The Evolution of Research & Innovation Governance in Thailand: Re-aligning Budget and Funding System towards National Priority

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Abstract

Considering Research and Innovation (R&I) governance, budget system reflects the power structure, history and socioeconomic background of a state, which present serious challenges to science, technology and innovation policy. To accelerate national technological development from government R&D spending, there has been a serious need for institutional reforms to improve effectiveness and ensure sufficient capacity and simplification in R&I administrations. However, as Thailand's budget process and practice has its own distinctive features. Government budgets are by law allocated directly to departmental agencies under ministries, without 'intermediation' from administration at ministerial level. Therefore, top-down deployment of national policies, including R&I policy, are ineffectual. The reform of research and innovation budget and funding system will not only have to incorporate more flexibility in response to unforeseen challenges, but also need to be tailored to Thai-specific issues. As a result, a recent transition in Thailand's research and innovation system was undertaken during 2016-2017. The top policy body known as National Research and Innovation Policy Council (NRIC), and single national policy on Research and Innovation (R&I) were introduced. In this article, we analyze and assess Thailand's recent R&I reform as well as its emerging reorientation in budget and funding system. We also identify some challenges in Thailand's efforts in realigning budget and funding system towards national priority.

Key words: Thailand, Research and Innovation System, Policy Deployment, Budget Allocation, Governance

1 Introduction

Research and innovation (R&I) is a source of national growth in this modern world. R&I has been considered as long term and huge investment. In 2017, Thailand invested approximately 1% of GDP or 4.28 billion USD in R&I, of which 80% were from private sector. It aims at investing 1.5% of GDP with hopefully at least 70% contribution from private sector in 2021 (STI Office, 2019). With this attempt, government need to increase its spending on R&I. However, not only the value of spending matters but also the effectiveness. In Thai government budgeting system, the budget are allocated directly to departmental agencies under ministries, without 'intermediation' from administration at ministerial level. Allocation of budget is done by negotiation one-on-one between

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the budgeting bureau and research institute or universities (as departmental agencies). Although the related national research and innovation policies and plans are incorporated into the annual budgeting process, the budget criteria and regulation, such as budget ceiling, still govern and influence the final budgeting decision with lower weight is given to the R&I policy and plan.

With the above characters of Thai budgeting system, it could be said that there is no effectual 'policy deployment' mechanism in the R&I sector in Thailand. The effectual deployment mechanism is the one able to get the actual performance of research institutes and universities directed in accordance with the national R&I policies and plans, normally by using budget allocation as a tool. When the budgeting cannot be used as the policy deployment, then all researches and innovation works carried out by the research institutes and universities tend to be fragmented and not well aligned in to the same directions. Hence government spending on R&I becomes not as effective as expected.

This paper illustrates Thailand's government policy deployment and governance of R&I sector, with the special focus on budgeting process of R&I, as the policy deployment mechanism. At the end, proposals for improvement of the policy deployment mechanism, by assigning a budgeting body inside the R&I governance system, was recommended. Afterward, the recommended structure was actualized by the emerging of the National Higher Education Science, Research and Innovation Council in 2019, which considered as major development of the R&I governance.

2 Literature Review

This section introduces the interplay of governance, national innovation system and budgeting and their impact on research and innovation policies.

To begin with, the concept of 'governance' is not new. Governance means 'the process of decision-making and the process by which decisions are implemented (or not implemented)' (UNESCAP, 2009). Governance involves the interactions among structures, processes and traditions that determine how power is exercised, how decisions are taken, and how citizens or other stakeholders have their say (Plumptre and Graham, 1999). To put it simply, governance is about power, relationships and accountability: who has influence, who decides, and how decision makers are held accountable.

As governance work is problem-driven, context-specific and people-centric, the design of governance system should address the political nature of a problem, identify the primary issue (s) and involve all relevant stakeholders to arrive at workable solutions. The outcomes of this interaction are new policies, new roles, and new institutional arrangements shaping the behavior and interests of all actors. However, if innovation is described as Schumpeterian's creative destruction, innovations demands a discontinuity of old governance and require a new one dedicated to start discontinuation (Borrás and Edler, 2014). The governance of processes of technological changes or innovations then requires special instruments to manage uncertainties arising from unpredictable market and unforeseen technological consequences, in particular when changes in socio-technical system are more profound and affect the whole system.

Governance analysis then illustrates how structures, institutions and unequal relations of power interact in the deliberation over ideas, interests and preferences to shape institutions, policies and programs, create or remove incentives, and condition political outcomes (Plumptre and Graham, 1999). An analysis of governance focuses on the formal and informal actors involved in decision-making and implementing the decisions made and the formal and informal structures that have been set in place to arrive at and implement the decision. Recently, governance has drawn enormous interest from research and innovation policy makers and scholars since the concept can be applied to research and innovation system. Their interests rest on the integration of research and innovation policies across ministries, better integration of R&I policies into macroeconomic policies and change in public investments in research and innovation.

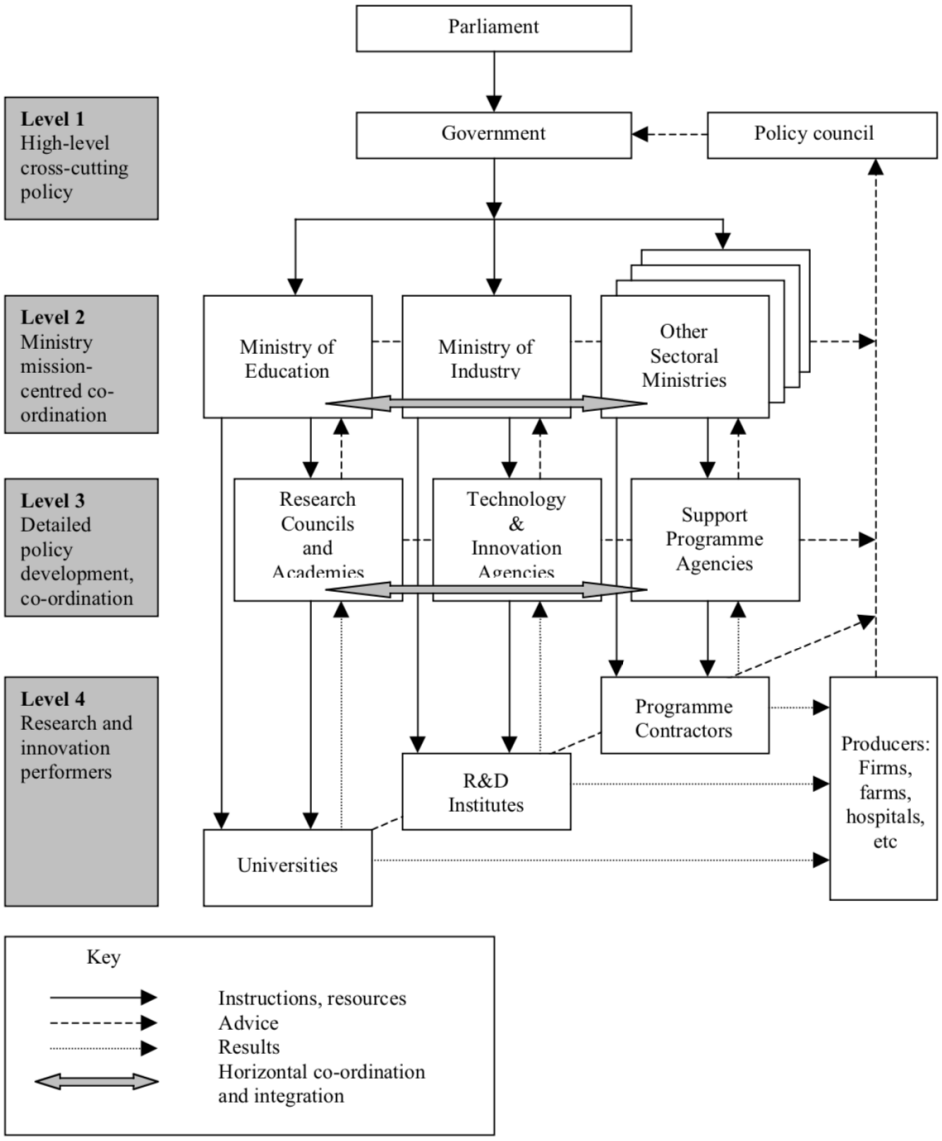
Second, the National Innovation System (NIS) approach also provides a useful framework for analyzing a country's capabilities to catch-up with other industrialized countries. It suggests that countries utilize a range of institutional arrangements to stimulate innovative activities and the way firms operate within an institutional national context (Freeman 1987; Lundvall 1992; Nelson 1993). Research and innovation governance is then a very important mechanism to link social purposes and resource allocation with the scientific and technical activities. Research and innovation governance cannot be viewed at policy per se, as it demands strong interplay between the various actors, i.e. businesses, universities and government, that together determine the priorities, strategies, activities and outcomes in research and innovation. Governance mechanisms stress the processes of policy formulation and implementation.

However, unlike industrialized countries, developing countries commonly face weighty barriers to design and implement Science, Technology and Innovation (STI) policies. Even though the NIS concept incorporate a dynamic concept and attempt to explain significant variations between countries regarding innovative capacity, the presence of bottlenecks that impede the operation of the innovation system in developing countries are too substantial. Chaminade and Perez (2017) criticize that apart from the fact that public financial support for STI activities in developing countries is meagre, long-term planning and continuous implementation of STI policies are absent. Public bodies in charge of STI policies do not have enough influence to push their own agendas across all ministries. Not only do science and technology agenda often fall under different ministries, such as economy, industry and trade, or education, but also STI policies do not always survive the arrival of new governments. The vertical and horizontal coordination among public organizations in designing and implementing STI policies is weak. The implementation of these policies suffers frequent institutional changes. Since tangible results of STI activities usually take a longer time than a political period, it is unlikely that government could see any concrete outcomes by the end of their administrations. As a result, the institutional culture to monitor and evaluate the impact of STI policies are also absent.

To fill those gaps, the government should try to design the governance mechanisms that fulfill missing functions in the innovation system covering the following aspects (Arnold et al, 2003): first, agenda setting by deciding the scope of actions the state and the publicly funded actors in innovation and research should take, second, prioritization by deciding which of these actions are most necessary in the context of scarce government resources, third, intelligence by learning and adapting policies to ensure effective implementation of the actions taken, fourth, coordinating knowledge production by balancing between the knowledge creation and utilization, and finally,

vertical steering by guiding agents towards socially desirable goals especially the engagement of private enterprises in research and innovation activities.

Exhibit 1 Generic Organizational Structure for Research and Innovation Policy



Source: Arnold, E.et al (2003)

Finally, co-ordination through budgeting is a natural response to produce coordinated policy during the annual budgeting process operating in all the countries (Arnold et al, 2003). A budget system reflects the power structure, history and socioeconomic background of a state. As a result, each country's budget process has its own distinctive features (OECD, 2005). Currently, there are two approaches of co-ordination through budgeting (Kim and Park, 2006). On one hand, the

traditional bottom-up approach to budget formulation had managed public finance by controlling individual appropriations and budget items of line ministries. On the other hand, the top-down budgeting system as a fiscal management reform initiative allows the government to manage fiscal deficits more efficiently. With the fiscal management target enforced as a rule and backed by an influential budget office, the government is able to regulate public expenditure and thereby control the fiscal balance efficiently. However, the approach and the level of delegation and the method of determining the expenditure ceilings depends on the choice of each country and still vary across countries. Section three will investigate the evolution of policy and budgeting approach of Thailand research and innovation system.

3 Evolutions of Policy and Budgeting Process of Thai Research & Innovation System

This section comprises of two sub-sections. Section 1 discusses the evolution of research and innovation (R&I) governance at national policy making. Section 2 highlights governance model for R&I transformation in the period of General Prayud Chan-O-Cha (2013-2019).

3.1 Evolution of Research and Innovation Governance at National Policy Making

In the period of Field Marshal Sarit Thanarat, the government enacted National Research Council Act in 1959, then the National Research Council (NRC), chaired by prime minister, was founded as a single policy council, with the National Research Council of Thailand office (NRCT) as it secretariat office attached to the Office of the Prime Minister. Main objectives of setting up NRC were to use academic community as a mechanism to formulate R&D policies and to propose those suggestions to the cabinet. NRC together with the NRCT is consider as the key R&D policy organization.

In 1979, Ministry of Science, Technology and Energy was established, based on the recommendation by the NRC, with the missions on science, technology, energy as well as environment related affairs. By science and technology development viewpoint, the ministry consists of agencies with the roles to facilitate as well as regulate science and technology development activities. At this point, the NRCT, which was established earlier, was included into the new ministry. The Ministry of Science, Technology and Energy has been changed to Ministry of Science, Technology and Environment, Ministry of Science and Technology and finally Ministry of Higher Education, Science, Research and Innovation in 1992, 2002 and 2019 respectively.

In 1991, National Science and Technology Development Agency (NSTDA) was created as the government's science and technology promotion and research and development organization. Since then, NSTDA has been growing rapidly and becoming the biggest government research institute in the country. During this period, several government research institutes have been subsequently created.

From 2001 to 2006 (the period of Prime minister Thaksin Shinawatra), Science and Technology (S&T) has been given a critical role in ensuring that productivity growth occurs, and that the economy is progressively transformed into knowledge based. Because of its importance in the nation's economic and social development, policy issues related to research, science, technology

and innovation tended to reach the Prime Minister level. In 2001, the government set up National Science and Technology Policy Committee. NSTDA was assigned to serve as the secretariat office.

In the period of General Surayud Chulanont, Science, Technology and Innovation (STI) has become a central to the development of the existing economic and social sectors as well as the creation of new ones with high growth potential. The government enacted the National Science, Technology and Innovation in 2008. This Act established National Science Technology and Innovation Policy Committee (NSTIC) and National Science Technology and Innovation Policy Office (STI) as the secretariat to the committee. From the system point of view, the NSTIC together with STI is by law supposed to be national policy body with specific function on science, technology and innovation policy. At this point, we can see functional overlapping between NRC and NSTIC.

Later on, in 2014, at the time when General Prayud Chan-O-Cha serves as the prime minister of Thailand, the Committee on Innovation System Development was established to promote utilization of research outputs. Later in 2016, the committee together with NRCT and NSTIC were dissolved and replaced by the National Council on Research and Innovation Policy (NCRIP), chaired by the prime minister, with NRCT and STI office as co-secretariat agencies. The objective of this reform was to establish R&I direction and policy of relevant government agencies in a unified manner. At this period, NRCT was assigned to undertake R&I policy in social sciences, arts and humanity, while STI was, in the other hand, assigned with R&I policy in science, technology and innovation. However, some overlapping of functions have been found during the recent period. During 2016-2018, the NCRIP attempted to draft the national policy and strategy on research and innovation, to improve budgeting system, to accelerate commercialization of research outputs, to propose recommendations on infrastructure development and to revise those laws and regulations related to utilization of intellectual property. These attempts aimed at raising effectiveness of R&I system through a unified policy making by the NCRIP. However, the outcome of the reform has not been very clear.

3.2 Governance Model for Research and Innovation Transformation up to 2018

3.2.1 Research and Innovation (R&I) Governance Structure

Up to 2018, R&I governance in Thailand could be simplified into 3 levels according to its functions.

Level I – National Policy Making and Line-Ministry Policy Making: This level is supposed to deal with cross-cutting policy issues related to R&I which cannot resolved by a single line-ministry. In Thailand, policy-making bodies at this level are usually in the form of a national policy committee. The key national policy body is the National Economic and Social Development Board (NESDB), a supra-ministerial policy body located in the Prime Minister's Office. It plays an important role in linking R&I policy to development policy in other areas. In R&I sector, there were two national committee related to R&I policy, namely National Science, Technology and Innovation Policy Committee (NSTIC) and the National Research Council (NRC), which later one dissolved and re-established in 2016 as the National Council on Research and Innovation Policy (NCRIP), as mentioned earlier.

Beside the Ministry of Science and Technology, there are several ministries involving R&I; for example, Ministry of Education (MOE) with a substantial responsibility to R&I manpower development and the development of research capability in universities, Ministry of Agriculture and Cooperatives (MOAC) with responsibilities for R&D and technology transfer in agriculture sector.

Level II – Granting and Grant Management: Agencies at this level are, basically, agencies for granting and grant management. While most of them do only funding function, some do both granting and operating functions. Key agencies in this group encompass:

- Thailand Research Fund (TRF) providing R&I fund in all fields to both universities and research institutions (as well as private sector) but mainly to universities.

- NRCT providing R&I grants in prioritized areas according to the current national R&D strategic plan to both universities and research institutes.

- Health Systems Research Institute (HSRI) providing R&I fund in areas related to healthcare policy and system.

- National Science and Technology Development Agency (NSTDA) providing R&I capability building support (e.g. funding, joint R&D, contracted R&D, joint investment, incubator, technical assistance, intellectual property assistance, R&D premise, etc.) to a wide range of recipients including universities, R&D institutes and private sector.

- Some other granting mechanisms such as the Energy Conservation Promotion Fund, Environmental Fund and the others, which also granting funds to research activities.

Level III – Operation and Utilization: Key players at this level can be either R&I organizations or standards and testing organizations or consumers/users of R&I. These include universities, research institutes, standards and testing agencies, private sector companies and other government organizations

3.2.2 Policy and Budgeting Process

Before 2016, the Prime Minister used a variety of mechanisms to obtain R&I advice and to initiate new policies; for example, Committee on Innovation System Development, National Reform Steering Assembly, Standing Committee. R&I budget framework at that time referred to National agenda and National Economic and Development Plan. When the National Council on Research and Innovation Policy was set up, the Council started drafting the National Research and Innovation Strategy.

The drafting process of the 20-year National Research and Innovation Strategy (2017-2036) took into account both the top-down and bottom-up approaches with inputs and participations from key stakeholders. STI and NRCT as joint secretariat organized several meetings, brain storming sessions and public hearings, in order to obtain all the necessary information, points of

considerations and important issues from all the sectors involved including public and private organizations, experts in all various national topics, policy makers, key players in each targeted sectors and other related stakeholders.

The (draft) 20-year National Research and Innovation Strategy (2017-2036) sets out a long-term shared vision for Country's research and innovation and a set of strategies which focus on economic development, social and environmental development, strengthening core knowledge pool, and improving research- and innovation-related infrastructure, human capital, as well as research and innovation system. However, the strategic priorities for economic and social development and STI priority areas have been loosely identified and announced. The priority setting at this time were criticized as 'too wide open'.

In addition, the council initiated a special funding scheme called 'Spearhead program' as a driving mechanism to get through the 20-year National Research and Innovation Strategy. This program aims at undertaking market-driven R&D, accelerating development and commercialization of innovative, market-driven products and services as well as encouraging the creation of intellectual property.

As country's budgeting body, the Budgeting Bureau used the 20-year National Research and Innovation Strategy (2017-2036) as a budgeting framework for R&I sector. The Cross-ministerial R&I Budgeting Committee were set up to undertake screening of programs/projects and proposing preliminary R&I budget ceiling. The budgeting process for R&I activities can be summarized as follows:

- STI Office and NRCT proposed budgeting framework consisting of goals, strategies, priority areas, and indicators to the Budgeting Bureau and the relevant government agencies.
- STI Office and NRCT were assigned as joint-secretariats to Cross-ministerial R&I Budgeting Committee. They called for program/project proposals from R&I organizations and arranged technical screening process.
- STI Office and NRCT proposed the results of technical screening and preliminary budget ceilings to the committee.
- STI Office and NRCT submitted the R&I budget proposal to the BB.
- The Budgeting Bureau, however, has its own authority to make a decision on budget allocation. It may or may not follow the committee's recommendations.

3.3 Discussion

It is worth discussing here that Thailand R&I governance has gradually evolved since its preliminary period (1959). At the beginning, policy body was established in the form of the National Research Council. Later on, the ministry responsible for facilitating and regulating of science and technology activities, several government research institutes, and some other relevant organizations have been established to focus on developing science, technology, research and

innovation of the country. Sever key research institutes have been established to strengthen research capability of the country. Up to 2018, there was the biggest attempt ever to consolidate all related committee or council into single policy body, the National Council on Research and Innovation Policy (NCRIP) with the Cross-ministerial R&I Budgeting Committee to make sure that the all relate R&I policies were unified into a single policy. There have been clearly several attempts and progresses in governance of research and innovation.

However, those progresses were only in either 'policy making' or 'implementing' levels. The missing link which is still left behind with no improvement is at the policy deployment level. The ministry which was established since 1979 could not perform as policy deployment level, as the budget allocation that is the most influential tool for policy deployment was under control of the Budgeting Bureau under the Prime Minister Office.

Thailand's government budgeting practices should be further explained here. Firstly, government budget is allocated by the Budgeting Bureau directly to the departmental agencies, almost without intervention by ministerial administration. It means the ministerial administration are not given solid control over budget allocation within the ministry, hence not supposed to held accountable for its performance. Furthermore, each agency has its own accountability of its allocated budget. In effect, agency own agendas may be given higher priority than that of the ministry. Secondly, budget allocations to the cross-agency research projects or program are not well coordinated. It occurs quite often that one or two projects within a research program are not budgeted, because the agency's budget ceiling is at its limit, and there is no necessary cross-agency coordination to make sure that budget to all projects in the same program is properly allocated. Thirdly, government budget is allocated on the basis of salary & welfare, itemized cost of detailed activities and projects, rather than output and outcome. Flexibility to adjust the already-budgeted itemized cost, activities and projects for better performance is still limited in some agencies.

These budgeting practices are very distinct when comparing to normal practices of the other countries. In the other places, government budget goes passing through administrative process of the ministry to make sure that the agencies within the ministry shall align their works toward direction set by the ministry and the administration is hence fully accountable for performance of the whole ministry. Although, in Thai case, the ministry still has power to impose policy packages such as some incentive and/or regulatory measures to drive the national research and innovation performance, but budget allocation is still the most powerful policy deployment tool.

From the abovementioned discussion, one of the key weaknesses of Thailand's R&I governance are clearly at the 'policy deployment' level. The weaknesses create inefficient and ineffective vertical linkage as well as horizontal coordination. Reform of the system is necessary.

4 Proposals for Governance Reform

From the discussions above, Thailand may need governance reform of its R&I system, especially at the policy deployment level. In order to close the gap in policy deployment level, four principles of the reform and three reform topics are proposed here. It would be noted that the proposal bases on the assumption that the 'top-down' budgeting system is employed in Thai context. This assumption again bases on the fact that as-is government budgeting practices uses also the 'top-

down' approach. Furthermore, Thailand has quite limited government R&I budget, therefore the top-down budgeting would be more suitable as the government would better choose to spend R&I budget to only some priority area.

4.1 Four key reform principles:

4.1.1 Firstly, division of labour of organizations within the system must be carefully clarified. This is important for accountability assignment. Layers of organizations should be clearly specified, namely, 1) policy making layer, 2) policy deployment layer, 3) funding and management layer, and 4) implementation layer. Within each layer, there must also be clear assignment of roles and responsibility.

For policy making layer and policy deployment layer (layer 1 and 2), the responsible body should be unified. In the other word, there should be single or a few bodies, at each layer, responsible and accountable for their missions. For layer 3 and 4, there should be multiple players to encourage competition for performance.

4.1.2 Secondly, government budget allocation of the R&I system must be reformed. R&I budget must be the effective tool for policy deployment. The budget allocation decision must be given to a accountable organization, 'buffer organization', within the system. In addition, the budget must be in the form of 'blocked grant' and 'multi-year' for flexibility in its spending.

4.1.3 Thirdly, R&I priority setting must be seriously determined and used as a key part of policy formulation and deployment. The priority areas should be the focused area, which must not be 'wide-open'. If the priority setting is properly done, a certain amount of national R&I budget should be strictly allocated to the priority areas, with the remaining amount may be allocated to the more wide-open areas.

4.1.4 Fourthly, monitoring and evaluation (M&E) system must be designed and strengthen. M&E here does not mean only research project or program level, but also sectoral, policy and system level. R&I progress of each sector within the R&I system should be monitored and reported regularly. Policies that issued must be monitored and evaluated for future adjustment. System efficiency and effectiveness must also be evaluated.

4.2 Three reform topics:

4.2.1 Topic 1: Structural Reform

- **Layers of R&I System:** R&I system should be clearly classified into 4 layers: 1) policy making layer, 2) policy deployment layer, 3) funding and management layer, and 4) implementation layer.

- **Policy Making Body:** At policy making layer, a national body (committee or council) on R&I policy must be appointed. This may be the same body as the existing NCRIP. This body is to formulate and legitimize the national R&I policy

and strategy. This committee should be at the national level, not ministerial level. The policy making committee should have a direct communication with the cabinet.

- **Policy Deployment Body:** At policy deployment layer, a proper body must be created. Thailand have never had this policy deployment body. The budget allocation function, which is the most powerful policy deployment tool, has been under the Budgeting Bureau. This newly created policy deployment body must act like a buffer body for budget request and allocation between Budgeting Bureau and the R&I system.

- **Funding & Management:** At funding and management layer, there should be sectoral funding and management platform, may be called 'Sectoral Focused Domain - SFD'. For example, there might be a platform for funding and management of R&I for food industry. The SFD may consist of a standing committee together with prominent scientists, experts, private sector as well as funding agencies responsible for funding of research and innovation program of the sector. The SFD should also be responsible for laying research and innovation plan/ roadmap of the sector. It may also be responsible for capability assessment of players within the sector. The SEF may also propose the bottom-up policies/measures up to the policy making body.

- **Implementation:** At implementation layer, capability of both government and private research institute as well as universities must be strengthen.

4.2.2 Topic 2: Budget Reform

- **Annual R&I Budget framework:** R&I budget cycle may start with that the policy making body (layer 1) proposes R&I budget framework together with annual budget amount, to cabinet to secure a pre-approval. This budget framework must take into account at least three factors: national necessity and demand for research and innovation, capability of organizations in the R&I system, financial reality of the country. Therefore, it may be more like dialogue with negotiation process between the policy making body and the cabinet, represented by Budgeting Bureau. It should be noted that this would be the high-level discussion on budgeting framework, not detailed budget screening process.

- **Block Grant basis:** After the budgeting framework is agreed, the actual budget should be allocated to the policy deployment body (layer 2) as a block-grant type of budget. It should be clarified here that the team 'block grant' in Thailand budgeting context means the government budget that allocated as a blocked lump-sum amount to the receiving agency and the agency has its own right to spend the allocated budget as it considers effective and efficient without having to follow the pre-agreed list of cost items. This give more flexibility to budget-receiving agency to make change or to redirect the spend into the better way when situation changes. In addition, with block grant, the remaining budget at the end of the fiscal year can be reserved at the agency, without having to return back to the government.

By block grant concept, the policy deployment body can partially exercise budgeting decisions. Examples of such decisions are: 1) to allocate the budget to the program and project that most aligned with the national policy and strategy under the dynamic situation. 2) to buffer the R&I budget from annual budget into multi-year budget, which is more suitable for research and innovation program and projects.

- **R&I Priority Setting:** Priority areas and issues for research and innovation must be clearly identified. The priority setting must be 'specific' and 'focus', not 'generic' or 'wide-open'. On this priority setting, sectoral approach is recommended. Priority area and issues should be identified with combination of national direction, future visioning & trends, as-is value chain and current capability of players. Again, research and innovation budget of the country would not be easily expanded, therefore effective and efficient spending is the key. Spreading too thin all over possible areas are not a good choice for R&I budget allocation.

4.2.3 Topic 3: Strengthening Monitoring & Evaluation System

- Monitoring and evaluation of the R&I system must be redesigned to cover all necessary areas. M&E should be clearly set up for three levels: 1) Policy and Strategy monitoring and evaluation 2) Sectoral monitoring and evaluation and 3) Program/project monitoring & evaluation. Each level consist of the evaluation issues which must be identified in according to the goal of each layer.

5 Conclusion

The reform proposal is aimed at improving Thai R&I system. As mentioned earlier, policy deployment is the weakest point of the system, therefore those reform principles and points are expected to close the deployment gap.

Fortunately, in May 2019, Thai research and innovation system was reformed by the establishment of new Ministry Act called the Ministry of Higher Education Science, Research and Innovation (MHESI) which is a merger of the Office of Higher Education Commission, the National Research Council of Thailand (NRCT), the Thailand Research Fund (TRF)with the Ministry of Science and Technology to create unity in R&D and innovation strategy including linkages of science, research and innovation at both policy and implementation levels.

This ministerial merging & reform crated some changes in the governance system. They are:

1. The ex-Ministry of Science and Technology is now merged with the higher education system. Therefore, role of the new ministry also covers administration of the universities. Synergy between universities and research and innovation organizations is expected to be improved by the merging.

2. National Higher Education, Science, Research and Innovation Policy Council is established with the purpose to unified the R&I Policy (as well as the higher education policy). The council is expected to make a clear top-down higher education and R&I policy and priority setting. The clear top-down policy and priority setting is essential for the successful policy implementation, as mention in Arnold et al (2003)

3. The clear structure and roles of organizations within the R&I system. The new structure consist of 4 layers: a) Policy formulation b) Budget allocation 3) Funding 4) Research organizations and related agencies. The reform acts clearly states about types and roles of those organizations.

4. The R&I budgeting role is assigned to a government agency within the ministry (Thailand Science, Research and Innovation TSRI), with a newly appointed by law the 'budgeting committee'. The budget allocation for R&I has also improved to Block Grant concept. The new budgeting structure is the very key improvement of this reform. The efficient and effective policy deployment mechanism depends largely on efficiency and effectiveness of budgeting mechanism.

However, not only the structural/ governance reform, but also the paradigm shift , mind-set and operation system including rules, regulations and related laws are critically essential to create success.

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References:

Arnold, E.et al (2003), Research and Innovation Governance in Eight Countries: A Meta-Analysis of Work Funded by EZ (Netherlands) and RCN (Norway), Technopolis.

Borrás, S. and Edler, J. (2014) Governance of Socio-Technical Systems: Explaining Change, Edward Elgar: Cheltenham.

Chaminade, C.; Padilla-Perez, R. (2017) The challenge of alignment and barriers for the design and implementation of science, technology and innovation policies for innovation systems in developing countries. in Kuhlman, S. and Ordoñez-Matamoros, G (2017). "Research Handbook on Innovation Governance for Emerging Economies: Towards Better Models". Edward Elgar Publishing. Cheltenham, U.K. Pp. 181-204.

Freeman, C. (1987), Technology policy and economic performance: Lessons from Japan, London: Pinter.

Kim, J. M. and Park, C. K. (2006), Top-down Budgeting as a Tool for Central Resource Management, OECD Journal on Budgeting, 2006, Volume 6, No. 1

Lundvall, B.-A. (ed.) (1992), National systems of innovation. Towards a theory of innovation and interactive learning, London: Pinter.

Nelson, R. ed. (1993), National innovation systems. A comparative analysis, New York: Oxford University Press.

OECD (2005), Reallocation: The Role of Budget Institutions, OECD, Paris.

Plumptre, T. and Graham, J. (1999), "Governance and Good Governance: International and Aboriginal Perspectives", Institute On Governance.

STI Office (2019), Budget Review on Thailand Research & Innovation 2018, Science Technology and Innovation Policy Office's working paper. (not published)

UNESCAP (2009), 'What is Good Governance?', United Nations Economic and Social Commission for Asia and the Pacific, Bangkok, Thailand.