Technological Innovation, R&D Activities and Innovation System between Organizations

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ABSTRACT

This theoretical paper aimed to explicit, through the rescue of theoretical assumptions, the innovation, the innovation system, and the research and development (R&D) activities. The innovation, especially technological innovation, is now seen as essential in differentiation strategies, competitiveness and growth in a greater number of businesses. Innovation is not only the result of financial investments by companies. For it to exist, it is necessary the existence of innovative capacity that should be present at all stages of the innovation process, and a favorable institutional environment and, increasingly, of specific incentive policies. That is, there are internal and external factors to companies and other institutions involved in the process. Innovation systems were discovered to resolve the variations in the degree of competitiveness of different economies and, above all, in relation to the technological performance and the ability to innovate these economies face the growing importance of international markets for high-tech products. Thus, it was found that successful innovators are not successful just because of their personal qualities and actions but as a result of their interaction with research and innovation systems that inhabit the quality of such systems.

Keywords: Innovation, Research and Development, Innovation System

1. INTRODUCTION

One of the dimensions in which the word innovation appears more often has related to the production of new products or processes. This dimension relates to scientific and technological developments, which is why we use the term Science, Technology and Innovation (STI) to describe the main elements that characterize the dynamic process that is deeply affecting the economy, society and the environment [1].

In this sense, innovation, especially technological innovation, is now seeing as essential in differentiation strategies, competitiveness and growth in a growing number of businesses. According to [2], by definition, innovation usually involves research in unfamiliar areas and requires significant time and effort. Furthermore, the result of innovation is typically uncertain and may take a long time to materialize.

Thus, companies spend significant amounts on R&D and do not necessarily achieve the expected new products, processes or services. Previous research confirms that relationships with others can be a valuable tool of innovation, with knowledge links affording firms easier access to new ideas [2;3].

The adoption of strategies and technological innovation practices in companies is closely linked to the pursuit of differentiation in producing goods and services that generate sustainable competitive advantages. The process of technological innovation is seen as an integral part of the economic development of any country, in general, companies in developed countries form partnerships to increase your productivity and rely on a network of collaborations with different actors involved in the process (Universities, Research Centers, governments and Industries) [4].

According [5] innovative companies that build their research results together with universities and other research collaborators, understand that scientific knowledge can bring improvements to the company's needs.

Collaborations between universities and industry are important mechanisms to develop and commercialize the fruits of university research. These collaborations are also see as contributing to technological progress and economic welfare, [6].

Thus, it is intended that address theoretical article on technological innovation, the innovation system, the relationship university-industry, and the research and development activities between the different actors. In addition, we hope to be contributing to identify these partnerships will cause companies to have a more positive perception of scientific knowledge. Since, in

this study we show how collaboration can be defined and how cooperation in product or product innovation affects the innovators.

2. THEORETICAL CONCEPTS

Technological Innovation

According [7], from the late 60s that through several empirical studies there was a breakthrough of understanding on the meaning of "innovation". Prior to this date, innovation was seen as occurring in successive and independent stages of basic research, applied research, development, production and dissemination (linear vision of innovation). In the following decades, there were a review of this qualification: widens the understanding of this concept. The innovation came to be seeing not as an isolated act, but as a learning process non-linear, cumulative, specific to the locality and shaped institutionally.

It was in the early 80s it was recognized that decisions and technological strategies are dependent on much broader factors - such as those related to the financial, education and work organization systems (already signaling a definition of "national innovation system") [7].

The origin of the concept of innovation can be credited to the work of economist Joseph Schumpeter (1883-1950) [8] - showing that innovation is "to produce other things, that the same things in another way, combining forces differently materials and, finally, make new combinations". Throughout his intellectual production, the author was progressively more sophisticated analysis of their innovation sources. In Theory of Economic Development, built in 1911 by the author emphasized the role of innovative entrepreneur in the development process [1].

According to [1] the dynamics of the innovation process makes the success of capitalist enterprise stimulates the action of competitors also innovative or even imitators, leading the innovative entrepreneur to always search innovation and to fear competition even when alone in the market.

University-industry collaboration

According to [9], academic researchers believe that the value of university-industry collaboration has increased and has also increased the number of obstacles and limits the formation of this collaboration. Examples of obstacles can cite the results of objective, cultures, procedures, permissions, value systems, and encouragement, communication and collaboration differences. Academic researchers consider this collaboration an increase of income as a priority and secondly the evaluation of the good things, the transfer of technology as being turned to the audience. Therefore, the development of academic capital and increasing collaboration can gather a contradiction opportunities and obstacles.

According to [10], university-industry collaboration is confronted face to face with major difficulties. While universities are betting primarily on creating new information, private enterprises focus on ensuring the advantage of rivalry and[6]get valuable information on the recycling of investment.

To [11], the types of obstacles to be succeed in university-industry collaboration can be summarized from the perspectives of industry and academic perspective.

- Industry Perspective - The industry is not willing to provide a financial contribution to an education program. There is sensitivity about the need for an education program and a serious contribution would be provided by the university. Interrogating the education program that was formed by universities, the industry is inclined to think that all may know much more than academic solutions.
- Academic Perspective - Educators have sensitivity industry time constraints and development specialist productive force. The university may not be aware of the real problems the industry is facing. The possibilities may not be sufficient to ensure the needs of the industry.

The interaction model proposed by [12] is based on a triangle where the government exercises indirect relationship between the demand and supply of knowledge possible. The system accepts negotiation, since they have to pay a number of taxes that are transfer by the government to academia. The latter, in turn, manages the science system by providing incentives for the generation and eventual dissemination of knowledge through lectures for other creative scientists to measure the creativity of scientists through its publications.

Research and Development (R&D)

According to [13], the most important in innovation studies is the analysis of the factors that lead companies to invest in R&D activities; these activities foster technological progress, and are primary sources of economic growth and welfare. There are two most factors discussed in the literature on R&D. According to [14] are the so-called "hypothesis of Schumpeter"[1]; 1) one that focuses on the effects of size and market power over spending in R&D; 2) and the other factors include the most fundamental determinants of R&D activities, such as pressure of demand, technological opportunity and appropriability.

However, R&D are two different activities that differ in purpose, knowledge bases, people involved and management styles [15]. As explained [16], innovation should understand as the result of a mix of internal and external ingredients, and you should not see it as an isolated act but within a larger context with the participation of a plurality of actors. Under the context of R & D, the activity of "search" can be understand as an instrument or tool for the discovery of new basic or applied knowledge; and activity "Development" deals with the application of this new knowledge to obtain practical results [17].

Note that this classification does not preclude situations where basic research generates results "applicable" considering that often the boundary between basic and applied the definition is difficult. [18] argues that the structure of internal R&D is closely relate to technological skills of a company. [19] emphasizes the importance of links between internal and external environments of a company,

emphasizing access to scientific and technological knowledge.

The scientific field of research activity is the management of innovation and knowledge and technology transfer. Its central theme is the relationship between companies and innovators that make technology transfer of its activities. Therefore, it is important to characterize a proper analysis tool for studying these agents, as disseminators of knowledge, and look for ways to maximize their performance while trying to take care of the needs of enterprises and enhance their intellectual property through technology transfer [20].

A tool that shows critical facilitators in an organization of R&D and allows interventions to improve performance should be comprehensive and should be built upon previous studies of technology transfer. Globally, there are many research papers addressing issues of technology transfer relationships as driven by the Triple Helix [21; 22]. However, not everything could be applied to various scenarios and regions due to specific social, economic and cultural.

Previous research confirms that relations with other actors can be a valuable tool for innovation, with knowledge of links providing businesses easier access to new ideas [3].

The innovation system

According to [23], an innovation system is a set of distinct institutions that contribute collectively and individually for the development and diffusion of new technologies and provides the framework within which governments form and implement policies to influence the innovation process. As such, it is a system of interconnected institutions to create, store and transfer the knowledge, skills and artifacts that we define new technologies [24].

According [25] the probability of scientific, technological and industrial innovation depends on the setting of national, regional and sectoral innovation systems. [26] show that the current orthodoxy is that the economic well-being is based on research systems and national innovation that work well, in which not only the actors but also the links between them to perform well. Innovation and learning should see more as collective activities or network. This type of joint activities have been strongly reflected in the policies of innovation funders internationally, financing increasingly innovative networks, often comprising a mixture of companies and institutions in the infrastructure of knowledge [27].

Interventions to improve the knowledge and capabilities can change the trajectory of the innovation system and therefore their performance. Learning means that there is path dependence: what you can do tomorrow depends on what knowledge and resources you have today and what you can do to adapt them. Thus, the financing of R & D at international level is increasingly focusing on improving the capabilities of the participants, than simply help companies or funding science [28].

It was observed that the different cultures of innovation - national, regional [29] or sectoral [30], with each of these reflecting its own historical origins, institutions (scientific, government and political and administrative) and inter-institutional networks - critically influence the ability of economic actors and policy makers to produce and support, respectively, the successful innovation.

3. CONSIDERATIONS

We highlighted the classification of innovations according to their degree of coverage. That was defining that the innovations are new to the company, to market and to the world, thus it is considered that the institutional and regional dimension is crucial the process of productive and innovative capacity. And to better understand the dynamics of a given system (and give suggestions on how to promote it) it appears necessary not only to know in depth their specific features, but also their weight and role within the industries in to insert, as well as regional and international economies. This article shows that cooperation between various actors facilitates innovation in a company. Thus, it was found that successful innovators are not successful just because of their personal qualities and actions but as a result of their interaction with research and innovation systems that inhabit the quality of such systems.

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