STUDIES OF STRATEGIES AND MANAGEMENT

COMMERCIALIZATION OF RESEARCH RESULTS FROM UNIVERSITIES TO BUSINESSES IN VIETNAM: CURRENT SITUATION AND SOLUTIONS

Dr. Ho Ngoc Luat[1]
Department of Local Science and Technology Development, MOST

BA. Nguyen Thi Kha
University of Economics, Hanoi National University

Abstract:

Technology transfer and commercialization of research results are the actual issues which interest a lot of domestic and international researchers and management agencies. Today, science and technology (S&T) becomes a decisive factor in socio-economic growth and development. Commercialization of research results actively contributes to fostering the development of S&T market and accelerate the introduction of research results into practical life. This article will discuss the concept of "commercialization of research results" and its implications; identify the status of commercialization of research results from universities to businesses in Vietnam in recent years; analyze difficulties and propose policies to promote the commercialization of research results from universities to businesses.

Keywords: *Technology transfer; Commercialization; Research results; Businesses; Universities; Office of Technology Transfer.*

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1. Concept of commercialization of research results

Research results is broadly understood as the output/outcome from activities of scientific research, experimental research and development, technology development, technology application and S&T services, innovation promotion and other creative activities for S&T development (Article 3, item 3 of the Law on S&T). It is usually shaped in the form of products of a S&T task (Article 3, item 13 of the Law on S&T).

Under the Law on Trade 2005, it said that *"Commercial activities are profitable activities, including the purchase and sale of goods, provision of*

[1] The author's contact is at hnluat@most.gov.vn

services, making investment, trade promotion and other activities for profitable purposes". Thus, the commercial activities of research results, referred to as commercialization of research results, is a process through which research results shall continue to be developed, complete towards the production of a commercial product capable of meeting the need of customers.

That process requires close, harmonized, unified cooperation and interaction among the State, the Government, management agencies, universities, research institutes (academies, institutes, research centers, laboratories, research, observation, experimental stations) and, in general, among S&T institutions (Article 9, item 1 of the Law on S&T) and businesses, companies, investors and even individuals.

Characteristics of commercialization of research results

In the current business environment, the two concepts of commercialization of research results and commercialization of products are quite often mentioned out. These two concepts are essentially different. Commercialization of research results is often associated with research and development (R&D) stages, dissemination or popularization and technology transfer activities in market economies. Meanwhile, commercialization of products tied to the division of labor, production and exchange of goods according to market mechanisms. There are some views saying that the commercialization of research results is the transformation of scientific research result into technological processes and their products are to be sold in the market to meet the customers' need. This transformation process is performed through two types of activities as follows:

- Activities of commercialization of research results carried out by S&T organizations such as "sale" or "transfer" of training activities, research contracts, research results and intellectual property;
- Activities to convert scientific knowledge and scientific research results into commercial products and technology processes of production or pilot production.

To date, S&T organizations or businesses have begun to commercialize research results under the impact of national policy environment, e.g policies in training, research, trade, innovation, technology transfer, etc. Nevertheless, in order for the commercialization of research results to develop in a strong, effective manner, we need first the parties involved in commercialization activities have sufficient creative capacity of generating appropriate research results (i.e, able to satisfy the need of customers) and there should be active support policies for processes of transfer, dissemination of such research results.

It is usually relied on the number of patents and utility solutions to assess the scale and efficiency of the commercialization of research results. The number of patents reflects the actual effectiveness of the research result and the capacity of applied research. In Vietnam, many businesses have recognized the great value of knowledge and intellectual property and tried to exploit these resources. However, the number of patents, research results of universities and research institutes transferred to and utilized by the business community is still very limited. Most commercialization activities of research results are largely spontaneous, there has not been any professional organizations dealing with technology transfer, as a result, the efficiency of commercialization is still low.

2. Scientific research, commercialization of research results from universities to businesses in Vietnam

As of 2012, in the country there were 204 universities, 215 colleges, with more than 84,000 teaching staff working under a clear decentralized model; restructure of tertiary education was implemented with two respective national universities, namely Hanoi and Ho Chi Minh City National University, some regional universities such as Hue University, Da Nang University, Thai Nguyen University, Can Tho University, etc; and many other public and private universities[2].

According to the Report by Ministry of Science and Technology (MOST) in the project "S&T development for the cause of industrialization and modernization under the conditions of socialist-oriented market economy and international integration" submitted to the 6th (XI) Conference of the Central Committee held on 10th October 2012, up to 2012, in the country there were about 4.28 million people having university/college and higher degrees, out of which 24.3 thousand and 101 thousand were doctors and masters, respectively. The number of people working in S&T institutions was approximately 62,000; the number of S&T institutions nationwide including research institutes, research centers was 1,600 out of which more than 600 were public and more than 900 were non-public organizations. These S&T organizations operated in 60 different fields of study with 140 professional areas and nearly 1,000 specializations[3].

Currently, many key universities in Vietnam have carried out basic research activities, while technology transfer and commercialization of research results basically belongs to the realm of applied research. Some remarkable universities with these activities were: Hanoi University of S&T, Ho Chi

[2] Statistics of the Ministry of Education and Training, 2012.

[3] Figures of Ministry of Planning and Investment, 2011.

Minh City University of S&T, University of Technology under Hanoi National University, Hanoi Agricultural University No 1, etc. The State has already created favorable conditions for these key universities to take part in research and training of human resources in basic research focused on the key sectors possessing great potential for national socio-economic development and security.

In Vietnam, universities or research institutes are places where primarily conduct basic research activities.

As reported by SCImago[4], in 2012, in the list of 3,290 scientific organizations in the world having international scientific publications, there were some universities of Vietnam, as follows:

- National University of Ho Chi Minh City, ranked 2774 in the list with 720 scientific publications in 5-year period from 2006 to 2010;
- Hanoi National University, ranked 3155 in the list with 492 scientific publications in the period 2006 - 2010;
- Hanoi University of S&T ranked 3,160 in the list with 488 scientific publications in the period 2006 - 2010.

According to the assessment of research, capacity based on number of international scientific publications it can say that leading universities of Vietnam has a clear development and nearly reach international standards. A typical example, in the period from 2011 to 2012, National University of Hanoi had 196 articles published internationally.

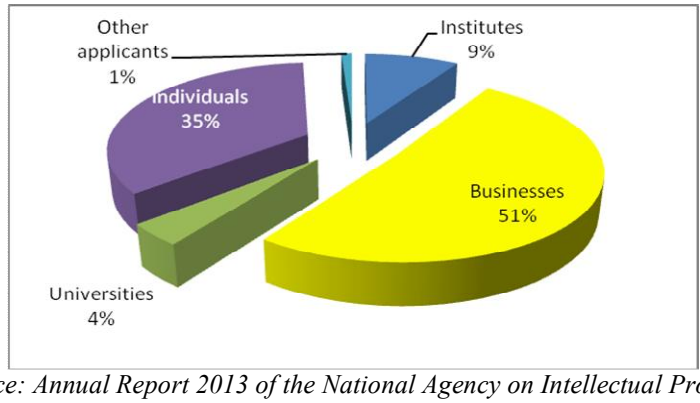
Besides doing basic research, universities also focus on applied research, technological development in the field of interest such as new materials technology, automation, agriculture, mechanical engineering, information technology, environment, etc. Applied research in universities are classified in stratification and field of study in a quite distinctive manner. Key universities often focus on researches of national, regional development challenges and require high research content such as development of software, nanotechnology, bio-products, new materials and healthcare, etc., while regional universities like Can Tho University, Da Nang University, Thai Nguyen University and many others tend to focus on product oriented research that serve the practical interest and need of the region and locality where they are located.

According to statistics of the National Office on Intellectual Property, under MOST[5], in the period from 2003 to 2010, universities/ research institutes of

[4] Source: SCImago (SCImago: Organization for scientific research institutions ranking - evaluation and classification of scientific research works, published scientific papers, journals, publications…, http://scimagojr.com).

Vietnam were granted with 61 patents and utility solutions, out of which only 30 are still valid and most of them have not paid maintenance fees after the first year in effect. Among the 30 patents currently in effect, only 11 were from universities, the remaining 19 were granted to research institutes. According to statistics of the Institute of Intellectual Property, MOST, as of 2010, the number of Vietnamese patents protected in Vietnam was 418 while the number of utility solutions was 530, 1.27 times higher than the number of patents[6].

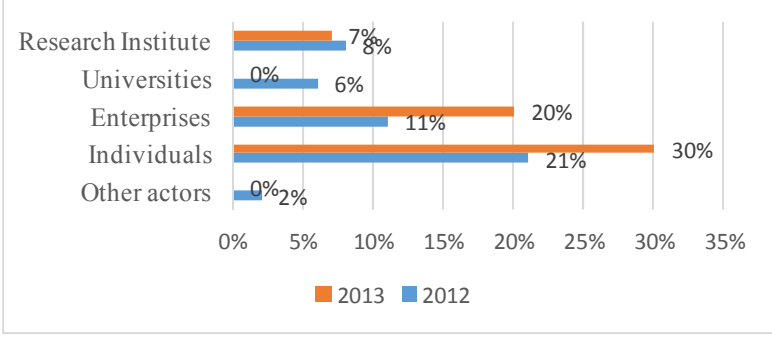
The number of applications filed for proprietary patents and utility solutions of Vietnam submitted in 2013 was 443. Of these, from universities was only 18, accounted for 4% of the total number of applications (Figure1 [9]).



Source: Annual Report 2013 of the National Agency on Intellectual Property

Chart 1. Applications for patents and utility solutions classified by applicants

Universities mainly applied for recognized monopoly on utility solutions and no application for protection of patents (Chart 2 and 3 [9]).

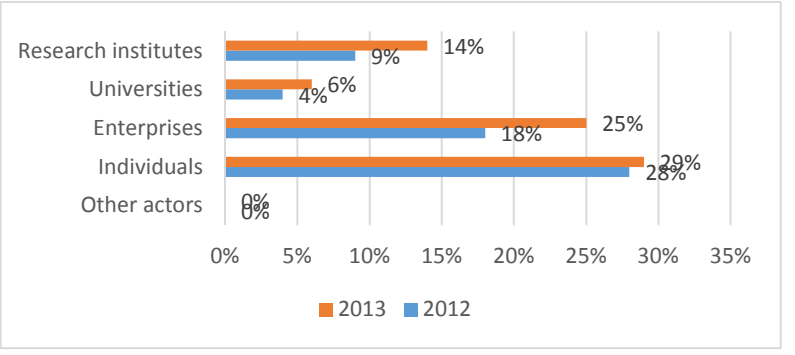


Source: Annual Report 2013 of the National Agency on Intellectual Property

Chart 2. The number of patents by applicants

[5] Statistics of the National Office on Intellectual Property, MOST.

[6] Data from the Institute of Intellectual Property.



Source: Annual Report 2013 of the National Agency on Intellectual Property

Chart 3. Patent and utility solutions according to subjects

In addition, for assessment of the practical effectiveness of research results, the number of contracts for transferring industrial property objects is also one of the evaluation criteria to measure the S&T achievement. However, the number of contracts for such purposes in Vietnam is still modest, accounting for less than 10%.

Through the above data and analysis, it was indicated that although universities and research institutes were strong potential suppliers of extremely abundant intellectual property, actual research results showed these potential "resources" had not "brought about" expected outcomes compared with the available intellectual manpower. It can be therefore confirmed that research activities at universities were not of high efficiency and technology transfer as well as the commercialization of research results from universities to businesses in the country was still weak, ineffective and very limited compared to abundant potential of universities and research institutes.

3. Difficulties in commercialization of research results from universities to businesses

- ***Loose tripartite linkage:*** the tripartite relationship between university - enterprise - state/locality has not been clearly established. Universities or research institutes were not really interested in this engagement and did not perceive the importance and effectiveness of the linkage and cooperation with businesses in respect of research strengthening, promoting technology transfer and commercialization of research results to create demand side for the study. For example, Hanoi University of Pharmacy has cooperated with Traphaco to promote R&D, or University of Technology under Hanoi National University and HiPT company established cooperation in the field of R&D to produce of high-tech products, transfer of technology in the field of electronics-telecommunications, information technology and some other

areas of technology. Although this model of cooperation was initially effective, it still had limitations, because sometimes research at universities went lag behind the need of the market; universities/research institutions still lack a thorough understanding of the market demand for research or even have to ignore it due to insufficient capacity of following/meeting the demand/requirement of the enterprise of concern. The current challenges, difficulties arising from the university side are as follows: Normally, technology is in rudimentary form, it stops at the laboratory scale so it makes further investment and development of high risk in practice. Technology has not been associated with practical needs nor met the market requirement due to lack of integration with businesses. Most of units at universities which are responsible for technology transfer and commercialization of research results have no legal status for bank loans. Therefore, in order to strengthen the above tripartite linkage, it is important that the State gets involved in making appropriate support policies and plays bridging rote for universities and businesses to "shake hand" and cooperate together. It is also important to rapidly implement policies to "encourage, facilitate S&T organizations, scientists to associate with businesses and other organizations to identify, perform the S&T tasks for meeting the requirement of technology innovation, improvement of technology level, productivity, quality and competitiveness of products and goods" (Article 32, Law on S&T).

- ***Low trust of businesses on the research results from universities/ research institutes:*** Companies applying technologies transferred from domestic universities/ research institutes had not yet exposed strong belief in the research results obtained. These companies tend to buy technology transferred from abroad for domestic production and consumption. Psychology of "preferring foreign made" and trust in imported technologies also impede the transfer of research results from research institutions into production. Therefore, the mobilization of financial sources from companies for research will be hampered despite many research projects at universities or research institutes have high applicability but could not find a place to be commercialized or applied in practice [6, p.65].
- ***Lack of Technology Transfer Offices***: presently, universities/ research institutes in Vietnam are still in need of Technology Transfer Office (Licensing Technology Office - TLO[7]), consulting services, support

[7] TLO is understood as Technology Transfer Office. The objective of establishing TLO is to develop and manage technology transfer mechanisms; conduct studies on cooperation modalities between universities and companies in technology transfer, find out necessary measures to promote technology transfer from universities to businesses. In addition, the establishment of TLO is also to harmonize the interests of the parties involved towards getting long-term benefits from the results of innovation and ultimately the interest of management agencies, bringing innovations created in universities/ institutes into practice, making them become high competitive products.

services for technology transfer, commercialization of research results. Besides, some universities have set up incubators to encourage creative activities, strengthen technology transfer and commercialization of research results within the university themselves such as Hanoi University of S&T, University of Agriculture and Forestry, Ho Chi Minh City University of S&T, etc. However, the existing incubator models still have a certain number of limitations; innovative ideas, research results have not been much transferred out nor commercialized; some newly established incubators suffered "premature death". One of the causes of this phenomenon was due to lack of close coordination and synchronization between the parties concerned in the incubation process, the scientists involved did not have much experience, while being dispersed between business, research and teaching activities, funding for running activities of the incubator was also limited.

- ***Lack of attention of State management agencies paid to commercialization of research results***: the commercialization of research results from universities to businesses in Vietnam is still at modest level due to lack of attention and support from the state and localities where the research results are applied. Currently, mechanisms and policies of the State are still inadequate, especially complicated financial mechanisms, there are a lot of redundant procedures… Therefore, the State should have policies to promote universities to strengthen the implementation of scientific research activities, encourage enterprises to accelerate technology development, innovation, commercialization of research results and technology transfer.
- ***Universities disregard scientific research***: many universities have not considered scientific research, especially those of concern of production and businesses as major and important tasks of the university, so it led to shortage of research projects, valuable technological solutions for socio-economic development of the country. Especially, now even in universities or research institutes there exists a situation where occurs the shortage of information on results of completed research as well as on ongoing research projects leading to duplication of research topic. As a result, there was a significant loss of state funding for research; no clear destination of the result after the research project is completed, except some pilot applications at small scale and can hardly be developed and expanded.
- ***The role of the State in market promotion***: the need of different sectors/areas/regions with regard to procuring S&T products and services, or in other words the "demand" of different customers on results of scientific research, S&T products and services is quite different. Therefore, in this case, the State plays an important role to stimulate the demand side,

because the market "demand" depends on the income of buyers in the market, high or low purchasing power will affect the transfer of research results to production, businesses. Thus, the State should have policies to adjust and make balance between supply-demand of buyers and the market.

- ***Inappropriate focus on research of key areas***: scientific research and technological development in Vietnam was mainly based on what researchers had perceived, not on the actual need and interest of businesses. The quality of the research results has not really met the market requirement, the psychology of "preferring foreign made" of the "demand" side is actually of the concern of local researchers.
- ***Universities/research institutes have not paid enough attention to their "intellectual products":*** S&T organizations as well as individual scientists have not paid attention to the commercialization of research results. For organizations and individuals performing S&T tasks, they considered that a research project is completed when the project outputs have been accepted and the research ideas come to an end. As a consequence, efforts will be made to find out and prepare the next research ideas. So far, there is not so many S&T organizations, universities establishing databases, compiling dossiers on assessment and evaluation of research projects after acceptance. Individuals, research organizations in Vietnam have not so far put attention to the commercialization of their research results.

4. Business oriented innovation policy to promote the commercialization of research results from universities to businesses

Policies to enhance the technology innovation capacity of businesses

Success of the commercialization of research results depends not only on the innovative capacity but also on the ability of businesses to acquire and master the technology. While it must admit the fact that the technological capacity of Vietnamese enterprises is still not high, especially for small and medium enterprises because most of small and medium enterprises in our country are still using outdated technologies, even those from 3-4 previous generations. Due to the low technology innovation capacity, most of Vietnamese enterprises have received technology mainly in the form of equipment, machinery and technology lines. Technology received in the form of patent, licensing and technological know-how was very limited. This was one of the main reasons leading to limitation in the commercialization of research results.

Thus, there should be policies available to support enterprises to realize technology innovation. *Firstly*, (1) It should have a strategy to exploit the

"open" wealth of information on intellectual property (patents, utility solutions, etc.) of Vietnam and the world. At the same time, it should promote the implementation of the "decoding technology" strategy for meeting the current need of technology innovation, particularly for small and medium enterprises in Vietnam. *Secondly*, (2) Effective implementation of the Government Decree No. 95/2014/ND-CP issuing "Regulations on investment and financing mechanisms for S&T activities" (Decree 95) to create a system of S&T development funds of enterprises, as well as enhanced support from the Foundation for Technology Innovation to actively support the technological innovation. *Thirdly*, (3) Providing guidance and encouraging localities to formulate and implement programs to support technological innovation of enterprises following good practices done by Ho Chi Minh City, Dong Nai, Hai Phong provinces.

Policies to promote the research and intellectual property management reform in universities

In reality, universities/research institutes or S&T institutions is the cradle of knowledge, where provides extremely rich intellectual property for socio-economic development of the country. However, policies in respect of using and giving preferential incentives, high appreciation to S&T workforce in our country has not really been so effective. Therefore, it is important to early train a cadre of personnel capable of creating knowledgeable value for the development of technology market in general and commercialization of research results, in particular technology transfer should be conducted first in Vietnam based on effective implementation of Government Decree No. 08/2014/ND-CP "detailing and guiding a number of articles of the Law on S&T" and the Decree 95 mentioned above.

On the other hand, the creative capacity of universities/research institutes or S&T institutions in our country in general is not high. Many research topics, projects have not really formulated based on the need of businesses or from practical urgent requirements, only focused on research of researchers' own strength. Furthermore, financial mechanisms, investment and financing policies for research has not really promoted innovative capacity of both S&T organizations and individuals. The spending level for S&T is still far from expectation and the allocation of funding for research is still scattered in ministries, localities, and not focused on key technology areas towards promoting the technology market development.

Policies to promote the linkage, cooperation between universities and businesses in research and training

In recent years, the relationship between the State, businesses and universities/research institutes or research institutions has prospered;

however, this relation has not yet really been effective for the parties involved. The State should create a legal corridor, issue supportive and incentive policies to help scientists and businesses come together in an easily and more favorable way.

Presently, businesses, universities/research institutes have come together because of their urgent needs. Scientists are eager to find place to sell their "intellectual products" and try to find an appropriate way in line with the customer/market demand; meanwhile, on the other side businesses need the latest, most innovative research results to satisfy their need and create better profit. However, the development of linkage between scientists and businesses still faces with many obstacles, mainly due to lack of information, less mutual understanding between scientists and businesses, particularly there exist many divergent views on the issue of benefit sharing… Therefore, the role of the State in harmonizing this relationship is very essential.

The State should have incentive policies to encourage cooperation, actively provide advisory services, create playground, common forum for the two partners come together, understand and cooperate with each other for the socio-economic development of the country. Successful cooperation will bring benefits to all parties involved because, when businesses benefit from the result of scientific research, they may save money and effort as no need to make investment in doing research, they can use right human resources consisting of scientists, researchers from existing universities/research institutes, thereby commercialization of research results and introduction of products into the market could be implemented for the need of customers. On the other hand, not only businesses but also universities themselves shall get benefit from the commercialization of research results in the collaboration with businesses. Finally, the country will benefit from the use of technological intellectual wealth making the economy quickly transform from a manufacturing industry based economy to an innovation based knowledge economy.

Currently, the State has policies issued to encourage enterprises to invest in S&T, expressed in a number of legal documents such as the Law on S&T No. 29/2013/QH13 (Articles 41, 42, 43, and 45 concerning regulations on ownership right and copyright over results of R&D activities and encouragement of the application of R&D results; Government Decree 80/2007/ND-CP issuing a number of supportive and incentive policies applied to S&T enterprises.

The state must promptly issue detailed guidelines for the implementation of such policies to support the "buyers" of research results aiming at stimulating the "demand" side on science products to create opportunities for research institutions/universities to introduce research results into production and business.

The state should create most favorable conditions for state management agencies to develop databases and reporting procedures to get information on technological advance application demand from different S&T sectors and localities in the country. This will help individuals, organizations, research institutes/universities pay more attention to the market needs, from that research can create scientific products as per the market requirement.

The state shall adopt policies to support research organizations to feel secure when publicize their research results on the mass media in order to avoid overlapping research and create references for future research projects. The announcement of research results to public will draw the attention and investment of both domestic and foreign investors and assistance organizations.

Study lessons learnt of the TLO model of the world and related experiences of other countries suitable for Vietnam to promote commercialization of research results from universities to businesses.

At present, promoting the commercialization of research results is a central point in economic policies of many countries around the world. As a typical example, in 1980 to promote the transfer of research results from universities to businesses, US government issued the Bayh-Dole Act. Since the introduction of this Act, universities of the United States have accelerated the establishment of Technology Transfer Service organizations to commercialize their research results. Presently there are more than 200 universities of the United States set up the Technology Transfer Office (TLO) within their university. Many TLOs in university have associated with incubators or research parks to implement the TLO activities. Application model of new technology developed in universities are permitted to conduct testing in Incubators and Research Parks. In addition, TLOs also assume an important task, i.e linking with local, regional, domestic and international partners in order to support start-up technology companies for these to overcome difficulties in the early stages of starting business. Following are some models of management of intellectual property activities in universities, models of technology transfer and commercialization of research results in universities implemented by TLOs.

It can say that TLO is a key element expressing an effective three-dimensional partnership among the State - Universities/reseach institutes/ S&T organizations - businesses in the US. Important measures taken by the United States to implement the above strategy are as follows:

- Establishment of university-business partnership centers and research centers to expand production to promote technology transfer to businesses;
- Setting up Technology Transfer Office/Center within the University itself.

Not only in developed countries like USA, UK, France,... but also in some Asian countries there actively promoted the commercialization of research results from universities to businesses. In early 2000, the Government of Republic of Korea promulgated the Law on Technology Transfer Promotion to foster the commercialization of research results. On the other hand, through incentive measures and policies in respect of tax exemption, financial assistance, the Korean government supported the establishment of such service organizations for technology transfer as National Center for Technology Transfer, Technology Transfer Office TLO in public research and development organizations.

Furthermore, to promote commercialization of research results, the government of Malaysia also developed a support program for the commercialization of research results. This program provided partly funding to promote the commercialization of research results in the country. Along with that, the Chinese government also provided policies to promote the commercialization of research results, allocated a considerable budget to encourage and support universities or research institutes to realize commercialization of their research results and register the inventions created for intellectual property protection./.

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