Technological Innovation Management and its Role in Performance of Organizations

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Abstract: This paper aims at identifing the main benefits of technological innovation in organizations and how it should be managed to ensure economic efficiency. The current level of social and economic evolution was possible only through active involvement of individuals and organizations in the innovative process. Adoption of appropriate policies and strategies at institutional, national and international level has significant impact on both the innovation process and innovation results. At company level, involvement in an innovative process depends on the financial and human resources and on the availability and interest of management and employees. The main motivating factor in adoption of technological innovation is, most often, obtaining financial benefits. This reflects itself either as a direct increase in profits, or by obtaining competitive advantage which leads, in the long run, to profits increase and achieving a favorable position on the market. Should not be neglected other motivating factors of innovation, such as compliance with environmental standards, ensuring a secure position on the market with opportunities for further expansion, reducing the cost of raw materials and / or production process, improving company image, attitude and achievements of partners in the field (competitors, suppliers, customers) etc. Managers need to carefully analyze these factors and decide the manner and degree of involvement in an innovative process.

Keywords: technological innovation; innovative process; economic performance; innovation management

JEL Classification: O32; Q55

1 Introduction

Technological innovation represents, directly or indirectly, an important component of the human existence influencing evolution and economic growth by different means. One of the arguments in this sense is represented by the results obtained even from the first studies on economic growth and technological innovation undertaken by Robert Solow in 1957. Using a Cobb-Douglas function with the production and labor factors, where technology was a „residual" and exogenous element of the pattern, he discovered that half of the growth in USA registered in the first half of the 20th century was due to technological change.

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(Sánchez & Rodríguez, 2009, p. 385) The Organization for Economic Co-operation and Development (OECD) published in the Oslo Manual the following conceptual definition of innovation: innovation is implementing a new or significantly improved product (good or service), a process, and a new marketing method, a new organization method in the business practice on labor distribution or in the external relations. (Toner, 2011, p. 16) From the same perspective of OECD, innovation is considered to be an iterative process, initiated as a consequence of the identification of a new sales market and/or the opportunity to insert a new service or product based on a technological invention, leading to development, production and marketing with the view of ensuring the commercial success of the invention. This definition underlines two important different concepts: (1) the innovation process includes the technological development of an invention together with its insertion on the market and its distribution to the end user and (2) the innovation process, is, by nature, iterative, automatically including the insertion and later development of the innovation. (Garcia & Calantone, 2002, p. 112) In *Green Paper of Innovation*, innovation is described by the following activities (European Commission, 1995, p. 1):

- the renewal and enlargement of the range of products and services and the associated markets;
- the establishment of new methods of production, supply and distribution;
- the introduction of changes in management, work organization, and the working conditions and skills of the workforce.

Another definition describes innovation as *the conversion of new knowledge in economic and social benefits as a result of complex interaction between numerous factors within a system including an environment (local, national, regional) with companies, research institutes, financers and their contact networks*. (Iancu, 2010, p. 9)

It seems clear, of all the approaches presented, that innovation is not confined to results obtained in laboratories and research centers. It supposes the projection and the production of products and services, their distribution to consumers and maintenance and, if necessary, the personalization and update throughout the entire lifecycle.

The importance of innovation is also pointed out when considering 2009 as "*The European Year of Creativity and Innovation*", by the European Parliament and Council in Decision no. 1350/16.12.2008. The objectives of this decision were to create a favorable environment for innovation, attract the audience and innovation organizations with the view of involving them in innovation as well as to promote the necessary abilities for innovation through education and creative thinking in all the fields etc. If we consider the definition of innovation according to its features, the studies showing the importance of the technological evolution for the economic

growth have led to the identification of the following aspects (Sánchez & Rodríguez, 2009, pp. 385-386):

- The technological innovation represents the "knowledge" for which the reproduction is often difficult and expensive;
- The specific feature of technology generates high transfer costs;
- The innovation activity is cumulative, with a growth yield in time;
- The empirical research demonstrates that the majority of innovations belong to products;
- Approximately half of the innovations are created by the product, machine or process users.

In organizations, the technological innovation has both a *qualitative* value, increasing the comfort offered to consumers and/or employees and a *quantitative* value since it conquers new markets, attracts clients and increases profits. It is carried out at the national level and may lead to the growth of exports and of the GDP and consequently to micro and macro-economic growth. Therefore, favorable attitudes and encouraging innovations are essential not only to the organizations involved directly or indirectly in the innovation process but also for the national economy of the country where the organization resides. A very important role in supporting and encouraging the innovation is played by public and international bodies which might raise the interest of companies for innovation through non-refundable or partly refundable money, elaboration and application of favorable policies such as fiscal facilities.

2. Types of Technological Innovations

The technological innovation can be classified according to at least two criteria: *"the object" of innovation* (of product and process) and *the novelty through innovation* (radical and incremental or sustaining and disruptive). The first criterion is also mentioned in the OECD approach, according to which (OECD, 2005, pp. 48-49):

- *Product innovation* is the introduction of a good or service that is new or significantly improved with respect to its characteristics or intended uses. This includes significant improvements in technical specifications, components and materials, incorporated software, user friendliness or other functional characteristics;
- *Process innovation* is the implementation of a new or significantly improved production or delivery method. This includes significant changes in techniques, equipment and/or software.

According to the level where innovation is found, namely either product or process, it can be classified as: *finding new solutions to older problems, insert new*

products/processes and using old products-processes in a new manner (Table 3). In most of the cases, process innovations are connected to product innovations and consequently the change of production processes lead to smaller or bigger changes of the final product, whereas the change of the product requires changes of processes. If we take into account the second criteria, the level of novelty acquired by the product or process, the innovation falls most often within two categories: *radical* and *incremental*. *The radical innovation* isdefined as the accomplishment of a new business line, respectively of a new process or product with unique performance features which are new or already existing but offering a performance improvement at least 5-10 times higher or a cost reduction with at least 30-50%. (O'Connor & McDermott, 2004, p. 13) *The incremental innovation* is represented by the changes of products and/or services in order to bring substantial benefits on price or functionality. (Banbury & Mitchell, 1995, p. 161)

Table 1. Types of innovations

Use/Problem		**Process/Product**	
		New	Old
		Category 1	Category 2
Old		**New solutions to older problems** Products: new medicine Processes: Just-in-Time	**No innovations**
		Category 3	Category 4
New		Mostly innovative: **new products/processes leading to new opportunities** Products: PCs, in 1980 Processes: bar codes for product inventory	**Old products/processes used in a new manner** Products: other uses of the paper clips, DVDs Processes: satellite images soil testing

(White & Bruton, 2007, p. 22)

The implication of the organizations in innovation processes is very important, especially in our days, in the context of globalization and spectacular technological development. According to Clayton Christensen companies should have the following attitude on innovation: "*All companies should be engaged in sustaining innovation, insert such products as to be sold to their best clients with higher profits. The continuous innovation process is predictable and carefully planned. By contrast, when new businesses are created through a radical innovation process, it is impossible to know from the beginning which is the best strategy. The manager can launch the product and, by trial and error, takes the best action.*" (Christensen, 2005)

The involvement of companies in the innovation process, whichever class it may belong to, must be supported by rational criteria and preceded by market studies

capable to estimate the right success and to objectively correlate the necessary investments with the expected financial results. Moreover, it is necessary to analyze the necessary actions for developing the innovative idea and implementing it in the organization as well as disseminating it to consumers due to the fact that innovation often implies a series of successive changes difficult to estimate from the beginning.

3. The Efficient Management of the Technological Innovation in Organizations

The efficient management of the technological innovation must be accomplished and distributed in a profitable manner for the company involved in its development, implementation and use. Its ability to improve the results and performance of a company does not depend only on the novelty of the process or product, but also on its interaction with other technologies and its influence on the competitive position of the company. According to specialists, *to a greater or lesser degree, innovations either enhance or destroy competencies that a company already possesses.* (Utterback, 1995, p. 141) The efficient management of innovation requires the involvement of top managers in the innovation process and the awareness of the following realities (Tushman, 1997, p. 23):

1. The innovation management requires an environment where innovative thinking and work are encouraged;
2. The innovation management requires better and more valuable products and services;
3. The innovation management is proactive and encourages creativity and risk taking.

All successful innovators should understand the importance of fast income and take the necessary measures to control costs and simplify the project planning, improve usage of raw materials and increase the production efficiency. Another possibility that should be considered, if possible and profitable, is to externalize certain secondary activities. This could determine important savings of human resources and technologies and also gathering innovation ideas, from outside the company, to improve the product and/or the production process.

The efficient management of innovation processes is based on clear policies, a budget planning which will improve and put into effect creative ideas, stimulate the creative thinking in human resources and its dissimulation between members inside and outside the company. Moreover, the following features are favorable to an innovation attitude (Delbecq & Mills, 1985, p. 23):

1. A periodical revision of informal proposals from groups within the organization;

2. Clear directions on studies which must be undertaken as well as on the expected results;

3. Learning activities from others, understanding the work of others;

4. Sets of realistic expectations;

5. A supportive environment for „troubleshooting" and trials, adequate resources for maintenance and service.

The factors influencing the performance of innovation and of the innovation process, inside a company, are in a large number and they are generated both by the internal environment, such as employees, technologies, management, approached strategy, etc. as well as by the external environment such as suppliers, markets, legislation, economic environment, competition etc.

4. The Influence of Technological Innovations on the Activity and Economic Performance of Organizations

In the current business environment, the capacity of a company to make new products and adopt new production methods is highly important taking into account the conditions imposed by a competitive global market. Consequently, the assets of a company prove a competitive advantage if it is valuable, rare, difficult to imitate and hard to replace. (Barney, 1991, pp. 105-106)

The innovation capacity of the company It might be reflected in many activities such as improving new products, using new technologies to obtain the products, responses to innovations from competitors, use 'accidents' as actions generating new technologies/products, design new products/technologies to satisfy he future needs of consumers. The corresponding approach of these activities, the encouragement and efficient management of the innovation process can bring strategic advantages to the company involved (Table 2).

Table 2. Strategic advantages through innovation

Mechanism	Strategic advantage	Examples
Novelty in product or service offering	Offering something no one else can.	The first…Walkman, mobile phone, fountain pen.
Novelty in process	Offering in ways others cannot match – faster, lower cost, more customized.	Pilkington's float glass process, Internet banking, online bookselling.
Complexity	Offering something which others find it difficult to master.	Rolls-Royce and aircraft engines – only handful competitors can master the complex machining and

Mechanism	Strategic advantage	Examples
		metallurgy involved.
Legal protection of intellectual property	Offering something others cannot do unless they pay license or other fee.	Blockbuster drugs like Zantac, Prozac, Viagra
Add/extend range of competitive factors	Move basis of competition, e.g. from price of product to price and quality, or price, quality, choice.	Japanese car manufacturing, which systematically moved the competitive agenda from price to quality.
Timing	First-mover advantage or fast-follower advantage.	Amazon. com and Yahoo! – other can follow, but the advantage „sticks" to early movers.
Robust platform design	Offering something which provides the platform on which other variations and generations can be building.	Walkman architecture – through minidisk, CD, DVD, MP3 Intel and AMD with different variants of their microprocessor family.
Rewriting the rules	Offering something which represents a completely new product or process concept.	Typewriters vs. computer word processing, ice vs. refrigerators etc.
Reconfiguring the parts of the process	Rethinking the way in which bits of the system work together.	Zara, Benetton in clothing, Dell in computers.
Transferring across different application contexts	Recombining established elements for different markets.	Polycarbonate wheels transferred from application market like rolling luggage into children's toys.

(Tidd & Bessant, 2009, pp. 8-10)

Any advantage obtained by the company from technological innovation is essential, as it can be observed from the examples above, both internally and externally, offering a competitive position on the market. Consequently, the innovation process must be approached from a rational manner, according to the possibilities of every organization.

5. Conclusions

The technological innovation is an instrumental factor in creating new forms of value in such a competitive environment as the current economic, social and politic world is. It favors the creation of new products which are accepted and sold worldwide, with a competitive price and quality. The technological innovation should be supported both by the public and the business enterprise expenditure.

The main reason in adopting technological innovations is, obviously, the desire of financial benefits. They aim, as a rule, directly or indirectly, to obtain higher returns which depend often on the development and use of the latest technologies. Favorable attitude toward innovation is the answer to many factors which have explicit or implicit connections and their analysis creates the involvement premises in such a process. In order to ensure the success of innovation the companies must have, create or buy the necessary financial, material and human resources, approach the innovation process in all its complexity and be ready to assume the risk of a possible failure.

Results of the innovative process depend not only on product or process obtained, but also of its efficient management. Also, companies should cultivate a pro-innovation attitude inside also in their relations with the outside world and to stimulate employees and collaborators by offering various incentives and create a favorable environment for shaping innovative ideas which on longer or shorter term could bring financial and / or competition benefits. Information and communication technologies now offer a favorable environment for accumulation of information and dissemination of creative ideas and innovation globally.

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