POLICY FOR PUBLIC PROCUREMENT OF RESEARCH RESULTS IN VIETNAM

Cao Thi Thu Anh[1]
National Institute for Science and Technology Policy and Strategic Studies

Abstract:

The public procurement of research results is an interesting topic for research where very rich theories and practical experiences of the world show the advantages of this policy to promote innovation. The policy for public procurement of research results attracts recent attentions expressed in core science and technology (S&T) policy documents, namely: Resolution No. 46/NQ-CP by the Government on S&T, Law on S&T 2013, and Resolution No. 95/ND-CP dated 17th October 2014 by the Government on finance and investment for S&T. However, for designing and implementing a policy for public procurement of research results, it is necessary to get answers to certain problems such as "What is the procurement of research results?, "What are the objectives of this policy?", "Which lessons learnt from promulgation of the policy for procurement of research results by the State?", "Does Vietnam need to issue a policy for procurement of research results by the State?", "What would be stands of view and objectives of actors involved into the policy for procurement of research results by the State?" and others. In the scope of this study, the group of authors gives answers to the above noted questions and draws out some problems to issuance of a policy for procurement of research results by the State in Vietnam.

Keywords: *Finance; Science and Technology; Policy; Procurement of research results.*

Code: *16120801*

1. Procurement of research results and the public procurement of research results

1.1. Procurement of research results

According to available studies, the policies to stimulate innovation are divided into two groups: one is demand-oriented and another on is supply-oriented *(Edler: 2007a; Georghiou, 2007)*. While the supply-side policies help orient activities, the demand-side policies are to orient output results of S&T and innovation activities. The main reason of issuance of supply-side policies to support S&T and innovation activities by enterprises is related to market failures in relation to push up investment for R&D activities. Facing risks in R&D activities enterprises, as always, have trends to make under-investments for R&D activities. But the propagating

[1] The author's contact email address: caothuanh@gmail.com

effects from R&D successes are very large then the State should make interventions to stimulate investments for R&D activities. The objectives of supply-side policies are to strengthen efforts for innovation by enterprises through investment for R&D activities. Policy instruments in the group of supply-side policies are now divided into two sub-groups: one is financial policies and another one is policies for service. These two sub-groups offer various types of supports including capital support through funds, supports for research activities of public sector, supports for training and mobility of staffs, supports for business R&D activities, supports for market activities, intermediary activities and networking measures. Demand-side innovation policies target to stimulate demands to push up and to propagate innovations *(Edler, 2007b),* and, at the same time, to orient outcomes of innovation activities. Demand-side innovation policies can be divided into three sub-groups, namely a group of system policies, a group of policies for regulations and standards and a group of policies for public procurement for innovation *(Blind et al., 2004; Edler, Georghiou, 2007b)*. Obviously this concept of division is, in fact, very relative because policies are interconnected and interactive, and many of them are integrations of single policies.

Public procurement of innovation is the case when a State organization makes a procurement or an order for a good, a service or a system which do not exist now yet but can be developed and completed in a defined interval of time on basis of innovation activities, this procurement or this order targeting the realization of an actual State function or objective *(Edquist et al., 2000)*. Public procurement of innovation was proved to have advantages and is considered as the strongest tool when the State plays the role of "the lead consumer". Here the lead consumer would stimulate innovation and coordinates activities to create the domestic market, to reduce initial costs for innovative measures and then to promote the propagation process of innovation *(von Hippel, 1986; Edquist et al., 2000; Edler and Georghiou, 2007)*. In practice, S&T and innovation policies of countries remain mainly supply-oriented ones *(Rigby et al., 2005)*. This view is found adequate when researchers show that the innovation-oriented public sector procurement and supports for R&D activities once being combined are capable of producing much greater impacts to innovation activities.

1.2. Objectives of the policy "Public Procurements of research results"

1.2.1. Procurement of research results for stimulation of innovation

In terms of policy approach and mindset, public procurement of innovation helps promote innovation in direct and indirect ways. The impacts of

actions are reflected through procurements of innovative goods and services. The State when targeting the stimulation of innovation can pay for them with a higher price rate or accept eventual losses *(McCrudden, 2004; Edler and Georghiou, 2007)*. More than that, the public sector itself may become "an user for test" of created innovative products and services *(Malerba et al., 2007)*.

For purpose of direct stimulating effects to innovation, public procurement of innovation policies should produce impacts to orientation or speed of technology changing process, or both of them *(Edquist et al., 2000; Geroski, 1990)*. From one side, impacts to speed of technology change include the increase of investment rate for R&D activities or the enhancement of application of R&D results, and, from another side, impacts to orientation of technology changes include the selection of targeted technologies

Cabral et al. (2006) argued that the identification of indirect impacts of public procurement policies deals with the size and structure of markets[2], establishment of standards and rules (leading to higher level of awareness for innovation by population) through change of competition structure of markets in both of long term and short term *(OFT: 2004)*.

According to *Edquist (2000)*, there are three market situations: (i) "monopsony" (only a single buyer in markets); (ii) "oligopsony" (low number of buyers in markets); and (iii) "polypsony" (large number of buyers in markets without holding large market shares). In case of a single buyer, the focus is made for "pushing efforts" through participation by the Government which leads to a larger scale of innovations. In case of "oligopsony", the Government may play the roles of "the lead consumer" to stimulate activities for innovation and to coordinate the establishment of standards. In case of "polypsony", public procurement may play the roles of catalysts to stimulate investment and R&D activities by private sectors, such as demonstration of advantages of innovations.

1.2.2. Benefits from procurement of research results for stakeholders

Through public procurement policies, the public sector can help establish standards or stimulate the focus on a single standard and, by this way,

---

[2] The scale of demand is crucially important for sectors characterized with high R&D demand, more saving effects (benefits from large scale production), break-through moves in technology application and high level of uncertainty *(Porter, 1990)*. High public demand would also reduce market risks thanks to a well secured volume of turnovers and offer conditions for innovative enterprises earlier to develop their scale, to enhance the productivity rate and to reduce costs. In addition, innovation-oriented public procurement policies can help draw out new demand when suppliers and potential are not awarded of changing trends of users as well as innovative products and services the market is oriented to *(Edler and Georghiou, 2007)*.

stimulate the propagation of innovation. By doing a large scale procurement of innovative products and services, public organizations may cause large impacts to outcomes of process of technology application through their own selection of novel technologies or standards of a technological specific option[3] *(Cabral et al., 2006)*.

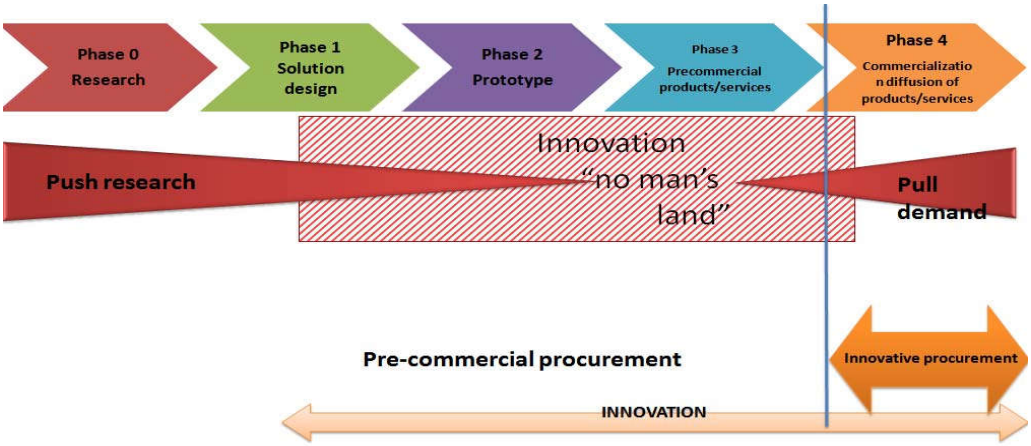
Public procurement policies have effects *to improve public policies and services* through the upgrading of State functions by implementation of procurement policies and then to give contributions to a good practice of public duties. Procurements for innovation can be coupled with objectives of ordinary procurement policies such as ones for sustainable development or enhancement of efficiency rates. And, as for final accounts, these objectives may be achieved earlier and more effectively through innovation. In addition, through application of innovation-oriented public sector procurement, *State organizations improve interactive relations with suppliers* (or help improve relations between users and suppliers, in case when State organizations are not final consumers,), or help improve interactive relations between them (in case of numerous suppliers).

In practice, European countries have the leading position in public procurement for innovation. Before implementation of public procurement for innovation policies, EU mainly applied supply-oriented policy measures such as supports for R&D activities to promote industrial sectors and to pay more investments for public interest related R&D activities. EU policy makers as well as researchers note that a better balance between public demands and R&D supply mechanisms would improve the absorption of creative ideas by public market sectors. Public procurement for innovation is able to help faster pass values created from R&D activities to market. Through playing the role of the first potential customer to introduce concrete initial application areas for novel technologies, the public sectors can help faster develop ideas from conceptual stage to prototype development stage and then to tests of products and services by customers.

In practice, public procurement for innovation policies were applied independently in some European countries such as Norway, Austria, Italy, England and Netherlands before a common policy was promulgated for EU. However, only in 2009, there appeared a public procurement of innovation policy at the regional level where the relations between selling and purchasing sides rises up to a transnational level. EU built up and implemented public procurement of innovation policies in context the

[3] The application of requirements for innovation-oriented technologies in bidding procedures may stimulate the use of not-yet-commercialized technologies. This move can push up investments for R&D activities to complete these technologies or to develop new technologies which would lead to activate entire economic activities.

values of this market gained a potential to hold up to 19% of GDP of the region. Public procurement of innovation policies were designed to target improvement of the quality of public service supplies and to cope with challenges the society actually faces to. At the same time, the appearance of this type of policies is expected to create conditions for and to promote development of the market of innovative solutions. In addition, these policies also target to promote EU markets to bring in benefits to the community of European enterprises (mainly for SMEs).



Source: EU, 2014

Figure 1. Pre-commercial procurement of innovation and procurement of innovative solutions

1.3. Lessons learnt from issuance and implementation of public procurement of innovation policies

European experience shows public procurement of innovation policies were designed to search a better balance between demands of public sectors and mechanisms to supply results of R&D activities for purpose to faster bring the latter to market. The State, as purchasing side, would play the role as the first potential customer to introduce concrete initial application areas for novel technologies, to help faster develop ideas from conceptual stage to prototype development stage. Therefore, the first tasks to put down are to identify clearly the objectives when designing innovation-oriented public sector procurement policies, to issue a new investment mode for R&D and innovation activities, to complete existing policies on basis of principles that the State will become the consumer which leads and stimulates the propagation of innovations to new actors in national economy. *Public procurement policies which push up innovations should be put in the totality of policies for science, technology and innovation but not for a single policy.*

When the State plays the role of "the lead consumer" to stimulate enterprises *a special attention needs necessarily to be paid to the context of individual countries and the region as a whole*. As practice shows, there exist countries where population have trends to purchase and to apply innovations more than other ones. An adequate attention paid on this analysis would help secure success for designing and implementing innovation-oriented public sector procurement policies.

The concept of "the lead consumer" may extend to a scale of lead market when this consumer creates a large enough market of innovative products and services. The requirements put towards a lead market would make appear needs to design a structure where *innovation-oriented public sector procurement policies have to select adequate products and services on basis of evaluation of practical demands*.

In addition, when designing and implementing innovation-oriented public sector procurement policies, *one of the objectives is to attract participation of domestic enterprises and organizations* for networking. Therefore, it is necessary to take special accounts for the situation where foreign enterprises gain public sector procurement contracts (it may occur that domestic organizations and enterprises are not qualified for supply of innovative products and services). This perspective requires enhancing capacities of State agencies in charge of implementation of public sector procurement policies. An example is the project for procurement of advanced lighting systems by the Federal Government and State governments of the Federal Republic of Germany. State agencies are in charge of implementation of the project need to convince decision makers and population in the rightness and economic advantages of procurement of the systems from abroad sources, the main arguments being energy saving benefits and longer life of the systems *(Pinnau, 2005).*

A series of problems related to *securing the procurement of R&D products and services at market price rates and linked intellectual property (IP) rights* should be taken into consideration when designing and issuing innovation-oriented public sector procurement policies. The problems are related to pricing products and services while the latter still need to be developed further and have not yet their markets, as well as to covering compensation payments for non-required IP rights and provision of solutions for expansion of markets.

Public procurement of innovation policies *requires a set of legal regulations for transaction activities.* Actually, European countries do it well and pay high attentions on successful evaluation of extent of demands by State organizations such as priorities and needs which fit well modes of

procurement of research results. EU had set up *Horizon 2020* which governs the rules for sides participating in public sector procurement activities such as beneficiaries, purchasing groups, hosting organizations, rights and liabilities of sides. Also, another condition for successful implementation of these policies deals with the necessity of clear rules to govern the status, rights and duties of participating sides.

Now, the question for Vietnam is whether it is adequate to apply the model from other countries. In order to get answers to this question, we need to process two aspects: (i) availability of conditions for issuance and implementation of policies for procurement of research results, and (ii) difference of environments for application of policies. The following analysis on potential policies for procurement of research results in Vietnam would help clarify the matter.

2. Necessity of issuance of policies for procurement of research results by the State in Vietnam

2.1. Regulations of existing policies related to the procurement of S&T research results by the State in Vietnam

Being regulated by Resolution No. 95/ND-CP on mechanisms of investment and finance for S&T activities, the State budgeted expenditures for S&T activities include investments for S&T development and expenditures for tertiary S&T activities. Investments for S&T development target research infrastructure facilities for public S&T organizations while expenditures for tertiary S&T activities cover regular operations and research tasks according to functional status of public S&T organizations and implementation of S&T tasks. The realization of S&T tasks can be assigned to S&T organizations, individuals and enterprises. Policies of supports for enterprises to realize scientific research tasks are governed by Article 31, Law on S&T 2013. Also, Article 57 of this Law governs measures to stimulate enterprises to apply scientific research and technological development results through financial support modes, preferential loans, supported interest rates of loans and guarantees for loans.

It is noted that the State issues many incentive financial support policies for domestic technology transfer activities, from proposal of solutions to prototype production and pilot production. These State budgeted financial supports are granted for realization of S&T tasks as governed by Law on S&T 2013. In addition to that, the investment capital supports can be granted to projects of application of S&T research results by enterprises for creation of novel products, higher productivity rate, higher quality and competitiveness of products. Also, enterprises may get supports from

National foundation for technological renovation for realization of S&T and innovation projects. Enterprises established and operate in conformity to Vietnam laws are allowed to extract maximally 10% of taxable incomes for S&T development funds (Article 17, Law on enterprise incomes) which cover expenditures of innovation activities by enterprises. In addition, Article 65, Law on S&T 2013, states that organizations and individuals conducting S&T activities are eligible for a series of support measures for incentive credits. Actually, there are no concrete mechanisms to stimulate application of domestically developed and produced equipment, materials and products by enterprises. This situation limits also the market access of research products.

It is then clear that existing policies of investment to push up innovation come from the side of the group of supply-oriented policies but not the side of the group of demand-oriented policies. Practice shows that the mechanisms for realization of S&T tasks, as evaluated by scientists, experience shortages including a very limited State budgets for application and development of research results. This situation requires policies which target: (i) to mobilize maximally all social resources for S&T investments; (ii) to push up quickly research results into market; (iii) to help enterprises in their access to research results feasible for application in production and business activities; and (iv) to implement the mechanism of procurement of research results by the State which are expected to settle the above noted issues. However, the actual regulations noted in Resolution No. 95/ND-CP toward the procurement of research results pay attentions just on needs of the State to serve internal consumption and public service targets and lack of attentions for the case where the users are not State organizations but a third party which gets benefits from the procurement of these results by the State.

2.2. Practical needs of use of research results by enterprises and State management agencies

As to serve the needs of State management works for S&T and innovation activities, State agencies exhibit also needs to use research results without using practical support modes for S&T tasks. It was the case where Hochiminh City S&T Department wishes to get immediately research results for application in production and business activities, saving, by this way, time and efforts of scientists from actual financial regulations of granting finances for S&T tasks. It was also the case of Dong Nai Province S&T Department where it needs to purchase solutions for immediate application to settle locally rising problems of public services (purchase of seeds for agricultural production and accumulation of irrigating water for dry season) without using the mechanism of granting finances for research

works. This move allows to avoid a lot of risks in S&T research and to mobilize social resources for research activities. However, the desire to get a new mechanism is not yet settled in Hochiminh City and even, according to Mr. Pham Van Sang, Dong Nai Province S&T Department, "if there appears a research result which fits rightly our needs, we do not know how to buy it".

The transfer of research results directly to production and business activities in Vietnam remains very limited. The study by *Nguyen Quang Tuan (2013)* showed the commercialization of research results achieves a rate only of 10%. This situation comes mainly from the following reasons: (i) lack of supports for pilot activities for research and technology completion; (ii) lack of State policies of supports for commercialization of R&D results; (iii) lack of capitals for venture investments; (iv) lack of supports of hosting organizations; and (v) low technological demands from enterprises. According to a report on implementation of State key S&T projects of 2006-2010 period *(Ministry of S&T, 2011)*, the rate of application and commercialization of research results gets improved but there exist technologies and equipment produced with limited potentials for commercialization due to their high costs and limited stability. In addition, the lack of concrete stimulation mechanisms for producing enterprises to apply domestically produced technologies, equipment, materials and goods limits also the market access of research products. Difficulties in mobilization of counterpart capitals and market risks, particularly the low earning rate from invested capitals do not stimulate scientists to continue efforts of further investment for completion of research results. Therefore, it is very difficult to ask scientists to carry on heavy loads of duties to complete research results and to bring them to market.

According to *Phung Van Quan (2013)* in a survey of technological market, more than 50% of the replies state there is a too small number of local S&T enterprises which supply technologies to the market, and, even if they do, the supplied technologies are so small sized and segmented that they cannot create integrated and completed technological chains capable of producing products for competition with imported ones. Every year, there are only 20-30 contracts are found successful for transfer of rights to own and right to use research results, and only some hundreds of research results are found successful in transaction of exploitation application (as agreed between research teams and enterprises without concluding sale/transfer contracts). The number is found too small in comparison to the total number 20,000 of potential research results and the number 13,000 of needs of technological innovations. It is clear that the rate of commercialization of research results is too small in comparison to potentials. Obviously, the availability of

research results for application is the prerequisite for stimulation of use of domestically developed research results by enterprises. However, even if research results are applicable in production activities, it is still necessary to support enterprises in their access to research results because they face with many difficulties in access to financial resources for innovation activities.

When talking about technology supplying sources for domestic enterprises, a CIEM report (2013) showed that a majority (about 66%) of technologies transferred to domestic enterprises come from other domestic enterprises. This shows that the technology transfer is made mainly between domestic enterprises. Only 10.2% of enterprises receive technologies transferred from local clients (7,174 survey samples) and the one from abroad clients is 11.9% (2,760 survey samples). This fact shows certain uncertainty of effectiveness of policies paying attentions to technology transfer between domestic enterprises and foreign enterprises. In addition to that, technology related problems would turn out to be easily settled if enterprises joint together to push up the deal to a bigger scale, and this fact shows the necessity of cooperation between enterprises to settle technology problems.

The above noted analysis shows that the State should issue policies for procurement of research results in order to provide enterprises with feasible measures for financial supports to enterprises as well as to link technology needs between numerous enterprises. Then the State will play roles of catalysts to support enterprises through public sector procurement contracts. In this chain, the scientist plays the role of sellers of research results, the manager plays the role of buyers, users and intermediates in procurement activities of research results and the enterprise plays the role of buyers and users of research results.

3. The views, objectives and actors in policies for procurement of research results by the State in Vietnam

There is no way to deny the importance of technology development and innovation for economic growth, particularly in the actual real context. This fact also shows that the natural resources and cheap labor forces stop being advantages of Vietnam enterprises and then the competitiveness based on S&T application and innovation turns out to be extremely important. In terms of policies, enterprises now come to center position of S&T and innovation activities. Therefore, it is necessary to issue measures to stimulate enterprises to apply science-technical advances and to conduct innovation activities.

Actually, the State applies many financial tools to stimulate investments for R&D and innovation activities by enterprises, namely:

- Financial supports for public S&T enterprises and universities to produce research results applicable for production and business activities;
- Financial supports for S&T tasks through forms of order, selection or direct appointment;
- Tax exemption and reduction for S&T and innovation activities;
- Financial supports in form of venture investment capitals and seed moneys.

The above noted policies, however, are listed among supply-oriented policies but not oriented to meet requirements for research results. Therefore, it is necessary to issue demand-oriented policies. Even in this context, a careful consideration is required to avoid overlapping with existing policies and to orient to long term objectives where the policies for innovation-oriented procurement of research results by the State may be an effective solution. In addition to a positive view by numerous scientists and managers to policies for procurement of research results by the State there exist some opposition views arguing that whether the State knows well the values of research results and whether the State is capable of applying the procured research results. In final accounts, the State should buy research results when it is well secured to be capable of developing and to use efficiently the procured research results but not to purchase them and then "put them in drawers and close". However, from practice of application of supply-oriented and demand-oriented policies to stimulate S&T activities, the need of procurement of research results rises from shortages existing in mechanisms for realization of S&T tasks, and from needs of application of research results in practical life, production and business activities. The view of points by a large community of scientists and managers is favourable for the necessity to issue such a policy for State budgeted procurement of research results. The perspective policy should target the following objectives:

- Policy for public procurement of research results is to complement support policies. It should be relatively independent from other investment policies by the State for science, technology and innovation;
- Policy for public procurement of research results is to satisfy many objectives: supports for selling sides (organizations and individuals producing research results), supports for purchasing sides (State institutions, innovative enterprises, farmers and etc.) and for linking the demand-supply with research results, stimulation for innovation, coordination for creation of domestic markets, reduction of initial costs

for innovative solutions and then promotion for propagation of innovation.

However, as international experience shows, since the State budget resources remain limited, the State should only:

- Procure research results under form of solutions and products which: i) are close to enter markets, or ii) have already a small circle of clients but still do not meet requirements toward price and quality terms which a large scale production would meet;
- Procure research results for further development to turn them afterwards to practical solutions and products to meet actual requirements of purchasing sides.

Also international experience shows, for successful implementation of policies for procurement of research results, it is necessary to satisfy the following conditions:

- Availability of actors involved into activities of sale-purchase of research results;
- Legal background and regulations for involved actors to conduct correctly transactions of research results;
- Identification of representatives of the State to conduct the procurement of research results;
- Financial mechanisms for procurement of research results including financial sources and procurement plans to meet requirements defined by the State (including needs of direct use by the State or needs of use by third parties);
- Evaluation of needs of procurement of research results: which priorities and which needs are to fit the modes of procurement of research results;
- Issuance of regulations for contracts of procurement of research results, IP rights, evaluation and risk management.

4. Conclusions

The issue of procurement of research results was set up as mainstream policies. The State issued numerous documents to increase research result supplying sources, application of research results and efficiency of production-business activities but still gains low positive results. The issuance of a policy for procurement of research results by the State is expected to settle practical shortages and, together with other related policies, to give parts to completion of the system of financial tools for

science, technology and innovation in Vietnam. However, we see different types of research results in different sectors and fields. Therefore, a mechanism for pilot trial of such a policy should be prepared. Particularly, the procurement of research results is a new form of financial investment in Vietnam then the conceptual design for this type of policy should be more carefully made in preparation stages. The targets, of course, are to enhance values of scientific research and technological development results, to mobilize social resources of investment for R&D activities, to open and to lead new markets, to stimulate research activities by enterprises, to enhance efficiency of application of research results and to stimulate innovation./.

REFERENCES

In Vietnamese:

1. Directive No. 2014/24/EU dated 26th February 2014 by the European Parliament and the European Commission on public sector procurement.
2. Ministry of Science and Technology. 2011. *Proposal of S&T Law, revision*.
3. Ministry of Science and Technology. 2013. *Vietnam Science and Technology, 2013*. Hanoi: Science and Technics Publishing House.
4. CIEM. 2014. *Competitiveness and technology at level of enterprises in Vietnam: Survey results, 2012-2013*.
5. Nguyen Lan Anh. 2003. *Study for mechanisms and measures to push up research and development results after acceptance*. Summary report of research projects at basic level, National Institute of Science-Technology Policies and Strategic Studies.
6. Dang Duy Thinh. 2008. *Study for innovation of financial mechanisms and policies for the State for S&T and innovation activities.* Ministerial research project. 2007-2008.
7. Phung Van Quan. 2013. "How to make more research for practical application". *Tia sang Magazine.*
8. Nguyen Quang Tuan. 2013. *Study for theoretical and practical background to build up policies for promotion of commercialization of R&D results of S&T organizations in Vietnam.* Ministerial research project, 2012-2013.
9. Phung Ho Hai. 2015. "On evaluation and support for fundamental science research", *Tia sang Magazine* on 02nd March 2015, <http://tiasang.com.vn/-quan-ly-khoa-hoc/ve-danh-gia-va-tai-tro-cho-nghien-cuu-trong-khoa-hoc-co-ban-8427>, .
10. Vu Duc Nghieu. 2015. *Some brainstorming for scientific research,* Hanoi University Bulletin.

In English:

11. OFT. 2004. "Assessing the impact of public sector procurement on competition", *Office of Fair Trading, Main Report.*

12. EU policy initiatives on Pre-Commercial Procurement and Public sector procurement of Innovative Solutions, 2014.

13. EU, 2014: Public sector procurement and repealing Directive 2004/18/EC.

14. Von Hippel, E., 1986. "Lead users: a source of novel product concepts". *Management Science* 32 (July, 7), 791-805.

15. Geroski, P.A. 1990. "Procurement policy as a tool of industrial policy". *International Review of Applied Economics* 4 (2), S.182–S.198.

16. Edquist, C., Hommen, L., & Tsipouri, L. (Eds.). 2000. *Public technology procurement and innovation.* New York: Kluwer Academic Publishers.

17. Thomas E Clarke, 2002. *Unique features of an R&D work environment and research scientists and engineers*, September 2002, Volume 15, Issue 3, pp 58-69.

18. Blind, K., Buhrlen, B., Menrad, K., Hafner, S., Walz, R., Kotz, C. 2004. *Fraunhofer Institute for Systems Research, New Products and Services: Analysis of Regulations Shaping New Markets*. European Commission.

19. Mccrudden, C. 2004. Using public sector procurement to achieve social outcomes Natural Resources Forum 28(4): 257-267

20. Edler, J. Ruhland. 2005. "Innovation and Public sector procurement". *Review of Issues at Stake*. Final Report.

21. John Rigby, Luke Georghiou Lund University, Leif Hommen, Max Rolfstam, Charles Edquist, Lena Tsipouri and Mona Papadako. 2005. "Innovation and Public sector procurement". *Review of Issues at Stake*, Study for the European Commission (No ENTR/03/24).

22. Pinnau, H., 2005. *Exchange lights. 2:1 for the climate. Modern technology for more efficiency in: Presentation at the Conference on Public sector procurement stimulating Research & Innovation*, Brussels, 14 December 2005.

23. Cabral L, Cozzi G, Denicoló V, Spagnolo G, Zanza M. 2006. *Procuring innovations*. In: Dimitri N, Piga G, Spagnolo G (eds) Handbook of procurement. Cambridge University Press, Cambridge, pp 483–528.

24. Edler, J. 2007a. *Needs as Drivers for Innovation*. Concepts and instruments of demand oriented innovation policy, Edition Sigma, Berlin.

25. Edler, J and Georshio. 2007b. Public sector procurement and innovation-Resurrecting the demand side *Research Policy* 36(7): 949-963.

26. Jakob Edler, Luke Georghiou. 2007. "Public sector procurement and innovation-Resurrecting the demand side", *Research Policy* 36 (2007) pages: 949-963.

27. Malerba, F., Nelson, R. R., Orsenigo, L., & Winter, S. G. 2007. "Demand, innovation, and the dynamics of market structure: The role of experimental users and diverse preferences", *Journal of Evolutionary Economics*, 17(4), 371-399.

28. Susana Borrás and Charles Edquist, 2013. *The Choice of Innovation Policy Instruments.*