the Director of the NSTDA with 12 other members from different agencies, including one from the RD. It took 13 years to make the R&D tax incentive functional.

The resistance to act and attain the policy objective continued even after the policy was formed. In 2002, the NSTDA proposed abolishing the requirement to register as registered R&D service providers with the MOF and to extend the definition of "research and development" to be more consistent with industry practice. In 2003, the Policy Bureau of the RD proposed exempting educational institutes and universities from VAT for remuneration from R&D services engaged in by the private sector for commercial purposes because no tax would be loss. However, until now no change as such has been made, although they would knowingly improve the effectiveness of the incentive. This is a reflection of the RD's low willingness to act and attain the policy objective.

It is reasonable to conclude that the factors relating to the formation of the policy that made the policy low in effectiveness were the high degree of conflict and resistance and the low degree of willingness to act and attain the objectives of the policy of the implementing officer during the policy-formation phase. This conclusion confirmed the view of Winter (1990), that successful implementation is likely to be negative if the degree of conflict in the policy-formation phase is high. Although the policy was based on the high level of the valid theory of cause and effect, there were several factors in the formation of the policy that made the policy have low effectiveness; namely, design and willingness to act and to attain the policy objective.

The next section will examine how these factors affected the implementation and also explore other factors in the implementation that impacted the

effectiveness.

5.3 Policy Implementation

The implementation emphasized the linkage between policy and performance. The implementation analysis answers the question concerning "how policy is implemented." Policy implementation encompasses those actions by public and private individuals (or groups) that are directed at the achievement of objectives set forth in prior policy decisions (Van Meter and Van Horn, 1974).

There are three variables to be examined in this study: Implementing Organizations, Implementing Officers, and Target Group.

5.3.1 Characteristics of Implementing Organization.

As hypothesized in Chapter 2, the factors relating to the implementing organizations that affect implementation are (1) the consistency of the organizational goals and the policy goals or objectives; (2) clear and consistent communication about policy objectives and procedure; and (3) the monitoring mechanism to facilitate and control the behavior change and the compliance of the target group.

In the evaluation of the policy in Chapter 4, it was concluded that the administration of the RD culturally stresses only control and investigation and not the support of taxpayers to do R&D. Private firms perceived that the culture of the RD was not to provide an incentive to collect more tax and that they would be penalized if they made mistakes. The firms viewed that the RD was not sincere in granting incentives. These factors are assumed to have negative impact on the effectiveness of the policy. They are further examined below.

5.3.1.1 Alignment of organizational goals.

The RD is the main organization of the government in generating tax revenue. The organizational goal of the RD is simply to collect taxes to the extent allowed under the law. Such a goal is to a certain extent in conflict with the objective of the R&D tax incentive policy. In providing the 200% deduction, the amount of tax collectible would be reduced at least in the short term. Goggin et al. (1990) viewed that the greater the compatibility among the goals of the implementing organizations

and the policy goals, the greater the success of program implementation will be. If that were the case, this factor should have a negative impact on the effectiveness of the policy. This section examines whether and how the conflict of the organizational goal and the policy objective impact the effectiveness of the policy.

The vision and mission of the RD are as follows:

Vision

"To deliver service and collect taxes fairly applying international standards."

Mission

1) Collect taxes as forecasted.

2) Deliver services and create voluntary tax compliance.

3) Propose tax policies to the Ministry of Finance which can be used as mechanisms to strengthen the economy, society, and the competitiveness of the country.

The 2004-2008 Strategic Plan of the RD and the Annual Reports for the years 20032007 showed that the RD was under administration reform towards good governance.

Governance signifies a change in the meaning of government, referring to a new process of governing; or a changed condition of ordered rule; or a new method by which society is governed. One dimension of governance is corporate governance, referring to the system by which organization are directed and controlled in order to have openness (the disclosure of information), integrity (straightforward dealing and completeness), and accountability (holding individuals responsible for their actions by clear allocation of responsibility and clearly defined roles) (Rhodes, 1996).

In the 2004-2008 Strategic Plan, the RD proposed to the Ministry of Finance that it should receive a fixed lump-sum budget, the so-called "Block Grant," at the rate of 1.5% of the total amount of tax collected. The budget was to be used to pay the RD personnel at the appropriate rate and for expenses incurred in administering the collection of tax. The amount of any unused budget in any year would be maintained for the development of the RD and to pay for expenses in the following year. In asking for more autonomy, it was most essential that the RD

illustrated a high level of accountability and performance measurement.

The 2003 Annual Report prescribed that the RD's most important objective was not to ensure that we meet out target tax collection, but to create voluntary tax compliance on the part of taxpayers in order to create financial stability for the country. From the variety of services we provide to increased convenience, the Revenue Department has received higher cooperation from the public.

The 2004 Annual Report further claimed that the public administration and state's duty operation shall be performed upon the principles of good governance, with effectiveness and efficiency, aiming to benefit the Thai people, and based on value for money and a streamline work process. In placing citizens at the center of interest, priority has been given to human resource management, as it will lead to a more efficient administration. The Revenue Office won the "Best Service to Citizens Award" from the Office of the Public Sector Development Commission. Taxpayers were satisfied with the filing process because the revenue officers were dedicated, helpful, friendly, transparent, polite, and provided useful information.

The 2005 Annual Report stated that the RD operated according to the principles of efficiency, transparency, and fairness in raising awareness of citizen's right and responsibilities relating to tax and the sense of community. Consequently everyone will realize his own rights and responsibilities, pay taxes according to his or her ability to pay reflecting fairness, which promotes the right attitude towards the community, builds voluntary compliance, and sets tax collection standards that will lead to a sustainable tax base. The Revenue Department launched the "Clean, Open and Transparent Strategy" to improve efficiency and transparency. The strategy would prove that the RD had its own integrity and fairness standard by ensuring that the RD would perform work with integrity and be responsible for our action and only do what was right and lawful.

The term "Clean, Open and Transparent Public Service" means the existence of a mechanism, management and service procedures provided by government agencies to the citizens that are transparent, accountable, and free of corruption. Civil servants and government officials must perform their duty with integrity, fairness, and must be accountable for their actions. On May 4, 2005, the Revenue Department set up the "Clean, Open, and Transparent Coordination Center."

In 2006, the RD gave priority to the importance of good services provided to taxpayers. This was done by ensuring that taxpayers would receive good and convenient services. It was claimed that the Revenue Department accomplished its task by having provided useful information to taxpayers via telephone operators. This is an extended service of the RD's state of art IT system.

The 2006 Annual Report also stated that the RD not only administers according to its performance on tax collection, but also places concerns on the people's ability-to-pay tax. As a result, the Revenue Department has issued and amended laws and regulations to be in line with the economic and social environment, while some tax measures are still effective and several have been extended in order to provide tax privileges to taxpayers without interruption, which will be beneficial to taxpayers' ability-to-pay tax, in the reduction of their tax burden, and support the business environment, as well as increase voluntary tax compliance which will lead to a sustainable tax base. The Revenue Department's tax measures in 2006 included approving more researchers to carry out research and development for companies such that their R&D expenses could be deductible for twice the amount.

The RD also emphasized the concept of "the taxpayer as the client." The 2007 Annual Report stated that there was a saying in marketing that "the customer is God." How about the Revenue Department's customers? After analyzing our customers, we find that the new generation of customers are advanced in terms of their understanding of technology and ready to utilize all RD available e-services, including tax payment via the Internet. At the same time, there were still some groups of customers that were more confident with face-to-face direct contact with the RD. There were also some groups of customers that had negative attitudes towards tax payment and the RD. Some customers were not yet in the tax base, and some customers had the intention to avoid taxes. Communication designed to make each group of customers understand their role and responsibility is the strategy that the RD currently applies.

In 2007, the Revenue Department's tax measures included promoting research and development in the private sector. The RD claimed that the RD continuously approves qualified technology researchers to carry out research and development by allowing their R&D expenses to be deductible for twice the amount.

The 2003-2007 Annual Reports showed that the RD:

1) Performed upon the principles of good governance to Improve their effectiveness and efficiency;

2) Not only ensured that the target tax collection was met;

3) Operated according to the principles of efficiency, transparency, and fairness to raise awareness of citizen's rights and responsibilities relating to tax;

4) Gave priority to the importance of good services provided to taxpayers;

5) Created communication which as designed to make each group of customers understand their role and responsibility;

6) Promoted tax incentive measures, including research and development of the private sector, by continuously approving qualified technology researchers to carry out research and development.

Taking governance into account, Hogye (2000) pointed out that a good tax administration is not there simply to collect the most revenue. Revenue outcome may not always be the most or only appropriate basis for assessing administrative performance. Among others, how the revenue is raised, how fairly taxpayers are treated and served, and how accountable the tax administrators are, may be equally or more important in some contexts. Bird (2003) further mentioned that the elements of accountability and fairness are as essential as the collection of revenue for good tax administration in modern society. Other than revenue outcomes, performance related to accountability and fairness is also an appropriate basis for assessing the performance of tax administration.

"Government that is fair" is one of the four guiding principles in administrative reform with democratic governance (Bidhya Bowornwathana, 1997). In order to achieve fairness, the tax administration has the main task of providing clear, accurate, and understandable information, and providing services in a timely manner and applying laws consistently and equitably.

Therefore, using the above as the criteria, if the RD achieved as claimed during 2003 -2007, it should be considered that the RD had made good progress in reforming its administration, which should have had a positive impact on the effectiveness of the policy. The question is whether or not, and to what extent, this

is true.

During the policy formation period of 1988-2001, the RD showed strong resistance towards the policy by allowing only an incremental progress in the development of the policy and attempting to maintain control. During 2002 -2003 when there were unsuccessful attempts to modify the policy to make it more effective, the RD showed its low level of support and willingness to attain the policy objective. However, it can be argued that these incidents happened before the RD began to reform its administration.

In the 2004-2008 Strategic Plan, in order to justify the proposal for a fixed lump-sum budget, the so-called "Block Grant," at the rate of 1.5% of the total amount of tax collected, the actions in the plan should be sufficient to illustrate that the RD would move towards good governance by assuring a high level of accountability and performance measurement and providing measures to give assurance to taxpayers that they will be treated fairly and justly according to the tax laws.

Anuphan Kitnitchiva (2006) argued that the actions of the RD established in the Strategic Plan were not sufficient to create an acceptable level of fairness under modern tax administration standards to justify the increase in the level of accountability and fairness before being eligible for such a proposal for the following reasons.

Firstly, there was no plan to improve the provision of clear, accurate, and understandable information that taxpayers needed in order to enable them to comply with the tax laws. The present information, particularly that available on the web site, as basic and difficult to understand for non-tax professionals, although there have been some improvements.

Secondly, there was insufficient commitment to the time that the RD would take to provide the requested services. More was needed to be done, for example, time for obtaining tax rulings, time for the result of tax appeals, time for tax audits, time for tax refunds in other cases, etc. The RD should also declare its commitment to discovering mistakes quickly after tax returns have been filed. This will improve fairness as it helps taxpayers to save a potential surcharge of 1.5% per month.

Finally, there is no guarantee that the taxpayers will be treated equally under the tax laws. Enforcing compliance equally is important for maintaining the perception that the tax system is fair. The RD plan relating to fairness was to prevent tax evasion, which is only one dimension of fairness. The RD should take measures to ensure that taxpayers that are already in the system will be treated fairly and equally under the law. More importantly, as the Revenue Code allows officials of different levels to exercise their discretion, it is critical for the RD (and for the government) to have mechanisms in place to monitor and control the use of discretion to ensure that taxpayers are treated the same in similar circumstances and differently in different circumstances, and that the officials will not use their discretion beyond the law.

The plan was considered as not being sufficient to ensure fairness, but the actual actions might have been. It needed to examine further what really happened in practice. In order to achieve fairness, the RD should have provided clear, accurate, and understandable information, services in a timely manner, and laws applied consistently and equitably. According to the principles of efficiency, transparency, and fairness, the RD should have raised awareness of citizen's rights and responsibilities relating to taxation. The incentive was one of the rights of the taxpayers under the tax laws. The question is what the RD has done to raise people's awareness.

In responding to the question about what the RD did to promote the R&D tax incentive, the RD officer at the policy level stated that:

> It is not our main responsibility. We had no policy to promote. Taxpayers must seek information by themselves to protect their own benefits.

The other officer also at the policy level responded that:

> The RD does not give importance to the promotion. If and when the NSTDA asked us for co-operation, we will do so. We assigned a speaker in their seminar. Actually, the NSTDA is frustrated with us. The NSTDA is active and devotes itself to the policy more than us.

The RD officers at both the policy and operational levels shared the same view—that the RD had no policy to promote the incentive. Further, it was not their responsibly to advise the taxpayers about the incentive. Thus, if they find that the taxpayers invest in R&D and do not claim the incentive, they will not advise the taxpayers to do so. The taxpayers need to find out the incentive by themselves.

The RD claimed that it promoted the incentive at its website as an extended service of the RD's state of art IT system. Actually, in January 2004, the NSTDA asked the RD for co-operation in promoting the incentive in the RD's website and also in providing a link with the website of the NSTDA. The Director-General of the RD approved doing so in May, 2004.

For the years of 2006 and 2007, the RD claimed that the RD continuously approved qualified technology researchers to carry out research and development. The numbers of the R&D service providers registered during those years were 18 and 13, respectively. It was difficult for the RD to claim credit as long as it still played only a supporting role. The main promotion activity carried out to promote the incentive was a seminar. For the review of relevant documents, it appeared that it as the NSTDA that planned and organized regular seminars to promote the incentive and asked the RD for co-operation in assigning a speaker. At any rate, the number was very small to make the policy effective.

Lastly the question was asked, "If during a tax investigation, the tax investigators find that the taxpayer invested in or spent money on R&D, will they advise them to claim the incentive? The official at the policy level responded that:

> No way! We do not go that far. Our official cannot judge what is R&D. We cannot make a decision.

Five out of 6 tax investigators responded "No" to that question. One of them provided an interesting reason:

> The RD has no culture to give the incentive. We are trained to pinpoint the mistake in collecting taxes. It is true that the Revenue officials might know which taxpayers are qualified

> for the incentive but do not exercise the right, but we will not advise them to do so.

When asking whether the RD had done anything in the past to change the culture. The answer was "No.'. The officer that had been a tax investigator for over 20 years said:

> Any trend to change the culture? No, I don't think so. To tell taxpayers to pay lower taxes, why should we do that? I do not see any change in this culture.

The Officer that said she would advise the taxpayer, in answer to the question "how will she do?," indicated that she would advise the taxpayer to seek advice from the NSTDA. Probably, her answer was right.

The SWOT analysis of the RD in the 2005 Annual Report showed that it is "not easy to change due to size of the organization" and "lack of incentive" was considered as a weakness, while "difficulty in changing the officers' mindset " was considered as a threat. It was realized that the culture as difficult to change. What was more interesting was that "unlimited needs for services from taxpayers and the private sector" and "taxpayers always find new schemes to avoid paying taxes" were considered as a threat. The latter reflected the realistic attitude of the RD towards the taxpayers. There should be no surprise then why the RD's culture is difficult to change as long as they still have that kind of attitude towards the taxpayers.

The two tax experts who also used to work with the RD commented that the granting of the incentive of the RD as difficult to effectively put into practice. The first one commented that:

> The RD has done a little promotion of the incentive only when it was pressured by the superior. There is a conflict for the tax collector to grant the incentive. The RD does not realize the necessity to lower their tax collection.

The other one commented that:

> Exercising the incentive granted by the RD is very hard in practice because the higher the incentive, the more details the officials would investigate. A lot of documents will be requested for complicated review. Like the R&D tax incentive, the investigation begins even before the registration for the R&D service provider. Who would like to exercise such an incentive?

The analysis led to the conclusion that the fact that the goal of the RD does not align with the objective of the policy impacts negatively on the effectiveness of the policy. The conclusion confirmed the view that goal attainment will be improved if the implementation is assigned to agencies that support the objectives and give them a high priority (Winter, 1990), as it appeared that the RD did not give high priority to the R&D tax incentive. The conclusion also confirmed the view (Goggin et al., 1990) that the greater the compatibility among the goals of the implementing organizations and the policy goals, the greater the success of program implementation will be. Although the RD, during the past 5 years, has claimed that its most important objective is not to ensure meeting out target tax collection but to create voluntary tax compliance on the part of taxpayers in order to create financial stability of the country and has attempted to reform its administration towards good governance. Such an attempt has not yet turned into a solid result. The RD still has an investigating culture that does not encourage the exercise of the incentive and also does not have good attitudes towards the taxpayers. The working hypothesis made in Chapter 4, that the fact that the culture of the RD that focuses on investigation to collect more taxes and does not support the incentive, is a barrier to building trust in taxpayers to claim the incentive. Such culture has had a negative impact on the effectiveness of the policy.

5.3.1.2 Clarity and Consistency in Communication of Policy Objectives

Effective implementation requires that a program's objectives be clearly and consistently understood by the implementing officials for their achievement (Van Meter and Van Horn, 1974). In Chapter 2, the hypothesis was made that the factors relating to the implementing organizations that affect the implementation include clear

and consistent communication about the policy objectives and procedures, and an enforcement mechanism to enforce or motivate the implementing officials to perform.

Specifically, this section examines how the objective of encouraging the private sector to do more R&D has been communicated to the RD officers and whether there is an enforcement mechanism whereby they can use the incentive to encourage the private sector to do more R&D. The RD should have administrative objectives to promote the accessibility of the R&D tax incentives for the targeted group and to increase awareness and understanding of the availability of the tax incentives. Such objectives should be communicated to the officers for action.

The finding indicated that there was no communication with the tax investigators, who faced the taxpayers regularly to make them understand the objective of the policy. One of the interviewed officers, who has been a tax investigator for more than 20 years, shared her experiences in the following:

> In the past, we learned about the new laws that gave benefits to taxpayers from the taxpayers. They would tell us immediately. Is it our failure, really? Yes it is. It is our failure that we did not update ourselves. It is shameful that we learned it from the taxpayers.

All of the tax investigators that participated in the study confirmed that there was no communication about the objective of the R&D tax incentive to them, just like other incentives under the Revenue Code. Asking them whether there was any official communication or guideline that required them to use the incentive to encourage the private sector to do more R&D per policy objective, they all said "no." One of the officers said clearly that "it is not our responsibility to promote R&D and we were not trained to do so."

The RD has no mechanism to enforce the officers to use the incentive to encourage the private sector to do more R&D. The RD has the mandate, as stated in their Annual Reports, to prioritize the importance of good services by assigning a group of Revenue Officers to supervise and give advice to taxpayers on an individual basis, and to provide tax privileges to taxpayer without interruption, which will be

beneficial to taxpayers' ability-to-pay tax, to reduce the tax burden, and support the business environment, as well as increase voluntary tax compliance which would lead to a sustainable tax base. Such a mandate has not been put into action.

The RD has only Operational Guideline No. MorKor. 5 B.E. 2546 (2003) that provides a guideline for investigation of expenses for technology research and development. Clause 2.3 stipulates that:

> (2.3) if the employer did not ask for certifying the research and development project from the Office of the National Science and Technology Development, the officer must inform the claimant to apply for a certificate from the Office of the National Science and Technology Development and deliver it for investigation… .

The Guideline requires the officers only to check with the claimant to comply with the regulation by obtaining the certificate. Basically, the RD officers have no technical ability to determine whether the R&D project is qualified for the incentive. The officers are not required to give advice to the taxpayers that invested in the R&D but that did not claim the incentive to do so. Such a guideline does not require the officers to supervise or give advice to taxpayers on an individual basis to use tax privileges without interruption, according to their mandate.

In conclusion, there was neither clear nor consistent communication concerning the policy objectives, nor was there a procedure or enforcement mechanism for enforcing or motivating the implementing officials to perform. The analysis indicated that the lack of these two factors has had a negative impact on the effectiveness of the policy. This conclusion is consistent with the view that effective implementation requires that a program's objectives be clearly and consistently understood by the implementing officials for their achievement (Van Meter and Van Horn, 1974).

5.3.1.3 Availability of the monitoring mechanism.

Another factor relating to the implementing organizations that affects implementation is the availability of a monitoring mechanism to facilitate and control

the behavior change in and the compliance of the target group. A control or monitoring mechanism system is required for enforcing the behavior of the implementing officials to act according to the policy and the behavior of the target group to comply or change as prescribed by the policy (Hasenfeld and Brock, 1991).

It was found that the information requirements to properly manage and monitor the R&D tax incentives have not been well served by the present data system. The allowance must be claimed in the computation of corporate income tax and a tax return must be filed with the RD. In the corporate income tax return form (PNR. 50) used until 2004, the claim of the R&D allowance was combined in one item together with other allowances. No information on how much the R&D allowance was claimed could be collected. Since 2005 onwards, the corporate income tax return form (PNR. 50) was revised and the claims of different allowances under the Revenue Code were listed as separate items. Data on the actual amount of tax allowance claimed should have been available at the RD. Unfortunately, the RD did not input data for all items in the tax returns into the computer system.

The officer at the Bureau of Tax Supervision and Audit Standards advised that they were developing a data system to collect the number of projects certified and the amount of R&D expenses approved by the NSTDA and that they would share the information on-line with the Revenue Offices to be used for tax investigation. The system is under testing and will be live soon.

The new data system will not enhance the capability for monitoring the R&D tax incentives or their delivery because it will not provide the basic information required, which is the actual amount of the tax incentive claimed and by whom. No information is available on the R&D tax incentives for management at either the RD or the MOF.

Facilitating compliance involves such elements as improving services to taxpayers by providing them with clear instructions, understandable forms, and assistance and information as necessary (Bird, 2003). As examined earlier, the policy still lacks clarity on what expenses can be claimed, and when and how the incentive will be deducted. It is not possible to provide taxpayers with clear instructions and assistance or information on what they should correctly do in claiming the incentive.

The result of the study confirmed the view of Hasenfeld and Brock

(1991), that the factor that no monitoring mechanism to facilitate and control the behavior change and the compliance of the target group was available had a negative impact on the effectiveness of the policy. The study could not make the conclusion in relation to the enforcement mechanism to enforce or motivate the implementing official to perform, which also may have impacted policy effectiveness, as viewed by Van Meter and Van Hon (1974), due to the lack of empirical evidence.

5.3.2 Behaviors of Implementing Officers

The factors that affect the behaviors of the implementing officials are their understanding and commitment to the policy's objectives and procedures and technical ability to perform the required behaviors. With these two factors, the implementing officers will have conforming behavior whereby goals and procedures correctly translate into behaviors on their part. This section examines whether the factors exist in the implementation of the policy.

5.3.2.1 Degree of Understanding and Commitment

Implementing officers are individuals, not machines. They as individuals make concrete differences in the pace and nature of implementation. What they think important to them as individuals, particularly those relating to the organizational goal and culture will drive their behaviors (Franklin and Ripley, 1982). As concluded in the previous section, although the RD has been in the process of administration reform towards good governance, the RD still gives priority to its most important objective—to ensure that it is meeting the tax collection target. The RD still has a investigating culture that does not encourage the exercise of the incentive and also does not have good attitudes towards the taxpayers.

The culture of the RD that focuses on investigation to collect more taxes and not to support the incentive is a barrier to building trust with taxpayers in terms of their claiming the incentive. With such organizational priority and culture, it is difficult for their officers to commit to supporting the objective of the tax incentive. The officers still have the attitude of maximizing tax collection and have negative attitudes towards taxpayers.

In order for the RD officers to have good understanding and commitment regarding the policy objective, the RD should have had administrative

objectives to promote the accessibility of the R&D tax incentives by the targeted group and to increase awareness and understanding of the availability of the tax incentives. Such objectives could then be communicated to the officers clearly. The officers then could have the right understanding as to what they should do to attain the policy objective and act accordingly.

As stated in the annual reports, the RD prioritized the importance of good services provided to taxpayers by assigning a group of revenue officers to supervise and give advice to taxpayers on an individual basis. It was necessary to determine whether or not the RD had good communication with its officers to support the policy objective sufficiently in order to create the correct level of understanding and commitment.

From the data collected from the interviews of the RD officers and a review of the documents, it does not appear that the RD set an administrative objective to support the policy and obviously no communication was made to them. Most of the officers at the operation level advised that most of the time they learned about the incentive from the tax payers. They also confirmed that they were never communicated with or trained to understand what the objectives of the tax incentive were and what their roles were to support the objective. As a result, their level of the understanding and commitment regarding the policy objective was low.

Almost all of the tax investigators answered "no" to the question as to whether they have advice to taxpayers about the incentive (on R&D and others). The following statement of an RD officer represents the attitude of all officers participating in the study.

> Overall, the attitude of the RD officers is that we view that more or less, taxpayers try to find ways to pay less tax. They do not need our advice about the incentive. Yes, our policy is to provide service to taxpayers but it depends on the mind set of each individual officer. It is very hard to change the mindset to have a service mind.

The officers who hold the highest position participating in the study

commented that the officers' attitude was to collect tax and not to provide information on the incentive. His comment is consistent with the answer in a questionnaire by a registered R&D service provider that set aside a budget for R&D at about 10% of the revenue of 40 million Baht a year. The RD officer questioned that their R&D expenses were too high. Below is the answer:

> We did not claim 200% deduction yet because we were still at a loss. However, the tax investigator commented that our R&D expenses were too high compared to other companies. Probably, the investigator may not be aware of our strategy, which focuses on R&D.

The answer demonstrated a non-supportive attitude towards R&D. Without a change in that kind of the attitude, it cannot be assumed that the degree of commitment to the policy objective will be high. The officers' personal and organizational attitudes towards the content and goals of programs are important factors that have a major impact on implementation (Franklin and Ripley, 1982).

One of the tax experts commented about the attitude of the RD officers toward the tax incentive, saying that the RD officers at the operational level have a narrow attitude in enforcing the lax, which is not supportive. He said that:

> The planning and policy officers developed the incentive that should be promoted. But in fact the officers in charge of investigation and legal affairs have a narrow attitude in enforcing the law. They created criteria that are not practical and become discouraging rather than supporting. At the end, taxpayers do not get privileges.

The officer at the policy level of the NSTDA commented that the attitude of the RD and their officers had become a barrier to the effectiveness of the policy and technology development. He suggested that:

> The RD and their officers should have the attitude of give and take. They should know when to give and when to take and not to take all the time. They want to tax today but overlook the fact that if they give the incentive today, the return in the future will be much higher. The R&D spending of 300,000 Baht can turn into millions of Baht of sales and profits in the future. At that time, the tax to be collected will be much higher. Their limitation is their shortsightedness without taking long-term effects into consideration. This kind of attitude is a barrier to the development of our technology.

The factor about the understanding of the policy objectives and procedures reflects the linkage with the factors on the clarity and consistency of the policy design and inter-organization communication (Mazmanian and Sabatier, 1989). The policy is not clear concerning what R&D activities are qualified for the incentive and what, when, and how R&D expenses and the incentive attached will be deductible. It will be difficult to have internal communication about the policy clear enough to create the correct understanding of the policy and to change their attitude.

Therefore, the study came to the same conclusion as the views of Van Meter and Van Horn, (1974) and Mazmanian and Sabatier (1989), that the communication and clarity of the policy design and a degree of understanding that is not high enough to create the commitment to support the policy objective will negatively impact the effectiveness of the policy.

5.3.2.2 Technical ability

Another factor driving the behaviors of the implementing officials that affect implementation performance is the ability to perform the required behaviors. As far as the incentive is concerned, the RD officers need the technical ability to carry out two functions: consider the registration of the R&D service providers and monitor the tax claim. The following incidents led to the conclusion that the RD officers do not have enough ability to undertake either function.

Firstly, the RD has no technical ability to consider the registration of the R&D service provider. The RD officers review whether an applicant is qualified to

conduct R&D services because the design of the policy was made in a way that the registered R&D service providers will be engaged in doing R&D services for others. An RD officer at the policy level made a comment that the RD officers had no ability to make the right decision and just used their common sense to decide. Below was what he said.

> We had no manual on how to review the qualifications of the applicant to register as an R&D service provider. We are not scientist, not engineers and not (scientific) researchers. We have no idea how to decide who is qualified to do R&D. We just use the layman's common sense. I was fighting to abolish the requirement for a long time. We should let only the NSTDA to do their job, to approve the R&D projects.

This is consistent with an experience shared by one of the tax experts, that her client was rejected because the researcher team was considered not qualified, although they had more than 10 years of research experience. She tried to explain without success that her client did R&D for more than 5 years with a sizable laboratory and a big R&D budget.

Secondly, the RD officers have no ability to monitor the tax claim. The RD has only Operational Guideline No. MorKor. 5 B.E. 2546 (2003) which provides a very rough guideline for the investigation of expenses for research and technology development. Basically the guideline requires the officer to ask for a certificate from the office of the NSTDA. If the certificate is available, the officers will accept the claim for the incentive.

The question was asked of the tax investigators participating in the study how the officers knew whether or not the project that was actually done was the approved project. The answers more or less were the same—that they could not know or investigate whether they were the same because they are not scientists or researchers. The question was further raised that if it was an approved project, how the officers could investigate whether the expenses that were claimed were actually used for the approved project. The officers accepted that they could not investigate that

issue and that the best they could do was to ensure that the actual expenses would not exceed the budget approved by the NSTDA. One officer made a further comment:

> I will see the overall system of the taxpayer whether it is reliable. If it is, I will rely on the system. As I cannot audit the details (of the R&D project and expense), I would have to trust the taxpayer.

It appears that the RD always has a concern that taxpayers will evade taxes but, on the other hand, they have no ability to prevent or investigate tax evasion, at least as far as the R&D tax incentive is concerned.

Lacking the ability to perform the required behaviors requires skill and expertise needed for the program design; the finding showed that the RD officers developed “coping” strategies or behavior by ignoring the detailed investigation of the R&D project and expenses that they encountered.

The officer at the Bureau of Tax Supervision and Audit Standards advised that they were developing a data system to collect only the number of projects certified and the amount of R&D expenses approved by the NSTDA and will share the information online with the Revenue Offices to be used in tax investigation. The system is under testing and will be live soon. However, such a system will not enhance the technical ability of the RD officers in monitoring the incentive claimed. She further advised that the Bureau has no plan to issue a detailed guideline or manual for investigation.

In conclusion, the RD officers do not have enough technical ability to undertake the functions of considering the registration of the R&D service providers and monitoring tax claims. As argued by Hasenfeld and Brock (1991), the availability of the expertise and skills needed for program design influences the agency's ability to translate program requirements into coherent technical specifications. The result of the study confirmed that the lack of technical ability has a negative impact on the effectiveness of the policy.

5.3.3 Behaviors of Target Group

From the review of the literature, the hypothesis was made that successful implementation is likely if: (1) communication of regulations and right to service are made clearly and consistently; (2) the attributes of the target group are aligned with the policy; and (3) the extent of the behavioral change required of the target group is minimum in the case of subsidy policy. The chance of success will be high even though the requirement for change is high for the subsidy policy that provides only benefits to the target group.

The theory of strategic management suggests that firms should respond to opportunities and threats that present themselves in the external environment (Hill et al., 2002). Organizations should change their strategies as the environment changes. However, the finding in Chapter 4 led to the conclusion that most of the private firms in the target group did not positively respond to opportunities that arose as a result of the introduction of the R&D tax incentive policy as an environment external to them. This section will examine further what internal factors or attributes of the target group led to such a response. The purpose of this section is to examine what the attributes leading to strategic changes in the R&D strategy of the private firms in responding to the implementation of the R&D incentive policy are.

5.3.3.1 Clarity and Consistency of Communication on the Right to Services

The degree of the response of the target group depends on the level of communication of regulations and right to service that was made to the target group (Winter, 1990). The question to be examined is how clearly and consistently the policy objectives and regulations have been communicated to the target group.

Despite the effort of the NSTDA to provide regular informative seminars, the valuation in Chapter 4 concluded that many firms claimed to have had no previous knowledge of the existence of the tax incentive. From the data collected through the interviews and questionnaires, most of the registered R&D service providers became aware of the incentive from their own intelligence by proactively studying laws and websites of the NSTDA and the RD or by attending the NSTDA seminars. (It should be noted here that the RD put the information about the incentive in the web site per the request of the NSTDA.) Few knew about it from their tax consultants. The rights

to the incentive are not widely known among the target group.

According to the 2003-2008 Annual Reports of the RD, the Revenue Department intends to provide to taxpayers by assigning a group of Revenue Officer to supervise and give advice to taxpayers on an individual basis. The RD Officer would accommodate the taxpayers by providing advice and consultation at the place where the business is conducted. The RD issued and amended laws and regulations to provide tax privileges to taxpayer that would be beneficial to the taxpayers' ability-to-pay tax, reduce their tax burden, and support the business environment.

However, as examined in the earlier section, none of the R&D officers participating in this study considered that they had the responsibility to advise the taxpayers about the incentive at least as far as the R&D tax incentive was concerned, due to their lack of awareness or understanding of and willingness to attain the policy objective. As long as the tax investigators who interface with the targeted group on a regular basis do not realize their responsibility to communicate the right to services, it will be difficult for the policy to be effective.

Clear and consistent communications that reach and “understand” taxpayers should have been an important responsibility of every RD officers. Lacking such communication, taxpayers will not have enough confidence to act responsively to the incentive because they are afraid of penalties for wrongdoing, as commented by the RD officers at the policy level who used to be in charge of the incentive.

> Also, parts of the private sector were unsure whether their activities qualified as R&D, and therefore were discouraged from utilizing the benefit. Since our tax is self-assessed, if you are confident and you apply for the deduction but are later disallowed expenses as part of R&D, you would face penalties. This is what taxpayers are very afraid of, and is another obstacle to making this measure fully effective.

The information provided on the website and also in the seminars is very general and emphasizes how to apply for a certificate for R&D projects with the NSTDA. No information was distributed about what expenses were needed, or how

and when they and the allowance attached could be deducted. Without such information, it will be difficult to make taxpayers confident in claiming the incentive.

The conclusion of this study therefore reinforced the view of Winter (1990), that the degree of the response of the target group depends on the level of communication of regulations nd right to service. The evaluation concluded that the response of the target group to the incentive was low. One of the factors leading to such a result could be the low level of clear and consistent communication of regulations to the target group and, consequently, a low level of awareness on right to service of the target group.

5.3.3.2 Attributes of Target Group

As behaviors of the target group varied individually based on their attributes, this section aims to examine the attributes of the target group that impacted the implementation and effectiveness of the policy. For this purpose, the target group was classified into 3 subgroups, the high R&D investment group, the low R&D investment group, and the no R&D investment group (as defined in Chapter 4),in order to identify the same or different attributes within and among the sub-groups.

One attribute that clearly stood out among the firms that invested in R&D both at the high and low level was leadership. The findings from the interviews with the executives of those firms were clearly that their founders, owners or top executive firms undertook R&D primarily to retain their competitive advantage. The answers of the heads of the R&D in the questionnaires confirmed that the leader’s or management's vision or support was number one or two of the attributes of their firms in investing in R&D.

However, not all firms undertaking R&D do it sufficiently to create a long-term competitive advantage. The management of the firm may focus and require investing in R&D projects that make only a short-term return and do not make enough investment for the long-term future. An example is a company in the low R&D investment group which is one of the country's leading companies. The company has a vision to become an innovative organization. However, the head of R&D made the comment that the management had short-term vision on R&D and needed short-term return from it and did not make enough R&D investment to sustain their competitive

advantage for the future. He made the following statement:

> Presently, the management emphasizes short-term (R&D) investment. For the long term, if we want to rely on our technology, we must build up a pilot plant. .... . Although the company has an R&D budget of more than 200 million Baht a year, we need 400-500 million Baht or more at the minimum to make the company an innovative organization. Research is not only testing. We need a pilot plant to stimulate real process, which needs a lot of money. Management is very commercial. R&D needs a longer-term view. But now we must make a quick return. Many times instead of developing a formula by ourselves through the R&D process, we bought some partially-completed formula and only adapted it into our local conditions. We will never be a genuine leader in this industry.

The amount of 400-500 million Baht for R&D investment may sound very huge, but for the company that was referred is less than 0.0 1 % of its annual sale, it was very tiny. If the management has a long-term vision of R&D, the decision to make such investment will be easy in financial terms. It depends on whether the leader has the vision for long-term R&D to make the company an innovative organization, as claimed in the company's mission and strategy.

The following will examine the attributes of the target group that impacted the implementation and effectiveness of the policy in 3 sub-groups: the high R&D investment group, the low R&D investment group, and the no R&D investment group.

1) The High R&D Investment Group

There are 6 firms in this group. As described in Chapter 4, 5 of them significantly invested in R&D even before the policy was enacted. They did not claim the incentive despite the fact that they were fully aware of it. The incentive had no impact on their R&D investment decision.

The finding from the analysis of the five firms in this group was that their leaders have two common characteristics that are attributable to R&D

investment: entrepreneurship and vision regarding business opportunities and threats.

The first character is entrepreneurship, which is concerned with the discovery and exploitation of profitable opportunities. Entrepreneurial activity is an important mechanism for creating changes, as well as for helping firms adapt to changes created by others. Firms that encourage entrepreneurship are risk takers, are committed to innovation, and act proactively in that they try to create opportunities rather than waiting to respond to opportunities created by others (Hitt and Hoskisson, 2003).

The executives of the five firms have common characteristics; namely, they enjoy innovation, taking risks, and are visionary. By using and leveraging R&D as their core competency, their firms became leading firms in their industries, not only in the country but also in the region. Below are some of their words:

> Development of new technology is always my inspiration. I know that it is very risky but I enjoy it. Thailand has many thinkers but they dare not try. Not like me. I like trial and error. I allow my people to think and try, make mistakes and learn from them. Of course, it lost money, sometimes, and a lot of money. But at the end we are very successful. I am always excited to have new products. I enjoy the (innovation) process. I am personally interested in the production process (his education background is accounting). I know every part of the machines. I learnt from my engineers. They have to explain to me and convince me until I fully understand. If I think the principle is right, I will allow them to go ahead with it. Those who like to do R&D like me must think long term and must not think of short term or easy money. R&D is my hobby.

While talking with this group of executives about R&D, their eyes sparkled with strong body language and showed a sense of pride, enthusiasm, confidence, and enjoyment. They showed strong charisma. They preferred to develop their own technology and envisioned that as the only way to sustain their business. They strongly believe that the way to gain a competitive advantage for the long term is to develop their own technology.

The second factor is management's vision on business opportunity and threat. An opportunity is a condition in the general environment that if exploited, helps a company to achieve strategic competitiveness, while a threat is a condition in the general environment that may hinder a company's efforts to achieve strategic competitiveness.

Firms cannot directly control the general environment's segments and elements. Strategic leadership is the ability to anticipate, envision, maintain flexibility, and empower others to create strategic change as necessary. Accordingly, leaders of successful firms gather the information required to understand each segment and its implications for the selection and implementation of the appropriate strategies. They are willing to make candid and courageous, yet pragmatic, decisions—decisions that may be difficult, but necessary—through foresight as they reflect on external conditions facing the firm (Hitt and Hoskisson, 2003).

Four executives in three different industries started their business as a trading firm; they imported products from overseas' suppliers for local sale. They envisioned that R&D could be their core competency to take advantage of opportunities and overcome threats in the external environment. Their trading business could not be sustained in the long term and they diversified their business by developing their own technology for production and product development and by using R&D as a core competency for their diversification.

One executive shared his vision of the potential of the market to diversify from trading to manufacturing:

> I was assigned (by the family) to be in charge of the business. I had to travel a lot. Saw a lot of things. Saw

> that merchants in underdeveloped countries do only trading. Saw the advantage of being a niche firm like those in developed countries that develop their own technology. There was a very big gap. I did not want my company to get struck at the buying and selling level (of the business cycle). I liked to be there (developed like firms in developed countries). I saw the potential of the market. So, I started to build up a team, assigned them to take courses to do R&D, and at the same time invested in marketing.

Another executive saw a business opportunity from the reduction of costs on import duties and transportation and began to diversify. Below is his story in his own words:

> I started the business about 29 years ago as importer of lubricant products for repacking and re-branding. I selected the best products from various overseas suppliers and put my own brand on did very well at the beginning but I needed to find a way to improve my business and make it more sustainable. When the sales volume justified the investment, I built up my own production facility. Also, local production was needed because of a high import duty of 40% on finished products compared with 5% on chemical ingredients. Transportation costs would also be reduced. I then decided to build up the facility about 25 years ago. I needed to invent my own technology. I recruited a chemist that used to work with my supplier. I used him as a base to set up my own research and development capability and started to develop my own formula, product by product, on top of the knowledge that he

provided.

One firm decided to heavily invest in R&D to ensure that there would be a sufficient supply of good quality raw materials for the business in the long run.

> In the group, we have 5 sugar mills and now we have moved to a by-product industry, electricity, furniture board, and ethanol. We need 110,000 tons of sugar cane a month to feed our group's production. We need a sustainable supply of sugar cane; otherwise we will have serious problems. This is our (R&D center) mission.

Not only does the vision of business opportunity result in high R&D investment but the vision of business threats does as well. A young executive saw the need to use R&D as a core competency to sustain and diversify his business, not because he encountered business opportunities but because of "business threats." He used the technology that he had in the current business to diversify to a new business that had a larger market and a higher profit margin. Here is what he said:

> I was forced by the environment to do R&D. Technology owners mainly in Italy are drying down and have stopped developing new technology because their technologies are copied illegally and the return did not justify the investment. I must have my own technology to continue to be in the business….. : But anyway, if I continue business as it is, I will be out of business in 5 years. I need to diversify using core technology in the existing business as a base to diversify into the craft and construction material

> business which has a larger market and higher profit margin.

Another executive said that because of a serious threat from competition, his firm decided to double investment in R&D.

> R&D has been our core competency for a long time. Recently, we got a serious threat from the competition. All key players in the world moved to Thailand, one after the other, to compete with us in both domestic and regional markets. They are all heavy R&D firms, probably at 6-8% of sales as we did. We decided to increase our R&D investment to 12-13% on sales per year to maintain our competitive advantage. And we do.

Another common character of the firms that do intensive R&D is that they are successful and have a sufficient cash flow margin from their business to fund investment in R&D, as required for business diversification. The funding comes from their profit and cash flow. This may be one of the reasons why they have no interest in the incentive.

The five firms achieved strategic competitiveness and earned above-average returns because their unique core competency, R&D, was effectively leveraged. Their key attributes of R&D investment are entrepreneurship and vision of business opportunities and threats. Their leaders maintained their current position with no response to the tax incentive.

2) The Low R&D Investment Group

There are 14 firms in 6 industries that are classified in this group. Among them, 10 firms have actively claimed the incentive. The evaluation in Chapter 4 concluded that the incentive had some impact on the R&D investment decision of the firms in this group. This section examines why it has such an impact.

It is difficult to identify common characters of the firm in this

group. Industries are very varied. Their sizes are also varied. They comprise very large firms and also very small ones.

Data from both the interviews and questionnaires imply leadership as one of the key attributes. Most of the questionnaires answered by the head of R&D referred to management's vision or support as a key attributes for R&D investment. However, it appears that the degree of entrepreneurship of the leaders in this group was lower than the group of high R&D investment. They do not have a strong vision that R&D can be their core competency to achieve strategic competitiveness. For them, R&D is something that should be done but not must be done.

Take the two largest firms as examples. The first one is in the petroleum and petrol-chemical business. Despite a vision to become an innovative organization, the R&D head commented that the management still focused on short-term return rather than a long-term one, and accordingly set aside an R&D budget of less than half of what it should have been for R&D to make the investment effective. One RD officer referred to this company during the interview, stating the following:

> I talked with the head of R&D. If the company will compete with other countries, the company needs at least 2 billion Baht for R&D budget. The company can afford it financially. But it depends on whether the management has a vision to do it.

That firm allocated about 200-300 million Baht for R&D budget during these years. It does not seem as though the management had a vision to do it. It would be difficult for the firm to be an innovative organization as envisioned as far as product development and process improvement are concerned.

The other firm is in construction materials and petrol-chemicals. The group also had a vision to be an innovative organization. The interviewed executive stated that the group encouraged staff at level to come up with new ideas and that management would provide a chance to implement them. However, the competitor of the group participating in the study commented that what that group

only focused on was organizational or management innovation. Product development was done at a low level for marketing purposes only. This comment was consistent with the comment of the business consultant that knew this group well—that the group did not achieve in developing its own technology and could not compete in terms of technology in the long term.

Other than the lower degree of entrepreneurship, profitability and cash flow appeared to be constraints or negative attributes to R&D investment for this group. Most of the R&D heads answered the questionnaire, saying that profitability and cash flow were the key negative attributes. Their R&D budget would be cut if the profits of the firms declined. This was consistent with the comment of the executive in the group:

> I did not do R&D in the past because I wanted the company to be strong financially enough to fund R&D investment by itself. In the future, I will set aside the firm's profits for R&D investment.

A cash flow was required for setting aside a budget for R&D. When a firm faced financial difficulty, the &D budget would be unavoidably cut, as stated by one of the executives:

> Before the economic crisis (1997), I set aside a specific budget for R&D, in some years, more than 10 million Baht. After the crisis, I had to reduce costs, including costs for R&D and used it as necessary. I had no specific budget but still spent money on R&D all the time … When the company has better cash flow, I will do more R&D and set aside a budget for it.

An executive in the pharmaceutical industry also commented that the availability of a cash flow margin is important for R&D investment.

> Thai medical firms can do only generic products. We develop them from formula of patented products under which the protection period is nearly expired so that we will have generic products on the market soon after that. There are a number of nearly-expired products every year. We would select and develop (copy) as many as possible. But our cash flow is limited. So we need to be very selective.

So, it is understandable why the firms in this group actively tried to take advantage of the incentive and also other incentives that would ease their cash flow and also increase their profits after tax. The reduced after-tax price of R&D should make it a more attractive investment opportunity for the firms in this group. One of the executives commented that the incentive would be more beneficial to them and have a high impact on their R&D investment decision if the amount to be certified were more ascertainable or at least more foreseeable at the time of preparing the annual budget.

The finding gives an indication that the firms with low R&D investment are most likely to take advantage of the incentive offered by the tax allowance. The firms with low liquidity positions try to take the greatest advantage of the tax allowance. Furthermore, the leaders of the firms in this group seem to have a degree of entrepreneurship at the lower level than the high R&D investment. They do not envision that R&D can be their core competency in achieving strategic competitiveness.

3) The No R&D Investment Group

There are 7 firms in various industries classified in this group. The evaluation in Chapter 4 concluded that the tax incentive was not strong enough to motivate them to change their behavior to begin investing in R&D. This section examines why the incentive could not motivate them to do so.

Five executives interviewed trended to agree that it was essential for their firms to have good and modern technology for product development and production process efficiency. Technology can help firms to produce their

products faster, with better quality and at lower costs. However, they preferred to rely on proven foreign technology that mainly comes with the machines and equipment purchased from foreign suppliers. Others preferred to copy with little development, so called "big C & small d."

The first group of executives believed that it was better for their firms to purchase proven foreign technology mainly because it is cheaper than developing their own technology and also has lower risks. One executive in the agro-food industry commented as follows:

> The source of technology that the company uses is mainly from the purchase of machines. Purchasing technology is cheaper with more effective and less risk than trying to develop my own. Further, as the technology in my business is mature, there is no need for intensive R&D.

Another executive who is in the construction materials industry believed that relying on foreign technology was less risky and yielded lower costs.

> Like in Europe, when they invent new technology, they make trial and error until the result is really perfect. If we do it ourselves, technology will be very expensive and unproven.

R&D investment requires long-term commitment both in terms of human and money. One executive preferred to have a quick and short-term return. He said that:

> For conducting R&D by ourselves, we need qualified personal, need time and money… . We need to have a large-scale market to justify the investment. Thai (business) people (including himself) make investment

> for quick return. It is hard to measure long-term (R&D) investment and the result is not very ascertainable.

They believe that their businesses can be sustained relying on technology from abroad. They realized that technology purchased from abroad may not be the most modern technology; on the contrary, it may be quite outdated. "The owner of technology who is in the industry will not sell their new technology as they must keep for themselves to maintain their competitive advantage and will sell technology that starts to be outdated." said one executive. Those who prefer the purchase of foreign technology would argue that it is "proven technology."

The above statement reflected the fact that the executive in this group had the lowest level of entrepreneurship. They do not want to take risks. They neither commit to innovation nor act proactively in that they try to create opportunities rather than waiting to respond to opportunities created by others. The firms that believe in the purchase of foreign technology would e limit their "R&D" function only to follow up on the development of this foreign technology, evaluating which technology would be appropriate for them and at what price, and finally after purchasing it, adapt it to their environment.

Two executives in this group preferred to copy foreign technology with little development, so called "big C & small d." Taking furniture as an example, the executive that had been in this business for more than 20 years explained about the nature of the furniture business in Thailand.

> Eighty-five percent of furniture makers in Thailand are contract manufacturing. They produce by order based on the design provided by customers only and do not have their own design. The key in the furniture business is a design which is dominated by furniture firms mainly in Italy, Japan, Scandinavia, and the U.S.A. Another 15% of Thai furniture makers try to have our own products but still need to follow the trend of the design originated in those countries. They only

> change materials, covers, colors, etc. For complicated parts, we select and buy from Taiwanese or Korean suppliers.

Van den Berg, Van Dijk and Van Hulst, (1990) have argued that barriers to commencing and/or completing R&D projects are a lack of financial resources. Financial constraints are more significant in small companies than in medium and large companies, given fewer internal resources, difficulty in absorbing risk, and difficulties in accessing external sources of funding. However, the finding from this study found that this argument may not be true because all 7 firms in this no R&D investment group were profitable and had no financial constraints, at least at the time of this study. They can invest in R&D but they choose not to. The tax incentive will not be a factor that is strong enough to change their behavior. What seems to be a more important attribute for R&D investment is leadership with entrepreneurship, vision, and the nature of business.

As pointed out by Winter (1990), successful implementation is likely if the attributes of the target group are aligned with policy. The findings from this study reinforced that the attributes of the target group which are entrepreneurship and the visions regarding business opportunities and threats of the impact the implementation and the effectiveness of the policy. The policy seems to be effective for the firms with a lower degree of entrepreneurship because they viewed that the incentive would lower their R&D risk, ease their cash flow, and increase their profit after tax.

The results of this study also confirmed that from the study of Knoll (2003)—that internal attributes had an influence on deciding to invest in R&D, including a vision-led strategy. On the other hand, the result of the study challenged the views of Van den Berg, Van Dijk and Van Hulst (1990)—that one of the barriers to commencing and/or completing R&D projects is lack of financial resources, particularly for small companies The study revealed that all 7 firms in the no R&D investment group were profitable and had no financial barrier in terms of investing in R&D and they did not make any investment. They did not view R&D as their core competency or that it was necessary for their business.

5.3.3.3 Extent of Behavior Change

From the review of the literature, an hypothesis was made that the chance of success of the policy implementation would be high for the subsidy policy that provides only benefits to the target group even though the requirement for change is high. This section examines whether or not the hypothesis is true for the target groups classified in 3 sub-groups: the high R&D investment group, the low R&D investment group, and the no R&D investment group.

1) The High R&D Investment Group

The requirement for change for this group is the lowest as they have already heavily invested in R&D. What they need to do is only to comply with the statutory requirements and claim the incentive. But the result of the evaluation showed that they have no interest in claiming the incentive at all.

The firms in this group had leadership with a high degree of entrepreneurship and vision. They consider R&D as their core competency and could fund R&D investment from their profit and cash flow. On the other hand, they viewed that the statutory requirements to claim the incentive were too complicated and troublesome and did not want to become involved with the RD, which has a bad attitude towards taxpayers. The following statement of one of the executives in this group can very well represent the views of the executives in this group towards the incentive.

> I do not trust the Revenue officers. They try to find mistakes and fine us although we had no intention to evade taxes. If I claim the incentive, I need to become involved in troublesome procedures and they will focus on me more. I do not want to do it.

The finding indicated that these factors outweighed the benefits offered by the incentive.

2) The Low R&D Investment Group

The requirement for change in this group is also low, as they have already invested in R&D. What they need to do is only to comply with the

statutory requirements and claim the incentive and invest more in R&D to obtain higher benefits.

Most of the firms in this group had a lower level of entrepreneurship and tried to take advantage of the incentive, viewing that the incentive would ease their cash flow constraints, reduce R&D investment risk, and increase their profit after tax. The incentive would have more beneficial to them they can estimate how much benefit they would get at the time when their set the annual budget.

3) The No R&D Investment Group

The requirement for change of this group is high, as they must begin to invest in R&D and then comply with the statutory requirements and claim the incentive.

All of the firms in this group viewed that the incentive could not motivate them to change their behavior regarding R&D investment. They view that the risk of R&D was too high to take and preferred to rely on the purchase of foreign technology, which is considered as a lower risk alternative.

Mazmanian and Sabatier (1989) raised the issue that the amount of behavioral modification required to achieve policy objectives is a function of the amount of change required of them. In other words, the greater the amount of behavior change, the more likely successful implementation will be. The finding of this study indicated a slightly different view from theirs. As a tax incentive policy that provides only benefits to the target group, it should likely be effective even though the requirement for change is high. However, as empirically evidenced in the high R&D investment group, the policy has no effect on them despite the fact that a minimum change on their part is required; but it seemed to have an effect on the low R&D investment group, although the same level of change was required. This means that other factors can out-weight this factor.

5.3.4 Environments

Social, economic, and technological conditions are exogenous variables that affect policy output and ultimately the attainability of the policy objective. With limited time and recourses, this implementation analysis has tried to identify the extent

to which, and how, social, economic, and technological conditions affect the implementation and effectiveness of the policy. The findings indicated that there are a number of exogenous factors that affected the policy; namely, the nature of the tax system, economic conditions, lack of skilled resources, government policy, and market competition. The examination of each factor is as follows.

1) Tax System

The nature of the tax system under the Revenue Code is one of the self-assessment systems whereby taxpayers must declare and calculate their own tax, file a tax return, and pay taxes at the same time. If they make a mistake that results in a tax shortfall, they will be liable, not only for the amount of the tax shortfall, but for a penalty (at 100% or 200% of the shortfall) and a surcharge (interest at 1.5% per month but not more than the amount of the tax shortfall). The nature of tax system is a unique factor for Thailand that has been identified in this study because Thailand is one of a few countries that uses the self-assessment tax system, with serve penalties, and offers the R&D incentive. A number of informants in the target group have raised a concern that if they make mistakes in claiming the incentive they will face a penalty. Furthermore, the comments of the RD officers at the policy level that used to be in charge of the incentive mentioned his impact of the self-assessment system on the effectiveness of the incentive.

> Also, parts of the private sector were unsure whether their activities qualified as R&D, and therefore were discouraged from the use of the benefit. Since our tax is self-assessed, if you are confident and you apply the deduction but are later disallowed expenses as part of R&D, you would face penalties. This is what taxpayers are very afraid of, and is another obstacle to making this measure fully effective.

When this factor is linked with other factors, namely, the lack of clarity of the policy design and the attitude and behavior of the RD officers to pinpoint mistakes, some firms are seriously concerned that if they wrongly claim the allowance, they will face the penalty. As a result they did not claim it. The evidence was clear, as

the firms with high R&D investment did not claim the incentive for this reason.

2) Economic Conditions

There are 5 firms that indicated that economic conditions had a negative impact on their R&D investment decision. Basically, the R&D budget would be cut during economic turmoil or a high interest period.

The incentive should have eased the impact on business from the poor economic condition. The Department of Industry of Australia in 2005 also indicated that a strong economic condition was a positive factor for R&D investment. However, there was no evidence in this study to confirm how much of an impact it would likely be.

3) Lack of Skilled Resources

Six firms, 5 of which are in the low R&D investment group, claimed that barriers to conducting R&D projects are a lack of skilled labor, especially engineers and scientists who want to work in rural or remote areas. This factor had a serious impact on the agriculture industry, in which it is necessary to work in a rural area.

However, the firms with high R&D investment could find ways to overcome this hurdle. Some of them recruited highly-experienced scientists, possibly from abroad, that were in the field to start and gradually build up an R&D team. Others used the trial and error technique by allowing their people to learn from mistakes or by recruiting junior researchers, who were trained and groomed year by year and allowed to build up their experience and expertise within the firms. If the leaders had vision and high commitment, and the firms had sufficient financial resources, the human resource constraint was only an issue to manage.

The incentive has no direct impact on this factor but may have some indirect impact; namely, the benefit of the incentive may be passed on to the staff. But there is no evidence to claim this.

4) Government Industrial Policy

The finding indicated that the government's industrial policy seems to have a negative impact on the R&D investment rather than a positive one. For example, the government had the policy to protect the local iron and steel industry and consequently the firms in this industry did not see the necessity of improving their

product quality or production efficiency to be competitive with foreign players in the long term. As a consequence, they did not invest in R&D, as remarked by the researcher of a government agency doing R&D support for the iron and steel industry.

Another example came from the pharmaceutical industry, which the government did not protect. The interviewed executive explained that Thailand agreed to protect foreign medical patents more than 10 years before China and India did. Thai players needed to wait 10 years to develop generic products (following the medical formula after patent protection had expired, while Chinese and Indian players did not. Their development was far ahead of the Thai players. Furthermore, the purchase policy of the government hospitals also did not support Thai generic medicines, while the country like Japan had more than 80% of the generic products in their medical market. With the government's right support, the industry could invest more in R&D.

5) Market Competition

The finding indicated that market competition factors had a positive impact on R&D investment decisions for 4 informants. When market competition became fierce, the firms with high R&D investment would invest more in R&D in order to maintain their competitive advantage.

The evidence was clear in one case, as an example, that the firm decided to double its R&D budget in response to the entrance of global competitors. Knoll (2003) also has suggested that market competition is one of the factors that positively impacts R&D investment.

The tax incentive should have an indirect impact on this factor because the benefit should allow the firm to invest more in R&D. However, as explained earlier, the benefit was outweighed by other factors. No evidence led to such a conclusion.

The result of this study confirmed the view that social, economic, and technological conditions affect policy output and ultimately the attainability of the policy objective (Van Meter and Van Horn, 1974; Mazmanian and Sabatier, 1989; Hogwood and Gunn, 1984). The exogenous factors that have a negative impact on R&D investment decisions are the tax system, economic conditions, lack of human resources, and government policy. Only market competition seemed to have a positive

impact. The R&D tax incentive should ease the impact on economic conditions and support market competition. However, there is no evidence that confirms such a claim.

5.4 Summary

This chapter analyzed how the policy was formed and implemented, and examined the key factors related to policy formation and implementation. Most of the factors examined had a negative impact on the effectiveness of the policy and resulted in the low effectiveness of the policy, as concluded in Chapter 4. The next chapter summarizes the key factors and the linkage between and among them, and also proposes recommendations for the modification of the policy and its implementation in order to increase its effectiveness.

CHAPTER 6

CONCLUSION AND RCOMMENDATIONS

6.1 Introduction

This chapter concludes the results of the evaluation of the policy as described in Chapter 4 and the key factors that impact the implementation and effectiveness of the policy as examined in Chapter 5. It also indicates the hypothesis linkage among those factors. Finally, it offers recommendations for the modification of the policy and for the improvement of policy implementation.

6.2 Conclusion – Academic Contributions

The result of the evaluation of the policy indicated that the policy had low effectiveness in terms of both output and outcome. Basically, the indicators of the policy output used for the evaluation are the number of R&D service providers registered, the number of R&D projects approved, and the amount of tax allowance claimed. The indicators of the policy outcome are the number of patent applications and the level of change of R&D behaviors or decision making of the target group.

The implementation analysis indicated the number of key factors relating to the policy formation, policy implementation and environments that impacted the effectiveness of the policy, most of which were negative. The key factors impacting the implementation and effectiveness of the R&D incentive policy are summarized in Figure 6.1: Key Factors Impacting Implementation and Effectiveness of the R&D Incentive Policy.

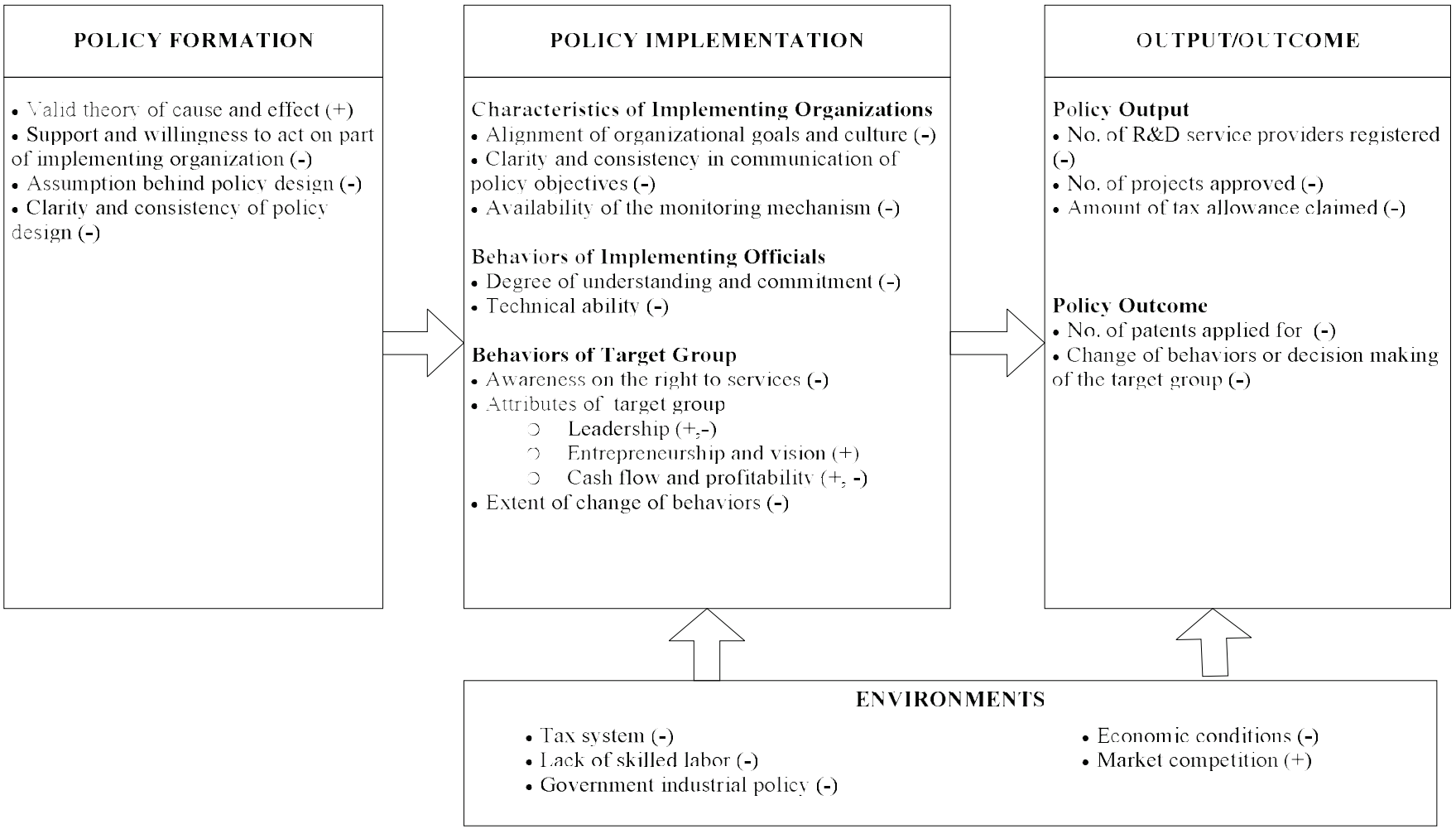

Figure 6.1 Key Factors Impacting Implementation and Effectiveness of the R&D Incentive Policy

The factors relating to policy formation and their direction of impact are support and willingness to act on the part of the implementing organization (-), valid theory of cause and effect (+), assumption behind policy design (-), and clarity and consistency of policy design (-).

The factors relating to the policy implementation and their direction of impact are: (1) characteristics of implementing organization comprising alignment of organizational goals and culture (-), clarity and consistency in communication of policy objectives (-), and availability of the monitoring mechanism (-); (2) behaviors of implementing officers, comprising degree of understanding and commitment (-), attitudes of the officers towards taxpayers (-), and technical ability (-); and (3) behaviors of target group, comprising awareness of the right to services (-), attributes of target group - leadership (+, -), entrepreneurship and vision (+), cash flow and profitability (-), and extent on change in behaviors (-)

Finally, the factors in the environment that impact the effectiveness of the policy and their direction are the tax system (-), lack of skilled labor (-), government industrial policy (-), economic conditions (-), and market competition (+).

6.2.1 Effectiveness of the R&D Tax Incentive

By using the effectiveness model or goal-attainment model, this study evaluated whether or not the goal of the policy was attained and whether the implementation succeeded or failed regarding the goals of the policy. The goal of the policy as remarked in Royal Decree No. 297 B.E. 2539 (1996) is to promote the encourage sector to do more research and technology development. The policy would be considered as effective if it results in stimulating the private sector to do more research and technology development.

Outcomes that are real results and that are actually achieved are chosen to be the main indicator (Hill and Hupe, 2002). The expected outcome of the policy is for the private sector as the target group to do more research and technology development. Therefore, the measure for the evaluation under this study was whether the R&D incentive policy resulted in stimulating R&D investment in the private sector.

The evaluation began with an overview of national R&D investment as a big picture in order to ascertain the extent to which the policy contributed to this big picture.

The NSTDA website, which provides an overview of R&D investment in Thailand indicated the low R&D investment of the country. In other words, total expenditure in research and development in terms of percentage of GDP in 2005 was 0.24%, falling far behind the comparable countries, i.e. Japan (3.17%), U.S.A. (2.67%), Korea (2.98%), Taiwan (2.52%), Singapore (2.36%), China (1.33%), and Malaysia (0.63%).

Throughout the period of the National Economic and Social Plan No.5 (1983 - 1986) to Plan No. 10 (2007 -2011), the target on R&D investment was set at 0.5%, but actual investment was about half of the target, i.e. 0.25%. The overall R&D picture seems to be even worse and more depressing, taking into account that about 60% of the R&D investment was made by the government's sector and only the other 40% made by the private sector. Statistical data about R&D expenditure in Thailand from the Thailand Annual Research Report 2003 showed that R&D investment increased from 0.10% to 0.22% of the GDP and RD investment of private firms increased from 466.3 million Baht to 4,009.2 million Baht from 1997 to 2001. From 2001 to 2005, R&D investment increased from 0.22% to 0.24% of the GDP and RD investment of private firms increased from to 4,009.2 million Baht to only 6,624 million Baht, as described in the NSTDA website.

R&D investment in the private sector during the past 10 years has still been very low. The R&D tax incentive, which has the main goal of stimulating R&D investment in the private sector, has had low effectiveness.

6.2.1.1 Output of the Policy

The outputs of the policy also indicated low effectiveness.

1) Number of Registered R&D Service Providers

As of December 2008, there are 164 firms registered as R&D service providers with the MOF, comprising 154 organizations in the private sector, 6 governmental organizations and 3 government universities and 1 private university.

Before the involvement of the NSTDA, from 1996 to 2000, there were 33 organizations registered as R&D service providers with the MOF or in

average, 6.6 organizations a year. From 2001 to 2008, there were 131 organizations registered as R&D service providers with the MOF or in average, 16.4 organizations a year. The average number of organizations registered as R&D service providers with the MOF increased from 6.6 to 16.4 organizations a year.

2) Number of R&D projects and amount approved

Since 2001, R&D projects that would be eligible for the tax incentive have been required to obtain pre-approval from the NSTDA. During the period of 2001 to 2008, 732 projects with a value of 2,717.52 million Baht were applied for and considered and 598 projects with a value of 1,513.52 million Baht were approved. On average, 104.5 projects were applied for and 85.5 projects were approved each year. The average value of the project applied for was 3.7 million Baht per project and the average value of the project was 2.5 million Baht per project.

3) Amount of tax allowance claimed

The data about of the actual amount of tax allowance claimed were not available at the RD or the NSTDA. As the value of the project approved by the NSTDA should be considered as the maximum amount of the tax claimed, the maximum value of the R&D project eligible for the incentive during the period from 2001 to 2008 was 1,513.52 million Baht. Applying a normal rate of corporate income tax of 30%, the amount of tax allowance granted under the policy from 2001 to 2008 would not exceed 454.05 million Baht or on average, 64.86 million Baht a year.

With an assumption that one Baht of tax forgone increases around one Baht of R&D investment (Hall, 2002), in 8 years, the incentive stimulated R&D investment of only 454.06 million Baht, or on average, only 64.86 million Baht a year.

6.2.1.2 Outcome of the Policy

The outcome of the policy also indicated low effectiveness of the policy. As mentioned earlier, the measure for the evaluation in this study was whether the R&D incentive policy resulted in stimulating R&D investment in the private sector. The measure was elaborated into two questions in evaluating the outcome. First, did the tax incentive cause firms to make changes in their behaviors on R&D spending or investment? Second, did firms respond to the tax incentive in a predictable fashion?

The R&D incentive policy is one of distributive programs that provide

tangible government benefits in the equivalent form of payments to private firms. The policy should hypothetically have high effectiveness. However, the result of the evaluation led to the conclusion that the tax incentive did not cause the private firms to make any serious changes in their behaviors on R&D spending or investment and the firms did not respond to the tax incentive in a predictable fashion. Such a conclusion was based on the responses of the private firms in the target group and confirmed by the opinion of the tax experts and personal opinion of the officers at the policy level of the RD and the NTSDA.

The 34 private firms participating in the study were categorized according to the size of their R&D investment into 3 groups: high, low and no investment—using the criterion of 0.5% of R&D investment/revenue which is equal to the country R&D investment target.

In the high R&D investment group, there were 6 firms that had a number of characteristics in common, other than having heavy investment in R&D. They should have been in the group of the firms that responded significantly and positively to the tax incentive in order to maintain their current relative position in R&D spending as an important strategic dimension (Dagenais, Mohan and Therrien, 1997).

The result of the examination indicated the opposite; namely, 5 out of 6 firms had no interest in the incentive for similar reasons although they were fully aware of the incentive. They did not register as an R&D service provider with the MOF. They viewed that the procedures for claiming the incentive were complicated and too costly to comply with. They also had a concern about the confidentiality of the information disclosed to apply for approval. Finally, they did not trust the RD because they believed that the attitude of the Revenue officers was to pinpoint mistakes in order to collect more taxes and that they would be fined if they wrongly claimed the incentive even if they had no bad intention.

The only one that registered as an R&D service provider had not applied for any incentive yet because they were in a loss position.

The second group was the low R&D investment group, comprising 14 firms. Executives of 6 firms were interviewed and the heads of the R&D function of 8 firms were interviewed or responded to the questionnaire.

They were the group of firms that actively sought benefits from the incentive, particularly by their heads of the R&D function. The interviewed executives shared the idea that the incentive had some effects on their decision to invest in R&D, basically to increase the size of the investment but not in a predictable fashion. This was because they could not predict the amount of the incentive eligible at the time of setting aside the R&D budget, as remarked by one of the executives.

> At the time I set an annual budget (which included the R&D budget), I had no idea whether or how much incentive I would get. I cannot take it into consideration. But if I get some this year, I probably increase next year's R&D budget.

If it is certain or predictable how much tax incentive they will get, the R&D investment will likely increase by the amount of the incentive obtained. This certainty is important for them. OECD country experience and empirical studies consistently indicated that predictability is essential in assisting enterprises in making R&D investment decisions, partly on the basis of tax incentives (OECD, 2002).

The heads of the R&D function of the firms in the low investment group reflected the same view—that the incentive has some effect on R&D investment and further, they used the tax incentive to negotiate their budget for R&D projects with their superiors, as remarked below:

> When my boss wanted to cut my (R&D) budget, I would remind him that the company will get the incentive for 30 Baht out of every 100 Baht spent. My budget was still cut but not as big as he initially intended. I must make sure that I get the incentive to continue to use it (the explanation) in the future.

It was concluded that the incentive had some impact on the firms in the low investment group in making their R&D investment decision, but not in predictable fashion.

Finally, the no R&D investment group had 7 firms, comprising 4 firms in the agriculture industry, 2 in construction materials and furniture, and 1 in software implementation and services. None of the five executives or owners in these firms was aware of the incentive, and they had no interest in the incentive after being informed about it. Obviously, the incentive could not motive them to change their R&D investment decision. Some preferred to rely on foreign technology that came with machines or equipment and others preferred to copy foreign technology with little development, so called "big C & small d."

In addition to the firms in industry, data were also collected from 3 R&D service provider firms, plus the engineering faculty of 2 universities and 2 governmental research organizations that registered as registered R&D service providers with the MOF. It was found that none of them undertook R&D engagements from clients in the industry that had applied for the tax incentive. One of them made the remark that the incentive had little or no impact on their clients in deciding to engage them to provide R&D services.

> The tax incentive gives some motivation to my clients to engage me to do R&D for them but only a little. There are other (business) factors that are more important…. If they have too much concern about the incentive, they will not engage me from the beginning.

The result of the patent analysis confirmed that the incentive did not result in an increase in the R&D activities of the registered R&D service providers, as indicated by the increase of patent applications submitted by them.

Only 30 firms out of 154 private firms (excluding 3 universities and 7 research arms of government agencies from a total of 164 registered R&D service providers) of registered R&D service providers submitted 180 patent applications during the period of 10 years from 1996 to 2005. These registered R&D service providers contributed only 0.76% of the total patent applications submitted by Thai firms. Most of the applications, 122, were submitted before the applicants registered as registered R&D service providers with the MOF and 58 applications were submitted

after the applicants registered with the MOF.

The conclusion regarding the low effectiveness of the policy was confirmed by the personal view of the RD and NSTDA officers that were involved with policy implementation and by the opinion of the tax experts participating in the study.

The two officials of the RD at the policy level viewed that the policy had low effectiveness. One of them commented on the effectiveness of the policy as follows:

> No, not effective, not useful at all. What a waste of government revenue it is. They gave reasons for their views. Firstly, the RD has no knowledge about technology research and development. The administration of the RD stressed only control and investigation and did not support taxpayers to do R&D or to use the incentive. Secondly, it is not the culture of the RD to provide an incentive but to pinpoint mistakes and to collect more taxes. It is not the direct responsibility of the RD to promote the policy. The RD officers will not advise the taxpayers to claim the incentive if they encounter a case where the taxpayer does R&D but did not exercise the incentive. Finally, they viewed that whether the taxpayers invest in R&D depends on the vision of the management. If the management views R&D is important, is necessary, they will do it regardless whether the government provides an incentive or not.

The NSTDA officer in charge of the policy viewed that the policy was not as successful as it should have been because of some barriers. Firstly, the claimers are required to separate the account books for R&D activities. Secondly, the approval process is one of the project bases, while R&D activities are practically continuous and cannot be divided into many small projects. Thirdly, the firms perceive that if they disclose more information to the RD officers, the officers may pay more attention to

them and consequently will be audited more often. Fourthly, the attitude of the RD officers emphasized investigating rather than promoting. Such an attitude scares away firms from the incentive.

All five tax experts participating in the study (six, if including the researcher) shared the same view that the policy has very low effectiveness for different reasons. Firstly, the policy lacks clarity. The definition of R&D is not clear and not even understandable. No details on what kind of expenses can be included, and more importantly when and how to deduct the incentive. Secondly, the private firms have serious concern about the attitude and culture of the RD, which focuses on investigation to collect more taxes. The incentive results in lower tax, which they do not encourage. Thirdly, the procedures on the registration of R&D service providers were too complicated. One shared the view that it took 5-6 months for this painful bureaucratic process while it should not have taken more than a month. Fourthly, the design of the policy is that the policy is based on the wrong assumption—that the private firms cannot do R&D by themselves but engage those that have ability to do so, as universities do. This results in requirements which are difficult for the private firms to comply with to obtain the incentive, e.g. to issue a receipt for itself, as if it were employed by outsiders.

Due to the above reasons, none of tax experts proactively promoted this program to their clients. This was a pity because the study in Canada reported that a large number of taxpayers in Canada became aware of the R&D tax incentive from their tax consultants.

The evaluation of the R&D tax incentive in Thailand from different perspectives indicates that the policy has very low effectiveness in stimulating R&D investment in the private sector. The firms in the high R&D investment group, which invested more than 0.5% of their revenue, had no interest in claiming benefits from the incentive and would continue to invest in R&D regardless whether they would benefit from the incentive or not. On the other hand, the firms in the no R&D investment group, which made no investment in R&D would not do so, regardless whether they would get benefits or not. The incentive seemed to have some impact on the firms in low R&D investment group which invested in R&D at lower than 0.5% of their revenue. The incentive resulted in some increase in R&D investment but not in a

predictable fashion. The factors relating to the policy formation and implementation that resulted in the low effectiveness of the policy are summarized below.

6.2.2 Factors Relating to Policy Formation

The following was initially hypothesized about the linkage between policy formation and implementation: that the policy as far as the formation is concerned, the successful implementation depends on the following factors: (1) a low degree of conflict during the policy-formation phase; (2) willingness to act and attain the objectives of the policy, and (3) valid causal theory (Winter, 1990; Mazmanian and Sabatier, 1989; Hogwood and Gunn, 1984).

The study of the historical background of the policy indicated that the development of the R&D tax incentive policy followed the strategy of "disjointed incrementalism" as advanced by Charles E. Lindblom (1963). That is, incremental decisions tended to be remedial; small steps were taken in the "right" direction, or, when it was evident that the direction was "wrong." Rather than attempting a comprehensive survey and evaluation of all alternatives, the MOF and the RD focused only the alternatives initially proposed by the BOI with a small number of possible consequences were evaluated. Further, in evaluation of the pros and cons of the alternatives and also in the proposal for the modification of the policy, there was no attempt to evaluate them comprehensively.

This course was altered by the high degree of conflict during the policy formation phase, which reflected the low level willingness to act and attain the objectives of the policy. The policy seems to be adopted only for symbolic reasons. The remark below by an official at the RD who was in charge of the policy from the formation of the policy and its implementation reflected such a symbolic reason.

> It is better than not having anything, isn't it? At least it ought to stimulate some R&D activities. Foreigners ought to see that Thailand tries to promote. It ought to stimulate as tax directly impacts the private sector.

These factors negatively impacted the effectiveness of the policy, although the

level of a valid casual theory about the relationship between the change of the target group behavior and the policy instruments was considered high.

1) Support and Willingness to Act on the Part of the Implementing Organizations

The incremental development of the policy indicated the high level of conflict and accordingly the low level of support and willingness to act on the part of the implementation organization, mainly the RD.

In 1988, the Board of Investment initiated to the MOF by asking them to consider reducing the burden on corporate income tax for companies doing R&D by allowing them: (1) to deduct expenses on R&D at a special rate, (2) to deduct deprecation on machines and equipment, including buildings used in R&D at a special rate, (3) to exempt not more than 20% of profits allocated to be used for R&D and (4) to exempt income tax of income from patents. The objective of the four measures was to encourage the private sector to do more R&D by using the tax incentive as motivation.

Only alternative 2 was considered appropriate by the RD because it would not result in losing tax revenue but only deferred the tax payment and would reduce the tax burden of the taxpayers at the initial stage of R&D investment, which should result in motivating more R&D investment. The initial deprecation rate was fixed at 40%. The measure was known as "initial depreciation."

The Secretary of the Cabinet to the Finance Minister made a comment to the MOF saying that the initial deprecation measure was only a first small step in using tax measures to promote R&D investment in the country and accordingly was not "serious" enough. The RD, through? its Planning and Policy Division at that time, considered the idea and provided feedback, indicating that the approved measure was appropriate and sufficient to promote R&D and no other measures needed to be considered at that time. Royal Decree (No. 226) B.B. 2534 (1991) was then enacted. As the measure was only to defer the tax payment, the RD officer in charge of the policy made the comment that it had potentially low effectiveness.

In 1992, the MOF and RD came under pressure once again to use the tax measure to promote more R&D in the private sector by allowing private firms to hire government or private agencies to do R&D in order to deduct two times the actual

expenses as tax expenses during the initial stage. The RD revised the proposal by allowing only 150% of actual expenses. After 2 years of consideration, Royal Decree (No. 271) B.E. 2537 (1994) was enacted. Section 3 of the Royal Decree provided exemption of corporate income tax for juristic companies and partnerships in an amount equal to 150% of the expenses incurred in the form of remuneration for research and development of technology paid to government or private agencies, as designated by Notification of the Ministry of Finance in the government gazette.

The RD officer in charge of the policy told a story abut how the rate of the incentive was increased to 200% in 1996.

> So, first, we offered, spend 100, and get 150, applying a legal technique which circumvents by issuing it as an "exemption" under a Royal Decree. Essentially, we "exempt 50%." Is the end result the same? Yes. You pay 100 Baht but 50 of it are tax-exempt. This came into effect in 1996. Was it effective? Some, but not to the full effectiveness. It wasn't enough of a motivation. Part of it is that our private sector doesn't really care about R&D, but only about profits. The Ministry of Science (and Technology) also concurred that the measure wasn't fully effective.
>
> Our department was asked by the government whether more could be done. So, we did further study on this issue, looking at Malaysia, for example, which offers double deduction. Under GATT, we can subsidize up to 50%. If we were to allow a 100% deduction, as our tax rate is 30%, what we would actually be subsidizing is 30%. So by allowing double deduction, for every 100 baht, we are only subsidizing 30— which do not violate GATT. We therefore suggested the amendment which led to the 200% tax deductible.

In 1996, Royal Decree (No. 297) B.E. 2539 (1996) was enacted and Royal Decree (No. 271) B.E. 2537 (1994) was repealed to provide 200% tax incentive for expenses incurred in the form of remuneration for research and development of technology paid to government or private agencies as designated by Notification of the Ministry of Finance in the government gazette. It took all together 8 years for the RD to put the tax incentive into place, but the incentive was not functional yet.

In 1999, the NSTDA study suggested that the policy still had low effectiveness and in addition to post-audit, the policy should allow pre-approving the projects eligible for the incentive and also certifying the budget for the project by classifying major items. In order to make the problem manageable, the RD issued Departmental Order No. 584/2542 (1999) on December 30, 1999, appointing the Committee for Certifying and Approving Expenses for research and development in the private sector. The Committee was chaired by the Director General of the RD, plus the 5 representatives from the NSTDA and 6 representatives from the RD, respectively. The committee was basically controlled by the RD officers, who generally had little knowledge about R&D.

The cabinet later on made a resolution to assign the NSTDA to examine and verify the R&D projects eligible for the incentive. Consequently, the RD issued Departmental Order No. Paw. 103/2544 (2001), providing the revenue officers with a guideline in conducting an investigation and giving advice on technological research and development. Correspondingly, the NSTDA issued Order of NSTDA No. 03/2547 (2004) Sub: Appointment of the Committee for Certifying the Research and Development Projects, and appointed a committee chaired by the Director of the NSTDA with 12 other members from different agencies, including one from the RD. If the project had been inspected and certified by the Committee, such a project would have been treated as basic industrial research or applied research eligible for the incentive.

The incentive began to function after the NSTDA became involved. It took all together 13 years for the R&D tax incentive to be functional. This reflected the strong resistance of the RD toward the policy and the low level of support and willingness to act on the part of the implementing organization. The results of this study confirm the view of Winter (1990)—that successful implementation is likely to

be negative if the degree of conflict in the policy-formation phase is high. The conflict in this study reflected the high resistance of the implementing organization throughout the formation phase.

2) Valid Theory of Cause and Effect

The R&D incentive policy, which is one of distributive programs, provides tangible government benefits at 30 Baht for every 100 Baht spent by private firms for R&D. The government expected to get the desired activity, namely to do more R&D. The benefit represents the reduction of the tax liability of the private firms and consequently increases their cash flow. At least in theory, firms should positively respond to the opportunity that are present in the external environment. Many studies (see in Dagenais, Mohan and Therrien, 1997) have suggested that the firms respond to the incentive by roughly increasing R&D investment one dollar for one dollar of the incentive received. The tax incentive has had the impact of promoting R&D in private firms. The policy decision to execute the incentive is therefore based on a valid theory of cause and effect concerning the incentive and changes in the target group behavior.

The Thai R&D tax incentive is relatively generous in allowing the deduction of expenses at the rate of 200% of actual expenses. The 200% allowance is in effect equivalent to a 30% tax credit. There exists theoretically a strong relationship between the 200% incentive and the increase of the R&D investment in the private firms. However, whether or not the policy will be effective also depends on whether the relationship between cause and effect is direct and there are few, if any, innerving links (Winter, 1990; Hogwood and Gunn, 1984).

The results of this study complemented the views of Hogwood and Gunn (1984), that the factor of the valid theory of cause and effect alone could not assure the effectiveness of the policy. The longer the chain of causality, the more numerous the reciprocal relationships among the links and the more complex implementation becomes, the less chance that the policy will be effective. Other innerving factors may lead a policy that is based on a valid theory of cause and effect to low effectiveness.

3) Assumption behind the Policy Design

Program design indicates policy specifications regarding the target population, the needs to be addressed, and the services to be provided. The design is

influenced by the assumptions that legislators bring to a given problem (Hasenfeld and Brock, 1991). The assumption of the R&D incentive policy made by the National Committee for Promoting the National Development of Technology was that Thai private firms had no ability to do R&D by themselves and needed to hire mainly government agencies to do so. That is why the incentive was granted for the private firms to hire government or private agencies to do R&D to deduct 200% of actual remuneration as a tax expense during the initial stage. The assumption resulted in complicated requirements and procedures in claiming the incentive, as follows:

(1) Apply for the status of "registered R&D service providers";

(2) Compute net profits and net losses of R&D business separate other activities; and

(3) Issue a receipt for a fee to an employer.

From the list of registered R&D service providers at the MOF, it can be seen that most of them are firms in the industry. This shows that most of the private firms interested in claiming the incentive do R&D by themselves. Furthermore, two government universities participating in this study advised that they did not accept any R&D engagement from private firms, although they have been registered R&D service providers for a long time.

Whether or not the design has negatively impacts on the effectiveness of the policy is examined. The process for registering for the status of an R&D service provider takes between 4 to 6 months and may last as long as 2 years. A tax expert who was involved in two applications commented that the process should have taken no longer than 2 months. Many firms do R&D by themselves for their own use and also want to claim benefits from the incentive. The design has been distorted to serve that situation by allowing private firms to apply for the status. Basically, they must register and hire themselves to do R&D for their own use and issue a receipt to themselves for a fee as if they were hired by outsiders. The fact that 5 out of 6 firms in the high R&D investment group clearly stated that they had no interest in the incentive because they viewed the requirements and procedures in claiming the incentive as troublesome reflected how the design has negatively impacted the effectiveness of the policy.

4) Clarity and Consistency of Policy Design

The factors relating to the program design that affect the implementation are clear and consistent in: (1) the objectives to achieve, (2) instructions to the implementing officers, and (3) directions for change in the target group.

The objective for the incentive is clear—that it is to promote R&D investment in the private sector. If the promotion is to be effective, the private sector should invest more in R&D and consequently the country's R&D investment should increase. However, it is unclear to both implementing officers and the target group as to what R&D projects qualified for the incentive per the R&D definition and who and when deduction of the incentive could be made.

The NSTDA study, carried out in 1999, identified that there were problems in the definition of R&D.

> The definition was copied from the GATT. Such a definition is quite limited and is not consistent with the R&D conduct of the private sector. There was a modification of the term "applied research" to cover the development of the method for analysis or control of products.

This study indicated that there are three problems relating to the definition of R&D. Firstly, it is required that basic research have a view to discovering "new" knowledge. The question is what is "new" and for whom? Secondly, the definition of the applied research has a condition that "such a project is not cable of being modified or applied for industrial or commercial purposes." The NSTDA clarifies this point in the manual, saying that only a prototype that is invented for the first time cannot be used for commercial purpose but the knowledge obtained from the invention of such a prototype can be used for commercial purposes. The problem remains because the manual is not a law and the RD officers may have different opinions. Thirdly, applied research does not include normal or periodical change of products, manufacturing systems, manufacturing process, provision of services or other activities of a going concern, even though the change does contribute to progress.

The NSTDA asked the RD in 2002 to consider the review and expansion of the R&D definition to serve and be consistent with the practice of the industry; namely, to include design and engineering, which do not directly result in the research conducted, but until now no change has been made. The definition includes only design and engineering, which are the direct result of research.

Royal Decree No. 297 provides no details on what kind of expenses can be included, and more importantly when and how to deduct the incentive; in other words, whether such expenses and the incentive attached to it need to be capitalized and amortized over a period of 10 years or can be deducted when they incur or when the NSTDA approves the project. As commented by one of the tax experts, "The RD always enacts the law or regulations without details and leaves taxpayer to blindly comply and practice."

The RD issued Operational Guideline No. MorKor. 5 B.E. 2546 (2003), which stated that in the investigation of expenses for technology research and development, it must be investigated whether or not the record follows accounting principles and complies with the condition under Section 65 ter (5) of the Revenue Code. It provides that capital expenditure shall not be allowed as tax deductible expenses. This means that if the R&D project results in a product that can be used for more than one accounting period, the expenses must be capitalized and depreciated at a rate not exceeding 10% a year or in other words, it will be depreciated for at least 10 years. If the R&D project fails and does not result in anything that can be used, the expenses will be deducted in the year when they are incurred.

Although there has been such a guideline, 7 RD officers who are on the field and are participated in the study had three different opinions on how to deduct the incentive.

The first opinion is consistent with the Guideline; namely, expenses need to be capitalized and depreciated for a period of 10 years.

The second opinion is that the expenses need to be capitalized until the NSTDA certifies and approves the project and then the full amount is to be allowed to deduct the full amount in the accounting period when the project is approved.

The third opinion is that current expenses will be deducted during the accounting period when they are incurred and capital expenditure will be depreciated

over useful life, regardless when the NSTDA approves the project.

As remarked by the officers of the RD and the NTSDA in charge of the policy, if the incentive must be used over a 10 year period, it would offer no benefits to private firms.

According to the data from the interview and the questionnaire responded to by the registered R&D service providers who claimed the incentive, it can be seen that all of them deducted the R&D expenses in the accounting period when the expenses were incurred. Therefore, if the Guideline is practically and strictly enforced, all of them over-claimed the incentive and would be exposed to a tax short, penalty and surcharge.

The problem is not only about how and when the incentive will be deducted, but also what expenses can be deducted. For example, the RD and the NSTDA had different views of training expenses. The former viewed that training expenses in all cases cannot be included while the latter viewed that training expenses can be included if they are related to an R&D project.

Although the policy was based on the high level of the valid theory of cause and effect, there were several factors in the formation of the policy that made the policy have low effectiveness; namely, the assumption behind the policy design, the clarity and consistency of policy design and the willingness to act and attain the policy. The conclusion reinforced the views of Van Meter and Van Horn (1974), Mazmanian and Sabatier (1989), Winter, (1990), and Hasenfeld and Brock (1991)—that a successful policy design needs to reflect the need for the clarity and consistency in its objectives and directives, needs to provide concrete and more specific standards for assessing program performance, and policy needs to be based on correct assumptions.

6.2.3 Factors Relating to Policy Implementation

The factors relating to policy implementation and the direction of the impact of the effectiveness of the policy are: (1) characteristics of the implementing organization, (2) behaviors of the implementing officers, (3) behaviors of target group and (4) environment.

6.2.3.1 Characteristics of the Implementing Organization

The result of the study indicated that three characteristics of the implementing organization, comprising alignment of organizational goals and culture, clarity and consistency in communication of policy objectives, and availability of the monitoring mechanism, negatively impacted the effectiveness of the policy.

1) Alignment of Organizational Goals

Organizational goals are the mandate or mission for the establishment of the implementing organization. That mandate determines the behaviors of that organization and the way in which the implementing organizations respond to and participate in the policy. The mandate affects the effectiveness of the policy implementation. As the organization trends to give priority to the policy that has consistent goals with their organizational goals, the greater the compatibility among the goals of the implementing organizations and the policy goals, the greater the success of program implementation will be (Winter, 1990; Goggin et al., 1990)

The objective of the R&D tax incentive is to provide an incentive and accordingly, reduce tax collectable at least in the short term, while the mission of the RD is to collect taxes as forecasted, deliver services, and create voluntary tax compliance The goals of the RD do not align with the objective of the policy and impact negatively on the effectiveness of the policy.

The RD, during the past 5 years, has claimed that its most important objective is not to ensure meeting out its target tax collection, but to create voluntary tax compliance on the part of taxpayers in order to create financial stability for the country, and it has attempted to reform its administration towards good governance, as described in the 2004-2008 Strategic Plan of the RD and the Annual Reports for the year 2003-2007. Such an attempt has not yet turned into a solid result. The RD still has an investigating culture that does not encourage the exercise of the incentive and also does not have a good attitude towards the taxpayers.

Anuphan Kitnitchiva (2006) has argued that the actions of the RD set in the Strategic Plan did not sufficiently create an acceptable level of fairness under modern tax administration standards to justify the increase of the level of accountability and fairness. The Plan was considered to not be sufficient to ensure fairness, and no actual actions had been taken according to the principles of efficiency,

transparency, and fairness. The RD should have raised the awareness of citizen's right and responsibilities relating to taxation, including the right to the tax incentive under tax laws. The study indicated that the RD has not done much to raise such an awareness. In responding to the question concerning what the RD did to promote the R&D tax incentive, the RD officer at the policy level stated that:

> It is not our main responsibility. We had no policy to promote. Taxpayers must seek information by themselves to protect their own benefits. The RD has no culture to give the incentive. We are trained to pinpoint mistakes to collect tax. It is true that the Revenue officers can know which taxpayers qualify for the incentive but they do not exercise the right, and we will not advise them to do so.

When asked whether the RD has done anything in the past to change the culture, the answer was "No.'. The official ,who has been a tax investigator for over 20 years, said:

> Any trend to change the culture? No, I don't think so. To tell taxpayers to pay lower taxes, why we should do that?! I do not see any change in this culture.

The SWOT analysis of the RD in its 2005 Annual Report described "not easy to change due to size of the organization" and "lack of incentive" as weaknesses, while "difficulty in officers' mindset changing" as a threat. It was admitted that the culture is hard to change.

The conflict of organization goals and the policy objective clearly impacts the performance of the policy, as can be seen from the fact that the RD denied a proposal to modify the policy to increase its effectiveness. In 2002, the NSTDA advised the RD that the NSTDA received advice from an advisor to increase the effectiveness of the policy by:

(1) Abolishing the requirement to register as an R&D service provider with the MOF.

(2) Expanding the definition of "research and development" to include design and engineering, which do not directly result in the research conducted (presently, approval of only design and engineering, which are a direct result of research.)

The analysis of the pros and con of the proposed modification of the policy made the RD indicate that the proposed modification would promote more R&D and that the expansion of the definition would result in more types of projects to be eligible for the incentive and more adaptable to the nature of R&D activities in Thailand. However, the RD concluded that it as not appropriate to make the modifications. Until now, no modification has been made. In their limited consideration, the RD recognized that the two proposed modifications would promote R&D, which is actually the objective of the policy. This denial showed that the RD outweighed the attempt to attain the objective of the policy by reason of control, workload, and investigation.

In 2003, it appeared that a large number of educational institutes and universities did not register for R&D service provider status because they did not register for VAT, which requires them to prepare VAT documents and reports and to prepare and submit a VAT return monthly. The Policy Bureau of the RD proposed a solution to exempt educational institutes from VAT for remuneration from R&D services engaged by the private sector. No tax would be lost from the VAT exemption because R&D is one of the services at the middle of the supply chain and the operators could use it as a credit anyway. However, priority was not given to such a proposal and consequently until now no change has been made.

The fact that the RD ignored the three proposals to modify the policy knowing that they would make the policy more effective, showed only lack of support and willingness to act and to attain the objectives of the policy.

The result of the study strengthened the view of Winter (1990) and Goggin et al. (1990), that the greater the compatibility among the goals of the implementing organizations and the policy goals, the greater the success of program implementation will be. This non-alignment of the goal of the RD and the objective of

the policy impacts negatively on the effectiveness of the policy basically because the RD did not give the policy high priority enough to make it effective.

2) Clarity and Consistency in Communicating Policy Objectives

Effective implementation requires that a program's objectives be clearly and consistently understood by the implementing officials for their achievement, with an enforcement mechanism to enforce or motivate the implementing officers to perform (Van Meter and Van Horn, 1974). The result of the study complemented view of Van Meter and Van Horn (1974)—that the lack of clear and consistent communication about policy objectives has a negative impact of the effectiveness of R&D tax incentive policy.

In order to communicate the policy objective clearly to their officers, the RD should have set administrative objectives, for example, to promote accessibility of the R&D tax incentives to the targeted group and to increase awareness and understanding of the availability of the tax incentives.

The finding indicated that neither was such an administrative objective set nor was there communication to the tax investigators, who faced the taxpayers regularly to make them understand the objective of the policy. One of the officers said clearly that "it is not our responsibility to promote R&D and we were not trained to do so."

The RD has only Operational Guideline No. MorKor. 5 B.E. 2546 (2003) which provides a guideline for investigation of expenses for technology research and development. The Guideline requires the officers only to advise the claimant to comply with the regulation by obtaining the certificate from the NSTDA, basically because the RD officers have no technical ability to determine whether the R&D project is qualified for the incentive.

Such a guideline does not required the officers to supervise or give advice to taxpayers on an individual basis, to use tax privileges without interruption, although the RD has a mandate to do so. The RD Annual Reports stated that the RD had a mandate to prioritize the importance of good services by assigning a group of revenue officers to supervise and give advice to taxpayers on an individual basis and to provide tax privileges to taxpayers without interruption, which would be beneficial to taxpayers in terms of their ability to pay taxes, and in terms of reducing

their tax burden and supporting the business environment, as well as increasing voluntary tax compliance, which would lead to a sustainable tax base. It did not appear, at least from this study, that such a mandate had been turned into action.

3) Availability of the Monitoring Mechanism

Control or a monitoring mechanism system is required for enforcing the behavior of the implementing officials to act according to the policy and the behavior of the target group to comply or change as prescribed by the policy (Hasenfeld and Brock, 1991). It did not appear to have the monitoring mechanism to facilitate or control the behavioral change and the compliance of the target group in the implementation of the R&D tax incentive. The study therefore confirmed their view that the absence of a monitoring mechanism has a negative impact on the effectiveness of the policy.

Information requirements to properly manage and monitor the R&D tax incentives have not been well served by the present data system of the RD. Data on the actual amount of tax allowance claimed should have been available at the RD. Unfortunately, the RD did not input data for all items in the tax returns into the computer system although since 2005 onwards, claims of different allowances under the Revenue Code, including the R&D tax incentive, have been listed as separate items in corporate income tax return form PNR. 50.

An officer at the Bureau of Tax Supervision and Audit Standards advised that they were developing a data system to collect the number of projects certified and the amount of R&D expenses approved by the NSTDA. The new data system, however, will not enhance the capability of monitoring the R&D tax incentives or their delivery because it will not show the actual amount of the tax incentive claimed and by whom.

6.2.3.2 Behaviors of Implementing Officers

The factors relating to the behaviors of implementing officers, comprising degree of understanding and commitment, attitudes towards taxpayers, and technical ability have a negative impact on the effectiveness of the policy.

1) Degree of Understanding and Commitment

The factors that affect the behaviors of the implementing officials are their understanding and commitment to the policy's objectives and

procedures (Van Meter and Van Horn, 1974; Mazmanian and Sabatier, 1989). In order for the RD officers to have good understanding and commitment regarding the policy objective, the RD should have administrative objectives to promote the accessibility of the R&D tax incentives to the targeted group and to increase awareness and understanding of the availability of the tax incentives. Such objectives could then be communicated to the officers clearly. The officers then could have proper understanding of what they should do to attain the policy objectives and act accordingly.

From the data collected from the interviews of the RD officers and the review of the documents, neither were administrative objectives set nor was communication about the incentive and the role of the officers made. They also confirmed that they were never communicated to or trained to understand what the objectives of the tax incentive were or what their roles were in supporting the objectives.

The Annual Reports of the RD claimed that the RD prioritized the importance of good services provided to taxpayers and intended to provide to taxpayers, by assigning a group of revenue officers to supervise and give advice to taxpayers on an individual basis. However, it did not appear that the RD had communicated with their officers to support the policy objective sufficiently to create the proper level of understanding and commitment. Their level of understanding of and commitment toward the policy objective was low and negatively impacted the effectiveness of the policy.

The study complemented the view of Mazmanian and Sabatier (1989)—that lack of communication and clarity regarding the policy design, and of the right degree of understanding, negatively impacted the effectiveness of the policy.

2) Attitudes of the Implementing Officers

This factor was not precisely or specifically raised in the review of literature in Chapter 4 and accordingly was not one of the variables in the initial conceptual of the framework, but it clearly stood out from the analysis of the implementation—that the attitudes of the implementing officers could have a negative impact on the effectiveness of the policy. As human beings, what the officers think is important to them as individuals, particularly ideas relating to organizational goals and

culture will drive their behaviors (Franklin and Ripley, 1982). The culture of the RD, which focuses on investigation to collect more taxes and not to support the incentive drives the behaviors of their officers. With such organizational priority and culture, it is difficult for their officers to commit to supporting the objective of the tax incentive. The officers still having the attitude of maximizing tax collection is a barrier to building trust with taxpayers to claim the incentive and reveals a negative attitude toward taxpayers.

The following statement of an RD officer very well represents the attitudes of the RD officers:

> Overall, the attitude of the RD officers is that the officers view that more or less, taxpayers try to find ways to pay less tax. They do not need our advice about the incentive. Yes, our policy is to provide service to taxpayers but it depends on the mindset of each individual officer. It is very hard to change the mindset to have a service mind.

One informant that is a registered R&D service provider and set aside and spent a budget for R&D at about 10% of revenue said that the RD officer questioned that their R&D expenses were too high although they had not claimed the incentive yet as they were in loss position. The comment demonstrated the non-supportive attitude towards R&D; basically, the RD officers rejected the goal of the policy. The NSTDA, working closely with the RD officers on the incentive, proposed that "the RD and their officers should have the attitude of give and take. They should know when to give and when to take and not to take all the time. They want to collect tax today but overlook the fact that if they give the incentive today, the return in the future will be much higher. Without a change in attitude as such, it would be difficult to expect a high degree of commitment toward the policy objective from the RD officers.

This conclusion reinforced the views of Van Meter & Van Horn (1974), who indicated implementers may fail to execute a policy faithfully

because they reject the goals contained in it. Because the goal of the R&D incentive policy results in a lowering of their performance in tax collection and the exercise of the right of the policy was viewed by them as an attempt to avoid tax, they discourage the exercise of the right under the policy. That behavior resulted in a negative effect on the policy.

3) Technical ability

The RD officers require technical ability to do two functions to perform the required behaviors. As far as the incentive is concerned, they need to, one, consider the registration of the R&D service providers and, two, monitor the tax claim. The result of the examination indicated that the RD officers do not have enough ability to undertake either function.

Firstly, the RD has no technical ability to consider the registration status of the R&D service provider. The RD officers at the policy level admitted that the RD officers had no ability to make the right decision and just used their common sense to decide whether an applicant was qualified to conduct R&D services.

Secondly, the RD officers have no ability to monitor the tax claim. The interviewed officers at the operational level admitted that they did know or investigate whether or not the project that was actually done was the project approved by the NSTDA because they were not scientists or researchers. They can neither investigate whether the expenses that were claimed were actually used for the approved project; the best they could do was to ensure that the actual expenses would not exceed the budget approved by the NSTDA.

6.2.3.3 Behaviors of Target Group

The factors that drive the behaviors of target group in making R&D investment are awareness of the right to services, attributes of target group (leadership, entrepreneurship and vision, cash flow, and profitability, and extent of change in behaviors.

1) Awareness on the Right to Services

The 2003-2008 Annual Reports of the RD claimed that the Revenue Department intended to provide better services to taxpayers by assigning a group of revenue officers to supervise and give advice to taxpayers on an individual

basis and the RD officers would accommodate the taxpayers by providing advice and consultation at the place where the business was conducted. However, the result of the examination indicated that none of the R&D officers participating in this study consider that they had the responsibility to advise the taxpayers about the R&D tax incentive due to their lack of awareness or understanding of the policy objective or the willingness to attain it.

Winter (1990) has argued that the degree of the response of the target group depends on the level of communication of regulations and right to service that was made to the target group. The tax investigators interfacing with the targeted group on a regular basis do not realize the responsibility to communicate the right to services; it would be difficult to expect a high level of awareness of the right to services.

The information about the tax incentive provided on the websites of the RD and NSTDA and also at seminars is very general and emphasizes how to apply for a certificate for R&D projects with the NSTDA. It will be difficult to raise the level of awareness and make taxpayers confident in claiming the incentive without detailed information about what expenses, how and when R&D expenses and allowance attached to it can be deducted.

2) Attributes of Target Group

The finding from the study reinforced the view of Winter (1990) that successful implementation of the policy is likely if the attributes of the target group are aligned with the policy. The results indicated that the attributes of the target group to R&D investment decisions that are the degree of leadership and entrepreneurship and the visions on business opportunities and threats. The policy seems to be effective for the firms with a lower degree of entrepreneurship because the incentive would lower their R&D risk, ease their cash flow and increase their profit after tax. The lack of financial resources does not seem to be a major barrier for not commencing R&D investment.

One attribute that clearly stands out among the firms that invest in R&D both high and low levels is leadership. Those firms undertake R&D primarily to retain their competitive advantage. However, not all firms undertaking R&D do it sufficiently to create a long-term competitive advantage. The management of some

firms seemed to focus on R&D projects that bring about quick, short-term results and do not invest enough for the long-term future.

The findings from the analysis of the five firms in the high R&D investment group was that their leaders have two common characteristics that are attributable to R&D investment: entrepreneurship and vision of business opportunities and threats. They also have common characteristics in that they enjoy innovation, taking risks, and are visionary. By using and leveraging R&D as their core competency, their firms became leaders in their industries—not only in the country but also in the region.

Furthermore, as strategic leaders they have the ability to anticipate, envision, maintain flexibility, and empower others to create strategic change as necessary. They have clear vision of business opportunities and threats.

Four executives in the high R&D investment group started their business as a trading firm, mainly importing products from overseas suppliers for local sale. They envisioned that R&D could be their core competency to take advantage of opportunities and overcome threats in the external environment. With their vision of the potential of the market, they diversified from trading to manufacturing, using R&D as a core competency to sustain and diversify their business. They were successful and had a sufficient cash flow margin from their business to fund investment in R&D, as required for business diversification from their profit and cash flow.

The finding from the analysis of the 14 firms in the high R&D investment group also indicated that management's vision or support are key attributes for R&D investment. However, it appears that the degree of entrepreneurship of the leaders in this group appeared to be lower than the firms in the high R&D investment group. They do not have strong vision that R&D can be their core competency to achieve strategic competitiveness but is only something nice to do.

Profitability and cash flow appeared to be the constraints or negative attributes of R&D investment for this group. Their R&D budget would be cut if the profits of the firms declined. This could explain why the firms in this group actively seek the advantage of the incentive and also other incentives that will ease their cash flow and reduce the after-tax cost of R&D. They claimed that the incentive would be more beneficial to them and have a higher impact on their R&D investment

decision if the amount to be certified were more ascertainable or at least more foreseeable at the time of preparing their annual budget.

The finding from the analysis of the 7 firms in the no R&D investment group indicated that the tax incentive was not strong enough to motivate them to change their behavior to begin to invest in R&D. This section examines why the incentive could not motivate them to do so. Although they viewed that good and modern technology for product development and production process efficiency were essential for their firm, they preferred to rely on proven foreign technology, which mainly comes with machines and equipment purchased from foreign suppliers

The executives in this group showed the lowest level of entrepreneurship. They do not want to take risks. They neither committed to innovation nor acted proactively to create opportunities but to respond to opportunities created by others.

This study indicated the opposite result from the study of Van den Berg, Van Dijk and Van Hulst (1990)—that the lack of financial resources does not seem to be a major barrier to commencing R&D investment. Van den Berg, Van Dijk and Van Hulst (1990) have argued that the barriers to commencing and/or completing R&D projects are lack of financial resources, particularly for small companies. The finding from this study led to the understanding that this argument may not necessarily be true because all 7 firms in this no R&D investment group were profitable and had no financial barriers. What seems to be a more important attribute for R&D investment is therefore leadership with entrepreneurship, vision, and the nature of business.

3) Extent of Change in Behaviors

Mazmanian and Sabatier (1989) raised the issue that the amount of behavioral modification required to achieve the policy objectives is a function of the number of people in the ultimate target groups and the amount of change required of them. The greater the amount of behavior change, the more problematic successful implementation will be. The result of this study challenged their argument that firms that already have made R&D investment may not wish to participate in the policy, resulting in the low effectiveness of the policy.

The finding from this study indicated that Mazmanian & Sabatier's argument may not be applicable to all cases. As evidenced in the high R&D investment group, the policy has no effect on their R&D investment behavior despite minimum change being required. The requirement for change for the group was the lowest, as they already heavily invested in R&D. What they need to do is only to comply with the statutory requirements and claim the incentive. As a matter of fact, they had no interest in claiming the incentive at all.

With a high degree of entrepreneurship and vision, they consider R&D as their core competency and that it had to be carried out regardless of the availability of the incentive. On the other hand, they viewed that the statutory requirements to claim the incentive were too complicated and troublesome and did not want to involve themselves with the RD, which had a bad attitude towards taxpayers.

The requirement for change in the firms in the low R&D investment group was also low, as they already had invested in R&D. What they need to do is only to comply with the statutory requirements and claim the incentive and invest more in R&D to obtain higher benefits. The result of the study indicated that most of the firms in this group sought an advantage from the incentive, viewing that the incentive would ease their cash flow constraints, reduce R&D investment risk and increase their profit after tax. The incentive would have been more effective for them if it were more ascertainable and foreseeable whether and how much tax incentive they would get from their R&D projects and budget.

The requirement for change in the firms in the no R&D investment group was high as they had to begin investing in R&D and then comply with the statutory requirements and claim the incentive. All of the firms in this group viewed that the incentive could not motivate them to change their behavior to make an R&D investment.

6.2.3.4 Environments

Social, economic and technological conditions are exogenous variables that affect policy output and ultimately the attainability of the policy objective (Van Meter and Van Horn, 1974; Mazmanian and Sabatier, 1989; Hogwood and Gunn, 1984). The findings from this study confirmed that there were a number of exogenous factors that affected the policy. Those factors are the nature of tax system, economic

conditions, lack of skilled human resources, government policy, and market competition.

The nature of the tax system under the Revenue Code is one of self-assessment systems that are based on the assumption that taxpayers have good knowledge and understanding of tax laws and regulations. Taxpayers must declare, calculate their own tax and certify it as true and correct. The taxpayers must file a tax return and pay tax at the same time. If they make mistakes that result in a tax shortfall, they will be liable not only for the amount of the tax shortfall but for a penalty (at 100% or 200% of the shortfall) and a surcharge (interest at 1.5% per month with the maximum of the shortfall).

There were 3 firms in the target group that did not claim the tax incentive although they invested heavily in R&D because they had a concern that if they made mistakes in claiming the incentive they would face a penalty. This concern is reflected in a statement by one of the RD officers at the policy level who used to be in charge of the incentive:

> Also, parts of the private sector were unsure whether their activities qualified as R&D, and were therefore discouraged from utilizing the benefit. Since our tax is self-assessed, if you are confident and you apply the deduction but are later disallowed expenses as part of R&D, you would face penalties. This is what taxpayers are very afraid of, and is another obstacle to making this measure fully effective.

A nature of the Thai tax system was identified in this study. Thailand is one of a few countries that uses the self-assessment system with serve penalty and offers R&D incentives. From the review of the previous studies in many other countries, no study claimed that the nature of the tax system in their countries could have a negative impact on the effectiveness of their R&D tax incentive policy. The study concluded that the Thai self-assessment tax system has negative impact on the effectiveness of the policy

There were 5 firms described in which economic conditions had a negative impact on their R&D investment decision. Basically the R&D budget would be cut during economic turmoil or high interest period. There were 6 firms, 5 of which were in the low R&D investment group, that claimed that barrier to conducting R&D projects was a lack of skilled labor, especially engineers and scientists who want to work in rural or remote areas. However, the finding from the analysis of the behaviors of the firms in the high investment group suggested that if the leaders have strong entrepreneurship and vision, and high commitment to R&D, the firms can find ways to overcome financial barriers and the human resource constraints in order to sustain a competitive advantage.

The findings indicated that the market competition factor had a positive impact on R&D investment decision for 4 informants. When market competition became fierce, the firms with high R&D investment would invest more in R&D to maintain their competitive advantage.

The R&D tax incentive should ease the impact on the economic condition and support market competition. However, there is not enough evidence in this study to confirm such a claim.

The finding indicated that government industrial policy seems to have a negative impact on R&D investment rather than a positive one. For example, the government had the policy to protect the local iron and steel industry; consequently, the firms in the industry did not see the necessity to improve their product quality or production efficiency to be competitive with foreign players in the long term. As a consequence, most of the firms in this industry do not see the need to invest in R&D, as remarked by the researcher of a government agency doing R&D support for the iron and steel industry.

6.2.4 Hypothetical Linkage between the Factors

The factors relating to policy formation and implementation, and environmental factors have an impact on the effectiveness of the policy, as discussed above. In addition, some factors are hypothetically linked with other factors and then indirectly impact policy output and outcome as dependent variables. This section aims to draw down the hypothesis linkage between the factors as illustrated in Figure 6.2:

Hypothetical Linkage between the Factors Impacting R&D Tax Incentive Policy Implementation and Effectiveness. The linkage showed four factors that have an impact on or influence many other factors, both directly and indirectly, as described below. These factors are: (1) wrong assumption behind the policy design, (2) non-alignment of organization goals and culture, (3) the attributes of the target group—entrepreneurship and vision—and (4) the tax system.

The factors relating to policy formation have a strong linkage with those relating the policy implementation stage (Winter, 1990). As argued by Hogwood and Gunn (1984), the policy to be implemented successfully is based upon a valid theory of cause and effect, provided that the relationship between cause and effect is direct and there are few, if any, innerving links. The incentive policy should positively affect the stimulation of R&D investment in the private sector because the policy is based on a valid theory of cause and effect.. The finding from this study confirmed their view—that the policy could have low effectiveness because there are a number of innerving links that have a negative impact on implementation and ultimately its effectiveness. The result of this study suggested that such innerving links relating to policy formation are support and willingness to act on the part of the implementing organization: (1) the assumption behind policy design (2), and clarity and consistency of the policy design (3).

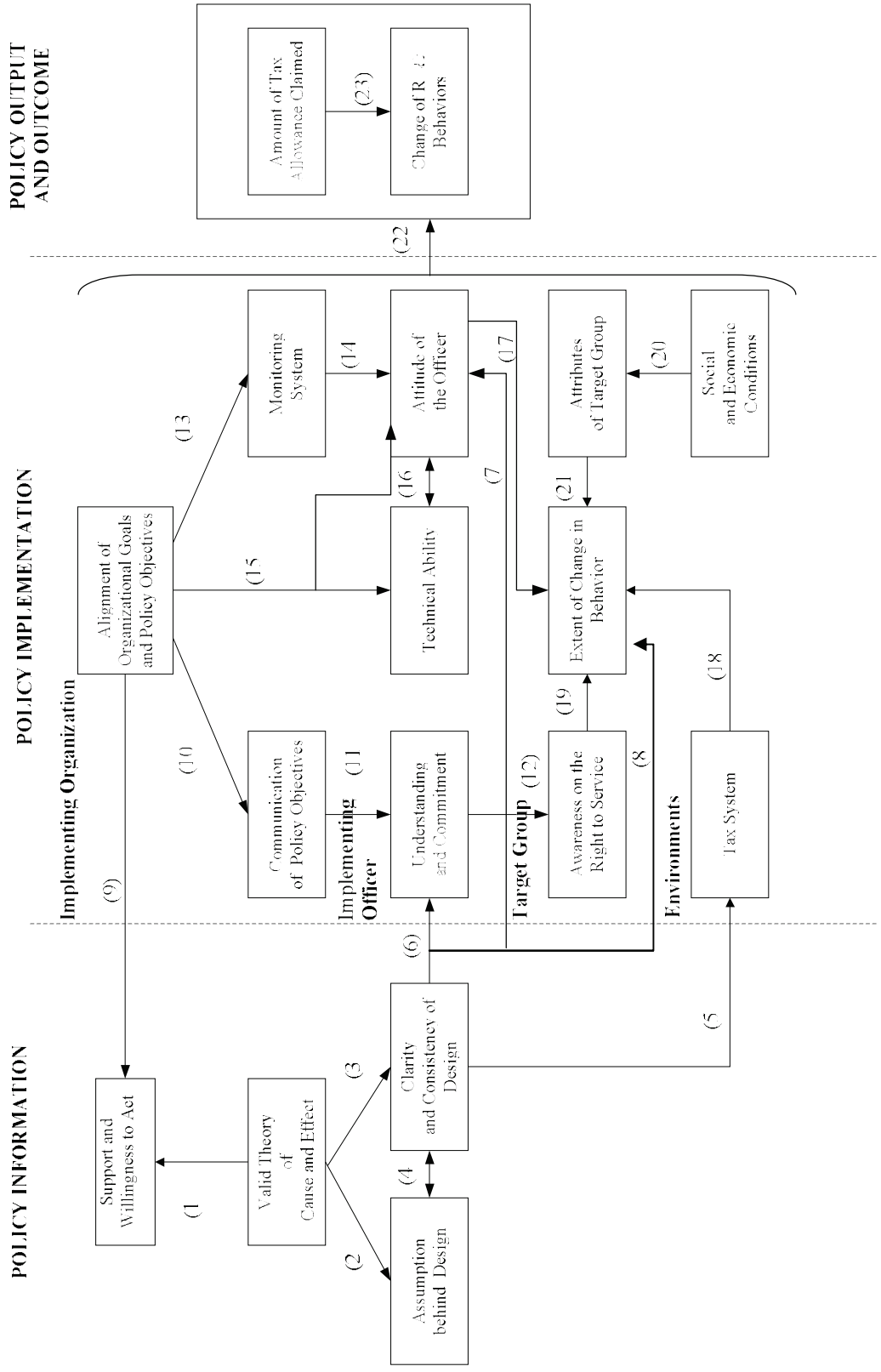

Figure 6.2 Hypothetical Linkage between the Factors Impacting the R&D Tax Incentive Policy Implementation and Effectiveness
Note: The numbers are referenced in the content below.

The factor of the wrong assumption was considered as one of the key factors that had a negative impact on the effectiveness of the policy. The R&D tax incentive was based on the assumption that Thai private firms at that time had no ability to do R&D by themselves and needed to hire mainly government agencies to do so. That is why the incentive was granted for private firms to hire government or private agencies to do R&D and to deduct 200% of actual remuneration as a tax expense rather than to simply and directly give an incentive for expenses for R&D activities paid for by the private firms.

The wrong assumption resulted in a complicated and unclear design of the policy, especially concerning the requirements and procedure in claiming the incentive (4). The design also lacked clarity regarding what R&D activities would qualify for the incentive under the definition of R&D and regarding what, when and how R&D expenses and the incentive attached to them would be deducted for tax calculation. Lack of the clarity in policy design has a serious impact on the effectiveness of the policy, taking into account that the tax system under the Revenue Code is one of self-assessment whereby the tax payer must calculate his or her own tax and pay tax correctly and will be penalized when making mistakes regardless of having bad intention or not (5). This is what taxpayers are concerned about and is one of the obstacles to making this policy fully effective. This reinforced that successful policy design needs to reflect the need for clarity and consistency of the objectives and directives and to provide concrete and more specific standards for assessing program performance, as argued by Van Meter and Van Horn (1974), Mazmanian and Sabatier (1989), Winter (1990), and Hasenfeld and Brock (1991).

The design factor links to three other factors relating to the implementation. Firstly, the poor design of the policy impacts the degree of understanding and commitment of the RD officers (6). As the design is not clear or consistent, it would be difficult to make the internal communication about the policy clear enough to create the proper understanding regarding the policy and commitment to its objective.

Secondly, the lack of clarity regarding the policy design links to the attitude and behavior of the RD officers in pinpointing mistakes (7). Some firms are seriously concerned that if they claim the allowance, the RD officers will pay more attention to them and they will face a penalty if the officers pinpoint mistakes. As a result, they did

not claim the incentive although they made intensive R&D investment.

Thirdly, there was a linkage between the target group behavior and the policy design target groups (8). As the design required complicated procedures and compliance in order to claim the incentive, the extent of change in the behaviors of the target group became greater. Consequently, the effectiveness became less likely. The factor of strong resistance and a low level of support and willingness to act on the part of the RD at the policy formation stage clearly reflected the non-alignment of the organizational goals and culture and the policy objective (9). The goal of the RD is to collect tax as forecasted rather than to give a tax incentive that would result in lowering tax collection. Due to the non-alignment factor, the RD allowed only small incremental steps in developing tax measures to promote R&D in the private sector and when problems were identified, the RD would take small remedial steps to manage them.

Such resistance continued at the policy implementation stage. The RD denied acting upon the three proposals to modify the policy knowing that the modifications would make the policy more effective. The 2004-2008 Strategic Plan of the RD and the Annual Reports for the year 2003-2007 showed that the RD was under administration reform regarding good governance. No evidence to support that such an attempt made any change as designed, at least as far as the granting of a tax incentive was concerned. The SWOT analysis of the RD in the 2005 Annual Report showed that it was not easy to change due to "size of the organization" and "lack of incentive" to change. It was realized that it is difficult to change the culture so that it is supportive of the incentive policy.

As the study complemented the view of Winter (1990) that the goal will attain if the implementation is assigned to agencies which support the objectives and give them a high priority, the factor on the non-alignment of the organizational goals and culture and the policy objective had direct and indirect impact on and linkage with other factors. That was why it was considered as one of the key factors.

Firstly, it affected the factor on the clarity and consistency in communication of the policy objective (10). Since giving the incentive is not the goal and culture of the RD, the RD did not set or communicate administrative objectives to promote accessibility of the R&D tax incentives to the target group, or increase awareness and

understanding of the availability of the tax incentives (11). The officers could not have the right understanding of what they should be to attain the policy objective and act accordingly. This resulted in the low degree of understanding and commitment of the officers. Ultimately, clear and consistent communication could not be made to the firms in the target group (12). The awareness of the right to the incentive of the target group was low, which had a negative impact on the effectiveness of the policy.

Secondly, the non-alignment factor links to the factor of the availability of the monitoring mechanism (13). Since providing the tax incentive was not the priority of the RD, no attempt was made to develop a mechanism to monitor the behavior of the officers to promote and attain the policy objective or to monitor the tax claims. Without a monitoring mechanism, the RD had no tool to monitor changes in the attitude of the officers as required to attain the policy objective as viewed by Hasenfeld and Brock, 1991) (14).

Thirdly, the non-alignment factor obviously affected the attitude and technical ability of the officers (15). The culture of the RD, which focuses on investigation to collect more tax and not to support the incentive drives the behaviors of their officers negatively with the objective of the tax incentive. The attitude towards maximizing tax collection is a barrier to building trust with taxpayers in terms of claiming the incentive. As argued by Van Meter and Van Horn (1974), the RD officers failed to execute the policy faithfully because they rejected the goals contained in them. With the non-alignment factor, it would be difficult for the RD to overcome a threat of "difficulty in officers' mind set changing," as identified in the SWOT analysis of the RD. At the same time?, there were not enough attempts to increase the technical ability of the officers to be able to attain the objective. As argued by Hasenfeld and Brock (1991) and as has been reinforced by the results of this study, the availability of expertise and skills needed according to the program design influenced the RD officers' ability to translate program requirements into coherent technical specifications. With such an attitude, the officers did not see the need to improve their technical ability (16).

The attitudes of the RD officers had an impact on the factor regardingen the extent to behavior change of the target group (17). With bad attitude towards taxpayer, it would be difficult for them to build trust with them to the level that they would be

comfortable and confident in claiming the incentive. With the nature of the tax self-assessment system identified by this study as a unique and negative factor of the policy's effectiveness, the taxpayers would be penalized if they failed to comply properly. This increases the risk to taxpayers in claiming the incentive (18). In order to make the policy effective, the level of comfort and confidence must be extraordinarily high. They must be well aware of their right to service and incentive to reach such a level (19). Due to the low level of awareness, the risk for non-compliance and the bad attitude of the officers, the policy was unlikely to be effective regardless of the extent of the effort of change of the behaviors of the target group. That was the reason why about the nature of the tax system was considered as one of the key factors under this study.

Winter (1990) pointed out and the result of this study reinforced that the implementation can likely be effective if the attributes of the target group are aligned with the policy. The responses and behaviors of the target group towards the R&D incentive policy are very much dominated by their attributes of leadership and entrepreneurship and of the vision of the leaders, which was considered as one of the key factors under this study. Strategic leaders who view the R&D function as their core competency would undertake R&D seriously and prepare to take the risk of failure regardless of their internal conditions or external environments, including the governmental incentives (20). Leaders with a lower level of entrepreneurship would try to reduce the price-after tax of their R&D by seeking benefits from the incentive (21). Their decisions on R&D investment are seemed to be an impact from economic and social conditions more readily than with the strong entrepreneurship leaders. If the tax incentive is predictable, it will have high impact on their R&D decision, i.e. they should invest in more R&D in a fashionable manner.

The finding from this study indicated that overall these factors negatively impacted the implementation and effectiveness of the R&D incentive policy (22). The amount of tax incentive was relatively low. With the assumption that every Baht of the tax incentive granted would increase R&D expenses by the same amount, the increase in R&D spending that was caused by the implementation of the policy was consequently very low (23). The policy had low effectiveness in changing R&D behaviors and on the decision making of the target group.

The study was concluded with an illustration of the holistic view of the major factors impacting the implementation and effectiveness of the R&D tax incentive in Thailand and with an hypothesis on the direction of the impact and the relationship between the factors, as illustrated in Figure 6.2: Hypothesis Linkage between the Factors Impacting the Implementation and Effectiveness of the R&D Tax Incentive. The researcher expected that this proposed hypothesis linkage could make a useful academic contribution by proposing a new framework for the analysis of the R&D tax incentive policy. It should also be useful for applying the analysis of other tax incentive policy that is governed by the tax collecting agencies at present and in the future. Further studies are needed and encouraged to measure how much each factor impacts the effectiveness of the R&D tax incentive policy and other similar policies, and how strong the relationships between the factors are.

6.3 Recommendations – Policy Contributions

The system of R&D tax incentives is one important way of encouraging research and development. Although the result of the study indicated that the policy so far had very low effectiveness, this does not necessarily imply that the incentive is not desirable. The recommendation is not to abolish the policy but to modify it and improve the implementation in order to enhance effectiveness for the following reasons.

Firstly, the R&D investment of the private sector in Thailand is still relatively low. The government needs to have effective measures to stimulate it. The tax incentive is a natural policy tool for a market-oriented government to increase R&D expenditures. Firms can decide where and how to spend their R&D rather than having it determined through a bureaucratic authority.

Secondly, empirical evidence indicates that the incentive generates more R&D, more or less, equal to the tax allowance claimed. This helps to finance R&D projects and to generate a socially optimal amount of R&D. The study indicated that the incentive mainly financed some groups of R&D spenders and encouraged them to more and if the compliance wee simplified, there would be a chance that the group of big R&D spenders would join.

Thirdly, what really matters is not the amount of R&D generated by the policy, but the social return from the additional R&D. The fact that the finding indicated that the amount of additional R&D generated by the policy seemed to be low should not be very discouraging. Social return from the spillover effect could possibly be significantly higher. It would be better to maintain and improve the incentive than to abolish it.

The existing tax incentive for R&D should be reviewed to consider further modifications in its design and administration, which would increase its effectiveness in stimulating increased R&D by private firms.

6.3.1 Modification of the Policy

The National Committee for Promoting the National Development of Technology initiated the tax measure to promote R&D in the private sector in 1992 by allowing private firms to hire government or private agencies to do R&D and to deduct two times of their actual expenses as tax expenses at the initial measure. The Committee further stated that, in the future, after there were more researchers, such deduction in general without the requirements to employ the government agencies to do R&D should be allowed. Now should be an appropriate time to consider this.

The change in the assumption behind the policy should simplify the design of the policy and accordingly make the policy more effective, and this modification should provide more clarity and consistency in the design. It should include the following.

1) Definition of R&D

The definition of qualified R&D should be expanded. As suggested by the NSTDA in 2002, the definition of "research and development" should include design and engineering which do not directly result in the research conducted.

The meaning of basic research should not only aim t discovering "new" knowledge but also creating correct and useful understanding of existing knowledge. Further, the definition of applied research should be clarified in such a way that the project may be cable of being modified or applied to industrial or commercial purposes. This applied research should include normal or periodical changes in products, manufacturing systems, manufacturing processes, provision of services or

other activities of a going concern if the change is to contribute to the progress of the body of knowledge.

These modifications should encourage more R&D investment because it would cover more types of R&D activities and be more adaptable to the nature of R&D activities in Thailand.

2) Assumption behind the Modification

The modification should be based on the assumption that private firms are cable of doing R&D by themselves, and accordingly the policy should allow an allowance in general without the requirements to employ other agencies to do R&D. The features that make the existing policy complicated, for example, applying for the status of "registered R&D service provider," computing net profits and net losses of R&D activities separately, and issuing a receipt for fee to an employer, can be abolished.

An allowance at 200% will directly be granted to private firms for expenses for R&D activities spent by the private firms.

3) Deduction of Tax Allowance

The modification should clarify what types of expenses will qualify for the incentive and when and how R&D expenses, and the allowance attached to them will be deducted for tax calculation.

Qualified expenses should include expenses for training that are related to and necessary for undertaking R&D projects. The modification should allow the deduction all qualified R&D expenses and the allowance attached to them in the year in which they are incurred. R&D expenses may be separated into: (1) current expenditures, which include the wages and salaries of research personnel and costs of materials, and (2) capital expenditures, which include the cost of equipment and facilities. Current expenditures on R&D should be allowed to be deducted in the year in which they are incurred while capital expenditures for R&D should be capitalized and depreciated over their useful life and be deductible in their full amount.

4) Pre-approval Requirements

Finally, the necessity of the pre-approval requirement should be reviewed if the allowance is to be granted directly to R&D spenders. The nature of R&D activities is continuing activity rather than on a project by project basis, as

observed by the informants in this study that heavily spent on R&D. Approval on a project by project basis becomes accordingly one of the barriers that should be eliminated.

The recommended modifications are consistent with the practice of OECD countries, where the concepts of the R&D tax incentive have been well-developed.

6.3.2 Implementation of the Policy

The tax policy will not be worthwhile if it cannot be implemented effectively. Good modification in its design will not be enough to ensure an increase in its effectiveness in stimulating increased R&D by private firms. Implementation and administration must be enhanced at the same time for it to be more effective. Clarity, consistency, and predictability are essential in assisting private firms to make R&D investment decisions partly on the basis of tax incentives. The implementation and administration of the tax incentive policy should aim at achieving them.

The areas of implementation and administration that should be enhanced are as follows.

1) Goals and Objectives

Basically, the RD should continue the effort of its administration to reform towards good governance, aiming to benefit the Thai people. The RD should not only aim at tax collection but operate according to the principles of efficiency, transparency and fairness in order to raise the awareness of citizens concerning their rights relating to taxation.

As far as the R&D tax incentive is concerned, the administrative objectives for delivery of the tax incentive should be defined and communicated. These administrative objectives should be, for example:

(1) To increase awareness and understanding of the availability of the R&D tax incentive;

(2) To promote the accessibility of the R&D tax incentive to the target group;

(3) To ensure the validity, completeness and accuracy of claims made; and

(4) To ensure consistency and predictability in delivering the R&D tax incentive.

2) Internal Communication

Based on the administrative objectives, operational standards and guidelines should be put in place for the officers to perform and comply with. These objectives, standards, and guidelines should be communicated clearly and consistently to the officers. Regular and repeated communications and trainings will also be necessary to create a change in culture and in the mind-set of the officers to promotethe incentive as one of the rights of taxpayers under tax laws.

3) Monitoring Mechanism and Information Management

A monitoring mechanism should be put in place to monitor the change in the mind-set and behaviors of the officers as desirable to attain the administrative objectives of the policy.

A data system should also be put in place to enhance the capability of monitoring the claims of the R&D tax incentive and its delivery. This data system should not only maintain data on who claims the incentive, and when and how much, but also should be able to track trends or changing patterns in claims.

4) Claim Review

A practical manual for claim review should be developed and applied consistently and equitably. The review processes should be accessible, transparent, and impartial.

A typical audit verification process for the R&D tax incentive claim will work better if it is done in parallel with scientific review. In order to address concern about the lack of technical capability in reviewing qualified R&D activities, sector specialists should be engaged and appointed as officials under the law to do scientific review. This engagement of specialists will be necessary regardless whether the pre-approval requirement will continue. The specialists can help to review whether the R&D activities are qualified for the incentive and, in the case of the pre-approval, whether what actually is done was the same as what was certified and approved. This will ensure that the incentive was claimed accurately and that no taxpayers' money was wasted by tax evasion.

5) Awareness on the Right to Service

The RD should provide taxpayers with information about the R&D tax incentive accurately and in a way that is easy to understand and in language that is plain and clear. Full detailed information on the incentive should be given to increase the confidence of the taxpayers in claiming the incentive and to ensure that the claimants can predict the amount of the incentive eligible to them.

Providing information at websites and in seminars will not be sufficient to create awareness of the right to exercise the incentive. The RD should take ownership and focus on promoting the R&D tax incentive and provide more information to taxpayers through an outreach campaign. This approach would include providing public seminars, increasing the availability of staff to answer telephone enquiries, encouraging closer partnerships with industry associations, and making greater use of websites. Tax investigators that interface with taxpayers on a regular basis should be demanded to advise taxpayers individually about the incentives available and applicable to them and their conditions.

The recommendations above focused on the problems created by two key factors: the wrong assumption behind the policy design and the non-alignment of the organizational goals and policy objectives. It would not be practical to recommend changes in the tax system to overcome problems caused by these factors. However, a modification in the policy concerning the right assumption should reduce the problems caused by it. Similarly, focus was not placed on a change in the attitude of the officers because it will take a long time to do so. However, if the implementation and administration of the tax policy is to be improved as recommended, the attitude of the officers should be gradually changed to be more supportive of the tax incentive policy and of the clients.

The above recommendations are nothing more than re-emphasizing the attempt of the RD to reform its administration reform toward good governance as far as the R&D tax incentive is concerned. Hopefully with the modification of the design and the enhancement of the tax administration, the policy will be effective in stimulating more R&D investment in the private sector for the long-term benefits of the country.

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APPENDICES

APPENDIX A

LIST OF FINAL GUIDING QUESTIONS BY THE RESEARCH QUESTIONS

1) Policy Formation

RQ 1: How serious did the implementing organizations support the R&D tax incentive policy when the policy was formulated?

1. What was the organization initiating the policy?
2. What were the problems to be solved and how were they identified? How serious were they?
3. What was the expected output/outcome and how were they set up? How clear were they?
4. What were determined as key factors/drivers for the success of the policy?
5. How was it determined that the policy was related to the expected output/outcome?
6. Why and how was it expected that the policy could solve the problems?
7. Were there any conflicts among the related authorities during the policy-formation phase? If so, what did they do to get support from or solve the conflict among them?
8. How long did it take to conclude the policy? Was there any delay? If so, what was the major cause of the delay?
9. How serious were the related authorities about attaining the policy?

RQ 2*:* How strong was the willingness of the implementing organizations to act and attain the objectives of the policy?

1. To what extent were the implementing organizations involved in the policy formation stage?
2. How did the implementing organizations respond to the policy initiatives?

3. What was the role that they played at this stage?
4. How actively did the implementing organizations co-operate in the policy formation?
5. To what degree did they understand the objectives of the policy? How supportive were they towards the objectives?

RQ 3: How would the R&D tax incentive policy affect the behavior of target group in investing in R&D?

1. Was the target group identified? If so, how were they identified and who were they? Does the target group change over time?
2. What were the changes in behaviors expect of the target group?
3. Did the policy aim at the target group that does not invest in R&D to invest or those who have already invest to invest more, or both?
4. How would the implementing organizations ensure that the change of behavior would be driven by the policy?
5. What are the measures designed to monitor the change of behavior in the target group?
6. Why should the government help private firms to solve their problems?

2) Policy Instruments

RQ 4: How clear and consistent is the design of the R&D tax incentive policy regarding the objectives to achieve, instructions to the implementing officials, and directions for change to the target group?

1. What policy alternatives were considered during the policy formation phase?
2. How was each alternative compared and evaluated? How was the cause and effect relationship of each alternative determined?
3. How were the choices made? What were the factors/criteria used in making the decision?
4. How clear and consistent were the objectives and directives of the policy during design phase?

5. How were the policy objectives and directives communicated to the implementing officials?
6. How clear and precise was it in providing instructions to the implementing officials and other actors?
7. How clear and precise was it in determining the direction for change in the target groups affecting the implementation?

RQ 5*:* Is there an incentive for the implementing officials to participate in the implementation process available?

1. What resources were prepared for the implementation in terms of money, personal, expertise, human skills, and facilities?
2. How were the resources allocated?
3. What were the incentives or inducements for participating in the implementation process?
4. What were the expertise and skills needed by the program design? Were they available?
5. How were they translated requirements into coherent technical specifications?

RQ 6: How do the organizational goals of the implementing agencies affect the implementation of the policy?

1. What are the mission/goals of the implementing agencies?
2. Are they considered as consistent or in conflict with the policy's goals and why?
3. How important was it in the success of the policy regarding the mission/goals of the implementing agencies?
4. How did they put the policy in their agenda/priority and why?
5. How was the performance of the organizations evaluated?
6. Was the success of the policy considered as one of the key performance indicators?
7. Did the mission/goals of the implementing agencies change over time?
8. Was such a change consistent or did it conflict with the policy's goals?

9. How did the change affect the implementation?

3) Characteristics of Implementing Organizations

RQ 7: How clear and consistent do the implementing agencies communicate the policy objective within the organizations and set the enforcement mechanism to obtain co-ordination from their officials?

1. How was the policy communicated within the implementing agencies and the network during the beginning and over time?
2. How has the communication been reinforced over time?
3. How strongly did the leader of the implementing organizations support and reinforce the policy's objectives at the beginning and over time?
4. Have the objectives been monitored over time? If so, how?
5. How did the organizations reward their officials who supported the policy and sanction those who did not?
6. How did the organizations evaluate their agents?
7. Was the achievement of the objectives of the policy used as one of the criteria in the performance evaluation?

RQ 8: How are the monitoring mechanisms set up to facilitate and control the behavior change and the compliance of the target group? Check below for the use of tense that you want.

1. How was the control or monitoring system required to enforce the behavior of the implementing officers to act? How did the superiors enforce or follow up on the actions of the subordinates?
2. How do the organizations monitor the behavior change of the officers?
3. Is any technical advice or assistance provided for facilitating implementation, or aide in interpreting regulations and guidelines and in structuring the response to policy initiatives?
4. How do the organizations motivate the implementing officials to perform?
5. How do the organizations facilitate and control the behavioral change of the officers implementing the policy?

6. How was the control or monitoring system required to enforce the behavior of the target group to act?
7. How do the organizations monitor the behavioral change and compliance of the target group?
8. Did they have to depend on other agencies for success? If so, how do they communicate and co-ordinate?
9. How well does the RD understand the definition and process R&D?
10. What has been done to communicate/promote the policy to the target group by the RD and the NSTDA?

4) Behaviors of Implementing Officials

RQ 9: Do the implementing officials have understanding of and commitment to the policy's objectives and procedures?

1. How were the policy objectives and procedures communicated to the implementing officials at the beginning and over time?
2. How well do the implementing officials understand and commit to the policy's objectives and procedures?
3. Have there been any measures carried out to improve communication on the policy or to improve level of understanding and commitment?
4. How important is the success of the policy in relation to the implementing officials' responsibilities?
5. What is the attitude or perception of the implementing officials on the nature of the policy, i.e. in providing the tax incentive and reducing the tax collected or assessed?
6. How supportive are the implementing officials in promoting the R&D tax incentive?
7. Do they recommend the target groups to use the incentive?
8. How did they view the achievements of the objectives in? their performance evaluation?

RQ 10: Do the implementing officials have sufficient technical ability to approve qualified R&D projects and to monitor the tax claim?

1. What are the criteria for enlisting the qualified R&D agencies and approving qualified R&D projects?
2. What is the technical ability required to enlist the qualified R&D agencies, approve the qualified R&D projects, and monitor the tax claim?
3. What are the skills and expertise necessary to implement the policy? Are they available within the implementing organization?
4. How was technical ability assessed over time?
5. What has been done to improve the technical ability of the implementing officials?

5) Behaviors or Responses of the Target Group

RQ 11: What are the attributes that the target group should have in order to align itself with the policy?

1. Who are the target group at the beginning of implementation and over time?
2. What are the attributes of the private firms that invest in R&D? Does the tax incentive align with such attributes?
3. What are the internal factors of private firms that impact the private firms in making decisions regarding R&D investment, for example:
    a. profitability,
    b. cash flow,
    c. product
        i. timing for introducing new products
        ii. average product development time
        iii. average product life time
    d. key market and market share,
    e. size (number of employees, asset size),
    f. growth - in the past, current and medium term prospects,
    g. leadership,

h. strategy - vision-led,
i. diversification into new fields, geography,
j. trend in the industry,
k. level of R&D activities

4. How does the R&D tax incentive impact those factors?
5. Is the impact strong enough to change the target group's behavior in making R&D investment?

RQ 12: Is the incentive offered under the policy sufficient to bring about a change in the behavior as desired under the policy and what are the behavioral changes?

1. How did the target group account for the benefits from the incentive?
2. How significant was the benefit considered by the target group?
3. Did the behavior of the target group change due to the incentive? If so, how?
4. Under what conditions does/doesn't the incentive change the behavior of the target group?
5. What are the measures that the government should take to change R&D investment behaviors?
   a. Tax incentives - to lower tax cost
   b. Personnel subsidies -to employ R&D staff
   c. Project grants -to subsidize R&D project
   d. Project loans -to lend money to do R&D project

   Are the different measures substitutes or complements? Are there differences between measures with respect to which firms they attract and their effect on R&D? Are there differences between measures with respect to what type of R&D is carried out?
6. What if the government supports in reducing R&D risks by:
   a. Conditional loan
   b. Loan guarantee
   c. Royalty grant
   d. Stock option grant

7. What if the government supports improving the research infrastructure by:
    a. Providing access to specialized know ledge in the (public) researching organizations
    b. Training researchers to improve the human capital industrial R&D facilities
8. Has the introduction of the scheme resulted in a change in the firm's R&D decision process?
9. Does learning about the benefits of R&D lead to sustained higher levels of investment?

RQ 13: Are the regulations and right to service communicated clearly and consistently to the target group?

1. How was the incentive communicated to the target group at the beginning?
2. Was the communication clear enough about what to do to obtain the incentive?
3. How clearly and consistently was the incentive communicated to the target group over time?
4. What was the cost/barrier/difficulty to the target group in the process of claiming the incentive?

6) Variables: Policy Performance—Output and Outcome

RQ 14: How many R&D agencies registered and R&D projects approved?

1. How many firms applied to register as R&D agencies?
2. How long did it take to register as R&D agencies?
3. What are the criteria for consideration for registration?
4. How many R&D projects are applied for the incentive each year and how what was the value of the projects?
5. What are the criteria for consideration of the approval of the projects?

7) Variables: Policy Performance—Output and Outcome

RQ 15: How does the target group respond to the policy in terms of R&D investment stimulation due to the incentive and amount of tax allowance claimed? In other words, how and under what conditions does the R&D tax incentive and its implementation stimulate the decision of the target group in making its R&D investment?

1. How much did the target group claim for tax credit each year?
2. How was the R&D budget set each year? Was the amount of incentive taken into account?
3. Was there an increment or decrease in the tax claimed? If so why? What happened, internally or externally, in those years that impacted the amount of tax claimed?
4. How did the target group claim the credit; in other words, for the full amount in one year or was is amortized over a 10-year period?
5. Was the amount claimed adjusted by the Revenue Officials during the tax investigation?
6. How much did the target group pay for claiming the incentive? What were their administration costs?
7. What was the total amount of tax credit claimed each year?
8. How many patent applications were applied for and registered by R&D agencies each year before and after being registered as R&D agencies?
9. Does the scheme stimulate more R&D investment?

8) Social, Economic and Technological Conditions

RQ 16: What are the social, economic and technological conditions that affect the performance of the R&D tax incentive policy and how strong are they?

1. What are external factors that impact private firms in making decisions on R&D investment. For example:
   a. interest rate,

b. economic condition (upturn or downturn),
c. level of technological development,
d. industry,
e. market competition,
f. business cycle,
g. country's research infrastructure (including organizations and education)
h. etc.?

2. How did those factors deviated from or how were they changed by the policy?
3. How did those factors impact or how were they related to other variables?

APPENDIX B

LETTER REQUESTING CO-OPERATION IN ANSWERING THE QUESTIONNAIRE

[Date]
Re: Ph.D. Dissertation Research Questionnaire

To: .....

As a Ph.D. candidate in the International Program in Development Administration, National Institute of Development Administration (NIDA), I am conducting research for my dissertation entitled "A Study of the Major Factors Affecting the Implementation and Performance of the R&D Tax Incentive Policy." The aim is to pinpoint the various factors which influence the implementation and performance of the Research and Development Tax Incentive Policy bestowed under Royal Decree No. 295 (B.E. 2539). This study is under the patronage of the National Institute of Development Administration, NIDA.

As ..... is/are registered as a R&D service provider with the Revenue Department per the abovementioned Royal Decree, I kindly ask for your assistance in filling out the attached questionnaire. The information collected will be used for academic purposes only and under no circumstance will any respondent be named.

There are 2 forms of the questionnaire:

Form A: R&D conducted for your own use (your company/organization conducts and utilizes the results of the R&D internally).

Form B: R&D service providers (your company/organization offers R&D services to external parties).

Please select the appropriate form. For your convenience, the questionnaire is available in both paper and CD format. Please return the completed questionnaire to the address indicated below by [date].

Dherakupt International Law Office Ltd.
900 Tonson Tower, *121F,* Ploenchit Rd.
Lumpini, Patumwan, Bangkok 10330
Mobile: 081-842-8326
Email: anuphan_k@drklaw.com

I sincerely appreciate your valued assistance. Thank you for your participation.

Respectfully,

APPENDIX C

QUESTIONNAIRE FORM A: RESEARCH AND DEVELOPMENT FOR OWN USE

Form A: Self-conducted Research and Development

Questionnaire: Assessing the effectiveness of the 200% R&D Tax Allowance as a tax incentive measure to promote research and development

This detailed questionnaire is designed for qualitative research purposes. Please fill in your response to each question with the appropriate details. Thank you.

1. **General Information**

   a. Company Name _____

   b. Type of Business (main) _____

   _____

   c. Financial Information of the Company (previous 3 years)

	2005	2006	2007
(1) Total Sales			
(2) Net Profits			
(3) Net Asset Value			
(4) No. of Employees			

d. Product/Service Information

i. Type _____

ii. Product life span _____months

iii. Average time spent for product development _____months

2. Objectives, Goals, and Strategy of the Company

a. Company objectives and targets

_____

_____

_____

_____

_____

b. Company strategy and plans for expansion/growth

_____

_____

_____

_____

_____

c. Industry trends/projections and market competition

_____

_____

_____

_____

_____

3. Research and Development

a. General Research & Development Information (previous 3 years)

	2005	**2006**	**2007**
(1) No. of Researchers			
(2) R&D Budget			
(3) No. of R&D Projects			
(4) Value of R&D-related assets			

b. Type and description of the Research and Development carried out by the Company

_____

_____

_____

_____

c. Objective, purpose, and necessity for the Research and Development carried out by the Company

_____

_____

_____

_____

d. What internal factors (i) encourage (have a positive impact on) the company to invest in Research and Development and (ii) discourage (have a negative impact on) the Company from investing in Research and Development (e.g. profit, cash flow, market share, executive decisions, etc.) and how?

_____

_____

_____

_____

e. What external factors (i) encourage (have a positive impact on) the Company to invest in Research and Development and (ii) discourage (have a negative impact on) the Company from investing in Research and Development (e.g. interest rates, industry trends, market competition, research personnel, government approval and audit process, etc.) and how?

_____

_____

_____

_____

_____

f. In your opinion, does the Company allocate sufficient funds (budget) for Research and Development as is necessary and in order to attain the Company's objectives? Please explain.

_____

_____

_____

_____

_____

4. Tax Incentive

a. How did you become aware of the 200% R&D Tax Allowance Incentive for Research and Development-related expenses?

_____

_____

_____

_____

_____

b. In registering as a Research and Development Operator with the Revenue Department, how time-consuming was the process? How would you describe the experience? What was your opinion of the process? Did the officers offer assistance/recommendations? Please explain.

_____

_____

_____

_____

c. What is your opinion of/how would you characterize your experience with the process of obtaining approval for a Research and Development project with the National Science and Technology Development Agency? How time-consuming was the process? Was it appropriate? Did the officers offer assistance/recommendations? Please explain.

_____

_____

_____

_____

d. Number of projects and allowance utilization from the time when the Company was first registered until the present day.

i. Number of projects submitted for approval_____Projects

ii. Number of approved projects _____Projects

iii. R&D budget submitted for approval _____Baht

iv. Approved R&D budget _____Baht

v. Amount of R&D-related expenses actually Deducted_____Baht

vi. Total number of patents applied for by the Company_____Patents

vii. Total number of patents applied for as a result of an approved R&D project _____Patents

e. How does the 200% R&D Tax Allowance impact the Company's decision to invest in Research and Development?
(e.g. if the incentive was not available, the company would not invest at all; encouraged the Company to invest more funds, had no impact, etc.)

_____

_____

_____

5. Tax Audit by the Revenue Department

a. How does the company apply the 200% R&D Tax Allowance? (i.e. deduction upon actual expenditure, capitalized and depreciated at 10% per year, etc.)

_____

_____

_____

b. Has the company been audited for its use of the 200% R&D Tax Allowance? If so, how did you find the experience?

_____

_____

_____

c. What was the result of the audit? Was the Company able to deduct all of its R&D expenses as listed in its PND 50 Form? Was there any expense not permitted as a deductible expense by the Revenue Department? If so, was a reason/explanation provided?

_____

_____

_____

_____

6. Opinion on the Tax Incentive

a. Please summarize your opinion regarding this tax incentive.

_____

_____

_____

_____

_____

b. In your opinion, what other measures or incentives should the government implement to encourage increased investment in Research and Development by companies? Please explain.

_____

_____

_____

_____

_____

Respondent _____ Position _____ Date _____

(Optional: you may choose to remain anonymous)

Contact Details: Ph.:_____ Email: _____

Thank you for taking the time to respond to this questionnaire. Your assistance is greatly appreciated. Please return the completed questionnaire to Anuphan Kitnitchiva at Dherakupt International Law Office, 900 Tonson Tower 12/F, Ploenchit Rd., Lumpini Patumwan, Bangkok 10330 or by email at anuphan_k@drklaw.com by [date] 2009.

APPENDIX D

QUESTIONNAIRE FORM B: RESEARCH AND DEVELOPMENT FOR SERVICES

Form B: Research and Development Service Providers

Questionnaire: Assessing the effectiveness of the 200% R&D Tax Allowance as a tax incentive measure to promote research and development

This detailed questionnaire is designed for qualitative research purposes. Please fill in your response to each question with the appropriate details. Thank you.

1. **General Information**
   - **a.** Company Name _____
   - **b.** Type of Business (main)_____

     _____
   - **c.** Other Information

	2005	2006	2007
Income from R&D service			
Other income			
Value of assets related to the provision of R&D service			
Total no. of employees			
No. of researchers			

d. Characteristic and type of R&D service provided

e. The majority of your clients are based in which industry? What is the scale of their operations (i.e. large corporations, SMEs, etc.)?

2. Registering as an R&D Service Provider with the Revenue Department

a. How did your organization/company become aware of the R&D service provider registry that offers the 200% R&D Tax Allowance benefit to your client?

b. What were the reasons why your organization/company registered as a R&D service provider?

c. What was your organization/company's experience with the process of registering as an R&D service provider with the Revenue Department? How long did the process take? Were you offered guidance/assistance from the officers involved? Please explain.

_____

_____

_____

3. Obtaining Approval for a R&D Project with the National Science and Technology Development Agency

a. Number of projects submitted for approval on behalf of your clients and the related budget (from the time when your company/organization was first entered into the registry until the present day).

i. Number of projects submitted for approval _____Projects

ii. Number of approved projects _____Projects

iii. R&D budget submitted for approval _____Baht

iv. Approved R&D budget _____Baht

v. Number of clients whose projects were submitted for approval _____

b. What is your opinion of/experience with the National Science and Technology Development Agency's approval process for a R&D project? (In getting a project approved, how long did the process take? Is this an appropriate amount of time? Were you offered assistance/guidance from the officer involved? If so, to what extent?)

_____

_____

_____

c. What internal factors do you think (i) encourage (have a positive impact on) or (ii) discourage (have a negative impact on) your clients in terms of investing in Research and Development (e.g. profit, cash flow, market share, executive decisions, etc.) and how?

_____

_____

_____

_____

_____

d. What external factors do you think (i) encourage (have a positive impact on) or (ii) discourage (have a negative impact on) your clients in terms of investing in Research and Development (e.g. interest rates, industry trends, market competition, research personnel, government approval and audit process, etc.) and how?

_____

_____

_____

_____

_____

4. Benefits for the Hirer of R&D Services

a. In your opinion, why do employers (your clients) find it important to carry out research and development?

_____

_____

_____

_____

_____

b. What role do you think the 200% R&D Tax Allowance Incentive plays in your client's decision to invest in either carrying out the R&D themselves or in hiring R&D service provider? (e.g. has no impact, leads to increased investment, allows for quicker decision making, etc.)

_____

_____

_____

_____

5. Opinion on the tax incentive

a. Please summarize your opinion regarding this tax incentive.

_____

_____

_____

_____

_____

b. In your opinion, what other measures or incentives should the government implement to encourage your clients to increase investment in Research and Development? Please explain.

_____

_____

_____

_____

_____

Respondent _____ Position _____ Date _____

(Optional: you may choose to remain anonymous)

Contact Details: Ph.:_____ Email: _____

Thank you for taking the time to respond to this questionnaire. Your assistance is greatly appreciated. Please return the completed questionnaire to Anuphan Kitnitchiva at Dherakupt International Law Office, 900 Tonson Tower 12/F, Ploenchit Rd., Lumpini Patumwan, Bangkok 10330 or by email at anuphan_k@drklaw.com by [date] 2009.

BIOGRAPHY

Name	Anuphan Kitnitchiva
ACADEMIC BACKGROUND	LLB (Honours), 1984 Thammasat University, Bangkok, Thailand LLM (Business Law), 1990 Thammasat University, Bangkok, Thailand. Senior Executive Program, 1999 Sasin, Graduate Institute of Business Administration of Chulalongkorn University, Bangkok, Thailand
PRESENT POSITION	Senior Partner, Dherakupt International Law office Ltd.