

Cooperation for technological development: an analysis in the context of Federal Universities of Minas Gerais State

Humberto Rodrigues Marques*, Marcelo de Oliveira Garcia, Déborah Lima Scalioni, Paulo Henrique de Souza Bermejo

Universidade Federal de Lavras (UFLA), Lavras, MG, Brazil

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Abstract

The open innovation concept emerges as a substantial factor to innovation management of organizations. Given the importance of universities to the innovation system, they also have adapted to this new paradigm. The objective was to identify the main partners of federal universities of Minas Gerais state - Brazil about the technological development. Characterized as qualitative and descriptive, the research was based on secondary data collected in the INPI patent database through the CNPJ of the 11 federal universities. Thus, it was evidenced that the interactions carried out by federal universities analyzed are an important way of corroborating for technological development.

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Introduction

The definition of open innovation is different from the concept of closed innovation, mainly with respect to the way in which companies capture ideas for the development of organizational innovations. The open innovation concept, originally defined by Chesbrough (2003), is a recent topic and still not well defined which according to its creator represents the use of internal and external ideas in innovation processes by companies.

In this sense, among several external agents to enable companies to strengthen partnerships for the development of innovation, the universities stand out as an essential actor in relation with many industries (Chesbrough & Vanhaverbeke, 2011; Oliveira & Alves, 2014; Venturini, Verbano, & Bron, 2013). Thereby, in addition to transmitting knowledge through teaching, universities gain a more enterprising character through the production and dissemination of new technologies as point

theme researchers (Fujino, Stal, & Plonski, 1999; Kalar & Antoncic, 2015; Marques, Garcia, Pereira, & Gava, 2014).

Although researches on open innovation have gained a lot of attention in academic researchers in recent years, there are still some unexplored areas that should have more prominence in future research. The studies in open innovation in higher education institutions are still incipient, since most of the researches focus on information technology industries. Thus, some authors emphasize the need to approach the open innovation theme in universities, as well as the interactions of these with others transmitters of knowledge agents (Chesbrough & Bogers, 2014; Janeiro, Proença, & da Conceição Gonçalves, 2013; Segarra-Blasco & Arauzo-Carod, 2008; Villasalero, 2014).

Understanding the cooperative interaction of universities to the promotion of innovation is important, since it is through these relationships that, mostly through a network, favor those universities and other entities are able to interact with the technological development (Hurtado, Correa, & Cardona, 2013; Janeiro et al., 2013). However, there are few studies exploring the important relationship between open innovation and the entities of a national system of innovation such as universities, since the literature on open innovation has largely focused on firm-centered analyses (Wang, Vanhaverbeke, & Roijakkers, 2012).

* Corresponding author.

E-mail: hbetorm@hotmail.com (H.R. Marques).

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Therefore, there is the need to develop new researches in which universities are analyzed as unities of analysis, since in most studies about the subject, higher education institutions are addressed only as external sources of knowledge, but little is explored as main actors in this process. Considering the above, we ask in this study: what are the main actors that federal universities of Minas Gerais state interact to technological development, as a way of obtaining knowledge exchange for the promotion of innovation and consecutively patenting?

The goal is to analyze the cooperation of the federal universities of Minas Gerais state on the technological development, seeking to identify the main actors that these universities relate, in the external search of knowledge for technologies development and protection. This research is necessary, as in the Brazilian context universities are highlighted in the promotion and propagation of new technologies on businesses. This is because Brazilian companies are in vast majority of micro and small size, which prevents the production and dissemination of new technologies by them, because they lack the necessary infrastructure for such activity. Thus, analyzing the dynamics of open innovation in higher education institutions is essential to understand and strengthen the actions of the Brazilian public universities, supporting the development of the country.

Still, it is found that Brazil is ranked 15th in the amount of world scientific production (PPG, 2012), being the universities responsible for this acknowledgment, so that, as the Higher Education Institutions (HEIs) have potential in the production of global basic research and, from this, the applied research can be boosted, and universities stand out in the Brazilian technological production. As demonstrated by Thomson Reuters (2013), among the top ten patent holders in Brazil in the years 2013 and 2012, five are public universities, and besides that 27% of all patents registered in the country belong to these types of organizations.

Public universities of Minas Gerais state are the units of analysis of this study since the state has been institutionalized in the country's innovation process. Among the efforts, the creation of the Intellectual Property Network (IPN) of Minas Gerais state is verified, which constitutes of a non-profit organization with the mission to spread and implement the policy of Intellectual, Transfer and Innovation Property in the State, having as one of its objectives the promotion of cooperation of its members with other institutions of the country and abroad. The state also has the Foundation of Research Support of the Minas Gerais State – FAPEMIG – agency of induction and fostering to research and scientific and technological innovation of the State, which among the way it operates tries to promote integration between agents of innovation of the state. In addition, the state has the Federal University of Minas Gerais (UFMG), the Federal University of Viçosa (UFV) and FAPEMIG among the major patent depositors in Brazil (Mendes, Gullo, & Guerrante, 2011).

Therefore, in addition to this introduction, this paper is structured in other six sections. The next section presents the theoretical aspects of open innovation and the context of universities across the innovation processes. Moreover, in the following section the methodological procedures are presented that are used to meet the objectives of the study. In the fourth and fifth section

the results and the discussion are presented, respectively, involving the cooperation performed by universities in the generation of patents. Finally, in the last two sections the final remarks and the references are presented that are used to develop the study.

Theoretical framework

The theoretical basis used for the development of this study is presented below. Initially this study discusses about open innovation, a new paradigm for the management of innovation in today's organizations. Then, it discusses about universities across the innovation process, presenting their features and processes to innovate from their academic researches.

Open innovation

Open innovation considers external knowledge and technologies to the organization as part of the innovation process, i.e., the boundaries of knowledge between organizations and the external environment become permeable (Ghisetti, Marzucchi, & Montesor, 2015). In this sense, the open innovation paradigm usually meets the traditional model of closed innovation, focused on vertical integration in which the research and development activities are developed and disseminated by organizations without cooperation with third parties (West & Gallagher, 2006).

The open innovation model was presented in the book "Open Innovation: The New Imperative for Creating and Profiting from Technology" by Henry Chesbrough, which was published in 2003, where, according to the author, the idea of opening is that an organization cannot innovate in isolation since it depends on many partners to acquire ideas and features. Thus, Chesbrough (2003, p. 43) states "Open Innovation means that valuable ideas can come from inside or outside the company and can go to market from inside or outside the company as well".

Henry Chesbrough studies contributed to the deepening of the thematic by approaching a variety of topics, ranging from the direction of knowledge flows (inward or outward), to the forms of openness (alliances, joint ventures, networks, etc.), the parties involved (suppliers, users, competitors, communities), or the impact of openness on innovation performance (Gambardella & Panico, 2014).

According to Wang et al. (2012), open innovation practices are positively affected by different elements, as a continuous supply of outside knowledge; highly-educated personnel; financial resources; effective legal systems; institutions protecting intellectual property rights. In this sense, Almirall, Lee and Majchrzak (2014) emphasize that open innovation is likely to succeed only when the needs of the entire ecosystem of sources and supporters are organized in ways that foster both competition and collaboration.

The work of Ghisetti et al. (2015) highlights that the way an organization seeks the external knowledge to innovate represents the first pillar in the open innovation mode. In this direction, Huggins et al. (2010) state that the proximity to key knowledge sources is regarded as a key reason for the greater competitiveness of some of the most successful cities and regions in the world. For these authors, the development of advanced regional

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