SOME HIGHLIGH PROBLEMS ON CURRENT STATUS AND RECOMMENDATION TO IMPROVE THE PERFORMANCE OF MATERIAL SCIENCES RESEARCH INSTITUTES IN VIETNAM

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Abstract:

This paper will provide a brief summary of some important findings, problems to be adjusted and some recommendations to improve the performance by research and development (R&D) institutes in the field of materials science (MS) in Vietnam based on analytical and survey data in 2016 by Vietnam Center for Science and Technology Evaluation. From the review of various data sources, the authors selected the optimal option to determine the list of R&D organizations in MS field in Vietnam and conduct surveys at those organizations to collect data whether serving the current status. In addition to analyzing a number of key operational issues, this report provides some recommendations for improving the performance of R&D organizations in MS field - one of priority fields in S&T development strategy 2011-2020 and vision 2030.

Keywords: *Current status; R&D organization; Material sciences field.*

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1. Introduction

MS is an interdisciplinary[2] S&T field, of particular importance to the development of modern technology products. In recent decades, not only in Vietnam but also in most countries, especially in developed countries, MS is an priority area for development[3]. Therefore, the development of R&D organizations in this field is always concerned by Governments. On the other hand, recently, the Government of Vietnam has issued several important new policies directly related to the operation of S&T

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[2] In the article "*Classification of R&D organizations by sector for assessment: case of material sciences in Vietnam*" in Journal of Science and Technology Policy and Management, No. 2, 2015, the author has analyzed the concept and subject areas, research direction of MS sector.

[3] Decision No. 418/QD-TTg dated 11th April, 2012 of the Prime Minister promulgated the S&T Development Strategy for 2011-2020, in which one of the priority S&T is new material technology- the next product of R&D in MS sector.

organizations in general and R&D organizations in particular. Prominent among these policies are the Prime Minister's Decisions: Decision No. 2245/QD-TTg dated 11th December 2015 approving the Project of restructuring of S&T sector to 2020 with a vision to 2030 associated with transferring the growth model to contribute to economic development; Decision No 171/QD-TTg dated 27th January 2016 approving the planning of the network of public S&T organizations up to 2020 with orientation to 2030. Among them, one of the main viewpoints is that it is necessary to plan the network of public S&T organizations in line with the process of restructuring S&T; To strongly and synchronously renovate the organization and management mechanism of S&T activities; To concentrate investment on developing potentials of a number of organizations in the S&T priority domains so as to reach the regional and world level. It is therefore important to analyze and evaluate the current status of R&D activities in S&T fields, which provide the basis for recommending measures to promote successful restructuring, at the same time, improving the performance of R&D organizations.

In a recent research (2016), authors analyzed some data sources to define the list of R&D organizations in MS field in Vietnam and surveyed, analyzed the current status of operations of these organizations in 2011-2015 periods. This paper will *brief some important finding, problems, which need to adjust and some recommendation to improve the performance* in R&D organizations in MS field.

2. What is the role of the research and development organizations in the materials science field?

The question for managers is: Which organizations in Vietnam are conducting R&D in the MS field?

The problem to be solved first is to look for data sources to give answers to the above questions. The data sources which can be used to list the R&D organizations in the MS field including: (i) The list of the Executive Board members of the Association are representatives from almost organizations which conduct R&D activities in MS field; (ii) Analysis of the sources of publications (articles, reports,...). Most R&D organizations in all S&T fields are requires to make public the outcomes of their research activities at various levels, in the journals or in the proceedings of national and international conferences. R&D organizations in Vietnam are taking advantage of the opportunity to announce research results at major international conferences held in Vietnam or periodic professional national conferences. Therefore, analysis of the origin of publications in the

proceedings[4] of professional conferences in MS field can at least provide a list of organizations that have studied the field.

The analysis outcomes based on the presence of R&D organizations in MS field at the workshops match well with the ones based on the list of Executive Board member of MS Association of Vietnam. This analysis shows that the majority of R&D organizations in MS sector are in the university system (mostly in Hanoi and Ho Chi Minh City) - about 65-70%. Organizations at the research institutes account for less than half of the universities (about 25-30%) and very few belong to ministries (about 5%). There are more than 30 organizations focusing on R&D in MS field and most organizations have been operating for more than 10 years. Many other organizations also have R&D in the MS field, but they are not focused - there are only a few small research groups working in this field.

The authors investigated R&D organizations in MS field with different aspects of activity, such as resource mobilization and utilization, results management, organizational governance,… and summary ***the main issues*** that organizations need to improve in order to improve operational efficiency.

3. Issues in the operation of research and development organizations in the materials sciences field

3.1. The problem of organizational scale

There are many R&D organizations in the MS field, however, most of them are very small-size organizations and are invested with quite scattered research funding. Except for a few organizations focusing on MS activities, such as Institute of Material Science (belong to Vietnam Academy of Science and Technology - VAST) with about 250 researchers[5] and some other institutions with about 80-100 researchers such as the Institute of Tropical Technology (VAST), Institute of Chemistry - Materials (under the Institute of Military Science and Technology), the rest are only about 50 researchers[6] down. Among them, 60% organizations have less than 15 researchers, 10% have 15-25 researchers and 30% have 25-50 researchers.

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[4] Proceeding of scientific conferences were exploited included: National Conference on Solid State Physics and MS (SPMS): Periodicals (2010, 2011, 2012, 2013, 2014, 2015, 2016); National Spectrum Optical Conferences: Periodicals (2010, 2011, 2012, 2013, 2014, 2015, 2016); International Workshop on Advanced Materials Science and Nanotechnology (IWAMSN): Periodicals (2010, 2012, 2014, 2016); International Conference on Advanced Materials and Nanotechnologies (ICAMN): periodical organization (2012, 2014, 2016); International Symposium on Frontiers in Materials Science, ISFMS: held in 2010, 2011, 2013, 2015 and 2016; International Workshop on Nanotechnology and Applications (IWNA): periodic odd years (2009, 2011, 2013, 2015).

[5] Source: The number of staff from the Institute of Material Sciences is taken from the Annual Report of Vietnam Academy of Science and Technology in 2015.

[6] According to a survey of R&D organizations of the Vietnam Center for S&T Evaluation in 2015, the number of researchers in organizations is averaged over the five-year period 2011-2015.

Most organizations operate separately, without close coordination in R&D with each other. In addition, the budget for research (excluding regular expenses and other funding) is not large: only 40% of organizations have budgets of more than 3 billion VND/year, 30% of organizations have the budget about 1 to 3 billion VND and 10% of the organization is less than 1 billion VND. Thus, very few organizations can have the capacity to achieve significant research results that generate social-economic value (according to opinion of experts).

3.2. Problem in result management

Most organizations have little experience in intellectual property (IP) protection. Nearly 90% of the surveyed organizations have prior orientations (some organizations set priority level 1 and others set level 2) to applied research with R&D results of this type are new technologies. However, most organizations do not have IPRs for technological results. Many organizations have opportunities to develop and commercialize new valuable products and services. Most organizations recognize the importance and value of being involved in this process. However, these organizations recognize that they are lacking of knowledge, skills and resources needed to carry out this activity. The shortage is: *Firstly,* lack of knowledge of the commercial market, research organizations will take time to understand the technology and products which bring great commercial value; *Secondly*, lack of experience in the protection of IP (eg, patents, property rights, etc.). The process of patenting new technology often includes evaluating existing inventions and analyzing the market to determine how to locate a new technology to apply successfully that patent into market success. Research institutes and universities around the world have done so well over the years especially in pursuit of international protection. *Thirdly*, the transfer of technology or the introduction of new products to the commercial market will have to go through difficult steps in issuing licenses to businesses or establishing a start-up business, while they have very little experience in these areas. Faced with these challenges, these organizations often ignore opportunities to protect IP against new technologies and products, and as a result, they will lose the opportunity to create significant economic value.

3.3. Problem in defining operational model

Most of the applied researches which R&D organizations are implementing focuses on the application of existing technology systems, sample models and fabrication. Many applied researches do not offer new technologies, much of which focuses on the application and creation of products for use in Vietnam and small-scale production. These organizations focus on creating value for money, increasing revenue and managing costs rather

than research, develop new technologies and advanced technologies. Although this activity can bring significant financial value to the organization, but not yet developed new technology has the potential to commercialize into products and services, organizations can not develop sustainably, even if they are all likely to be. Although the construction of new technology systems is likely to protect IPRs which are technical risks, but at the same time, there are many great opportunities for economic value.

The cause of this problem may be: inexperienced organizations in R&D orientation, as well as lack of experience in working with other R&D organizations and in cooperating with the business sector. Many organizations recognized the importance of building partnerships with strong businesses and many organizations have made significant progress in this respect. However, most organizations lack the experience, skills and resources to maintain these important relationships.

3.4. Problem in organizational governance

R&D organizations in MS do not set the performance targets nor annual performance evaluation. 100% of the surveyed organizations reported annual activity reviews, including a review of activities, achievements in the previous year and directions for the next year, but not yet evaluated of every aspect of the activity to find out the strengths to be promoted, weaknesses to overcome and especially no serious, specific plans to overcome weaknesses. Organizations are well aware of the importance of evaluating, monitoring and improving performance. This process does not have an effective monitoring and evaluating programs. Organizations are not focused on the following processes: (i) Establishing annual goals and once-a-year organizational goals will reorient activities at all levels of the organization; (ii) Evaluating of the progress/results at the end of the year according to the objectives; and (iii) Evaluating of what is needed to improve organizational performance in the future and decide which actions should be taken to do.

4. Recommendations to improve the performance of organizations

The recommendations made here are aimed at overcoming the issues identified by the survey of activities of R&D organizations in MS field as mentioned above. However, the authors also want to express their views on setting up policies towards capacity development, improving the performance of R&D organizations in different areas of the S&T organizations system in general:

4.1. Improve the allocation of public finance

In many countries with the most effective R&D organizations, the majority of public funding allocated to R&D organizations is simultaneously passed

through two evaluation processes. *The first* is the process of evaluating of the performance of the organization in the preceding years. *The second* is the allocation of these limited funds to organizations through an evaluation procedure of proposals for funding. These evaluation procedures are carried out by independent expert panels and ensured objectivity when allocating funding. Funding allocations based on these two concurrent evaluation procedures will be a source of excitement for large-scale organizations to have significant R&D achievements and for small-size organizations to seek the closely co-ordination with large and mature R&D organizations.

It is clear that the allocation of public funds based on evaluation systems is effective and brings at least two major benefits: *First*, the strength of organizations in terms of productivity and quality of R&D. Investment in R&D organizations should have a balance between short-term and long-term results; between the different research directions if they have competitive advantages and prioritize the development capacity for high value results. In addition, *investment should focus on key tasks that are researches under linked target groups* rather than individual targeted research. This approach will achieve the best results, the highest benefit in allocating funds when investing in R&D is always risky; *Secondly*, it is possible to produce high value results which is protected IP, to create valuable R&D products and services, to create community values, to train qualified researchers and engineers, to enable future projects is funded by the industry and other sectors.

4.2. Efforts to manage results through intellectual property management

Researchers often have limited about intellectual property experience so they need guidance and support to achieve high value in technology development, IP protection for technology and commercialize of outputs which is protected by IP (including patents, copyrights and spin-offs). The Government plays a very important role in this process by orienting to create the outputs related to the supply of the industry as well as reducing the financial burden of IP protection in abroad for both R&D organizations and businesses. The Government can also help by reducing the cost of IP protection, at the same time funding development at an early stage, or offering incentives to motivate businesses to grow their businesses on the basis of commercialization of R&D results are protected by IP.

4.3. Enhance the interaction between research and development organizations and the industry sector

This is very important object to develop the R&D organizations in Vietnam. R&D organization-industry interaction has many different benefits. One of the primary benefits is the ability to gain a clearer understanding of the

issues that businesses need, to set goals to access funding that helps improve R&D, and identify the optimal way to commercialize high value researched IP research results. Therefore, the Government should immediately implement separate policies and programs to build relationships between R&D organizations and the industry sector.

4.4. Improve governance through operational structure

The organizational structure of an organization is made up of strategic objectives and operational models that reflect the organization's core functions to achieve critical outcomes such as strategic objectives. While organizational governance is the task of setting up a specific activity plan to achieve the goal. This specific plan contains the mission, vision, goals, strategic objectives, performance (for annual and 5 years plan), R&D plan, strategic investment plan and annual performance. Thus, improvement of certain organizational governance must be through the operational structure, especially the specific plan. The plan should describe the requirements for infrastructure, laboratories. This includes the status quo, the plan to innovate, the organizing and managing the operation system as the laboratories management and operation, development of human resources, financial resources and technology information systems, security system, administration system and other necessary investment. Every year, the organization should follow this plan to work and the annual performance assessment should be done according to the goals stated in the plan.

4.5. Organizations need to be systematically assessed on the basis of international standards

A process of assessing organizations should be designed and implemented to acknowledge their performance. This is important to account for the success of organizations. And for the organizations themselves, to recognize the results achieved, thereby identifying the issues that need improvement in their activities.

The result of the organization's performance assessment is a document that provides information about the annual performance of organizations to achieve the organization's strategic goals and overall strengths. This is measured by criteria, indicators of success in the implementation of the proposed plan, as well as other measurements indicating the effectiveness of overall management.

Performance evaluation is an opportunity for organizations to continually improve their own management and to provide data for the Government to evaluate of the governance of R&D organizations. R&D organizations need to conduct annual self-evaluation and, on that basis, the Government will review the assessment every 2, 3 or 5 years.

5. Conclusion

This paper reviewed prominent issues in R&D activities of R&D organizations in MS field and took the authors views on recommendations for activities to address the issues, to improve the performance of organizations. Key points are: (i) The investment in R&D should be based on the performance of the organizations and stimulate linkage of R&D tasks, encourage R&D organizations to link together in an appropriate way to bring high-value results; (ii) Opportunities should be created for R&D results to be protected for IP and opportunities to commercialize high-value results which are protected by IP to overcome shortcomings in managing their activities; (iii) The Government should create opportunities and R&D organizations should also actively enhance their interactions with enterprises to link industry needs with R&D activities for R&D organizations to identify right operational models, achieve strategic goals and improve governance through operational structure based on detailed plans of established requirements. This aims at overcoming the existence of a kind of operation as business on the basis of economic contracts to improve the existing technologies in accordance with Vietnamese conditions or to model and create prototype rather than focus on researching and developing new technology, advanced technology; and (iv) R&D organizations should be systematically assessed by international standards to provide the basis data for identifying the achieved results and the issues that need for improvement of performance.

The consultants and the authors of this paper agree that the operational issues of R&D organizations in MS field as analyzed in this paper are also a common problems of many R&D organizations in other S&T fields. Therefore, the above recommendations are also worth representing to contribute more basis and facts for managers to further improve S&T development policies in Vietnam./.

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