

**IMPACT OF TEN INFLUENCING FACTORS
IN THE APPLICATION OF NEW TECHNOLOGIES
IN PRODUCTION BY SCIENCE
AND TECHNOLOGY ENTERPRISES**

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Abstract:

This article pointed out relevant impacts of ten factors influencing the application of new technologies in production which were respectively classified into three environmental, organizational and technological groups. Clear understanding of the impact as well as difficulties, barriers caused by the factors could help managers of science and technology enterprises making better decision towards effective application of new technologies.

Keywords: *New technologies; Technology application.*

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Introduction

Complex, dynamic and unstable characteristics have become dominant nature of the competitive market. In the current global business environment, technology is the predominant factor for survival of productive enterprises, in general and science and technology (S&T) enterprises in Vietnam, in particular. Production is constantly affected by competition and fluctuating need of consumers. Thus, S&T enterprises need to keep abreast of market needs and new technology development trends if they desire to exist. When considering the development of a new technology, leadership/management of S&T enterprises need to solve a variety of problems such as, which resources for developing new technologies would be secured? How new technologies to be assessed? What implementation arrangement of new technology ideas would be? To what extent the development and benefits of new technologies could bring about? Recently there have been some reports mentioned about methods of fostering, developing and applying new technologies in production [1-9]. However, there was only a limited number of domestic publications referring to influencing factors in the introduction of new technology into production.

This paper introduced and systemized the most basic factors affecting the application of technology in production by S&T enterprises. At the same time,

the author pointed out the impact of these factors when S&T enterprises wishing to make investment in the application or development of a new technology.

Group of factors affecting the application of new technologies in production

In order to systemize the factors affecting the application of new technologies in production we divided them into three distinctive groups, i.e:

- Group of environmental factors;
- Group of organizational factors;
- Group of technological factors.

Below is the discussion on each specific group.

1. Group of environmental factors

Factors deriving from internal conditions of the S&T enterprise play a very important role. Considering new technology as a platform, it requires S&T enterprises to handle their internal factors and the external context in a very flexible manner. This contributes to the success of new technology application. There are many environmental factors of concern, but three following are the key central factors:

Factor No.1: External pressure. Technological innovation is influenced by two external sources of pressure: pressure from customers and pressure from competitors. In general, external source of pressure is the market. It is a decisive factor to the applicability of new technologies in production. The pressure from the market can be viewed under two angles, one is the technology push and two is the market pull.

In an environment where technology innovation and commercialization vibrantly takes place today, S&T enterprises in Vietnam by all means try to improve and realize technological change to maintain their competitiveness. This means that S&T enterprises are forced to improve their product characteristics and focused on R&D activities for production purposes. In this case, S&T enterprises must consciously upgrade their technology level and strengthen the application of new technologies to promote their competitive to a higher level. External pressure is the most critical factor for S&T enterprises to proactively upgrade the quality of production and make further investment in production equipment to remain competitive.

Factor No.2 Support capacity. The relationship between the State and S&T enterprises is the unique external factor determining the influence to the outcome of the application of new technologies in production. In current reality, the State guidelines and policies such as Decree 119/1999/ND-CP, Decree No. 115/2005/ND-CP, Decree No. 80/2007/ND-CP, Decree No. 96/2010/ND-CP is limited as technology provider in supporting the relationship.

Factor No 3. Financial resources. Financial resources of small-scale enterprises in general and S&T enterprises in Vietnam, in particular are mostly very weak, or no allocation for fostering the development and application of technology. This is the main obstacle, researchers in financial sector have discovered that monetary factor is indispensable which decides the fate of a new technology whether it can be applied or not [9].

In Vietnam, managers and owners particularly appreciate cash. In addition, it was rarely or extremely restrictive that monetary funds provided grant or approved loans for S&T enterprises for realizing projects of new technologies application in production. Therefore, the Government needs to make funds available for S&T enterprises in a more effective manner to encourage the application of new technologies in production.

2. Group of organizational factors

For S&T enterprises, technology innovation modality is very different, but it has been approached in a strategic manner, whereby organizational factors have not been considered as decisive player. Under the perspective of Vietnamese business administrators, benefit from the application of new technologies in production only can be obtained if they are compatible with the designed organization. The degree of impact by group of organizational factors in the application of new technologies in production includes:

Factor No 4. Organizational structure. The application of new technologies in production requires internal organizational restructure of the enterprise and rearrangement of the personnel involved. Correct organizational structure helps S&T enterprises capture advantages to successfully implement new technologies [8].

Not only for S&T enterprises in Vietnam, the application of new technologies in production always leads to change of internal organization. Because organizational structure consistent with new technology should be based on decentralized management and high specialization. In other words, application of new technologies in production means the rearrangement of the enterprise's organization. A new technology is only appropriate to a specific organizational structure and technical personnel corresponding for that technology. Moreover, in order to adapt new technologies, a dynamic enterprise with the flexible organization can quickly adapt to changes, otherwise it may take a lot of time, waste money, effort, even be collapsed due to the application of new technologies. It should be noted that the application of new technology is successful or not, it depends on suitable, sound organizations in all aspects of S&T enterprises.

Factor No 5. Organizational culture: Organizational culture denotes a general concept. It is the knowledge and understanding of the personnel in

performing their duties and social behavior. The relation between organizational culture and results related to the application of new technologies in production has been clarified by some authors [3]. Organizational culture is of a concern by most organizations. Enterprises with successful application of new technologies in production because they have built a successful organizational culture, creating oriented flexibility together with creating an atmosphere of encouragement and trust [3].

For our country's S&T enterprises, organizational culture is newly approached and aware of, it is still unclear from the perspective of technology innovation and application of new technologies, and it needs to further be considered and amended.

Factor No 6. Production strategy. The importance of production strategy in the application of technology has attracted wide attention of many scholars. Production strategy is considered as the missing link in the production chain of the S&T enterprise's general strategy. More specifically, production strategy is the investment capacity of S&T enterprises to create a higher capacity, stay long in the product consumption market. The correlation between manufacturing strategy and activities of S&T enterprises include a set of unified tangible and intangible resources to create and maintain competitive advantages [6,7]. Production strategy of a S&T enterprise includes four central pillars, i.e quality, cost, customer confidence and flexibility. A S&T enterprise can quickly meet the market demands if it can proactively capture, combine the flexibility in the application of new technologies with the production strategy.

Like all types of other enterprises in the world, production strategy of S&T enterprises of Vietnam is considered as the most important factor to cope with the instability of the market, especially in the one with rapid changes affecting the production. Flexibility is the biggest advantage that only new technology could bring to S&T enterprises of Vietnam, based on a right production implementation strategy.

Factor No 7. Human resources. Regardless of form of organization, manpower is the central resource of innovation. Almost every aspect of scientific research, technology development, technology application often requires skilled people. With creative activity in all sectors of the economy, both technological and non-technological, it is clear that all employees being directly or indirectly involved in scientific research and technological development are required a minimum of basic skills for them to be able to acquire new technologies as well as improve the way of working, create possibilities for successful innovation at their workplace.

Although people graduated from every disciplines can contribute to the innovation effort, especially non-technological innovation, those having S&T

background are still the key human resource of the company or enterprise. This kind of personnel has mix skill of innovation formed in the university along with the requirement of the labor market, wages and job opportunities. Continuous movement of skilled personnel will provide an important means to meet the demand of best skilled manpower for technological creation and innovation. Human movement flow is a strong leverage to the process of knowledge accumulation and sharing for S&T enterprises.

Factor No 8. Managers. This is the most prominent factor characterized only by S&T enterprises. A S&T entrepreneur really needs to perceive the following: technological innovation and new product development; possible accomplishments; and potential opportunities. Though entrepreneurs are invention traders, but not all traders are real entrepreneurs. Entrepreneurs do not just mean by titles and positions, they must be a socially recognized person with good nature of trading elite. The function of entrepreneurs is being constantly creative and technology application oriented in order to improve products and get high benefit for the enterprise.

There are countless works that S&T entrepreneurs need to do to promote the technological innovation process by themselves. They can be summarized as follows: *First*, the enterprise should address the issue of proactiveness of the enterprise in respect of technological innovation, that means the issue of motivation; *Second*, the enterprise must have pioneer people in technology innovation, who will be leaders in the innovation movement and can solve problems of concern; *Third*, the enterprise must have an appropriate strategy to provide right directions and arrange proper way for implementation; *Fourth*, the enterprise should have capacity of solving problems during the implementation of technological innovation, that is the issue of innovation organization; and *Fifth*, the enterprise should accumulate enough resources necessary for technological innovation, that is the logistic issue.

3. Group of technological factors

Technology application in production should focus on advanced technology. Without raising the level of technology, it cannot be called technological innovation. In reality, there is always an interference between technological improvement and innovation but they cannot be considered as one single issue. While improvement consists of only some minor changes for upgrading from lower original to a higher level of technology embedded in the device, new technology is, on the other hand, considered as an innovation with prominent technological features. There are similarities between innovation and improvement. If technological innovation is characterized by outstanding new technology with focus on the replacement

of current old technology. New technology is a group of top advanced technologies compared with the existing enterprise's technological development level. Application of new technologies to obtain a more comprehensive technology encompasses not only the content that people often refer as "high-tech", but also the application of advanced technology to replace a part or the entire old technology. In technological innovation, it must include new technologies and production processes.

Factor No 9. Technological advantages. Advantage in using new technologies is considered as a competitive advantage. A technology can have positive impact if it is consistent with advantages of the enterprise, consistent with the development trend and constantly updated. Technology administrators have identified that technological advantage is one of the most powerful predictors of the successful utilization of new technologies with many benefits brought about [5].

Factor No 10. Use of technology. Application of new technologies in production means the constant update of advanced technologies in production. Using new technologies are always closely incorporated with accurate planning and sufficient provision of necessary resources for the use of technology. Therefore, the use of technology is considered as a constant change and transformation.

For S&T enterprises in Vietnam, the use of new technologies should be planned and implemented at lower levels of management. Because the use of technology does not require decision making on venture capital, setting up a complex institution or a specific functional unit. This also means that the use of technology does not require direct involvement of the highest levels of management as this decision making task rests with the responsibility of entrepreneurs.

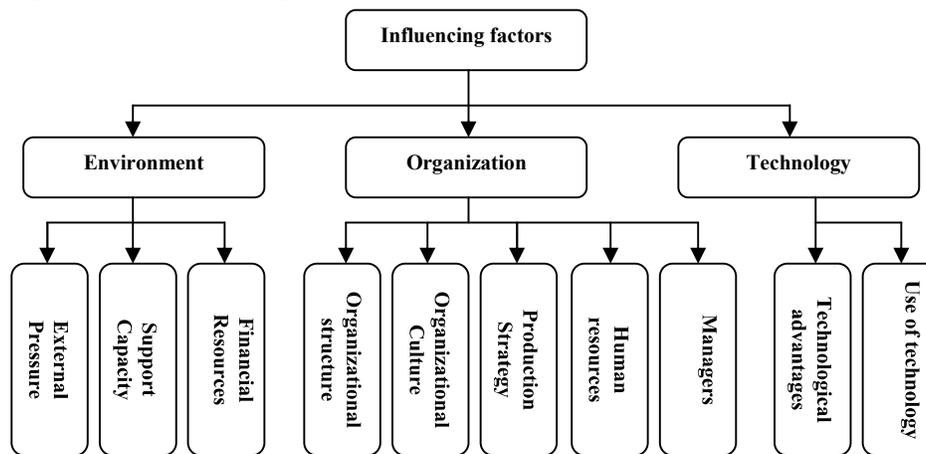


Diagram 1: System of 10 factors affecting the application of new technologies in production by S&T enterprises

Recommendations and suggestions

This paper reviewed 10 key influencing factors in the application of new technologies in production. On the other hand, the content of this can support managers of S&T enterprises to address issues of concern before making decision on the application of new technologies in production, namely: Why does our enterprise need to apply new technologies in production? Is this the strategic decision of the enterprise or not? What are obstacles, expectations and interests in the planned technology application?

In order to successfully apply new technologies in production, S&T enterprises should take the following recommendations and suggestions into their consideration:

- (1) Is the new technology welcomed by the S&T enterprise itself? Are there competent agencies and units available to support the technological innovation process? How production strategies and personnel policies of the organization/unit serves the technology application process? Is there any commitment by top management to create favorable conditions, as well as share the risk in the adaptation of new technologies in production? Is it necessary to set up a specific unit for effective development of S&T human resources?
- (2) Does the market accept the products from the application of new technology or not? Are there reliable suppliers of new technologies whom we can easily secure in the market? Could the enterprise have easy access to financial resources as required?
- (3) What are the expected benefits of new technology application? How existing technologies in use can support the applications of new technologies?

By making analysis and answering these questions, we see that all the factors mentioned above are closely linked. However, it does not necessarily mean that every answer must be positive to carry out technological innovation. Managers should sum up the answers obtained in a comprehensive manner for having a profound understanding of the situation, inside and outside, and the technology to be applied before making decision.

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