

## MODALITY TO PROMOTE THE INTRODUCTION OF NEW TECHNOLOGY INTO PRODUCTION, BUSINESSES

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### **Abstract:**

*This article pointed out various modalities to promote the application of scientific research and technological development achievements in production and businesses. The author had systemized sequential activities related to the process of technology development and promotion of new technologies commercialization in order to provide basic knowledge in systematic way and measures to increase the likelihood of success in the introduction of new technologies into production and businesses.*

**Keywords:** *Technology development; Technology commercialization.*

**Code:** 15041401

### **Introduction**

New technology innovation, new product development is a vital task in production and business. Theory and practice have already demonstrated the development process of new products must derive from scientists who recognize and understand the importance of scientific research, technology development until the implementation of science and technology (S&T) activities and introduction of their results into production, businesses. Along with that, S&T managers often want to control factors such as cost, time, information and results of S&T activities. But more important, entrepreneurs can capture the key and exact information on new S&T so as to be able to apply in their production and business. Based on that, they then calculate a specific period with appropriate investment costs to acquire the desired technology, create new products, put them on sales and get maximum profit (*Bui Tien Dung, 2014*).

Normally, in order to develop a new technology scientists need to conduct long, meticulous scientific research, technological development with low success rate (according to UNESCO: the success rate of fundamental research; applied research and research and development was only 1/4; 2/5 and 3/5, respectively). When there are achievements of S&T available, scientists, managers, entrepreneurs need to continue together to commit

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themselves to the objectives of reaching product prices, satisfying the needs of customers in terms of product quality, performance,... Therefore, to develop new products, it is necessary to fully converge the conditions to get the result consistent with the objectives of S&T development, the market requirements and the management objectives.

In reality, when S&T results obtained this is only a first step, or tentatively called "a step of generating potential asset". Putting new technologies into production for business purposes covering various stages, including stage of recognizing the value of S&T results and making decision to apply in production, which is crucial for the creation of product. Therefore, this article focuses on figuring out those activities necessary to recognize the value of S&T results and find the way how to quickly introduce them into production.

## **2. Modalities of introduction of new technologies into production and businesses**

In this study, the author had intended to build a method of introduction of new technologies into production and businesses in the form of a continuous process of operations starting from research idea to commercialization of new technology (see Diagram 1). However, to complete the diagram 1, the author expanded his consideration to the following relevant factors:

- Effects of barriers of economic-technical infrastructure on creative activities (*here is referred to as S&T activities*) and commercialization (*focus on trading S&T results*);
- Concretization of stages of the process from research concept/idea to production, and application;
- Specify relevant stakeholders and their roles in this process;
- Highlighting the important stages of development, such as market assessment and definition, development of prototype products and pilot production,...
- Instructions on business, management, marketing, and financial issues.

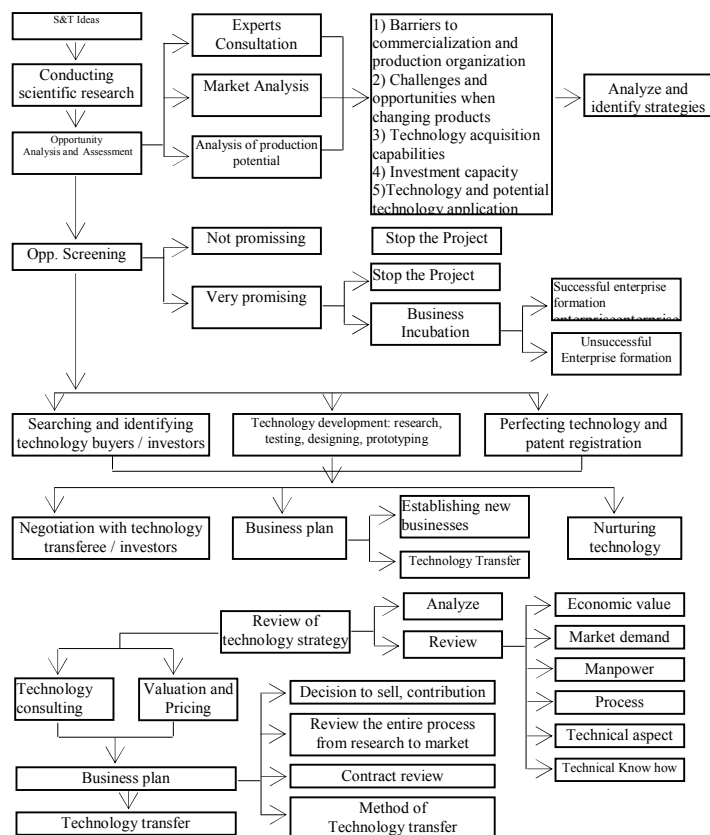
### **2.1. Initiating research ideas**

Initiating S&T research ideas is the first step. Inventors with knowledge in their field, combining with new knowledge and innovation to create a new concept associated with the requirement of production, businesses. Admittedly, pure researches carried out in this period have characteristics of public goods and any assistance at this stage is very necessary. Thus,

every organizations and individuals can be able to provide funding for basic research (Bui Tien Dung, 2015).

### 2.2. Conducting scientific research, technological development

When conducting scientific research, technological development, each laboratory or S&T institution has its own specific regulations, criteria and mechanisms. At laboratory level, new technologies are gradually formed and established their position, activities of intellectual property right protection are realized such as: completing the description of the invention; searching previously published documents and related works; review of previous research results to see whether there is any duplication or similar research project; any research results has been published or registered for protection of ownership or not.



Source: Research team

**Figure 1:** Detailed process and sequence of promotion activities to commercialize new technologies

While conducting R&D activities to create new technology, researchers admit that there are too many barriers arise in this period, such as for a new technology formed, successfully developed and stably operated, there must be a multifaceted enabling environment. This environment includes favorable macroeconomic conditions, the participation of social organizations, national organizations involved in technology innovation, human and institutional capacities for technology selection and management, national legal institutions to reduce risks and protect intellectual property rights, codes and standards for research and technological development, and tools to address equity and respect for intellectual property rights issues (*Bui Tien Dung, 2015*). This is the question for many stakeholders in society to resolve, not only for S&T managers.

### ***2.3. Opportunity of Analysis and Assessment***

Opportunity is the possibility to transform scientific and technological ideas into the establishment of a business or the production of a new product. An idea can come easily, but far more difficult if the idea of creating a business opportunity. After undergoing steps of research and testing, new technology can create and shape new products, after that a process of analyzing, assessing and screening opportunities. However, opportunity screening should comply with following procedures:

#### *a) Expert Consultation*

Before or after experimental research, it should proceed to consult a few experts in related fields, as follows: the method to complete a portfolio of technology; a description of the technology and technology trends in the future; possibility to commercialize; barriers, potential limitations when conducting technology transfer; assessment of technical and commercial pre-feasibility; technical feasibility, the uniqueness of technology; the most feasible solution in existing conditions; timeframe to reach the market (time); and the estimated cost of the technology (cost analysis).

#### *b) Analysis of production potential*

The way of analyzing the potential of new technology production is an attempt to answer the following questions: Whether the new technology is in the sector of high-growth or not? What are the opportunities in this sector/field? How the sector can cope with the new technology? Is there annual expenditure on research and development (R&D) in this sector/field? What are the main competitors? How young entrepreneurs in the sector can survive? What are the likely threats to this sector/field? What are advantages and disadvantages of the sector? Growth life-cycle of

technologies in the sector: Birth, growth and adaptation, make a difference, competitiveness, growth and recession.

*c) Market Analysis*

Analysis of opportunities from market should consider the following features: market structure analysis; description of the market environment; identification of economic trends and prospects of the sector/field; quantifying the market framework; identifying the market segments; analysis of market segments framework, growth rates, competitive environment; analysis of the possibility of business in market share, competitive position, product capabilities, resources capacity; identifying unique features or advantages of the new product; identifying competitors (rated competitors); set of customer requirements by product categories; identifying potential barriers to market; determining potential distribution channels in the market; determining criteria for the product.

*d) Analysis and assessment of strategies by combining Section a), b) and c)*

To come to conclusion of the business strategy and the efficiency of the use of new technologies it should consider the following elements: 1) Possible barriers to market participation and organization of production; 2) Challenges and opportunities of product changes; 3) The capacity to acquire technology; 4) Investment capacity; 5) New technologies and promising applications of new technologies (*Bui Tien Dung, 2013; Nguyen Tien Cuong, Hoang Xuan Long, 2014*).

## **2.4. Opportunities Screening**

After potential opportunities have been identified, the next step is to determine the nature of the opportunity and it should be done by sorting them into:

*a) Not promising*

Not promising means the market attractiveness is not sufficient to start a new business. At this point, the project can temporarily pause waiting for another opportunity in the future or stop definitely.

*b) Very promising*

In this case, the attractiveness of the market is enough to start a new business. To this point, it opens up two possibilities:

First, new technologies will be nurtured serving as the basis to establish productive enterprises. Reality is not so simple, because the process of business incubation may produce many different outcomes.

Second, after the process of nurturing technology, it could not bring what should have been expected, or technology has become obsolete. In this situation, it had to stop the project or divert to other direction.

### **2.5. Technology development**

After the screening process, the new technology is transferred to the next step to create a new product, specifically it often goes through following stages: technical design, prototyping and testing. Technological development here are mostly technical activities, but it should consider a range of issues such as (1) Checking the technical feasibility; (2) Checking the operational requirements; (3) Determination of safety and potentially dangerous environment; (4) Carrying out a preliminary assessment of production activities; (5) Cost of technical prototyping and measuring techniques; (6) Identification of materials, processes, components, and the steps necessary to meet the technical performance and specifications in production; (7) Consider testing components and technical operations; (8) Design and build a engineering process of testing samples; (9) Assess feasibility of pilot production; (10) Optimization design; (11) Conduct final testing; (12) Develop technical documentation; (13) Planning/production plan development.

### **2.6. Searching technology buyers or investors**

In principle, technology buyers or investors need to understand the characteristics of the existing technologies in their enterprise, before proceeding to purchase new technology. Otherwise, the potential risks of new technologies are very high. Moreover, the first phase of the relationship of technology buyer - seller is extremely important, it decides upon the success of transfer activities (*Nguyen Quang Tuan, 2012*). Back to the stage of opportunity screening, when making through analysis of sector activities, it will contribute to successful commercialization activities.

### **2.7. Technology completion and patent registration**

Through steps of technology development, the completion of new technology is never focused on an unique technology. More specifically, R&D activities will produce many similar technologies or related techniques. Based on information from R&D activities and legal regulations on ownership of intellectual property, new technologies may be submitted applications for patent to establish ownership or be kept as technology know-how. However, it is not so simple to keep technological know-how confidential.

## **2.8. Technology Business Plan**

The purpose of a business plan is to: (1) Help consider all options and anticipated any potential difficult situations; (2) Convince lenders and investors that the project is under control and their money will be safe with you; (3) Provide guidelines to make technology put into a viable business deal; (4) Identify financial, human and material resources necessary for commercialization.

### *a) Establishment of a new business*

Plans to create new technology based businesses should: (1) Develop a financial analysis to identify various situations, even based on the unit price, sales volume and cost; (2) Identify persuasive profitable business opportunities; (3) Review the value of the business license (business permit).

### *b) Transfer of technology*

To transfer and commercialize technology, there needs to develop an electronic information page; actively formulate a detailed business/transfer plan until the product development stage, including: goals, progress, timelines, allocation of necessary financial and manpower resources. The more specific the plan is, the more favorable technology transfers.

## **2.9. Negotiation with the technology transferees/investors**

The relationship between the buyer and seller depends on the understanding of socio-economic knowledge, management skills and professional qualifications of both sides. The understanding and mutual understanding is critical factor for the success of transfer of new technologies. The content of negotiation may consist of many issues that both sides are interested in and some problems of the new technology that need to be addressed.

## **2.10. Nurturing technology**

Nourishing technology process is the stage to raise awareness on the technology (popularization, promotion), on requirements for technological improvements (more beautiful in form, higher quality in content); enhancing value added and scale-up;... (Costa S.E.G., Lima, E.P, 2009).

## **2.11. Assessment of technology strategy for improvement**

### *a) Analysis*

Analysis of the socio-economic-political context of the presence of technology; the prevailing law provisions or the current practices; advantages and weaknesses of competitors; comparing the new technology with the

technology currently in use; issues of protection of ownership;... (*Wessner. C. W, 2002*).

#### *b) Assessment*

Assessment of economic value based on cost analysis of inputs and outputs; market assessment, which means that the compatibility of the level of technology with market and social needs; assessment of human resources in the use, reception of new technologies; assessment on usability, simple and efficiency of technology process; assessment of technical feasibility, simple or complex operations; assessment of the technical know-how which can create a difference in products.

### **2.12. Valuation and pricing**

Technology valuation process is an opportunity for dialogue and cooperation between the transferor and the transferee. Researchers and entrepreneurs can share their knowledge and their special skills during the valuation process, they learn from each other, and share their mutual interests. The valuation has a specific meaning, it refers to the task of determining the monetary value of an asset, an object or an entity. Four technology valuation methods include: (1) Market approach: The value of intangible assets in an active market (measuring the present value of future benefits by obtaining a consensus of what others stakeholders in the market have evaluated); (2) Costing method: the value of technology assets by measuring the expenditure necessary to create and develop the technology assets; (3) Income method: the net present value of the anticipated economic benefits of the asset; (4) Selection method: is considered as an extension of the income analysis by considering opportunities (but there are also risks).

### **2.13. Business plan**

This phase is to gather data, such as identification of potential markets, cost estimates and production needs, it can be used in the formation of a commercialization plan, and include the following activities: (1) Making decision whether to sell, license, or share capital with partners; (2) Review the entire process from research to market; (3) Consider and prepare a technology transfer contract; (4) Determine the form of technology transfer; (5) Establish a commercialization group combining elements of designing, production, marketing and management.

### **2.14. Technology transfer**

When conducting technology transfer, it should take some following actions: (1) setting up a Working Group; (2) Making scheduled payments



and financial clearance; (3) Taking into account of factors that can lead to success and failure; (4) List of products to be launched; (5) Elaborating the process of transferring and receiving technology; (6) Monitoring, providing technical advice and division of responsibilities to complete the contract.

As described in Diagram 1 above, methods of promotion of introduction of new technologies into production, businesses would undergo through many stages, but reality showed that this method was quite flexible in specific circumstances, for example, the case of Spencer Silver Patent number **US 3691140** concerning a product, e.g the post-it notes (*Spencer Ferguson Silver*) as described as follows:

In 1968, Spencer Silver worked in the laboratory of the 3M Company (USA) with the task of preparing the under pressure glue. Silver made transparent glue, however, it had weak adhesion, easy to peel off and was long dry. Although the study did not meet the requirements, Silver had reported the result to the company. This new colloidal was enough to keep papers stick together, but it was also enough to peel off each other without tearing off and can repeatedly be used. Silver had tried to find out the way to apply the glue for other purposes but without success. In 1973, Silver presented the results of this study in a workshop and this product was received much attention by Arthur Fry who worked in research and development department of new products. Fry often prayed at the church and often used paper to bookmark notes. However, this piece of paper often moves while folding and opening book. Fry remembered colloids could be used multiple times by Silver and then he asked Silver to provide colloidal form. Fry coated adhesive to one edge of the paper bookmark to avoid gluing on Bible books. The results were successful more than expected. Then Fry used these adhesive papers to write notes and sent to his supervisor, Sir Bob Molenda. Bob helped Fry develop experimental application, and he was in charge of marketing and distribution of this product on the market.

*Note*, the method of introduction of new technologies into production, businesses has two types of risk: The first is technical risk and the second is market risk. In these situations, it should provide reliable evidence, compelling technology to convince the buyer in terms of technical review and the market of new technologies (*Westphal, L. E, 2002*). Professional staff will discuss the technology with the buyer of technical information and market.

## **Conclusion**

Introduction of new technologies into production, businesses has always been the concern of scientists, managers, entrepreneurs and science enthusiasts. In Vietnam, finding paths for technology to be applied in life is becoming an issue of social interest. This article described methods to promote actively the rapid introduction of new technology into production. Here, scientists and S&T managers are placed in a position to proactively seek partners, promote and expand market for S&T products. The author focused on study of a systematic theory with basic condensed general knowledge with the aim to find ways to enhance the likelihood of success in commercialization of new technologies. However, for production and business sector, the biggest difficulty now facing is the uncertainty of market of products generated from new technologies. There are many solutions to address this problem, but the focus is the decisive, strategic vision and the sensitivity before opportunities of entrepreneurs./.

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