

HISTORY OF ESTABLISHMENT AND DEVELOPMENT OF TECHNOLOGICAL RESEARCH AND DEVELOPMENT ORGANIZATIONS UNDER MINISTRIES IN VIETNAM

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Abstract:

Research and development (R&D) organizations under ministerial administration are important components in the national system of science and technology (S&T) organizations. They are also institutions which get large impacts from policy measures of re-management, shift or restructuring the system of S&T organizations during recent time. As shown by experiences of developed nations, R&D organizations are those institutions which play decisive roles in successful realization of objectives of the industrialization and modernization of the country. In order to give contribution to a better understanding of establishment and development of R&D organizations under ministerial administration, the paper deals with their formation, establishment, functions, tasks as well as actual state of activities.

Keywords: *System of S&T organization; Technological R&D organization.*

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1. Formation of technological R&D organizations under ministerial administration

After the re-gaining of independence by 1945, in lines with the activities to take over the administration of research organizations of the previous government, the Vietnam Government, step by step, built a new system of S&T organizations. Following the organizational model of S&T organizations of the Soviet Union, the one built by Vietnam was divided into three levels, namely: (i) Central research institutes of academic nature to realize fundamental research activities under administration of the Council of Ministers (actually the Government); (ii) Sectorial research institutes under administration of ministries to realize research activities to serve specific needs of line ministries (including some research institutes under administration of People's Committees of certain large cities and provinces); and (iii) Research units in producing organizations to realize

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research activities to serve their direct needs. The first technological research institute of Vietnam was the Research Institute of Military Technics under administration of the Ministry of Defense which was established in 1947.

A study by *Vu Cao Dam (2007)* explained the formation of the organizational model of technological R&D organizations in non-producing sectors and under ministries which first appeared by 1920 in the Soviet Union. The first research institute of this type was the Research Institute of Gas and Fluid Dynamics established by Prof. N.E.Zhukovskij. The reasons leading to the establishment of this institute were, after the triumphal October Revolution, instead of formation of the State structure based on traditional model with ministries, V.I. Lenin established the Council Committee of People's Commissars (in Russian: Совет народных комиссаров). It was a form of government in combination of State administration and economic management functions (its organizational structure included State-owned producing enterprises). Afterwards, the organizational structure of Council Committee of People's Commissars stopped the existing and the ministerial structure replaced where the ministries combined both the functions of State administration and economic management (production and business activities). This Soviet model then was applied in all the socialist countries of that time. In fact, the ministries in that model had the nature of huge producing organizations including multiple enterprises. As result, to continuously innovate producing technologies of enterprises in technical-economic sectors under their administration, ministries have set up some technological R&D organizations.

Having almost the supporting point of view for this interpretation of formation of R&D organizations under ministerial administration, *Nguyen Thi Anh Thu (2000)*, in her study, confirmed that technological R&D institutes in ministries had functions of research for application and development to enhance effectiveness of production-business activities in their assigned sectors, to solve conceptual, methodological and strategic problems, to carry out studies of integrated solutions for development orientation nature for applied researches for development process of the sectors.

In a study of research for organizational structure and activities of research institutes of agricultural-mechanical technologies, *Nguyen Dien (2002)*, gave a solid vision that in the countries with centrally controlled economic structures, ministries, such as Ministry of Agriculture and Ministry of Industry, have their own technological research institutes. For example, in

USSR, Ministry of Industry had Tractor Designing Institute, Agricultural Machine Designing Institute and other designing facilities which had functions and duties to design agricultural-mechanical machines and the Ministry assigned duties of mass fabrication of these machines to State owned plants and, then, deliver them to producing units in agricultural sectors. Similarly, Ministry of Agriculture had Research Institute of Agricultural Mechanics, Institute of Agricultural Electrification, Institute of Research-Application-Reparation of Agricultural Machines which had functions and duties to study and to design technical and organizational procedures of using of machines and then to produce instructions for collective farms to use machines supplied by industrial sectors. It is worth to note that, technological research institutes of industrial and agricultural sectors have systems largely extended from federal level down to republic level. These technological R&D organizations are State organizations where the State authorities provided staffs and budgets, and assigned tasks and contents of scientific research according to the State plans.

Many socialist countries of that time copied the organizational model of these two types of industrial and agricultural research institutes from the Soviet Union. Namely, in Vietnam, we had Institute of Agricultural Tools and Machines (IMI) under administration of Ministry of Agriculture (actually Ministry of Agriculture and Rural Development - MARD) and Institute of Research and Design of Agricultural Machines under administration of Ministry of Mechanics and Metallurgy (actually Ministry of Industry and Trade - MOIT). In Poland, there were Research Institute of Rural Construction and Institute of Agricultural Mechanization and Electrification under administration of Ministry of Agriculture, and Institute of Industrial Manufacture of Agricultural Machines under administration of Ministry of Industry. In Hungary, there was Research Institute of Agricultural Mechanics under administration of Ministry of Agriculture and Food Industry. In Romania and Czechoslovakia, there was Research Institute of Agricultural Mechanics under administration of Ministry of Industry. And there are many other examples.

Dang Duy Thinh (2007), in one of his studies, made know that there was, in developed nations, a clearly seen process of evolutionary development of R&D organizations inside enterprises and, together with that, unified links were maintained between R&D activities and technical, production and marketing activities. As consequences of this evolutionary process, technological R&D activities were mainly conducted inside enterprises and R&D links were also set up inside enterprises (as components of enterprises). Independent technological R&D organizations (outside

enterprises) also appeared but their roles were minor, e.g. in USA, independent technological R&D organizations made 15% by early 1920s and 6% by 1940s. The formation and development of technological R&D organizations in developed nations have the following two particularities: (i) Evolutionary nature in their organizational model of formation and development (internal needs of development of enterprises); and (ii) R&D activities link closely with production-business activities inside organizational structure of enterprises.

Another illustration for this interpretation is a study by *Dang Kim Son (2007)* where he provided a remark: As it is in many other industrial developed nations, Head quarter offices of ministries in Australia and New Zealand are very small scaled in terms of staff number (Head quarter office of New Zealand's Ministry of Science has only 80 staffs) because the State administrative works, as their functions and duties, are focused only on policy planning activities. While, in Vietnam, Head quarter offices of ministries entered firstly the stage of separation from direct administration of enterprises' activities and now are separating from administrative activities of tertiary organizations (research institutes, universities, centers, stations and etc.), in industrial developed nations, ministries entered a higher stage where they get separated from direct administrative works, financial supply activities and major part of public service supply activities. The financial supply and management activities are now passed to other organizations such as S&T research funds (RDC in Australia and FRST in New Zealand) which are not under administration of ministries. Research and training organizations (research institutes and universities) have the independent status of operation.

In State administrative works, ministries do not have duties to set up plans with concrete production targets such as superficies or production volumes as it is in practice in Vietnam but are focused on policy planning activities to offer favorable conditions for production-business activities. In addition to that, ministries provide instructions and participate in support activities for farmers in case of natural disasters, epidemics, management of rural infrastructure construction works, negotiations for export market exploration and extension, setting up of quality indexes and etc.

The study of the history of establishment and development of industrial R&D organizations system in Vietnam (*Report: Ministry of Science-Technology - MOST, 2004*) also shows: Together with the appearance of producing facilities and the development of industrial economic-technical sectors, the system of R&D organizations was established during 60 and 70

decades of the last century basically following the models applied in socialist countries. The concepts were relatively simple, namely the development of every economic-technical sector requires corresponding research institutes with low attentions to be paid to practical needs as well as finance providing capacities for construction and development of those research institutes.

With the above presented way to organize the R&D system, there exists, from initial stages, a gap between R&D sectors and production sectors. Therefore, not surprisingly, the establishment of links between R&D sectors and production sectors rests the main points of concerns in S&T policy making activities in Vietnam. Accordingly, all the efforts of State authorities in policy making activities are oriented to the shift of organizational mechanisms of R&D organizations with the purpose to link research outcomes produced in research sectors to needs of production sectors.

2. Functions and tasks of technological R&D organizations under ministerial administration

On basis of the history of establishment and development of technological R&D organizations, *Vu Cao Dam (2007)* made a study where he provided an interpretation of roles and missions of technological R&D institutes. He noted that, in the centrally commanded economic system, line ministries play the role of the State representative to carry out State administrative functions and, at the same time, the role of the Chief Commandant to control production activities. All activities of technological R&D institutes have to follow commanding orders from ministry bodies, namely research and application plans assigned by ministry bodies, reports of research results submitted to ministry bodies, research budgets provided by ministry bodies. As practice, R&D institutes usually carry out works as follows:

- Conducting researches of application and development for creation of new products, new materials, new techniques and new technologies;
- Conducting pilot projects to complete new technologies which successfully set up;
- Fabricating single prototypes or low volume series of specific products;
- Conducting designs and installations of production lines with new products and technologies;
- Implementing contracts of technical and technological consulting services, and maintenance services for related equipment in their scope of specialties;

- Implementing contracts of organizational, managerial and legal services in their scope of specialties;
- Conducting technical services of tests, measurement, experiments and etc.

Table 1: Comparison of research activities in R&D organizations

	Nature of research activities	Products/Outcomes
1. Universities	Being bound strictly to education and training tasks.	Training documents, research papers, scientific publications and etc.
2. Academic research organizations	Enrichment of knowledge and understanding.	Scientific publications, research works.
3. Research institutes under ministerial administration	Service for targets of application in production practice.	Concrete products of services and technologies.
4. Institutes of policy and strategy studies	Provision of scientific backgrounds for ministry bodies and State management authorities for purpose of use in sector management policy making activities.	Reports, recommendations and counter-arguments for policies and etc.
5. Research institutes for socio-economic development	Provision of scientific backgrounds for city leading bodies for purpose of use in local management policy making activities	Reports, recommendations and counter-arguments for policies and etc.

In order to assure the above noted functions, the organizational structure of technological R&D institutes is found more complex than the one of fundamental research institutes. The matrix model is usually applied to design the organizational charts of these institutes, namely many institutes still include specific research departments but apply the linear models which go from conceptual setting, technological establishment to fabrication of prototypes. In many cases, it also includes pilot production units (single products or low volume series of products) and market commercialization units. Some technological R&D institutes have early steps of successful market access and effective production organization, like an engineering enterprise.

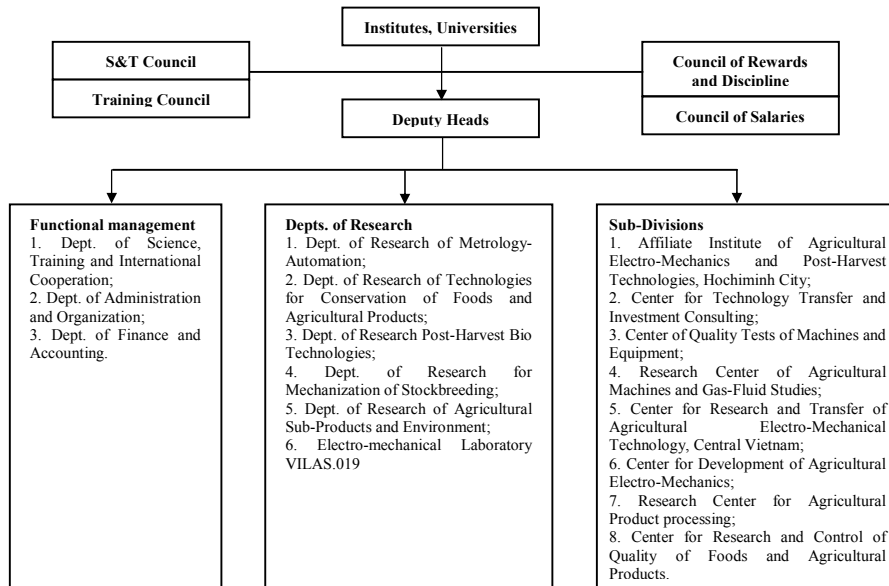


Figure 1: Organization chart of Vietnam Institute of Agricultural Engineering and Post-Harvest Technologies (VIAEP), MARD².

Technological R&D organizations in a productive sector are particularly important actors of the network of S&T organizations having functions to enhance continuously effectiveness of production-business activities of enterprises in the sector. One of the extremely important indexes for evaluating the effectiveness of activities of research institutes under administration of enterprises is the index of application of their R&D results and produced socio-economic effectiveness through the application activities. However, it is impossible to miss research tasks of conceptual and methodological nature as well as integrated solutions and orientation explorations for applied researches, particularly in relation to central research institutes of the sector. Certain R&D institutes in the sector have to be key scientific centers of the sector which should have positions independent from duties to solve short term or daily problems. Their key roles are to identify and to solve inter-sectorial problems of development, other crucial problems of organizational and managerial natures, and conceptual systems (*Dang Duy Thinh, Nguyen Van Hoc, 1999*).

² Decision No. 82/2007/QĐ-BNN on 3rd October 2007 by MARD defines functions, tasks and organizational structure of Vietnam Institute of Agricultural Engineering and Post-Harvest Technologies (VIAEP) as follows: VIAEP is a S&T organization under administration of Ministry of Agriculture and Rural Development (MARD) having functions of fundamental research, research of policies and strategies, public services, applied research, post-graduate training, technology transfer and production-business activities in the sector of agricultural and rural engineering, and post-harvest technologies over the whole country.

In the absolute centrally commanded economic system, in certain historical stages of development, the technological R&D organizations made positive impacts to socio-economic development as well as S&T development in many nations³. However, when the economic management mechanisms shifted to the market driven ones, the old functions cause difficulties to technological R&D organizations in their activities. Together with the shift in macro-economic management mechanisms, technological R&D organizations experience large changes in definitions of their functions, tasks, organizational structure and operational modes. This process occurs fast and strongly in lines with the rate of administrative reforms and economic management mechanisms of every nation. In Hungary by early 1990s, for example, due to heavy impacts of economic crisis, the budget sources from the Government could not “*subsidize*” fully costs of S&T activities of institutes. The situation of that time required institutes to look for ways of existence through development of links with industrial sectors. Positively, these activities enhanced their incomes and benefits in comparison to the previous period. Almost all the technological R&D institutes of Hungary became companies under charge of large production-business corporations since 1992. Initially, the research capacities of these organizations were very limited. Their production and service activities were mainly focused on efforts to make benefits. Averagely, 20 - 25% of their total turnover came from R&D activities, 30 - 40% came from service activities and the remaining part came from production-business activities. After the stage of shift activities, there were 11 industrial research institutes under State ownership status and 5 - 6 research institutes under private company status.

In the countries with the centrally controlled economic mechanism, almost all the technological R&D organizations in the system are under State ownership status where the State is in charge to provide development investments and to assign research duties according to plans. This economic mechanism made activities of technological R&D organizations passive and they have to rely on the State provided resources.

The self-governance status of technological R&D organizations remain restricted by State financial regulations in terms of contents of activities, number of staffs and organizational structure of technological R&D organizations. It is the State budgets which provide the main financial

³ Dang Duy Thinh (2000): For evaluation of historical roles of non-enterprise technological R&D organizations, it is possible to say, in initial stages of industrialization process, these organizations play very important roles, and with the time, they get increasingly incompatible with real conditions of industrialization. On this basis, the basic problem is not related to adjusting of the old system but to shifting of the old structure to the new one which can play basic structure for unification of R&D activities, production operations and technology innovation.

resources for activities of technological R&D organizations and only a minor part comes from enterprises. Relations between R&D activities and training activities in S&T activities of every technological R&D organizations' type are close and do not inherit research results from each other and are not based on market demand-offer backgrounds. Therefore, outcomes of research activities of technological R&D organizations remain limited in their supports for socio-economic development and production activities.

The re-structuring and the shift of technological R&D organizations in directions to link to production activities of enterprises were realized by many nations which followed the centrally controlled economic models. One of the clearly seen particularities of the new trends of S&T activities is the close binding between S&T activities and production activities⁴ which require research institutes in general and industrial R&D institutes in particular to extend pro-actively links with enterprises. The distance from scientific discoveries, through technological development to production application gets increasingly shorter. For example, during previous centuries, new techniques needed to wait for tens or hundreds of years to get into production practice. It happened that technical ideas appeared in ancient time, such as steam machines, but only by 1715 the first prototypes of steam machines were introduced to production activities in British coal mines. But the distance from scientific discoveries to industrial application is only 30 years in the first half of the XX-th century, 15 - 20 years during the post-war time, 7 - 10 years during 70-80 decades and now only 3 years during the 1990 years.

3. Actual status of technological R&D organizations under ministerial administration

In Vietnam, technological R&D organizations are mainly under administration of some line ministries with specific functions in industrial sectors, universities, technical colleges and State owned groups/corporations. Technological R&D organizations can be divided into 5 main areas of activities⁵: Engineering-automation, Materials-Chemicals, Energy, Mining and Electronics-Information Technology.

A easy particularity to remark is that technological R&D organizations are dispersed and segmented without inter-connections and close links with market and production activities. Investment for research infrastructure come mainly from State budgets (finances for development investment,

⁴ Magazine *Tong luan Khoa hoc Cong nghe Kinh te* (General Report of Science Technology and Economy) No. 1/2005 on self-governance and self-liability status of State owned technological R&D organizations.

⁵ MOST. (2015) *Report on Project for Establishment Vietnam-South Korea Institute of Science and Technology* (V-KIST)

regular operations and supports for purchase of equipment from realization of research projects and S&T projects). A major part of them does not have enough financial potential taken from earned incomes for re-investment for S&T research activities.

- ***Area of engineering-automation***

There are some typical technological R&D organizations in this area such as Institute of Industrial Machines and Tools, Institute of Mechanical Research, S&T Research Institute of Mining and Metallurgy (MOIT); Vietnam Institute of Agricultural Engineering and Post-Harvest Technologies, Research Institute of Water Resources (MARD); S&T Research Institute of Transport (Ministry of Transport). Research human resources and technical infrastructure include 400 doctors and master of science, 1800 engineers, 2 national key laboratories (welding and surface treatment, metrology) and 25 specific laboratories.

Strong fields: Technologies of work-piece manufacturing, mechanical engineering, thermal metallurgy and surface treatment, manufacturing of specific purpose equipment and parts (carrier ships, river way mechanical equipment, transformers, specific purpose vehicles, extra-long and extra-heavy equipment), machine engineering for agricultural mechanization, conservation and processing of foods and agricultural products.

- ***Area of materials-chemicals***

There are many typical technological R&D organizations in this area such as Institute of Industrial Chemistry, Institute of Technology Research, Institute of Oil & Gas Research, Research Institute of Foods, Research Institute of Paper and Cellulose, Research Institute of Ceramic and Glass (MOIT), Research Institute of Construction Sciences, Research Institute of Construction Materials (Ministry of Construction), Research Institute of Chemicals and Materials, Research Institute of New Materials, Research Institute of Tropical and Environment Sciences (Ministry of Defense), Research Institute for Technological Application (MOST) and others. Research human resources and technical infrastructure include 500 doctors and masters of science, 800 engineers, 1 national key laboratory (oil refining chemistry) and 100 specific purpose laboratories.

Strong fields: Industrial chemistry, agricultural chemistry, nano technologies, electronic materials, optical materials, optic-electronic technologies and lighting techniques, specific performance ceramic materials, anti-erosion and protection materials, metal materials, rare elements and rare earth materials.

- ***Area of energy***

There are some typical technological R&D organizations in this area such as Vietnam Institute of Nuclear Energy (MOST), Research Institute of Energy (MOIT), Research Institute of Hydropower and Renewable Energy (MARD) and others. Research human resources and technical infrastructure include 14 professors and associate professors, 55 doctors and masters of science, more than 1000 engineers, 2 national key laboratories (hydrodynamic modeling, high voltage power) and 40 specific purpose laboratories.

Strong fields: Nuclear energy, traditional energy, new sources of energy, renewable energy, marine energy, exploitation-transmission-distribution-consumption of energy, engineering and test of new equipment and materials in energy sector, management and processing of radioactive wastes, processing of uranium ore.

- ***Area of mining***

There are some typical technological R&D organizations in this area such as Institute of Mining-Metallurgy S&T, Institute of Mining Sciences (MOIT), Institute of Geology and Minerals (Ministry of Natural Resources and Environment). Research human resources and technical infrastructure include 173 doctors and masters of science, 358 engineers, large investments for research infrastructure and specific equipment for mining sector, mineral processing, color metal metallurgy, metal material, fabrication of metals and alloys.

Strong fields: Researches for exploitation and processing of metal minerals, non-metal minerals and metallurgy, engineering and installation of machines and specific purpose equipment, chemical-physical analysis services, mechanical engineering, automation in mining sector.

- ***Area of electronics-information technology***

There are some typical technological R&D organizations in this area such as Research Institute of Electronics and Telecommunication, Research Institute of Information Technology, Institute of Military Technics Automation (Ministry of Defense), Research Institute of Electronics-Information Technology-Automation (MOIT), Institute of Software Industry and Digital Contents (Ministry of Information and Communication) and others. Research human resources and technical infrastructure include: 7 doctors, 97 engineers (of Research Institute of Electronics-Information Technology-Automation only), large investments for modern research infrastructure and equipment.

Strong fields: Electronic techniques (specific purpose IC designs, medical

electronic equipment, industrial electronic equipment), information technologies (automatic software of open sources, industrial control software), electro-mechanics (CAD/CAM technologies in design, engineering of CNC systems, robotics and application), automation (application of SCADA systems in mineral minings and environment activities, industrial automatic systems for gauging and material feeding devices).

A global vision shows that, despite of the existence of certain technological R&D institutes with notable achievements in some fields⁶, up to now, Vietnam does not have institutes of applied research with large scale, strong inter-sectorial potentials, high qualified human resources and modern research infrastructure enough to supply technologies, to provide advanced technical supports and to make strong impacts to various economic sectors and fields. There is a conflict between a huge number of R&D organizations in the system and limited State budget resources. The network of established R&D organizations is heavily localized and close then low capable of inter-links and mutual supports. As results, they are isolated in their specific economic sectors and scopes of activities. Research organizations are low linkable with production activities and other activities of enterprises in terms of co-existence and mutual development perspectives (*Report by MOST, 2015*)⁷.

One of the ways to interpret the above noted situation comes from the strong influences of models from the Soviet Union and other East-European socialist countries (*Ngo Tat Thang, 2004*). In fact, the economic mechanism as well the S&T models of Vietnam are of heavy nature of centrally controlled and planned mechanisms. The controls and interventions of the State were largely seen almost in all the economic activities as well as S&T ones. Almost all the research institutes and R&D organizations were established and governed by the State with functions and tasks to be defined and also assigned by the State. The number of R&D institutes increases very fast and they have trends to cover all the increasingly narrower areas and set up a huge network of subsidized R&D organizations. The principles of centrally controlled and planned mechanisms were applied mechanically in

⁶ *Institute of Industrial Machines and Tools (IMI)* was founded in 1973 and now operates as joint stock company. After a successful operation of shifting from a small scaled institute of mechanical research, the Institute became a leading research institute in electronic fields. The Institute has 6 centers of research technology transfer and training activities, 2 functional units, 1 affiliate center and 14 member companies. Strong fields of activities of the Institute include: engineering and manufacturing of electronic devices in tool machines, agricultural product processing machines, construction machines, industrial measuring equipment, environment protecting and processing equipment. *Institute of Vaccines and Medical Biologicals (IVAC)* was founded in 1978 and now is under administration of Ministry of Health. It is a high class research institute with national prestige for products of vaccine and medical biologicals. It gives great contributions to the successful Government-led project for “*self-controlled domestic production of vaccines*”. Strong fields of the Institute are research, production, business and consulting services of vaccines and medical biological products.

⁷ MOST (2015) *Report of Project of Establishment of Vietnam-South Korea Institute of S&T (V-KIST)*.

S&T activities. R&D organizations were assigned with research plans, provided with operational budgets. The training of R&D human resources and the research infrastructure also were covered by State budgets and implemented by top-down indicated plans. Since being financially subsidized by State budgets and assigned with S&T tasks indicated by the State, research institutes and R&D organizations were fully controlled by the State. The inter-connections and links between R&D organizations and between them and production activities almost did not exist.

Also, the property status and the economic institutions cause certain impacts to the establishment and development of the system of R&D organizations in general and to the inter-links of this system with production sectors in particular (Nguyen Van Hoc, 2000). The net difference here is that, in capitalist countries, the talk about “*industry*” leads to the understanding of “*private status*”, and the State owned R&D organizations (including universities) do not make more than 1% of the total figure. In these countries, State owned R&D organizations are non-profit organizations and they deal mainly with problems of national and international importance, problems of high techs and “shortcutting and anticipating” technologies. By other words, State owned R&D organizations are in charge to solve long-term national capacity building problems.

Actually, Vietnam is in stage to accelerate the industrialization and modernization programs and has only 5 years to achieve the plans to turn the country basically to a modern industrial nation by 2020. These objectives put huge challenges to all the sectors and the entire national economy when the growth resources based on the model of investment growth, cheap labor forces and non-renewable natural resources turn out to be incompatible with real conditions. In this context, the Government defined S&T development and training of high quality human resources as one of the three strategic breakthrough measures and, at the same time, takes science and technology as *leverage* for the economic re-structuring process bound with the shift of growth models. Only by the way to rely on application of modern S&T advances to upgrade sectors and to promote competing capacities of products, commercial goods, services and enterprises, we get able to create deep rooted socio-economic growths, to assure a fast and sustainable development, to escape from “medium income traps” and to rise to join the block of developed nations.

However, this mission puts huge challenges to Vietnam S&T forces in context of limited potentials and low development level which, without being invested and upgraded, are difficult to become leverage and driving forces for industrialization and modernization of the country. Applied

research institutes of Vietnam are, in major part, small scaled and out-date equipped, and lack high qualified S&T experts. A bigger concern is the absence of links of these research institutes, in their activities, to key strategic economic sectors. Vietnam enterprises are lack of capacities to master and to use new technologies. R&D activities remain in very low level and lack investment capitals and human resources for technological innovation which lead to low competitiveness in export markets. The system of technological R&D organizations (research institutes and universities) is incapable of meeting technological needs and providing technical assistance necessary to support enterprises and economic sectors. As measures to recover this situation, this system needs to get immediately improved, to enhance capacities and to link research activities of R&D organizations to market activities and key economic sectors.

In the world, nations practice firm stands toward the system of public R&D organizations which have functions related to industrial sectors, namely: they must be self-governed without being subsidized by State budgets. Then they have to shift to the following models of activities: (i) Merging research institutes with enterprises or universities/colleges; (ii) Applying the full financial self-governance mechanism as enterprises; (iii) Shifting fully to operational status of enterprises or non-profit organizations; and (iv) Re-orienting operational status to increase non-S&T rates. Keeping pace with the shift of public R&D organizations to the self-governance and autonomy status, the nations issue series of policies and mechanisms to support the shifting process, particularly the renovation of support mechanisms, namely: (i) Implementing competition based mechanisms for programs and funds; (ii) Forcing R&D organizations to set up cooperation with industrial sectors; (iii) Enhancing the autonomy status of R&D institutions. Particularly, China can be a good illustration where it carried out the strong and global process of arrangement/shift of S&T organizations according to forms of their activities for purpose to allocate budgets for salaries and operational costs. In terms of finances for project implementation as well as investments for S&T infrastructure construction, there is also applied an equal mechanism for submission of applications and bidding procedures according to annual announcements of State authorities. In addition, Chinese MOST issued a series of measures related to innovation of management mechanism of R&D organizations after re-arrangement to enhance economic accountability requirements and to extend self-governance rights of R&D organizations⁸.

⁸ MOST . (2015) *Report of Project of Planning of the network of public S&T organizations up to 2020, Vision to 2030*.

4. Conclusions

First, as the above noted contents of studies show that the appearance of non-productive technological R&D organizations according the models of the Soviet Union and other socialist countries is only a transitive solution in the history of establishment and development of technological R&D organizations. Many nations conducted afterwards reforms/shifts/restructuring to turn these technological R&D organizations back to production activities and enterprises by many various measures. The restructuring process of the system of technological R&D organizations in directions to enhance research capacities within production sectors is also the shift of mechanisms which is compatible with the common trends of the world.

Second, in the system of S&T organizations in Vietnam, technological R&D organizations under ministerial administration were established very early for purpose to serve directly development needs of economic sectors and fields. The evidences through the two wars and the early years of national construction after the reunification of the country show well that it is impossible to deny the fact that the design of the system R&D organizations according the above presented models gave certain contributions to socio-economic development and S&T development as well as enhanced the knowledge level of large public. However, since the organization of the system of R&D organizations was independent from the system of production activities and the system of education and training activities the supports for socio-economic development as well as S&T development were not assured. During long periods, R&D activities in technological R&D organizations were conducted independently from activities of technological innovation in production sectors, design and operation of production processes. R&D capacities in industrial sectors were not established and developed within enterprises but built up in national research institutes or research institutes under ministerial administration. Their operation was assured mainly by State budgets with prejudged concepts that enterprises have no capacities or attentions to investments for their own R&D activities. Experiences of organization of the R&D system from the world's developed nations show well that technological R&D organizations always play very important roles in linking scientific researches with production activities and then enhance competitiveness of each enterprise as well as the whole economy.

Third, acknowledging shortcomings of the separation in organization structure of technological R&D organizations from production activities, recently the State issued many guiding documents to adjust, to arrange and to re-organize this type of research institutes. Some of them can be listed,

namely: Decision No. 324-CP on 11th September 1992 governing *the reorganization of the network of scientific research and technological development organizations*. Decision No. 782/QĐ-TTg on 24th October 1996 governing *the rearrangement of research and S&T implementation organizations* or even mostly Resolution No. 115/2005/ND-CP on 5th September 2005 governing *the self-governance mechanism and self-liability status of public S&T organizations* and Resolution No. 80/2007/ND-CP on 19th May 2007 governing *S&T enterprises* and etc. But, up to now, because of many various reasons, the problem of lack of links between research activities and production activities remained unsolved through these measures.

Due to the above noted reasons, it is crucially needed in future time to continue research for identification of solutions to improve the organizational models and activities of technological R&D organizations under ministerial administration./.

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