

**FROM KNOWLEDGE TRANSFER MODEL
TO INTELLECTUAL PROPERTY INNOVATION:
GLOBAL TRENDS AND PROBLEMS OF VIETNAM**

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Abstract:

The important position of science towards technological innovation requires a strong push-up of legal reform for Intellectual property (IP) protection of public research organizations (PROs) and universities. This trend is observed not only in developed countries but extended also to emerging economies. Experiences of advanced countries create opportunities for technological transfer but put also challenges to developing countries to bring research results to production. Being based on the models of knowledge transfer in various periods, this research summarizes basic features of IP protection in our developing economy.

1. Knowledge transfer models - global development trends

In many developed countries, universities and PROs play the crucial role for socio-economic development. They provide creative human sources as starting point of knowledge transfer process and create economic development advantages. Through decades, this process shifted from the “open science” (OS) model through the “license” model and now to the “innovation” model.

In the OS model, PROs do not hold the IP rights but research results are accepted to be innovation resources. When research results are made public, everyone can use them. PROs are allowed to establish with industries to develop technologies; but in many cases industries own research results and patents to protect long-term development.

With the nature of the OS model, users have only aesthetic duties of thanks for shared knowledge and technological advances. In this case researchers do not hold and administer IP assets, but the OS model still attracts researchers because this model harmonizes the global values of sciences,

non-limited movement of information and the prestige of scientists through their public made research works [2].

In the US before 1980, inventions made through Government support sources were under the Government's ownership and the Government granted only non-exclusive licenses. In practice, this policy did not encourage many researchers to file for patents and industries were not interested in purchasing of non-exclusive license. In order to encourage PROs to receive more research supports, the US promulgated the *Bayh-Dole Law* which recognized property right towards the inventions made by the Federal Government's supports and the sharing of benefits from the use of patents delivered to inventors. The Government held the rights to deliver or to withdraw the licenses of commercialization (in case contractors do not complete fully the committed duties) and the most important point is that the Law provided *the priorities to deliver licenses to small and medium enterprises (SMEs)* [1].

Since the *Bayh-Dole Law* entered force, *the "license" model* was set-up and 2/3 of financial sources to encourage research came from the Government's supports. The Law impacted much the activities of PROs and universities. It facilitated the technological transfer for public interests and led to establishment of transfer offices which carried out activities to make inventions public, protect IP rights and deliver licenses.

Technological transfer made through traditional models provided the potential to attract industries. If PROs and universities, however, are not proactive enough they would not help industries to identify opportunities and then make necessary investments. Industries were, in fact, to get benefits if PROs have rights to administer IP rights because this status makes them easily to catch new inventions then conveniently positioned to identify supports to develop original ideas. Since then, *the "innovation" model* was conceived and then born for administration of IP assets by PROs and universities. The new way of transfer of research results was found useful in business transaction, which is in fact the cooperation with industries and the establishment of secondary companies.

The *"innovation" model* allows to short the distance between research and development of technologies. The license rights are interested, in terms of technologies, not only for inventions but also know-how and applications supported by industries to improve and complete research results made through the Government's supports. *Technologies developed by PROs and universities are platforms to set up potential activities through licenses where the rates of shares and possible benefits are defined from patents.*

This practice requires new additional elements to identify brokers and initial capital sources (which may be interest-free loans).

In addition to patents and licenses, in the ‘*innovation*’ model, technological transfer offices manage a large scope of relevant tools and services of business development, material provision, incubator means and initial capitals for science parks. It is the way to combine policies and resources to facilitate PROs and universities to administer IP rights in large areas of exploitation. The main target of the ‘*innovation*’ model is the transfer of knowledge to socio-economic benefits which occur as indispensable outcome of complex and long-term cooperation of multiple stakeholders.

2. Research system and IP trends in developing countries

With the role to provide human resources and disseminate development ideas and models, scientific organizations keep an important position in institutions of socio-economic development in all countries. In developing economies, particularly in low-income countries, PROs and universities are considered key for catch-up development process. These organizations are not here for research tasks only but, in majority of cases, also training ones to form qualified human resources and help enterprises to absorb new technologies.

In initial stages of development process, the provision of human resources and training of industrial techniques were the important task of universities. Once a higher development level achieved, the demand and the level of technologies are compatible to the needs to develop advantages of technologies, then enterprises and scientific knowledge fits more the requirements of development. This aspect needs to be considered better when we set up strategic plans and necessary steps for use of patents and IP rights to enhance economic impacts from PROs and universities.

In context of global economy, the systems of research activities of low-and-medium income countries are considerably different to the one of developed nations. A great majority of developing countries are found in scope of traditional research which is focused on PROs. These organizations keep an important role in both supports and efficiency rate of R&D activities. In countries having research institutes and technological organizations of international standard, in addition to provide services of basic technological formation, the results of key laboratories do not have considerable roles in process of technological catching-up. A general vision shows that research institutes carry out globally independent researches and only a few of them play the role of knowledge bridging.

The limited connection between PROs/universities and business sectors is assigned to structural factors, stagnations, limited R&D infrastructure and lack of research programs for private sector. The weak interaction between science and industries is also explained by the development orientation. Many countries skip technical and industrial research stages. The management and research dispatching works are focused on technical supports for public sector, but not for business and private sectors. This lack of research works, the shortage of methodically trained engineers and applied scientists as well as insufficient attention for industrial manufacturing capacity led to the heavy separation between science organizations and enterprises.

In terms of science-technology (S&T) human resources, the shortage of technological experts and leading researchers impacts the limited capacity of technological research in many countries. This situation gets harder when the number of science-technical graduates is many times lower than the one of social sciences and humanities. Up to recent time, the links between industries and universities remains single cases. In field of research, universities remain totally dependent on the Government budget, without having strong links to business community and local economic activities. Another factor of missing the attention for technical transfer comes from the lack of financial budget for cooperation development between industries and PROs/universities.

The analysis of activities related to commercialization of research results of R&D organizations shows that PROs and universities are main players in national research activities, but the investment for them remains low in low-and-medium income countries. In fact, the R&D national investment of 0.35% GDP (5.8 time lower than the medium size of developed countries) where 3/4 of them comes from the Government budget and a very limited part comes from industries and business has impacted greatly the technological transfer and commercialization of research results (*UNESCO Statistics, 2010*).

In terms of research capacity, in context of limited investment, the limited number of researchers has great challenges in keeping talented scientists and qualified experts. This situation leads to the increasing gap between their S&T national potentials and the ones of developed nations (*UNESCO, 2010*). Low technological potential and practical absorbing capacities (where the important strategy is assigned mainly for improvement and purchase of foreign technologies) lead to various fractions in innovation system. Majority of technical transfer is contained within PROs and the nature of

links is oriented to case-by-case technical supports but not fully packed development.

Globally the actual policy framework in many countries does not yet encourage the creation of benefits from technological commercialization. The Government holds the IP rights toward results obtained from the Government-supported research. In context of actual financial structure in almost the low-and-medium income countries, research funds come mainly from the Government budget and some limited support channels come through international organizations, development banks, non-Government organizations (NGOs) and small contractual research activities. All of these lead to difficulties to bring research results to production [2].

3. Capacity of technical enterprises - problems put toward R&D and IP in Vietnam

In developed countries, innovation and technological capacity are focused on center of efforts for policies. In Vietnam, however, this matter remains novel and gains no exhaustive studies. After almost three decades of Doi Moi, the private sector gets more dynamic and flexible to become a driving force for growth and high benefits. As the requirement of economic restructuring, the growth model based on investment for simple factors passed the leading position to the growth model based on innovations with higher efficiency where enterprises gain the particularly important role.

In the Report of Competitiveness and Technological Enterprises of Vietnam published in 2012, scientists from the Central Economic Management Research Institute gave a global view as background for studies to build up the policies for technological transfer and IP activities, namely: *the policies for innovations and technologies purely based on existing scientific indicators could lead to the under-evaluation of the innovation system and technological advances actually occurring in Vietnam, and then it is necessary to catch fully the scale of technological advances in enterprises to form a broader definition for innovations and R&D* [3].

Surveys conducted for more than 7620 enterprises of all the economic sectors over the whole country concluded that almost all the enterprises have to accept the actual technological level and the ones who have needs or want to renovate technologies face the difficulties of capitals. The obvious trend is that enterprises try to follow the solution to enhance the productivity of their core products while they do not turn their strategic focus to search new markets in other industrial sectors. This situation reflects another difficulty of enterprises to diversify their products and consumption channels. The limited range of products and the narrow market raise risks for enterprises in

context of multiple uncertainties. A special attention should be paid to this aspect when the policies for industries and technological transfer are prepared and built up.

It is necessary to note that, in building technological capacities of enterprises, the majority of activities are oriented to solve concrete problems to reduce production costs rather than to enhance investments for future. The increasing pressure from competition would expose the weakness of competitive capacities based on low labor costs and natural resource exploitation. The surveys also show that after 25 years of FDI efforts the impacts of technological transfer for enterprises are not clear. The foreign investment is not a sure factor for technological transfer and the role of FDI for technological renovations does not appear as expected. This fact hints the necessity to have a proper evaluation of FDI incentive policies for technological transfer in actual context of enterprises in Vietnam.

Since the financial sources are limited and new technologies are expensive, the main activities of technological innovations of enterprises are conducted to upgrade existing equipments. This type of activities is extremely suitable for small and super-small enterprises. However, among failed trials and efforts, the highest rate is for technological improvement of quality of products. Naturally, enterprises want to enhance the quality of their products but they face difficulties if their efforts are based on the existing capacity. Therefore, they need supports from the Government, PROs and universities in their expectation to enhance the quality of products and competing capacities.

The technological transfer in practice is made through binding commercial contracts, but the surveys show that only 10% of enterprises (mainly of big size) signed long-term contracts. SMEs cannot conclude long-term contracts and this fact makes their big obstacles in technological transfer. For them there exist two options for technological transfer, namely upstream transfer (from clients to enterprises) and downstream transfer (from suppliers to enterprises); the latter keeps only 10% of transfer volume. This fact, according to analysts, reflects correctly the real situation when private enterprises are of small size, low technological level and limited capital, and they are impossible to buy technologies from FDI enterprises. Then this situation requires an adequate study for expectation of technological transfer between local and FDI enterprises [3].

Another finding is the high rate of local enterprises participating in improving and upgrading of technologies. A good sign of surveys, however, is the fact that 1/3 of them committed to upgrade their technological level

through R&D and/or re-assessment of existing technologies. Policy makers and managers should take it to account for implementation.

The actual situation of enterprises put down many problems not only for absorbing and improving of their existing technologies but also innovations of new technologies from PROs and universities to meet requirements of sustainable development and competitiveness in global value chain.

These findings show that the policies to promote technological transfer should not be too ambitious but be oriented to capacity building and technological creativity of enterprises, to enhance further links between PROs/universities and enterprises, to facilitate the improving and upgrading of technologies, to provide more technical and financial supports, and, most important, to enhance the awareness and wills for technological advances. These activities could lead to success only if they are supported by suitable mechanism and policies of IP management for technology developers.

4. Intellectual property from abroad experiences and suggestions for policies in Vietnam

There are many reasons to make the Governments pay attention to the establishment and exploitation of IP assets developed by budget-supported research organizations. It is evident that the research results which are protected through inventions and patents contribute actively to technological innovations and economic growth. In almost all the countries, the Governments are the most important supporters for successful research projects and then disseminate largely the produced IP assets for socio-economic development. In addition, the particular relation between fundamental research and applied research which link research organizations and enterprises, requires the Government to issue the IP legal framework and policies to support research and training of innovations.

It is necessary to provide researchers with IP rights in order to encourage them to disclose and commercialize their research results, but the protection costs are too high. The high costs occur also for legal process against IP right violations. It remains the reason that from 1920 to now in the USA, the number of patents granted to individuals is only 1/4 of the ones granted to companies and organizations.

The practice of providing of IP rights to research organizations and sharing the gained benefits for inventors has become popularly applied in OECD countries. The property rights are provided also to PROs and universities for their own control and this move creates a solid background to promote technological transfer and joint research projects with private sector. The

provision of IP rights to PROs and universities helps also the Government to implement and to support more effectively the transfer and commercialization of public research results. The practice shows that the IP rights of research results produced by PROs/universities and supported by enterprises are shared on the following basis: inventing PROs/universities hold the ownership of patents and supporting enterprises hold the exclusive rights of licensing (when the supports exceed 50% of research costs the enterprises hold also the nominal rights to inventions). This would push up market transactions.

The benefits of inventors and the success of technological transfer are core elements in IP right management which require the close involvement of inventors. For this matter, in developed countries and emerging countries, the Governments are very attentive in searching incentive measures to encourage researching individuals and organizations to disclose and exploit their research results. Among these measures, the recognition of the participation of inventors in transfer process is the decisive factor. The income of inventors is made from sharing of benefits raised from the exploitation of IP rights and other activities or settled by a single transaction. In addition, inventors get encouraged through awards, prizes or other secondary benefits.

The practice shows also that the higher importance of knowledge and know-how would make the absorption and application of new technologies more difficult. Then the start-ups in PROs and universities are the effective solution to commercialize breakthrough technologies to extend the market. The encouragement of researchers to make shares in start-ups or to provide licenses are good hints to short-cut the way for research results to enter production. Analysis shows that research organization, if wanting to promote technological transfer by enterprises, should make them involved. Some suggestions say to make researchers to set up spill-outs which would be in favor for start-ups. The preparation of venture capital is useful also to cover the financial shortage for technological transfer in spill-outs.

Conclusion

The use of inventions and patents to promote the technological transfer is *a long and consuming process which requires specific skills, institutional regulations and financial supports to keep the development sustainable*. The extended activities in field of inventions, patents and licensing as well as increasing cooperation between research/training and industries in global scale led to the intensive development of legal regulations which are to settle

the conflicts in terms of duties and benefits between researchers and business community in market driven economy.

Experiences from developed countries and the actual technological situation of Vietnam show well that *technological needs of enterprises require the renovated mechanisms of technological transfer and IP rights which would let PROs and universities can carry out their role of driving force in process of technological transfer and science - industry connection*. The innovative system of technological transfer can get successful when the research-training factors in management system are mobilized to follow development targets of enterprises. They would find here demands for research capacity and training to meet requirements of socio-economic development.

The innovative technological transfer system requires also an open legal framework coupled with corresponding infrastructure and financial resources for activities of start-ups and spill-outs to bring fast research results into production. *The fruitful cooperation in technological transfer does not follow a single direction but multiple complex and feasible ways which can be implemented when the legal system and adequate IP right enforcement system can secure the justified benefits of participants./.*

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